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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 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.
- 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 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:**

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**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 feedback 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. : 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 it 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.
      - (a) 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.
      - (b) Part-A will be short answer type with multiple parts covering all the units in the syllabus, which will be compulsory.
      - (c) 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.
      - (d) 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.
      - (e) Laboratory Courses:
        - (a) 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.
        - (b) The student will be given randomly an experiment to perform from within the list of experiments in the course.
        - (c) 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 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 Gneuvance 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
  (a) He is disqualified for using malpractice in the examination;
  (b) A mistake is found in his result;
  (c) He is found ineligible to appear in the examination

AWARD OF DIVISIONS
- The overall performance of a student will be indicated by two indices:
  (i) TGPA which is the Term Grade Point Average
  (ii) CGPA which is the Cumulative Grade Point Average

TGPA for a Term is computed as follows:
\[ TGPA = \frac{\sum C_i G_i}{\sum C_i} \]
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:
\[ CGPA = \frac{\sum C_i G_i}{\sum C_i} \]
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:
(i) Grades in all core courses,
(ii) 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:
  (i) 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.
  (ii) There shall be a minimum earned credit requirement on all Departmental Core Courses, Elective courses and Major Project as specified by BOS.
  (iii) There shall be a maximum duration for complying to the degree requirement.
  (iv) 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:

<table>
<thead>
<tr>
<th>DIVISION</th>
<th>CONDITIONS TO BE FULFILLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Division with Honours</td>
<td>CGPA \geq 8.5</td>
</tr>
<tr>
<td>First Division with Distinction</td>
<td>No ‘FF’, N or W grade in any course during the programme and total 195 credits</td>
</tr>
<tr>
<td>First Division</td>
<td>CGPA \geq 8.5</td>
</tr>
<tr>
<td>Second Division</td>
<td>CGPA \geq 6.75</td>
</tr>
</tbody>
</table>

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:
  (a) University Requirements:
      (i) Minimum Earned Credit Requirement for Degree is 190 for regular programme. However, the credits required for consideration for honours degree will be 195.
      (ii) Satisfactory completion of all Mandatory Learning Courses.
  (b) Programme Requirements:
      Minimum Earned Credit Requirements on all Core Courses, Elective Courses and Major Project/Internship as specified by the BOS.
      (c) The CGPA at the end of programme is atleast 5.0.
      (d) 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:
  (1) If a student fails to earn the minimum credits specified below:

<table>
<thead>
<tr>
<th>CHECK POINT</th>
<th>CREDIT THRESHOLD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of FIRST year</td>
<td>20*</td>
</tr>
<tr>
<td>End of SECOND year</td>
<td>50*</td>
</tr>
<tr>
<td>End of THIRD year</td>
<td>85</td>
</tr>
<tr>
<td>End of FOURTH year</td>
<td>125</td>
</tr>
</tbody>
</table>
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 then 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 Information Technology

DEGREE OBJECTIVE

To provide dynamic and quality education to the students in the field of Information Technology, making them fit to analyze and mould themselves according to the industry needs from time to time, through limited specialization in the areas of Software Development, Research & Development, Advanced Computing and IT Services & Management.

The students will have in-depth knowledge of the technological developments covering concepts, tools and techniques in various spheres of handling information and ultimately, develop sufficient skills in the areas of information technology, especially, in IT Services & Management, Data Mining and Software Development.
### COURSE CATEGORY

**General (Humanities, Soc Sc. Man) (GEN.)**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
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<td>Economics</td>
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<tr>
<td>BA-226</td>
<td>Principles of Management</td>
<td>5-1-0</td>
<td>4</td>
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<tr>
<td>CE-101</td>
<td>Environmental Science &amp; Ecology</td>
<td>5-0-0</td>
<td>3</td>
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<tr>
<td>EN-101</td>
<td>Communication Skills</td>
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<tr>
<td>EN-151</td>
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**Basic Science & Mathematics including Computer (BSM)**

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<td>CS-101</td>
<td>Computer Programming</td>
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<td>MA-101</td>
<td>Applied Mathematics-I</td>
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<td>MA-102</td>
<td>Applied Mathematics-II</td>
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<td>Applied Mathematics – III</td>
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<td>MA-202</td>
<td>Applied Numerical Methods</td>
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<td>PH-102</td>
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**Engineering Science & Technical Arts (ESTA)**

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<td>EL-101</td>
<td>Electrical Engineering</td>
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<td>ME-152</td>
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<td>ME-153</td>
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**Department Core (DC)**

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<td>CS-201</td>
<td>Data Structures &amp; Algorithms</td>
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<td>IT-201</td>
<td>Object Oriented Programming using C++</td>
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<td>CS-203</td>
<td>Discrete Structures</td>
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<td>CS-204</td>
<td>Computer Organization &amp; Architecture</td>
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<td>IT-203</td>
<td>Internet Fundamentals</td>
<td>5-1-0</td>
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<tr>
<td>IT-251</td>
<td>Object Oriented Programming Lab</td>
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<td>IT-253</td>
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<td>CS-254</td>
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<td>CS-301</td>
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<td>CS-302</td>
<td>Operating Systems</td>
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**Department Elective (DE)**

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<td>CS-431</td>
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<td>CS-432</td>
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<td>Computer Vision/Image Processing</td>
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<td>CS-434</td>
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<td>CS-435</td>
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<td>CS-442</td>
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<td>CS-444</td>
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<td>EC-305</td>
<td>Embedded Systems Design</td>
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<td>IT-422</td>
<td>Computer Software Testing</td>
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<td>IT-423</td>
<td>Introduction to E-commerce &amp; ERP</td>
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<td>IT-424</td>
<td>Mobile Computing</td>
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<td>IT-425</td>
<td>Object Oriented Software Engineering &amp; UML</td>
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**Open Elective (OE)**

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<td>BA-271</td>
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<td>BA-272</td>
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<tr>
<td>CE-471</td>
<td>Advanced Traffic Engineering</td>
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<td>CE-472</td>
<td>Elements of Town Planning and Architecture</td>
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**Project/Internship, Seminar Training, CSOP**

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**Additional/Bridge Course**

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## Scheme of Studies

### B. Tech. Degree Programme (Regular)

(Common to all Branches)

### 1st Year

#### TERM – I

##### THEORY

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##### PRACTICAL/DRAWING/DESIGN

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

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### FINAL EVALUATION IN GRADES

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

CW – Class Work

MTE – Mid-Term Exam

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.
Lingaya’s University, Faridabad

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

1st Year

TERM – II

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

GROUP

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FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits
CW - Class Work
MTE - Mid-Term Exam
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.
B.Tech. Information Technology (Regular)

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

1st Year

TERM – III

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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
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 Information Technology
### Scheme of Studies
#### B.Tech. Degree Programme (for 10+2), Full Time

### 2nd Year

#### TERM – IV

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**Total:** 20-2-6 (28) 17

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**Total:** 20-2-8 (30) 18

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**Total:** 20-4-6 (30) 18+1*

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**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.**
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</tr>
<tr>
<td>2</td>
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<td>Data Mining &amp; Data Warehousing</td>
<td>5-1-0</td>
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<tr>
<td>3</td>
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<td>Software Project Management</td>
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<td>Multimedia Technologies</td>
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<td>Data Mining &amp; Data Warehousing</td>
<td>0-0-2</td>
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<tr>
<td>6</td>
<td>IT-357</td>
<td>Multimedia Technologies Lab</td>
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<tr>
<td>7</td>
<td>PD-392/</td>
<td>Problem Solving Skills/Advanced Professional Development**/</td>
<td>0-0-2</td>
<td>1</td>
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<tr>
<td></td>
<td>PD-393/</td>
<td>Advanced Professional Development**/</td>
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<td></td>
<td>PD-357</td>
<td>Network Simulation Lab</td>
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<td></td>
<td>PD-391</td>
<td>Co-curricular Activities</td>
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</table>

Total: 20-2-6 (28)

**SUMMER TERM – INDUSTRY TRAINING/FIELD TRAINING/INTERNSHIP**

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-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 Information Technology**  
**Scheme of Studies**  
**B.Tech. Degree Programme (for 10+2), Full Time**  
*(PROJECT MODE)*

### 4th Year

#### TERM – X

<table>
<thead>
<tr>
<th>SN</th>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P</th>
<th>Cr.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>IT-401</td>
<td>System and Network Administration</td>
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</tr>
<tr>
<td>2</td>
<td>IT-402</td>
<td>Advanced Java</td>
<td>5-1-0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>IT-451</td>
<td>Dept. Elective – I</td>
<td>5-0-0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>IT-452</td>
<td>System and Network Administration Lab</td>
<td>0-0-2</td>
<td>1</td>
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<tr>
<td>5</td>
<td>IT-492</td>
<td>Advanced Java Lab</td>
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<td>IT-493</td>
<td>Project (including Seminar)</td>
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<td>Industrial Training/Field Training**</td>
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**Total Credits: 15-0-12 (27)**

#### TERM – XI

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<tbody>
<tr>
<td>1</td>
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<td>Open Elective</td>
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<td>IT-453</td>
<td>Department Lab</td>
<td>0-0-2</td>
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<tr>
<td>4</td>
<td>IT-481</td>
<td>Major Project Phase-I***</td>
<td>0-0-10</td>
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<td>5</td>
<td>IT-494</td>
<td>Seminar – I****</td>
<td>0-0-2</td>
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**Total Credits: 10-0-16 (26)**

#### TERM – XII

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<td>Artificial Intelligence</td>
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<td>Dept. Elective-III</td>
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<td>Major Project Phase-II</td>
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<td>Seminar – II*****</td>
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<td>PD-491</td>
<td>Co-curricular Activities</td>
<td>1*</td>
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</table>

**Total Credits: 15-0-10 (25)**

**FINAL EVALUATION IN GRADES**

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

* 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 Information Technology  
Scheme of Studies  
B.Tech. Degree Programme (for 10+2), Full Time  
(INTERNSHIP MODE)

4th Year

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Course No.</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>1</td>
<td>IT-401</td>
<td>System and Network Administration</td>
<td>5-1-0</td>
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<td>2</td>
<td>IT-402</td>
<td>Advanced Java</td>
<td>5-1-0</td>
<td>4</td>
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<td>3</td>
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<td>Dept. Elective – I</td>
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<td>IT-451</td>
<td>System and Network Administration Lab</td>
<td>0-0-2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>IT-452</td>
<td>Advanced Java Lab</td>
<td>0-0-2</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>IT-492</td>
<td>Project (including Seminar)</td>
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<td>2</td>
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<td>7</td>
<td>IT-483</td>
<td>Internship-I**</td>
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<td>8</td>
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<td>Software Engineering Lab</td>
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15-0-12 (27)

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<th>Cr</th>
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<tr>
<td>1</td>
<td>IT-494</td>
<td>Seminar - I (to be given in Term-XII)**</td>
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<td>Internship - II (in industry)</td>
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0-0-28 (28)

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<tbody>
<tr>
<td>1</td>
<td>CS-402</td>
<td>Artificial Intelligence</td>
<td>5-0-0</td>
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<tr>
<td>2</td>
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<td>PD-491</td>
<td>Co-curricular Activities</td>
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</table>

15-0-10 (25)

FINAL EVALUATION IN GRADES  
(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

* 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

## Stream 1: Software Development

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
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<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS-421 Compiler Design</td>
<td>5-0-0</td>
<td>3</td>
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<tr>
<td>2</td>
<td>CS-422 Cryptography and Data Compression</td>
<td>5-0-0</td>
<td>3</td>
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<tr>
<td>3</td>
<td>IT-422 Computer Software Testing</td>
<td>5-0-0</td>
<td>3</td>
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<tr>
<td>4</td>
<td>IT-423 Introduction to E-commerce &amp; ERP</td>
<td>5-0-0</td>
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<tr>
<td>5</td>
<td>IT-424 Mobile Computing</td>
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<td>6</td>
<td>IT-425 Object Oriented Software Engineering &amp; UML</td>
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## Stream 2: Research & Development

<table>
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<tr>
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<td>2</td>
<td>CS-433 Computer Vision/Image Processing</td>
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<td>CS-434 Expert Systems</td>
<td>5 0 0</td>
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<td>CS-436 Speech Recognition &amp; Generation</td>
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<td>5</td>
<td>CS-437 Soft Computing</td>
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<td>6</td>
<td>IT-431 Bioinformatics</td>
<td>5 0 0</td>
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<td>7</td>
<td>IT-445 Human Computer Interaction</td>
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## Stream 3: Advanced Computing

<table>
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<tr>
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<th>Credits</th>
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<tbody>
<tr>
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<td>CS-431 Advanced Computer Architecture</td>
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<td>2</td>
<td>CS-435 Robotics</td>
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<tr>
<td>3</td>
<td>CS-441 Advanced Database Management Systems</td>
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<td>4</td>
<td>CS-442 Digital Image Processing</td>
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<td>5</td>
<td>CS-444 Real-time Operating Systems</td>
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<td>6</td>
<td>EC-305 Embedded Systems Design</td>
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## Stream 4: IT Service Management

<table>
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<tr>
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<th>Credits</th>
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<td>CS-443 Distributed Computing</td>
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<tr>
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<td>IT-441 Network Security &amp; Management</td>
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<td>IT-442 Information Security</td>
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<td>IT-443 Information Storage &amp; Management</td>
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<td>IT-444 Pervasive Computing</td>
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</table>
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/programmes/exercises are to be performed in a term.
   b. It is expected that more experiments/programmes/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/programmes/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 Computer Science & Engineering and Information Technology constitute one group for the purpose of deciding core courses as these all are based on electrical sciences.
11. For the students admitted in 2009-10 the sequence of PD Courses is given in the table below:

<table>
<thead>
<tr>
<th>Professional Development (PD) – Gen.</th>
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<tr>
<td>PD-251 MATLAB</td>
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<td>PD-191 Co-curricular Activities</td>
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<td>PD-292 Effective Communication</td>
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<td>PD-393 Advanced Professional Development</td>
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<td>PD-391 Co-curricular Activities</td>
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<td>PD-192 Personality Skills</td>
<td>0-0-2 1</td>
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<tr>
<td>PD-193 Entrepreneurial &amp; Professional Skills</td>
<td>0-0-2 1</td>
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<td>PD-357 Network Simulation Lab</td>
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<td>PD-391 Co-curricular Activities</td>
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<tr>
<td>PD-392 Problem Solving Skills</td>
<td>0-0-2 1</td>
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<tr>
<td>PD-293 Intra &amp; Inter-personal Skills</td>
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<tr>
<td>PD-457 Software Engineering Lab</td>
<td>0-0-2 1</td>
</tr>
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<td>PD-491 Co-curricular Activities</td>
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</tr>
</tbody>
</table>

* 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**

**REFERENCE BOOKS**

### 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**

**REFERENCE BOOKS**

<table>
<thead>
<tr>
<th>CA-101</th>
<th>DATABASE MANAGEMENT SYSTEMS</th>
<th>L T P</th>
<th>Cr.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 1 0</td>
<td>4</td>
</tr>
</tbody>
</table>

**OBJECTIVE**
To provide knowledge about various organizations and management information systems, keeping in view the aspects of shareability, availability, evolvability and integrity.

**PRE-REQUISITES**
Knowledge of data structures, discrete mathematical structures

1. **INTRODUCTION:** Purpose of database system; characteristics of database approach; advantages of using DBMS; database concept and architecture; data abstraction; data models; instances and schema; data independence; schema architecture; database languages; database manager; database administrator; database users.

2. **DATA MODELING:** Entity sets attributes and keys, relationships (ER); database modeling using entity; type role and structural constraints, weak and strong entity types; enhanced entity-relationship (EER), ER diagram design of an E-R database schema; object modeling, specialization and generalization; modeling of union types.

3. **RELATIONAL MODEL:** Introduction to Hierarchical model and Network Model. Relational model: relational model - basic concepts, enforcing data integrity constraints, relational-algebra operations, extended relational algebra operations, relational calculus, assertion and triggers, introduction on views, Codd's rules.

4. **DATABASE DESIGN:** Database design process; relational database design, relation schema, anomalies in a database; functional dependencies membership and minimal covers normal forms, multi-valued dependencies, join dependencies, inclusion dependencies; reduction of an E-R schema to tables; converting EER diagrams to relations; practical database design tuning; effect of de-normalization on database performance.

5. **QUERY LANGUAGES:** Query-by-example (QBE); introduction to SQL, basic queries in SQL, advanced queries in SQL, functions in SQL; basic data retrieval, aggregation, categorization, updates in SQLs; views in SQL, different types of views, theoretical updatability of views.

6. **FILE ORGANIZATION:** Introduction, indexing and hashing, overview of file organization techniques; secondary storage devices, operations in files, heap files and sorted files; indexing and hashing.

**TEXT BOOK**

**REFERENCE BOOKS**

**LIST OF EXPERIMENTS**
Write programs to carry out:
1. Record operations:
   a) Create a table
   b) Add a record, delete a record, modify the record in the database
   c) Generate queries
   d) Generate the report; listing all the records of database in ascending order
   e) Create table from a given table
   f) Insert the data into the table interactively means by using & operator.
2. Menu driven project for management of database system
3. Delete data from the given table.
   - Delete data from the table based on the given condition.
   - Update the contents of the table
   - Modify the structure of the table.
   - Delete complete structure of the table
4. Create Keys: Table with Primary Key; Table with Foreign Key, Non Null and Unique Constraints;
Table with Check and Default Constraints; Insert data in the Tables created with constraints
5. Use of operators: Scaler Operators, Group Operators; Pattern matching operator
6. Locking and unlocking the table, using different modes like Exclusive and Share, etc.
7. Create View and see the relationship with table it has been created from, and finally, drop the view
8. Use command to save the already executed command
   • Change contents the most recently executed command.
   • Delete any line of the command.
   • Use Pseudo Columns in the Table.
   • Run the saved Command.
   • Edit using Word Processor and save the command or Program in the desired Drive
9. Create cursor, fetch data and show application of cursor
10. Create a function and use cursor in the function
11. Create Procedure.
12. Create Package and use Procedure and Function
13. Create a Trigger on a table
14. Perform various table operations: Delete the structure, use Delete command with conditions, Update records of the table with conditions, Alter structure of the table, Add a new column into the table, Change size of the existing column in the table, etc.
15. Create the view from the table, combine using equi-join, retrieve data with left join, outer join and self join

REFERENCE BOOKS

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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.
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
B.Tech. Information Technology (Regular)

REFERENCE BOOKS

CH-101
APPLIED CHEMISTRY

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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; electrodialysis.
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; ldone 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); chemiluminiscence; 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

REFERENCE BOOKS
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(), 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 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, fseek(), fwrite(); the preprocessor and comments – the preprocessor, conditional compilation directives, using defined, the # and ## preprocessor operators, predefined macro names, comments.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES

LIST OF EXPERIMENTS/EXERCISES
1. Basic/Simple logic building
2. Handling mathematical problems
3. Use of control structures
4. Use of Function
5. Handling mathematical data
6. Array and Pointer
7. Searching and Sorting
8. String Manipulation
9. Use of Structure and Union
10. File handling

REFERENCE BOOKS

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

CS-201 | DATA STRUCTURES & ALGORITHMS | L T P Cr
| | | | 5 1 0 4 |

OBJECTIVE
To relay the theoretical and practical fundamental knowledge of most commonly used algorithms.

PRE-REQUISITES
Knowledge of basic computer programming

1. INTRODUCTION TO DATA STRUCTURES:
   Definition of data structures and abstract data types; polymorphic data types; linear vs. non-linear data types; primitive vs. non-primitive data types; static and dynamic implementations; arrays, 2, 3 and multi-dimensional arrays; examples and real life applications.
2. RUNNING TIME: Time complexity; Big Oh notation; running times; best case, worst case, average case; factors depends on running time; introduction to recursion; divide and conquer algorithm; evaluating time complexity.
3. STACKS AND QUEUES: Stacks: definition, array based implementation of stacks, linked list based implementation of stacks; examples: infix, postfix, prefix representation; conversions, applications; definition of queues; array based implementation of queues.
4. LINKED LISTS: Lists; linked list implementation of stacks and queues; circular implementation of queues and singly linked lists; straight / circular implementation of doubly linked queues; priority queues; applications.
5. TREES: Definition of trees and binary trees; properties of binary trees and implementation; binary traversal pre-order, post-order, in-order traversal; binary search trees; implementations; threaded trees; balanced multi way search trees; AVL trees; implementations
6. GRAPHS: Definition of undirected and directed graphs and networks; array based implementation of graphs; adjacency matrix; path matrix implementation; linked list representation of graphs; shortest path algorithm, graph traversal: breadth first traversal, depth first traversal; hash tables, hash function; implementations and applications.
7. SORTING AND SEARCHING ALGORITHMS:
   Introduction, sorting by exchange, selection, insertions, bubble sort, straight selection sort, efficiency of above algorithms; shell sort, performance of shell sort, merge sort, merging of sorted arrays and algorithms; quick sort algorithm analysis, heap sort: heap construction, heap sort, bottom – up, top – down heap sort approach; searching algorithms: straight sequential search, binary search (recursive & non–recursive algorithms)

TEXT BOOK

REFERENCE BOOKS
Web References

CS-203 Discrete Structures

Objective
To lay mathematical foundation for the fundamentals of various computational structures such as Boolean algebra, propositional logic, graph and trees.

Pre-requisites
Knowledge of Data Structure

1. Set Theory: Introduction to set theory; set operations; algebra of sets: duality, finite and infinite sets, classes of sets, power sets, multi sets, Cartesian product, presentation of relations, types of relation, equivalence relations and partitions, partial ordering relations and lattices; function and its types, composition of function and relations; cardinality and inverse relations
2. Propositional Calculus: Basic operations: AND (Λ), OR (V), NOT (~), truth value of a compound statement, propositions, tautologies, contradictions
3. Techniques of Counting: Permutations with and without repetition, combination
4. Recursion and Recurrence Relation: Polynomials and their evaluation; sequences, introduction to AP, GP and AG series, partial fractions; linear recurrence relation with constant coefficients; homogeneous solutions, particular solutions, total solution of a recurrence relation using generating functions
5. Algebraic Structures: Definition and examples of a monoid, semigroup, groups and rings, homomorphism, isomorphism and automorphism; subgroups and normal subgroups; cyclic groups, integral domain and fields; co-sets; Lagrange’s theorem
6. Graphs: Introduction to graphs, directed and undirected graphs; homomorphic and isomorphic graphs; subgraphs; cut points and bridges; multigraph and weighted graph; paths and circuits, shortest path in weighted graphs; Eulerian path and circuits, Hamilton paths and circuits; planar graphs; Euler’s formula
7. Trees: Trees, spanning trees, binary trees and its traversals

Text Book

Reference Books

CS-204 Computer Organization & Architecture

Objective
To provide basic knowledge of internals of microprocessor, its architecture, components, terminologies, etc. at minute level and ultimately about the working of a digital computer hardware as a whole

Pre-requisites
Knowledge of data structures, microprocessors and interfacing

1. General System Architecture: Functions and block diagram of computer, store program control concept, Flynn’s classification of computers (SISD, MISD, MIMD); multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language; structured organization; CPU, caches, main memory, secondary memory units & I/O; performance metrics; MIPS, MFLOPS, GFLOPS and TFLOPS
2. Digital Logic: Computer registers, basics of logic design, accumulator logic, Boolean algebra and logic gates, combinational logic blocks (adders, multiplexers, encoders, de-coder), sequential logic blocks (lashes, flip-flops, registers, counters)
3. Instruction Set Architecture: Instruction codes, instruction set formats (fixed, variable, hybrid); types of instructions, memory reference, register reference, I/O reference; addressing modes: register, immediate, direct, indirect, indexed; operations in the instruction set; arithmetic and logical, data transfer, control flow; types of interrupts; timing and control; instruction set based classification of processors (RISC, CISC, and their comparison)
4. Basic Non pipelined CPU Architecture: CPU Architecture types (accumulator, register,
stack, memory/register) detailed data path of a typical register based CPU, fetch-decode-execute cycle (typically 3 to 5 stage); micro-instruction formats, implementation of control unit: hardwired and micro-programmed, control memory, microinstruction sequencing.

5. MEMORY HIERARCHY & I/O TECHNIQUES:
   Need for a memory hierarchy (Locality of Reference Principle, memory hierarchy in practice: cache, main memory and secondary memory, memory parameters: access cycle time, cost per bit); main memory (semiconductor RAM & ROM organization, memory expansion, static & dynamic memory types); cache memory: associative & direct mapped cache organizations.

6. INTRODUCTION TO PARALLELISM: Goals of parallelism (exploitation of concurrency, throughput enhancement); Amdahl’s law; instruction level parallelism (pipelining, super scaling-basic features); processor level parallelism (multiprocessor systems overview).

7. PROCESSOR ARCHITECTURE: Clock speed; processing power and buses of a microprocessor, components of microprocessor; I/O ports; 16-bit (80286) architecture, 32-bit (80486) architecture; super scalar architecture in Pentium processors; 64-bit (Pentium dual-core) architecture.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES

LIST OF EXPERIMENTS
1. Search an element in a two-dimensional array using linear search.
2. Using iteration and recursion concepts write programs for finding the element in the array using Binary Search Method.
3. Perform following operations on tables using functions only
   a) Addition   b) Subtraction c) Multiplication d) Transpose
4. Using iteration and recursion concepts write the programs for quick sort technique.
5. Implement the various operations on string such as length of string concatenation, reverse of a string and copy of a string to another.
7. Implement binary search tree. (Insertion and Deletion in Binary Search Tree)
8. Create a linked list & perform operations such as insert, delete, update, reverse in the link list.
9. Implementation of a file and performing operations such as insert, delete, update a record in the file.
10. Create a linked list and perform the following operations on it
    a) Add a node    b) Delete a node
11. Simulate the various searching and sorting algorithms and compare their timings for a list of 1000 elements.
12. Simulates the various tree traversal algorithms.
13. Simulate various graph traversing algorithms.

REFERENCE BOOKS

CS-254 COMPUTER ORGANIZATION & ARCHITECTURE LAB

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LIST OF EXPERIMENTS
1. Check and measure various supply voltages of PC.
3. Observe and study various cables, connections and parts used in computer communication.
4. Study various cards used in a system viz. display card, LAN card etc.
5. Remove, study and replace floppy disk drive.
6. Remove, study and replace hard disk.
7. Remove, study and replace CD ROM drive.
8. Study various monitors, its circuitry and various presents and some elementary fault detection.
9. Study printer assembly and elementary fault detection of DMP and laser printers.
10. Observe various cables and connectors used in networking.
11. Study parts of keyboard and mouse.
12. Assemble a PC
13. Troubleshooting exercises related to various components of computer like monitor, drives, memory and printers etc.

REFERENCE BOOKS

**TEXT BOOK**

**REFERENCE BOOKS**

**WEB REFERENCES**

**CS-301**

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5. PROCESS - SYNCHRONIZATION & DEADLOCKS: Critical section problems, mutual exclusion with busy waiting, semaphores; methods for handling deadlocks: deadlock prevention, avoidance and detection; deadlock recovery; Classical IPC problems: dining philosophers' problem, readers-writers problem.

6. I/O SYSTEMS: I/O hardware, device controllers, interrupt handlers, device drivers, application I/O interface, kernel, transforming I/O requests, performance issues.

7. LINUX/UNIX SYSTEM: LINUX/UNIX architecture; UNIX system calls for processes and file system management; basic commands of LINUX/UNIX; shell interpreter, shell scripts.

REFERENCE BOOKS

WEB REFERENCES

CS-303 COMPUTER GRAPHICS

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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.

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.

2. 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).

3. POLYGON CLIPPING ALGORITHM: Sutherland-Hodgeman polygon clipping algorithm, homogeneous coordinates system, two dimensional transformations: translations, scaling, rotation, reflection, shearing, transformation, composite transformation.

4. 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.

5. HIDDEN SURFACE REMOVAL: Introduction to hidden surface removal; the Z- buffer algorithm, scan-line algorithm, area sub-division algorithm.

6. REPRESENTING CURVES AND SURFACES: Parametric representation of curves: Bezier curves, B-Spline curves; parametric representation of surfaces; interpolation method.

7. ILLUMINATION, SHADING, IMAGE MANIPULATION: Illumination models, shading models for polygons, shadows, transparency; what is an image, filtering, image processing, geometric transformation of images.

REFERENCE BOOKS
WEB REFERENCES

LIST OF EXPERIMENTS
3. Study of Linux Operating System (Linux kernel, shell, basic commands like make, pipe and filter and Simple programs to display process group IDs: PID, PPID, GID), Internal/system commands for network and system monitoring in Linux.
4. Display "Linux Programming Lab" N times using library function calls and system calls
5. Programs using system calls that provides error checking
6. Programs using Processes.
7. Administration of Linux Operating System (connecting users, connectivity across LAN and WAN; Mounting and un-mounting of devices, taking backups, restoring data from backups
8. Writing of Shell Scripts
9. AWK programming
10. Study of MacOS features, Internal/system commands for network and system monitoring in MacOS
11. Study of differences between Windows 2003 Server, Linux and MacOS
12. Programs using Command Line Arguments.
13. Programs for Simple Shell and Complex Shell with cd command, editor command, etc.
14. Programs for Primitive Communications.
15. Programs using Pipes: Unnamed Pipes, Names Pipes
16. Programs using Message Queues.

REFERENCE BOOKS

LIST OF EXPERIMENTS
1. 2D line as raster graphics display using Bresenhem line drawing algorithm
2. 2D line drawing as raster graphics display using DDA line drawing algorithm
3. Circle drawing as raster graphics display using mid point circle drawing algorithm
4. Polygon filling as raster graphics display using Boundary fill algorithm and Flood fill algorithm
5. Line clipping
6. Polygon clipping
7. Display 3D object as 2D raster graphics display using perspective transformation
8. Rotation for 3D object about arbitrary axis
9. Hidden surface removal from a 3D object
10. 2D transformations of a given object (triangle, rectangle, pentagon) for translating, scaling, rotating, reflecting, shearing 11. Create a screen saver using inbuilt functions of graphics
12. Zoom an object
13. Reverse zooming
14. Create a Bezier Curve

REFERENCE BOOKS

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

PRE-REQUISITES
Knowledge of neural networks, data structures

1. 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.
2. KNOWLEDGE REPRESENTATION ISSUES: predicate logic; logic programming; constraint propagation; representing knowledge using rules.
3. 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.
4. 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
5. 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.
6. 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.

7. 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

REFERENCE BOOKS

WEB REFERENCES

CS-421 COMPILER DESIGN L T P Cr
5 0 0 3

OBJECTIVE
To lay adequate foundation for design and development of compiler and other system software tools such as linkers, debuggers, assemblers, etc.

PRE-REQUISITES
Knowledge of data structures, basic programming concepts, theory of computations and operating systems.

1. INTRODUCTION: Evolution of Components Systems Programming, Assemblers, Loaders, Linkers, Macros, Compilers, Software tools: Text editors, Interpreters, program generators, Testing software, Programming environment (such as Integrated Development Editors)

2. SYSTEM SOFTWARE SPECIFICS: Compiler: Brief overview of compilation process, Incremental compiler, structure of compiler: its different phases, Compiler construction tools. Assembler: Problem statement, single phase and two phase assembler, symbol table; Loader schemes, compile and go Loader, general loader schemes, absolute loader, Subroutine linkage, Reallocating loader, Direct linkage Loader, Binders, Linking loader, overlays

3. LEXICAL AND SYNTAX ANALYSIS: Role of lexical analyzer, design of lexical analyzer, regular expressions, Specification and recognition of tokens, input buffering, a language specifying lexical analyzer. Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer. Syntax Analysis: Role of parsers, context free grammars, definition of parsing

4. PARSING TECHNIQUE: Shift-reduce parsing, operator precedence parsing, top down parsing, predictive parsing. LR parsers, SLR, LALR and Canonical LR parser

5. SYNTAX DIRECTED TRANSLATIONS: Syntax directed definition, construction of syntax trees, syntax directed translation scheme, implementation of syntax directed translation, three address code, quadruples and triples

6. SYMBOL TABLE & ERROR DETECTION AND RECOVERY: Symbol tables, its contents and data structure for symbol tables; trees, arrays, linked lists, hash tables. Errors, lexical phase error, syntactic phase error, semantic error

7. CODE OPTIMIZATION AND CODE GENERATION: Code generation, forms of objects code, machine dependent code, optimization, register allocation for temporary and user defined variables

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
2. www.cse.iitd.ernet.in/~sak/courses/cdp/slides.pdf
3. www.holub.com/software/compiler_design.in.c.docs .pdf
4. en.wikipedia.org/wiki/Principles_of_Compiler_Desi gn
5. www.holub.com/software/compiler_design.in.c.html

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

REFERENCE BOOKS

WEB REFERENCES

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<th>CS-431</th>
<th>ADVANCED COMPUTER ARCHITECTURE</th>
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OBJECTIVE
To introduce various technological aspects about parallelism in super computing, microprocessors supporting such high scale computing, other hardware architectures, ultimately leading to high performance computing through grid computing.

PRE-REQUISITES
Knowledge of digital electronics, digital system design, computer networks and computer organization & architecture

1. PARALLEL COMPUTER MODELS: The state of computing, multiprocessors and multicomputers; multi-vector and SIMD computers; architectural development tracks.
2. PROGRAM AND NETWORK PROPERTIES: Conditions of parallelism; data and resource dependences; hardware and software parallelism; program partitioning and scheduling; grain size and latency; program flow mechanisms; control flow versus data flow, data flow architecture; demand driven mechanisms; comparisons of flow mechanisms
3. SYSTEMS INTERCONNECT ARCHITECTURES: Network properties and routing, static interconnection networks; dynamic interconnection networks; multiprocessor system interconnects; hierarchical bus systems; crossbar switch and multiport memory; multistage and combining network.
4. PROCESSORS AND MEMORY HIERARCHY: Advanced processor technology; instruction-set architectures; CISC scalar processors; RISC scalar processors; superscalar processors, VLIW architectures; vector and symbolic processors memory technology; hierarchical memory technology, inclusion, coherence and locality, memory capacity planning, virtual memory technology
5. BACKPLANE BUS SYSTEM: Backplane bus specification; addressing and timing protocols; arbitration transaction and interrupt; cache addressing models; direct mapping and associative caches.
6. PIPELINING: Linear pipeline processor; nonlinear pipeline processor; instruction pipeline design; mechanisms for instruction pipelining; dynamic instruction scheduling; branch handling techniques; arithmetic pipeline design; computer arithmetic principles; static arithmetic pipeline, multifunctional arithmetic pipelines.
7. VECTOR PROCESSING PRINCIPLES: Vector instruction types; vector-access memory schemes; synchronous parallel processing: SIMD architecture and programming principles; SIMD parallel algorithms; SIMD computers and performance enhancement

TEXT BOOK

REFERENCE BOOKS

Lingayas University, Faridabad
OBJECTIVE
To motivate understanding of issues related to natural language understanding, generation and translation, which ultimately linked to machine learning, computer vision and expert systems. This course provides an introduction to the field of computational linguistics, also called natural language processing (NLP) - the creation of computer programs that can understand and generate natural languages (such as English). Natural language understanding as a vehicle will be used to introduce the three major subfields of NLP: syntax (which concerns itself with determining the structure of an utterance), semantics (which concerns itself with determining the explicit truth-functional meaning of a single utterance), and pragmatics (which concerns itself with deriving the context-dependent meaning of an utterance when it is used in a specific discourse context). The course will introduce both knowledge-based and statistical approaches to NLP, illustrate the use of NLP techniques and tools in a variety of application areas, and provide insight into many open research problems.

PRE-REQUISITES
Knowledge of theory of computations

1. INTRODUCTION TO NATURAL LANGUAGE UNDERSTANDING: The study of language; applications of NLP; evaluating language understanding systems; different levels of language analysis; representations and understanding; organization of natural language understanding systems; linguistic background: an outline of English syntax.
2. GRAMMARS AND PARSING: Grammars and sentence structure; top-down and bottom-up parsers; transition network grammars; top-down chart parsing; feature systems and augmented grammars; basic feature system for English.
3. MORPHOLOGICAL ANALYSIS AND THE LEXICON: Brief review of regular expressions and automata; finite state transducers; parsing with features; augmented transition networks.
4. GRAMMARS FOR NATURAL LANGUAGE: Auxiliary verbs and verb phrases; movement phenomenon in language; handling questions in context-free grammars; hold mechanisms in ATNs.
5. HUMAN PREFERENCES IN PARsiNG: Encoding uncertainty; deterministic parser; word level morphology and computational phonology; basic text to speech; introduction to HMMs and speech recognition; parsing with CFGs; probabilistic parsing; representation of meaning.
6. AMBIGUITY RESOLUTION: Statistical methods; estimating probabilities; part-of-speech tagging; obtaining lexical probabilities; probabilistic context-free grammars; best first parsing.
7. SEMANTICS AND LOGICAL FORM: Word senses and ambiguity, encoding ambiguity in logical form, semantic analysis; lexical semantics; word sense; disambiguation; discourse understanding; natural language generation, Indian language case studies.

WEB REFERENCES
1. http://www.doc.ic.ac.uk/~phjk/AdvancedCompArchitecture/Lectures/
2. http://www.ecs.syr.edu/faculty/ercanli/cse661/

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CS-433
NATURAL LANGUAGE PROCESSING
L T P Cr
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OBJECTIVE
To introduce the student to computer vision algorithms, methods and concepts this will enable the student to implement computer vision systems with emphasis on applications and problem solving.

PRE-REQUISITES
Introduction to image processing

1. RECOGNITION METHODOLOGY: Conditioning; labeling; grouping; extracting, matching; edge detection; gradient based operators; morphological operators; spatial operators for edge detection; thinning, region growing, region shrinking; labeling of connected components.
2. BINARY MACHINE VISION: Thresholding; segmentation; connected component labeling; hierarchical segmentation; spatial clustering; split and merge; rule-based segmentation; motion-based segmentation.
3. AREA EXTRACTION: Concepts; data-structures; edge; line-linking; Hough transform; line fitting; curve fitting (least-square fitting); Region Analysis: Region properties, external points, spatial moments; mixed spatial; gray-level moments; boundary analysis: signature properties, shape numbers.
4. FACET MODEL RECOGNITION: Labelling lines; understanding line drawings; classification of shapes.
by labelling of edges; recognition of shapes; consisting labelling problem; back-tracking; perspective projective geometry; inverse perspective projection; photogrammetry – from 2D to 3D. Image matching: Intensity matching of 1D signals, matching of 2D image, Hierarchical image matching.

5. OBJECT MODELS AND MATCHING: 2D representation, Global vs. Local features. General Frame Works For Matching: Distance relational approach, Ordered structural matching, View class matching, Models database organization

6. GENERAL FRAME WORKS: Distance –relational approach, Ordered –Structural matching, View class matching, Models database organization.

7. KNOWLEDGE BASED VISION: Knowledge representation, Control-strategies, Information integration.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES

OBJECTIVE
To educate the students about theory behind Expert system and how they fit into the scope of computer science; that is the logic, probability, data structures, AI, and other topic that form the theory of expert system.

PREREQUISITES
Knowledge of Artificial Intelligence and PROLOG

1. INTRODUCTION TO EXPERT SYSTEM: Introduction; characteristics; development of expert system technology; applications and domains; languages, shells and tools; elements, production systems.
2. THE REPRESENTATION OF KNOWLEDGE: Introduction; the meaning of knowledge; productions; semantic nets, object-attribute-value triples; frames; logic and sets; propositional logic; the first order predicate logic; quantifiers
3. EXPERT SYSTEMS ARCHITECTURES: Introduction; rule based system architecture; non production system architectures; dealing with uncertainty; knowledge acquisition and validation; knowledge system building tools
4. METHOD OF INFERENCE: Introduction; trees, lattices and graphs; state and problem spaces; rules of inference; first order predicate logic; logic systems; resolution; resolution systems and deductions; forward and backward chaining
5. REASONING UNDER UNCERTAINTY: Introduction; uncertainty; types of error; errors and induction; probabilities; hypothetical reasoning and backward induction; temporal reasoning and markov chains; uncertainty in inference chain
6. INEXACT REASONING: Introduction; uncertainty and rules; certainty factors; Dempster–Shafer Theory; approximate reasoning; the state of uncertain
7. DESIGN OF EXPERT SYSTEM: Introduction; stages in the development of an expert system; errors in development stages; software engineering and expert system; the expert system life cycle; a detailed life cycle model.

TEXT BOOK

REFERENCE BOOKS

OBJECTIVE
The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, chose, and incorporate robots in engineering systems.

PRE-REQUISITES
Exposure to linear algebra and matrix operations, programming in a high level language

1. ROBOTIC MANIPULATION: Automation and robots; classification; application; specification; notations.
2. DIRECT KINEMATICS: Dot and cross products, co-ordinate frames; rotations; homogeneous; co-ordinates; link co-ordination arm equation, (five-axis robot, four axis robot, six axis robot).
3. INVERSE KINEMATICS: General properties of solutions tool configuration; five axis robots, three-four axis; six axis robot (inverse kinematics).
4. WORKSPACE ANALYSIS AND TRAJECTORY PLANNING WORK: envelop and examples, workspace fixtures; pick and place operations; continuous path motion; interpolated motion, straight-line motion
5. **ROBOT VISION**: Image representation, template matching; polyhedral objects; Shake analysis, segmentation (thresholding, region labelling, shrink operators, swell operators, Euler numbers, perspective transformation, structured illumination, camera calibration).
6. **TASK PLANNING**: Task level programming; uncertainty; configuration; space; gross motion; planning; grasp planning; fine-motion planning; simulation of planer motion; source and goal scenes; task planner simulation.
7. **MOMENTS OF INERTIA, PRINCIPLES OF NC AND CNC MACHINES.**

**TEXT BOOK**

**REFERENCE BOOKS**

**WEB REFERENCES**

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**OBJECTIVE**
Develop an understanding of the relationship of vocal tract shapes and physical acoustics to the acoustic speech signal. Use a spectrum analyzer to relate the acoustic speech signal to acoustical processes. Design and implement digital filters to synthesize speech and code speech at a low bit rate. Implement speech analysis and speech synthesis modules using object-oriented software programs, using techniques such as class derivation, the use of software objects as components in a larger software system.

**PRE-REQUISITES**
Knowledge of artificial intelligence, natural language processing, digital signal processing, neural networks

1. **FUNDAMENTALS OF SPEECH RECOGNITION**: Introduction, the paradigm for speech, recognition, out line, brief history of speech recognition research.
2. **SPEECH GENERATION**: Formant frequencies in speech, parametric source-filter synthesis, formant synthesizers, pitch detection, amplitude analyzer, vocabulary, text-to-speech conversion, vocoders
3. **THE SPEECH SIGNAL**: Production, reception, and acoustic-phonetic characterization: the speech production system, representing speech in time and frequency domains, speech sounds and features; approaches to automatic speech recognition by machine.
4. **SIGNAL PROCESSING AND ANALYSIS METHODS FOR SPEECH RECOGNITION**: The bank-of filters, front-end processor; linear predictive model for speech recognition; vector quantization; auditory based spectral analysis model.
5. **PATTERN COMPARISON TECHNIQUES**: Speech detection, distortion measures: mathematical considerations, distortion measures-perceptual considerations, spectral-distortion measures, incorporation of spectral dynamic features into distortion measures; time alignment and normalization.
6. **SPEECH RECOGNITION SYSTEM DESIGN AND IMPLEMENTATION ISSUES**: Application of source coding techniques to recognition, template training methods; performance analysis and recognition enhancements; template adoption to new talkers; discriminative methods in speech recognition; speech recognition in adverse environment.
7. **THEORY AND IMPLEMENTATION OF HIDDEN MARKOV MODELS**: Discrete time Markov processes; extensions to hidden Markov models; the three basic problems for HMMs; types of HMMs; implementation issues for HMMs; HMM system for isolated word recognition

**TEXT BOOK**

**REFERENCE BOOKS**

WEB REFERENCES

CS-437  SOFT COMPUTING  L T P  Cr
5 0 0 3

OBJECTIVE
To introduce about incorporating more mathematical approach (beyond conventional logic system) into the artificial intelligence approaches for problem solving such as fuzzy logic, genetic algorithms, etc.

PRE-REQUISITES
Knowledge of mathematics, statistics and probability

3. NEURAL NETWORKS: Different architectures; back-propagation algorithm; hybrid learning rule, supervised learning; perceptrons, adaline, back-propagation multilayer perceptrons, radial basis function networks; unsupervised learning: competitive learning network, Kohonen self-organizing networks, Hebbian learning, Hopfield network.
4. FUZZY SET THEORY: Basic definition and terminology; basic concepts of fuzzy logic; set theoretic operators; membership functions; formulation and parameterization; fuzzy union, intersection, and complement; fuzzy rules and fuzzy reasoning; fuzzy inference systems; Mamdani and Sugeno fuzzy models; fuzzy associative memories.
5. NEURO-FUZZY MODELLING: Adaptive neuro-fuzzy inference systems (ANFIS), neuro-fuzzy controller; feedback control, expert control, back propagation through time and real-time recurrent learning, reinforcement learning control; gradient-free optimisation.
6. NEURO-FUZZY CONTROLLER IN ENGINEERING APPLICATIONS: Fuzzy logic in control engineering; Mamdani and Sugeno architecture for fuzzy control; analytical issues in fuzzy logic control; applications: fuzzy logic in intelligent agents; fuzzy logic in mobile robot navigation, fuzzy logic in database systems, fuzzy logic in medical image segmentation

REFERENCE BOOK

WEB REFERENCES
1. en.wikipedia.org/wiki/Soft_computing
2. www.springer.com/engineering/journal/500
3. www.soft-computing.de
4. www.softcomputing.es
5. www-bisc.cs.berkeley.edu

CS-441  ADVANCED DATABASE MANAGEMENT SYSTEMS  L T P  Cr
5 0 0 3

OBJECTIVE
To bring out various issues related to advanced computing with respect to database management systems such as parallelism in implementation, data backup and recovery management, intelligent data mining techniques, standards, etc.

PRE-REQUISITES: Knowledge of database management systems

1. DATA MODELS: EER model and relationship to the OO model; object oriented data model and ODMG standard; other data models - NIAM, GOOD, ORM
2. **QUERY OPTIMISATION:** Query execution algorithms; heuristics in query execution; cost estimation in query execution; semantic query optimisation; database transactions and recovery procedures: transaction processing concepts, transaction and system concepts, desirable properties of a transaction, schedules and recoverability, serializability of schedules; transaction support in SQL; recovery techniques; database backup; concurrency control, locking techniques for concurrency control, concurrency control techniques; granularity of data items

3. **CLIENT/SERVER COMPUTING:** Client/Server concepts; 2-tier and 3-tier client/server systems; client/server architecture and the internet; client/database server models; technology components of client/server systems; application development in client/server systems

4. **DISTRIBUTED DATABASES:** Reliability and commit protocols; fragmentation and distribution; view integration; distributed database design; distributed algorithms for data management; heterogeneous and federated database systems

5. **DEDUCTIVE DATABASES:** Recursive queries; Prolog/Datalog notation; basic inference mechanism for logic programs; deductive database systems; deductive object oriented database systems

6. **DATA WAREHOUSING:** Basic concepts; data warehouse architecture; data characteristics; reconciled data layer data transformations; derived data layer user interface.

7. **COMMERCIAL AND RESEARCH PROTOTYPES:** Parallel database; multimedia database, mobile database; digital libraries; temporal database

**TEXT BOOK**

**REFERENCE BOOKS**

**WEB REFERENCES**
1. www.cse.iitb.ac.in/dbms
2. www.idt.com/products
3. www.developers.net/isearch?searchkeys=databases+management+system+tutorial
4. www.pdf-word.net
5. www.slideshare.net

**TEXT BOOK**

**REFERENCE BOOKS**

**OBJECTIVE**
To introduce the students about the basic concepts and analytical methods of processing digital signals, especially, the images and imaging part; to understand the properties of static and streaming images/video.

**PRE-REQUISITES**
Knowledge of data compression, discrete structures, digital signal processing, computer graphics.

**CS-442**
**DIGITAL IMAGE PROCESSING**

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**INTRODUCTION AND DIGITAL IMAGE FUNDAMENTALS:** Origins of digital image processing; examples of fields that use digital image processing; fundamentals steps in image processing; elements of digital image processing systems; image sampling and quantization; some basic relationships like neighbours; connectivity, distance measures between pixels; linear and non linear operations.

**IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN:** Some basic gray level transformations; histogram processing; enhancement using arithmetic and logic operations; basics of spatial filters, smoothing and sharpening spatial filters, combining spatial enhancement.

**IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN:** Introduction to Fourier transform and the frequency domain, smoothing and sharpening frequency domain filters; homomorphic filtering; image restoration: a model of the image degradation / restoration process, noise models, restoration in the presence of noise only spatial filtering, periodic noise reduction by frequency domain filtering; linear position-invariant degradations; estimation of degradation function; inverse filtering; Wiener filtering, constrained least square filtering, geometric mean filter; geometric transformations.

**IMAGE COMPRESSION:** Coding; inter-pixel and psycho visual redundancy; image compression models; elements of information theory; error free compression; lossy compression; image compression standards.

**IMAGE SEGMENTATION:** Detection of discontinuities; edge linking and boundary detection; thresholding; region oriented segmentation; motion based segmentation.

**REPRESENTATION AND DESCRIPTION:** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms.

**OBJECT RECOGNITION:** Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

WEB REFERENCES
1. en.wikipedia.org/wiki/Digital_image_processing
2. www.imageprocessingplace.com
3. www.icaen.uiowa.edu
5. www.eng.auburn.edu/~sjreeves/Classes/IP/IP.html

CS-443 DISTRIBUTED COMPUTING
L T P Cr
500 3

OBJECTIVE
This course will introduce the algorithms and technologies of distributed systems. It will teach both fundamentals as well as systems where these fundamentals are applied in practice.

PREREQUISITES
Knowledge of databases, networking, operating system and web technologies

1. DISTRIBUTED COMPUTING: History, forms of computing; strengths and weaknesses of distributed computing; OS basics; network basics; software engineering basics; CLIENT SERVER PARADIGM: issues, software engineering for a network service, connection oriented and connectionless servers, iterative server and concurrent server, stateful servers.
2. INTERPROCESS COMMUNICATION: Archetypical IPC program interface; event synchronization; timeouts and threading; deadlock and timeouts; data representation, data encoding; text based protocols, request response protocols; event and sequence diagram; connection vs. connectionless IPC.
3. DISTRIBUTED COMPUTING PARADIGMS AND SOCKET API: Paradigms; abstraction; socket metaphor; diagram socket API, stream mode socket API; sockets with non-blocking I/O; secure socket API
4. GROUP COMMUNICATION: Unicasting; multicasting, archetypical multicast API; connection oriented and connectionless; reliable, unreliable multicast; Java basic multicast API.
5. DISTRIBUTED OBJECTS: Message passing vs. distributed objects; archetypical distributed object architecture; distributed object systems; remote procedure calls; Java RMI architecture; API for Java RMI; Advanced RMI: Client callback, stub downloading, RMI security manager; allowing for stub downloading
6. SIMPLE OBJECT ACCESS PROTOCOL: SOAP request, SOAP response; Apache SOAP; invoking web service; implementing web service
7. ADVANCED DISTRIBUTED COMPUTING PARADIGMS: Message queue system paradigm; mobile agents; network service; object spaces

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES

CS-444 REAL-TIME OPERATING SYSTEMS
L T P Cr
500 3

OBJECTIVE
This course will first give an introduction into the basic concepts of real-time computing and then treat the two major issues real-time scheduling and real-time kernels. Real-time scheduling will concentrate on predictable scheduling algorithms and provide the scientific methodology required for the design of real-time systems. Real-time kernels will address the challenges and issues in the design and implementation of real-time operating systems.

PREREQUISITE
Knowledge of operating systems

1. INTRODUCTION: Concept of real time system; issues in real time computing; performance measures of real time system; hard and soft real time systems; real time application.
2. TASK ASSIGNMENT AND SCHEDULING: Different task model, scheduling hierarchy; offline vs online scheduling; clock drives; inter-task communicating and synchronization.
3. MODEL OF REAL TIME SYSTEM: Processor, resources; temporal parameter; periodic task model; sporadic task model; precedence constraints and data dependencies; scheduling hierarchy.
4. SCHEDULING OF PERIODIC TASK: Assumptions; fixed versus dynamic priority algorithms; schedulability test for fixed priority task with arbitrary deadlines.
5. SCHEDULING OF APERIODIC AND SPORADIC TASKS: Assumptions and approaches; deferrable; sporadic servers; slack stealing in deadline driven and fixed priority systems; two level scheme for integrated scheduling; Scheduling for applications having flexible constrains.
5. RESOURCES AND RESOURCE ACCESS
CONTROL: Assumptions on resources and their usage; resource contention; resource access control: priority ceiling protocol, priority inheritance protocol, slack based priority ceiling protocol, preemption ceiling protocol; real time memory management.

6. MULTI PROCESSOR SCHEDULING: Model of multi processor and distributed systems; scheduling algorithms for end to end periodic tasks in homogeneous/heterogeneous systems; predictability and validation of dynamic multiprocessor system.

7. REAL TIME COMMUNICATION: Model of real time communication; priority base service for switched network; weighted round robin service; medium access control protocol; real time protocol; real time applications; air traffic control system, space launching system, etc.

TEXT BOOKS

REFERENCES

EC-201 ELECTRONICS ENGINEERING

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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

1. HISTORICAL BACKGROUND: Vacuum tubes; working of vacuum tube and their characteristics; vacuum diode; triode; tetrode and pentode
2. 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.
3. 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.
4. BIPOLAR JUNCTION TRANSISTOR: Introduction; basic theory of operation of PNP ad NPN transistor-I characteristics; CB; CE and CC configuration; different biasing techniques.
5. 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
6. 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.
7. INTEGRATED CIRCUIT: Analysis of principle of integration. Introduction to Digital Integrated circuits; THRISTORS: 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

REFERENCE BOOKS
OBJECTIVE
To acquaint the students with the knowledge of different modes of communication techniques as well as equipments and standard guiding such communication.

1. COMMUNICATION SYSTEM COMPONENTS:
   Introduction to Communication: definition & means of communications; digital and analog signals: sign waves, square waves; properties of signals: amplitude, frequency, phase; theoretical basis for data communication: Fourier analysis: Fourier series and Fourier Transform (property, ESD, PSD and Raleigh) effect of limited bandwidth on digital signal.

2. DATA ENCODING SCHEMES:
   Physical connections: modulation, amplitude-, frequency-, phase- modulation; Data encoding: binary encoding (NRZ), Manchester encoding, differential Manchester encoding.

3. DATA TRANSMISSION:
   Transmission Media: Twisted pair-, co-axial-, fiber optic-cables, wireless media; transmission impairments: attenuation, limited bandwidth of the channels, delay distortion, noise, data rate of the channels (Nyquist theorem, Shannon limit)

4. DATA COMMUNICATION INTERFACES:
   Physical layer interfaces: RS 232, X.21; parallel interfaces: the telephone network: DDD network; private- line service; the telephone circuit; data modems: synchronous modems; asynchronous modems; modem synchronization

5. STANDARDS IN DATA COMMUNICATIONS:
   Communication modes: simplex, half duplex, full duplex; transmission modes: serial-, parallel-transmission; synchronizations: asynchronous-, synchronous-transmission; type of services: connection oriented-, connectionless-services; flow control: unrestricted simplex protocol, simplex stop- and -wait protocol, sliding window protocol.

6. SWITCHING SYSTEMS:

7. SECURITY IN DATA COMMUNICATIONS:
   Transmission errors: feedback-, forward-error control approaches; error detection; parity check, block sum check, frame check sequences; error correction: hamming codes, cyclic redundancy check. data encryption: secret key cryptography; data compression: run length encoding, Huffman encoding.

TEXT BOOK

REFERENCE BOOKS

LIST OF EXPERIMENTS
1. Study V-I characteristics of diode; and its use as a capacitance.
2. Study of the characteristics of transistor in Common Base configuration.
3. Study of the characteristics of transistor in Common Emitter configuration.
4. Study of V-I characteristics of a photo-voltaic cell.
5. Study of characteristics of MOSFET/JFET is CS configuration.
6. Plot characteristics of thyristor.
7. Plot characteristics of UJT.
8. Plot characteristics of diac and Triac.
9. Introduction to Orcad PSPICE Software.
10. Simulation of semiconductor device circuits using Orcad PSPICE.

REFERENCE BOOKS
B.Tech. Information Technology (Regular)

The objective is to teach embedded system design process which includes requirements, specification, architecture, components and system integration phases. The course will have real-life design examples to illustrate the design process and the students are encouraged to design embedded systems to gain experience.

PRE-REQUISITES
Knowledge of logic design, assembly language programming, computer organization and architecture, microprocessors and interfacing, operating systems

1. INTRODUCTION: Introduction, overview, design process; instruction set architecture; CISC and RISC instruction set; architecture; basic embedded processor/ microcontroller architecture; memory system architecture; I/O sub-system; co-processors and hardware accelerators; processor performance enhancement; 16 & 32 bit microprocessor and micro-controller and DSP hardware with reference to embedded system.

2. REAL TIME OPERATING SYSTEMS: Real time operating system overview; basic features of an operating system, kernel features; processes and threads, context switching; scheduling, inter-process communication; real-time memory management; I/O processes; exposure to Windows CE, QNX, micro kernels and μC/OS of introduction to process models; interrupt routines in an RTOs environment; encapsulating semaphores and queues; hard real-time scheduling considerations; saving memory space.

3. DESIGNING EMBEDDED COMPUTING PLATFORM: Using CPU bus, memory devices and their characteristics, I/O devices, component interfacing, memory interfacing; I/O device interfacing, interfacing protocols, designing with processors: system architecture, hardware design, FPGA based design; implementation: development environment, debugging techniques, design examples: data compressor, alarm clock.

4. PROGRAMMING EMBEDDED SYSTEMS: Program design, programming languages, use of high level languages, programming and run-time environment, basic compilation techniques, analysis and optimization of execution time, analysis and optimization of energy and power, analysis and optimization of program size, program validation and testing

5. NETWORK BASED EMBEDDED APPLICATIONS: Network fundamentals, layers and protocols, network architectures, distributed embedded architectures, elements of protocol design; high level protocol design languages, network based design, internet-enabled systems: protocols for industrial and control applications; internetworking protocols; wireless applications

6. EMBEDDED CONTROL APPLICATIONS: Introduction, open-loop and closed loop control systems; PID controllers, fuzzy logic controller; application examples: washing machine, automotive systems, auto-focusing digital camera, air-conditioner

7. EMBEDDED SYSTEM DEVELOPMENT: Design methodologies; architectural design; design examples: telephone PBX, PDA, set-top box, elevator control system, ATM system, fault-tolerance techniques, reliability evaluation techniques

TEXT BOOK
Simon David E., “An Embedded System Primer”, Addison-Wesley, 1999

REFERENCE BOOKS

WEB REFERENCES
1. http://www.technology.niagar.on.ca/courses/ctec

EC-307 WIRELESS COMMUNICATIONS L T P Cr
5 1 0 4

OBJECTIVE
This subject covers the entire concept behind the cellular technology. It covers the standards like GSM, CDMA and various design parameters for wireless system. Going through these topics will help the students to face telecom sector and software companies.

PRE-REQUISITES
Prior knowledge of Digital Communication, Probability, Basic Electromagnetic, Antenna and Wave Propagation and Computer Network

1. INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS: Evolution of mobile radio communications; examples of wireless communication systems, paging systems, cordless telephone systems; comparison of various wireless systems.
2. MODERN WIRELESS COMMUNICATION SYSTEMS: Second generation cellular networks; third generation wireless networks; wireless in local loop; wireless local area networks; blue tooth and personal area networks.
3. INTRODUCTION TO CELLULAR MOBILE SYSTEMS: Spectrum allocation, basic cellular systems; performance criteria; operation of cellular systems; analog cellular systems, digital cellular systems.

4. CELLULAR SYSTEM DESIGN FUNDAMENTALS: Frequency reuse; channel assignment strategies, handoff strategies; interference and system capacity; tracking and grade off service; improving coverage and capacity.

5. MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction to multiple access; FDMA, TDMA, spread spectrum multiple access, space division multiple access, packet ratio; capacity of a cellular systems.

6. WIRELESS NETWORKING: Difference between wireless and fixed telephone networks; development of wireless networks; fixed network transmission hierarchy; traffic routing in wireless networks; wireless data services; common channel signaling, ISDN (Integrated Services digital Networks), advanced intelligent networks.

7. INTELLIGENT CELL CONCEPT AND APPLICATION: Intelligent cell concept; applications of intelligent micro-cell systems; in-building communication; CDMA cellular radio networks.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
1. www.epanorama.net/links/tele_mobile.html
2. www.scss.tcd.ie/~htewari/mobility.html
3. www.populararticles.com/article4979.html
5. www.skydsp.com/publications/4thyrthesis/

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.


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

LIST OF EXPERIMENTS
1. To verify KCL and KVL.
2. To verify Thevenin’s and Norton’s Theorems.
B.Tech. Information Technology (Regular)

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.
12. Measurement of power in a 3 phase system by two wattmeter method.
13. Connection and testing of a single-phase energy meter (unit power factor load only).

Note: At least ten experiments are to be performed by the students.

REFERENCE BOOKS

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

TEXT BOOK

REFERENCE BOOKS

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

LIST OF EXPERIMENTS/EXERCISES
1. Word accent based on stress: Cluster of words will be repeated by the students on the basis of recorded voice.
   (a) 1st syllable stress
   (b) 2nd syllable stress
   (c) 3rd syllable stress
2. Sentence intonation: Simple day to day sentences will be repeated by the students
3. Public speeches and debates: Recorded debates and public speeches will be heard by the students to enhance their knowledge on the pitch and tone.
4. Conversation: Regular conversations will be heard and later practiced in the lab.
5. Listening comprehension: Students will hear the text and answer the questions that follow.
6. Reading comprehension: Text at par with international standard will be read by the students. Questions will than be answered.
7. 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
8. Error correction: Grammatically incorrect sentences will be given to the students to correct.
OBJECTIVE

Providing a sound conceptual understanding of the fundamental concepts of computing hardware, software, networking and services; build programming logic and thereby developing skills in problem solving using C++ programming language; 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. **INTRODUCTION TO C++**: C++ standard library, basics of a typical C++ environment; pre-processors directives; illustrative simple C++ programs; header files and namespaces, library files.

2. **OBJECT ORIENTED CONCEPTS**: Introduction to objects and object oriented programming; encapsulation (information hiding); access modifiers; controlling access to a class; method, or variable (public, protected, private, package); other modifiers; Polymorphism: overloading, inheritance, overriding methods, abstract classes, reusability, class behaviors.

3. **CLASSES AND DATA ABSTRACTION**: Introduction; structure definitions; accessing members of structures; class scope and accessing class members; separating interface from implementation; controlling access function and utility functions, initializing class objects; constructors, using default arguments with constructors; using destructors; classes : const(constant) object and const member functions, object as member of classes, friend function and friend classes; using this pointer, dynamic access to class objects; constructor, using default arguments with constructors; using destructors; classes : const(constant) object and const member functions, object as member of classes, friend function and friend classes; using this pointer, dynamic memory allocation with new and delete; static class members; container classes and integrators; proxy classes; function overloading.

4. **OPERATOR OVERLOADING**: Introduction; fundamentals of operator overloading; restrictions on operators overloading; operator functions as class members vs. as friend functions; overloading, << >> overloading unary operators; overloading binary operators.

5. **INHERITANCE, VIRTUAL FUNCTIONS AND POLYMORPHISM**: Introduction, inheritance: base classes and derived classes, protected members; casting base-class pointers to derived-class pointers; using member functions; overriding base-class members in a derived class; public, protected and private inheritance; using constructors and destructors in derived classes; implicit derived--class object to base-class object conversion; composition vs. inheritance; virtual functions; abstract base classes and concrete classes; polymorphism; new classes and dynamic binding; virtual destructors; polymorphism; dynamic binding.

6. **FILES AND I/O STREAMS**: Files and streams; creating a sequential access file; reading data from a sequential access file; updating sequential access files, random access files; creating a random access file; writing data randomly to a random access file; reading data sequentially from a random access file; stream input/output classes and objects; stream output; stream input; unformatted I/O (with read and write); stream manipulators; stream format states; stream error states.

7. **TEMPLATES & EXCEPTION HANDLING**: Function templates; overloaded template functions; class template; class templates and non-type parameters; templates and inheritance; templates and friends; templates and static members; basics of C++ exception handling: try, throw, catch, throwing an exception, catching an exception, re-throwing an exception, exception specifications, processing unexpected exceptions; stack unwinding; constructors, destructors and exception handling; exceptions and inheritance.

**TEXT BOOK**

**REFERENCE BOOKS**
4. Bhave, "Object Oriented Programming with C++", Pearson Education.

**OBJECTIVE**

To have a fundamental understanding of the design, performance and state of the art of wireless communication systems, Topics covered include state of the art wireless standards and research and thus changes substantially form one offering of this course to the next

**PRE-REQUISITES**
Knowledge of computers hardware and software

1. **OSI REFERENCE MODEL AND NETWORK ARCHITECTURE**: Introduction to computer networks, example networks: ARPANET, Internet, private networks; network topologies: bus-, star-, ring-, hybrid-, tree-, complete-, irregular –topology
2. **TYPES OF NETWORKS**: Local area networks, metropolitan area networks, wide area networks; layering architecture of networks, OSI model, Functions of each layer, services and protocols of each layer
3. **TCP/IP**: Introduction, history of TCP/IP; layers of TCP/IP; Protocols: Internet Protocol, Transmission
Control Protocol, User Datagram Protocol; IP Addressing, IP address classes, subnet addressing; Internet control protocols: ARP, RARP, ICMP; application layer, domain name system; Email – SMTP, POP, IMAP; FTP, NNTP, HTTP; Overview of IP version 6.

4. LOCAL AREA NETWORKS: Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs; LAN standards, IEEE 802 standards; Channel Access Methods: Aloha, CSMA, CSMA/CD, Token Passing, Ethernet; Layer 2 & 3 switching; fast Ethernet and gigabit Ethernet, token ring; LAN interconnecting devices: hubs, switches, bridges, routers, gateways.

5. WIDE AREA NETWORKS: Introduction of WANs, routing, congestion control, WAN Technologies; Distributed Queue Dual Bus (DQDB); Synchronous Digital Hierarchy (SDH) Synchronous Optical Network (SONET); Asynchronous Transfer Mode (ATM); frame relay, wireless links.


7. SOCKET PROGRAMMING: Introduction to socket, Client side and Server side programming, byte ordering, implementation of socket, Socket Interface.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES

OBJECTIVE
To understand the internet and email, the HTML 4.0 specification and the SEO

PRE-REQUISITES
Knowledge of basic operation of computers and net-surfing

1. THE INTERNET: Introduction to: networks and internet; history, working of Internet, Internet Congestion, internet culture, business culture on internet; collaborative computing and the internet; modes of connecting to Internet, Internet Service Providers(ISPs); Internet address, standard address, domain name, DNS, IP.v6; Modems and time continuum, communications software; internet tools.
2. ELECTRONIC MAIL: Introduction, advantages and disadvantages; User-ids, Pass words; email addresses, message components, message composition, mailer features, e-mail inner workings, e-mail management, Mime types; newsgroups, mailing lists, chat rooms.

4. HTML 4.0 SPECIFICATION: Introduction to HTML 4; conformance: requirements and recommendations; HTML document representation; basic HTML data types; The global structure of an HTML document; Language information and text direction; text; lists; tables; links; objects, images, and applets; style sheets; alignment, font styles and horizontal rules; frames - multi-view presentation of documents; forms - user-input forms: text fields, buttons, menus, and more; scripts - animated documents and smart forms; Introduction to XML, DTD and Schema, HTML 5.

5. SERVERS: Introduction to web servers: PWS, IIS, Apache; Microsoft Personal Web Server: Accessing and using the servers

6. PRIVACY AND SECURITY TOPICS: Introduction; secured http, TLS, SSL; Secure Web document; Digital Signatures and message digest; Firewalls

7. SEO TECHNIQUES: History; Webmasters and search engines; getting indexed; preventing indexing; white hat versus black hat; marketing strategy; International markets; legal precedents.

TEXT BOOK

REFERENCE BOOKS
WEB REFERENCES
1. www.secinf.com
2. www.hackers.com
3. http://www.w3.org

IT-251  OBJECT ORIENTED PROGRAMMING USING C++ LAB  L T P  Cr
          0 0 2  1

LIST OF EXPERIMENTS
1. Find the greatest among three numbers
2. Swap two numbers using call by value and call by reference.
3. Print the Fibonacci series and calculate factorial of a number.
4. print the numbers in ascending order using array.
5. Create a record for a student using Structure and class.
6. Find volume of cube, cylinder and cuboid using function overloading.
7. Calculate largest of two entered numbers using nested member function.
8. Count number of objects using static data members.
9. Calculate the interest using friend function.
10. Calculate the area using constructor and destructor.
11. Use static member function.
12. Find the eldest of two persons using this pointer.
13. Implement single inheritance, multiple level inheritance, hybrid inheritance.
15. Implement binary operator.
16. Implement overload + operator using friend function.
17. Implement virtual function and pure virtual function.
18. Implement function template and function template overloading.
19. Implement class template.
20. Create files with constructor and open function.
21. Perform input/output operations on characters.

REFERENCE BOOKS
4. Bhave, "Object Oriented Programming with C++", Pearson Education
5. Write a program to obtain the local and remote socket address and to obtain information about the (A) Host (B) Network (C) Protocols (D) Domains
6. Write a program to manipulate the IP Address
7. Building a small Ethernet LAN.
8. Write a program to make a Telnet Client and an FTP Client
9. Write a program to implement checksum method for proper data transmission
10. Write a program to implement RSA and SHA algorithm for security of a network
11. Types of Optical fibers and study of connectivity of optical modules
12. Study of (a) Wireless Connectivity and (b) Different networking commands
13. Study of Ethernet Switch configuration (Simulator to be decided)
15. To configure a Linux/Windows Server Box as an IP Router
16. Setting up and configuring an IP Router using (a) Distance Vector Routing Protocol, (b) Link State Routing Protocol, and (c) Border Gateway Protocol (BGP)
17. Analysis of Transport Layer Protocols using IP utilities like TCP Dump, etc.
18. Setting up of any one (a) Web Server and a ftp server or (b) DNS Server and a DHCP server

IT-252  COMPUTER NETWORKS LAB  L T P  Cr
          0 0 2  1

LIST OF EXPERIMENTS
1. Describe the stages of creating the email? How will send and receive the email?
2. Describe the chatting components on the internet?
3. Describe the use and function of following:
   a. Telnet
   b. TCP/IP
   c. HTTP
4. Create a webpage in HTML using notepad.
5. Create your login webpage for your college webpage or any company website.
6. Create a webpage with following constraints:
   a. An Image on the webpage
   b. Hyperlink to the college website
   c. A table of marks of IT Students
7. Show the blinking effects on webpage using java script.
8. Design the digital clock on your webpage using java script.
10. Design a website of your college.

IT-253  INTERNET FUNDAMENTAL LAB  L T P  Cr
          0 0 2  1

REFERENCE BOOKS
B.Tech. Information Technology (Regular)

REFERENCE BOOKS

IT-301 WEB DEVELOPMENT L T P Cr
5 0 0 3

OBJECTIVE
To impart knowledge of basic terms of Internet, various standards like HTML, XML etc., client side and server side programming.

PRE-REQUISITES
Knowledge of Web Designing and Computer Network

1. INTRODUCTION TO THE INTERNET, THE WORLD WIDE WEB: The idea of hypertext and hyper media; how the web works: HTTP, HTML and URLs; how the browser works: MIME types, plug-ins and helper applications; standards: HTML, XML, XHTML and the W3C; functionality of MacroMedia DreamWeaver.
2. HYPERTEXT MARKUP LANGUAGE: The anatomy of an HTML document; marking up for structure and style: basic page markup, absolute and relative links, ordered and unordered lists, embedding images and controlling appearance, table creation and use, frames, nesting and targeting; descriptive markup: meta tags for common tasks, semantic tags for aiding search, the doubling code and RDF.
3. SEPARATING STYLE FROM STRUCTURE WITH STYLE SHEETS: Internal style specifications within HTML; external linked style specification using CSS, page and site design considerations.
4. CLIENT SIDE PROGRAMMING: Introduction to JavaScript syntax; JavaScript object model, event handling; output in JavaScript; Forms handling; miscellaneous topics such as cookies, hidden fields and images; applications.
5. SERVER SIDE PROGRAMMING: Introduction to server side technologies: ASP/JSP, programming languages for server side scripting; configuring the server to support ASP/JSP; applications; input/output operations on the WWW; forms processing, (using VBScript/JavaScript)
6. OTHER DYNAMIC CONTENT TECHNOLOGIES: Introduction to ASP & JSP. Delivering multimedia over web pages; the VRML idea; the Java phenomenon: applets and servelets; issues and web development.
7. INTRODUCTION TO MICROSOFT .NET TECHNOLOGY AND ITS COMPARISON WITH THE COMPETING TECHNOLOGIES.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
1. http://www.web-source.net/

IT-302 OPEN SOURCE BASED RAPID APPLICATION DEVELOPMENT L T P Cr
5 1 0 4

OBJECTIVE
The course on RAD focuses on building applications within a very short time period. After successful completion of this course the students will be able to obtain a firm foundation on RAD concepts and methodologies and acquire sufficient working knowledge in RAD tools.

PRE-REQUISITES
Knowledge of programming in C, C++, JAVA

1. INTRODUCTION TO RAPID APPLICATION DEVELOPMENT: Definition, history; effect of mistakes on development schedule; importance; modern rapid life cycle model; modern RAD.
2. ISSUE IN RAPID APPLICATION DEVELOPMENT: Characteristics; strategy; constraints; advantages and disadvantages; customer oriented development; different RAD tools: open source versus licensed software builder; Easy Eclipse, Net Beans, Anjuta, Glade, Visual Studio .Net, etc.
3. RAPID APPLICATION DEVELOPMENT PROJECT ESTIMATION: Estimation processes; estimation refinement.
4. SCHEDULING A RAPID APPLICATION DEVELOPMENT PROJECT: overlay optimistic scheduling, schedule pressure: beating schedule pressure; invent option for mutual option.
5. TEAM WORK: Importance to RAD; effective team building; reason for failure; long term team building team structure.
6. RAPID APPLICATION DEVELOPMENT BEST PRACTICES: Daily build & smoke test; Agile methods, reuse; miniature milestones; throwaway prototyping; goal setting; managing out sourced projects; developing full Project using RAD.
7. APPLICATION DEVELOPMENT: Installing a FOSS based IDE; configuration; GUI building, integrating application with a database; XML; web based application development; debugging.
TEXT BOOK
McConnell Steve, "Rapid Development", WB Publishers and Distributors, 1996

REFERENCE BOOKS

WEB REFERENCES
1. http://anjuta.org

IT-303 LINUX AND SHELL PROGRAMMING L T P Cr 5 0 0 3

OBJECTIVE
To introduce to the students the in-depths of Unix operating system structure and function, as well as to acquaint them with programming using Shell commands, and handling advanced concepts like semaphores.

1. UNIX UTILITIES: introduction to UNIX file system; vi editor; file handling utilities; security by file permissions; process utilities; disk utilities; networking commands; cp; mv; ln; rm; unlink; mkdir; rmdir; du; df; mount; umount; find; umask; ulimit; ps; who; w; finger; arp; ftp; telnet; rlogin; text processing utilities and backup utilities; detailed commands to be covered are cat; tail; head; sort; nl; uniq; ggrep; egrep; fgrep; cut; paste; join; tee; pg; comm.; cmp; diff; tr; awk; tar; cpio.
2. PROBLEM SOLVING APPROACHES IN UNIX: Using single commands; using compound commands; shell scripts; C programs; building own command library of programs; working with the Bourne shell: what is a shell; shell responsibilities; pipes and input redirection; output redirection; here documents; the shell as a programming language; shell meta character; shell variables; shell commands; the environment; control structures; shell script examples.
3. UNIX FILES: UNIX file structure; directories; files and devices; system calls; library functions; low level file access; usage of open; creat; read write; close; lseek; stat; fsat; oct; umask; dup; dup2; the standard I/O ( fopen; fclose; flush; fseek; fgetc; getc; getchar; fputc; putc; putchar; fgets; gets); formatted I/O; stream errors; streams and file descriptors; file and directory maintenance (chmod; chown; unlink; link; symlink; mkdir; rmdir; chdir; getcwd); directory handling system calls (open; readdir; close; closedir; rewinddir; seekdir; telldir).
4. UNIX PROCESS AND SIGNALS: what is process; process structure; starting new process; waiting for a process; zombie process; process control; process identifiers; system call interface for process management-fork; vfork; exit; wait; waitid; exec; system; Signals; Signal functions; unreliable signals; interrupted system calls; kill and raise functions; alarm; pause functions; abort; sleep functions.
5. INTERPROCESS COMMUNICATION OVERVIEW: introduction to IPC; IPC between processes on a single computer system; IPC between processes on different systems; file and record locking; other UNIX locking techniques; pipes; FIFO; streams and messages; namespaces; introduction to three types of IPC(system-V)-message queues; semaphores and shared memory.
6. MESSAGE QUEUES: UNIX System-V messages; UNIX kernel support for message; UNIX APIs for messages client/server example.
7. SEMAPHORES: UNIX System-V semaphores; UNIX kernel support for semaphores; UNIX APIs for semaphores; file locking with semaphores; Shared Memory- UNIX System-V shared memory; UNIX kernel support for shared memory UNIX APIs for shared memory; semaphore and shared memory example.

TEXT BOOK
W. R. Stevens, "UNIX Network Programming", Pearson Education/Prentice Hall of India

REFERENCE BOOKS
OBJECTIVE
To provide basic knowledge of properties of software and its development processes, software quality, CASE tools, etc.

PRE-REQUISITES
Knowledge of computer programming, principles of management


2. SOFTWARE PROJECT MANAGEMENT: Project management concepts, software process and project metrics project planning, project size estimation metrics, project estimation techniques, empirical estimation techniques, COCOMO- a heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management, project scheduling and tracking.

3. REQUIREMENTS ANALYSIS AND SPECIFICATION: Requirements engineering, system modeling and simulation, analysis principles: modeling, partitioning software, prototyping: methods and tools; specification principles, representation, the software requirements specification and reviews analysis modeling: data modeling, functional modeling and information flow: data flow diagrams, behavioral modeling; the mechanics of structured analysis: creating entity/ relationship diagram, data flow model, control flow model, the control and process specification; the data dictionary.

4. SYSTEM DESIGN: Design Process: design and software quality, design principles; design concepts: abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding: functional independence, cohesion, coupling; design heuristics for effective modularity; design model; design documentation, architectural design: software architecture, data design: data modeling, data structures, databases and data warehouse, analyzing alternative architectural designs, architectural complexity; mapping requirements into a software architecture; transform flow, transaction flow; transform mapping and transaction mapping.

5. TESTING AND MAINTENANCE: Software testing techniques, software testing fundamentals: objectives, principles, testability; test case design, white box testing, basis path testing; control structure testing; black box testing, testing for specialized environments, architectures and applications. software testing strategies: verification and validation, unit testing, integration testing, validation testing, alpha and beta testing; system testing; recovery testing, security testing, stress testing, performance testing; acceptance testing; alpha and beta testing; the art of debugging, debugging process debugging approaches; software re-engineering, reverse engineering, restructuring, forward engineering, software configuration management.

6. SOFTWARE RELIABILITY AND QUALITY ASSURANCE: Quality concepts, software quality assurance, SQA activities; software reviews: cost impact of software defects, defect amplification and removal; formal technical reviews: review meeting, review reporting and record keeping, review guidelines; formal approaches to SQA; statistical software quality assurance; ISO 9000 quality standards, ISO 9001 and six sigma standards, software reliability: measures of reliability and availability, software safety.

7. COMPUTER AIDED SOFTWARE ENGINEERING: CASE, building blocks; integrated case environments and architecture, repository.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES

OBJECTIVE
This course introduces basic concepts, tasks, methods, and techniques in data mining. The emphasis is on various data mining problems and their solutions. Students will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems. Students will also be exposed to a sample of data mining applications.

PRE-REQUISITES
Basic knowledge of data base management system

1. DATA WAREHOUSING: Definition, usage and trends. DBMS vs data warehouse; data marts; metadata; multidimensional data mode; data
cubes; schemas for multidimensional database: stars, snowflakes and fact constellations.

2. **DATA WAREHOUSE PROCESS AND ARCHITECTURE**: OLTP vs OLAP, ROLAP vs MOLAP; types of OLAP, servers, 3-Tier data warehouse architecture; distributed and virtual data warehouses; data warehouse manager.

3. **DATA WAREHOUSE IMPLEMENTATION**: Computation of data cubes; modelling OLAP data, OLAP queries manager; data warehouse back end tools; complex aggregation at multiple granularities; tuning and testing of data warehouse.

4. **DATA MINING**: Definition and task; KDD versus data mining; data mining techniques, tools and applications.

5. **DATA MINING QUERY LANGUAGES**: Data specification, specifying knowledge; hierarchy specification; pattern presentation and visualization specification; data mining languages and standardization of data mining.

6. **DATA MINING TECHNIQUES**: Association rules; clustering techniques; decision tree knowledge discovery through neural networks and genetic algorithm; rough sets; support vector machines and fuzzy techniques.

7. **MINING COMPLEX DATA OBJECTS**: Spatial databases, multimedia databases, time series and sequence data; mining text databases and mining Word Wide Web.

**TEXT BOOK**

Anahory Sam and Murray Dennis, "Data Warehousing In the Real World", Pearson Education, 1997

**REFERENCE BOOKS**

1. Han Jiawei and Kamber Micheline, "Data Mining - Concepts & Techniques", Morgan Kaufmann, 2001
2. Berson Alex, "Data Warehousing, Data Mining and OLTP", Tata McGraw Hill, 1997

**WEB REFERENCES**


**OBJECTIVE**

To provide the foundation required for becoming a good software project manager by means of planning, evaluation and estimation, risk management, allocation and monitoring of resources, controlling software quality.

**PRE-REQUISITES**

Knowledge of software engineering and the basic principles of management.

1. **INTRODUCTION**: Definition of a Software Project (SP), SP vs. other types of projects activities covered by SPM; categorizing SPs; project as a system; management control, requirement specification; information and control in organization.

2. **STEPWISE PROJECT PLANNING**: Introduction, selecting a project; identifying project scope and objectives; identifying project infrastructure, analyzing project characteristics; identifying project products and activities; estimate efforts each activity; identifying activity risk; allocate resources; review/publicize plan.

3. **PROJECT EVALUATION AND ESTIMATION**: Cost benefit analysis; cash flow forecasting; cost benefit evaluation techniques; risk evaluation; Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods: rapid application development, water fall, V-process-, spiral-models; Prototyping; delivery; Albrecht function point analysis.

4. **ACTIVITY PLANNING AND RISK MANAGEMENT**: Objectives of activity planning; project schedule; projects and activities; sequencing and scheduling activities, network planning model; representation of lagged activities; adding the time dimension, backward and forward pass; identifying critical path; activity threat, shortening project; precedence networks; Risk Management: Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule calculating the z values.

5. **RESOURCE ALLOCATION AND MONITORING THE CONTROL**: Introduction, the nature of resources, identifying resource requirements; scheduling resources creating critical paths; counting the cost; being specific; publishing the resource schedule; cost schedules, the scheduling sequence; Monitoring the control: Introduction, creating the frame work, collecting the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control.

6. **MANAGING CONTRACTS AND PEOPLE**: Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behavior, organizational behavior: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, conclusion, further exercises.

7. **SOFTWARE QUALITY**: Introduction: the place of software quality in project planning; the importance of software quality; defining software quality, ISO.
9126; Practical software quality measures; product versus process quality management; external standards; techniques to help enhance software quality; Study of any software project management software: viz Project 2005 or equivalent

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
1. en.wikipedia.org/wiki/Software_project_management
2. www.comp.gla.ac.uk/staff/dwfarthi/projman.htm
3. www.softwareprojects.org
4. www.sei.cmu.edu
5. www.iimb.ernet.in/iimb/docs/eep06/SPM_EDPOutline.pdf

OBJECTIVE
To provide basic knowledge of image compression, audio, video, sound, virtual reality, intelligent multimedia systems etc.

PRE-REQUISITES
Knowledge of computer graphics, programming, 3D geometry

1. BASICS OF MULTIMEDIA TECHNOLOGY:
   - Computers, communication and entertainment; multimedia an introduction; framework for multimedia systems; multimedia devices; CD-Audio, CD-ROM, CD-I, presentation devices and the user interface; multimedia presentation and authoring; professional development tools;
2. LAN AND MULTIMEDIA:
   - internet, World Wide Web and multimedia distribution network: ATM & ADSL; multimedia servers and databases; vector graphics; 3D graphics programs; animation techniques; shading; anti aliasing; morphing; video on demand.
3. IMAGE COMPRESSION & STANDARDS:
   - Making still images; editing and capturing images; scanning images; computer color models; color palettes; vector drawing; 3D drawing and rendering; JPEG: objectives and architecture, DCT encoding and quantization, statistical coding, predictive lossless coding, performance; overview of other image file formats as GIF, TIFF, BMP, PNG, etc.
4. AUDIO:
   - Digital representation of sound; time domain sampled representation; method of encoding the analog signals; sub-band coding; Fourier method; transmission of digital sound; digital audio signal processing; stereophonic and quadraphonic signal processing; editing sampled sound; MPEG audio; audio compression and decompression; brief survey of speech recognition and generation; audio synthesis; musical instrument digital interface
5. VIDEO:
   - digital video and image compression; MPEG motion video compression standard; DVI technology; time base media representation and delivery.
6. VIRTUAL REALITY:
   - Applications of multimedia, intelligent multimedia system, desktop virtual reality, VR operating system, virtual environment displays and orientation making; visually coupled system requirements; intelligent VR software systems.
7. APPLICATIONS OF ENVIRONMENT IN VARIOUS FIELDS.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
2. http://books.google.co.in/books?id=8NzP- u9j5YoC&dq=Multimedia+Technologies&printsec=f rontcover&source=bl&ots=qszNBz_QKwD&sig=7nT 0fk_us03Kclv6aNykwTe1k&hl=en&ei=JfesSbaYlp LnKAW11eXhBq&sa=X&oi=book_result&resnum=6 &ct=result
LIST OF EXPERIMENTS

1. Design a web-page using (a) frames and tables, (b) using style sheets
2. Design a web-page showing the use of forms
3. Design a web-page to show different validation checking using Java script
5. Write a program to implement (a) a class,(b) different sorting algorithms.
6. Write a program to show the use of constructor
7. Write a program to do(a) matrix multiplication and create user defined interface.
8. Write a program to create user defined packages.
9. Write a program to create a file and perform different operations on a file.
10. Write a program to design a calculator.
11. Write a program to show the different layouts available in java.
12. Write a program to design an applet to (a) display a face, (b) analog clock.
13. Write a program to design an applet for the students detail entry.
14. Write a program to show the Client-Server communication
15. Develop a website for the college
16. Develop a website for a the newspaper agency

REFERENCE BOOKS

9. O'Reilly Associates

SOURCE OF EXPERIMENTS

List of Practicals for Rapid Application Development

1. Study of development environment on Linux using GTK+/QT toolkit using Anjuta/Glade/KDevelop
2. Create a GUI for finding the Income tax for current financial year, using GTK/QT. The given values are Basic Salary (BS), Dearness Allowance (DA), House Rent Allowance (HRA), City Compensatroy Allowance (CCA) and Other Allowances (OA).
3. Create a simple database using any RDBMS and connect with a GUI based frontend to manipulate the data values.
4. Write a simple program to build a GTK/QT based GUI for showing the calender and managing the meetings
5. Write a simple program to build a GTK/QT based GUI for playing the game board / snake and ladder
game
6. Write a simple program to build a GTK/QT based GUI for playing the .mov files
7. Write a simple program to build a GTK/QT based GUI for accepting a text and show the following counts: no. of lines, words, characters, white spaces, special characters, numbers.
8. Write a simple program to build a GTK/QT based GUI which will show randomly generated letters/characters and accept them in an adjacent text box. at the end of one minute it will show the total number of correct words entered.

REFERENCE BOOKS

2. Rochkind, "Advanced UNIX Programming", O'Reilly Associates
3. O'Reilly Associates

LIST OF EXPERIMENTS

1. Write a simple program to build a GTK/Q based GUI that joins functionality of paintbrush.
2. Write a simple program to build a GTK/Q based GUI to apply following functions on a photograph loaded from file system: blur, sharpen, change contrast/brightness/color values
3. Write a simple program to build a GTK/QT based calculator.
4. Write with the help of GTK+/QT a program to display an error message, whenever an illegal operation is performed
5. Create a simple database using any RDBMS and connect with a GUI based frontend to manipulate the data values.
6. Write a simple program to build a GTK/QT based GUI for showing the calendar and managing the meetings
7. Write a simple program to build a GTK/QT based GUI for displaying the chess board / snake and ladder game
8. Write a simple program to build a GTK/QT based GUI for playing the .mov files
9. Write a simple program to build a GTK/QT based GUI for accepting a text file and show the following counts: no. of lines, words, characters, white spaces, special characters, numbers.
10. Write a simple program to build a GTK/QT based GUI which will show randomly generated letters/characters and accept them in an adjacent text box. at the end of one minute it will show the total number of correct words entered.

SOURCE OF EXPERIMENTS

List of Practicals for Rapid Application Development

1. Write a shell script that displays the list of all files in a directory.
2. Write a shell script that copies multiple files to a directory.
3. Write a shell script to generate a multiplication table.
4. Write a shell script that displays the list of all files in the given directory.
### LIST OF EXPERIMENTS

1. **Schematic implementation of a University Data Warehouse**
   - Write a program to simulate the game of pool by breaking a ball into smaller pieces for the purpose of sending it over the web.
   - Create a web page for a clothing company which contains all the details of that company and at least five links to other web pages.
   - Implement in C the following Unix commands using system calls: cat, ls, mv.
   - An experiment to highlight the use of Rough Sets and how it categorises data.
   - A simple experiment to highlight the usefulness of sampling in large scale data mining.
   - An experiment to highlight the use of Genetic Algorithms in rule mining or clustering.
   - An experiment to highlight the use of Rough Sets in Data Mining.

### REFERENCES

2. Han Jiawei and Kamber Micheline, “Data Mining - Concepts & Techniques”, Morgan Kaufmann, 2001
9. Write a program to simulate the game Mine Sweeper.
10. Write a program to play “wave” or “midi” format sound files.

REFERENCE BOOKS
2. Andy Harris and Chris McCullough, “HTML, XHTML, and CSS All-in-One Desk Reference For Dummies”, For Dummies, 2008

OBJECTIVE
To lay a strong foundation for overall system and network management

PRE-REQUISITES
Knowledge of computer organization and architecture, operating system, computer networks

1. INTRODUCTION TO SYSTEMS AND NETWORK ADMINISTRATION: Scope of systems and network administration; goals of systems and network administration; system components and their management
2. OPERATING SYSTEMS UTILITIES: Windows and Unix variants; file systems and standards (UFS, NFS, NTFS); processes and job control; privileged, user and group accounts; logs and audits; advanced scanning concepts and tools; advanced sniffer
3. HOST MANAGEMENT: Booting and shutting down of an operating system; formatting, partitioning and building a file system; file system layout; concept of swap space; OS installation; installation and configuration of devices and drivers
4. SERVER CONFIGURATION & TROUBLESHOOTING: Linux/Windows server configuration; superuser/ administrator privileges; user management, controlling user resources; disk space allocation and quotas; process management (monitoring, killing/stopping, monitoring activity); file system repair, backup and restoration; integrating multiple operating systems; system sharing; authentication process
5. NETWORK ADMINISTRATION: Introduction to network administration approaches; addressing and subnetting: fixed vs. variable masks, VLAN principles and configuration, routing concepts, static and dynamic routing; routing protocols (RIP, OSPF, BGP)
6. ADVANCED NETWORK MANAGEMENT SERVICES: Configuring a Linux/Windows box as a router; dial-up configuration and authentication: PPP, RAS; configuring a DNS server; configuring Sendmail service; configuring a web server; configuring a proxy server; TCP/IP troubleshooting (ping, traceroute, ifconfig, netstat, ipconfig, network management)
7. NETWORK SECURITY: Security planning; categories of security; access control and monitoring; wrappers; firewalls: filtering rules, detection and prevention of Denial of Service (DOS) attacks; automatic identification of configuration loop holes; security information resources: cert, installing and upgrading system software, use of scripting tools

TEXT BOOK
Burgess Mark, “Principles of Network and System Administration”, John Wiley and Sons Ltd., 2000

REFERENCE BOOKS

WEB REFERENCES
1. oreilly.com/pub/topic/serveradmin
2. www.linuxtopia.org
3. en.wikipedia.org/wiki/System_administrator
4. www.iu.hio.no/SystemAdmin/principlebook.html
5. data.fas.harvard.edu/micah_altman/unix/

OBJECTIVE
To relay the theoretical and practical knowledge of Advanced Java programming language

PRE-REQUISITES
Basic knowledge of programming language and object oriented programming

1. CORE JAVA: Introduction to Java; data types; variables; operators; arrays; control statements;
classes and methods; inheritance; exception handling; multithreading; collections; I/O streams; AWT and applet programming; swings

2. NETWORKING: Networking basics, socket, port, proxy servers, internet addressing and URL, java.net – networking classes and interfaces, implementing TCP/IP based server and client; classes to be covered: Socket, ServerSocket, IP Address, URL connections

3. JDBC: Types of JDBC Drivers, Writing JDBC applications using select, insert, delete, update; Types of Statement objects (Statement, Prepared Statement and Callable Statement); ResultSet, ResultSetMetaData; Inserting and updating records, connection pooling.

4. RMI AND JAVA BEANS: Introduction of RMI and architecture; implementing RMI methods; Introduction to Java Bean; rules for writing a simple bean, using beans to build an application; Java naming directory interface concepts

5. SERVLETS: Configuring directory structure for a web application; servlet API overview; writing and running simple servlet; servlet life cycle; GenericServlet and HTTPServlet, ServletConfig & ServletContext; writing servlet to handle get and post methods, reading user request data; writing thread safe servlets; HTTP Tunneling; concept of cookie, reading and writing cookies

6. JSP: Why JSP? JSP directives, writing simple JSP page; scripting elements; JSP & Java Beans; JSP actions: include, forward and plug-in, managing sessions using JSP; JSP & databases; error handling in JSP; writing custom tags; Different scopes in a JSP page; Using JDBC in JSP; study and development of a web application and an assignment; tags c:out, c:set, c:if, c:catch, c:choose, c:when, c:otherwise, c:redirect, c:forEach, fmt:parseDate, fn:escapeXml, sql:query, sql:update

7. INTRODUCTION TO STRUCTS: A Web Application Framework – struts-config.xml; understanding MVC architecture; ActionServlet, ActionForm, ActionMapping, action classes.

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
3. www.w3schools.com/js/default.asp

OBJECTIVE
To develop deep understanding about computer software testing methodologies and tools

PRE-REQUISITES
Knowledge of programming, software engineering, software project management

1. FUNDAMENTALS AND TESTING TYPES: First, second and later cycles of testing, Objectives and limits of testing, Overview of software development stages, Planning and Design stages and testing during these stages. Glass box code, Regression and Black box testing, Software errors, Categories of software error

2. REPORTING AND ANALYZING BUGS: Problem reports, Content and Characteristics of Problem Report, analysis and Tactics for analyzing a reproducible bug, Making a bug reproducible

3. PROBLEM TRACKING SYSTEM: Objective of Problem Tracking System, tasks of the system, Problem tracking overview, users of the tracking system, mechanics of the database

4. TEST CASE DESIGN: Characteristics of a good test, equivalence classes and boundary values, visible state transitions, Race conditions and other time dependencies, load testing. Error guessing, Function equivalence testing, Regression Testing, General issues in configuration testing, printer testing

5. LOCALIZATION AND USER MANUALS TESTING: Translated text expands, Character sets, Keyboards, Text filters, Loading, saving, importing, and exporting high and low ASCII, Operating system Language, Hot keys. Error message identifiers, Hyphenation rules, Spelling rules, Sorting Rules, Uppercase and Lowercase conversion, Printers, Sizes of paper, CPU’s and video, Rodents, Data formats and setup options, Rulers and measurements, Culture-bound Graphics and output, European product compatibility, Memory availability, automated testing, Testing User Manuals, Effective documentation, documentation tester’s objective, How testing documentation contributes to software reliability

6. TESTING TOOLS AND TEST PLANNING: Fundamental tools, Automated acceptance and regression tests, standards, Transparent box testing Overall objective of the test plan: product or tool? Detailed objective, type of test, strategy for developing components of test planning
documents, components of test planning documents, documenting test materials

7. **MANAGEMENT ISSUES OF TESTING:** Software Development tradeoffs and models, Quality-related costs, The development time line, Product design, alpha, Pre-beta, Beta, User Interface freeze, Pre-final, Final integrity testing, Project post-mortems, Legal consequences of defective software, Managing and role of a testing group, independent test agencies

**TEXT BOOK**

**REFERENCE BOOKS**

**WEB REFERENCES**
1. en.wikipedia.org/wiki/Software_testing
2. www.uxd.com
3. www.onestoptesting.com/introduction
4. www.developers.net
5. www.wiziq.com/tutorials/Software-Testing
6. www.softwaretestinggenius.com

**IT-423**

<table>
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<th>INTRODUCTION TO E-COMMERCE &amp; ERP</th>
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**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

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, worlds 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 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.


6. **ERP - INFORMATION SYSTEM PERSPECTIVE:** Introduction to OLAP (Online Analysis and Processing), TP, OAS, KBS, MRP, BPR, SCM, REP, CRM, Information Communication Technology.


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

**REFERENCE BOOKS**
1. INTRODUCTION TO WIRELESS TRANSMISSION: Applications, A short history of wireless communication, Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.

2. MEDIUM ACCESS CONTROL: Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.


7. MOBILE TRANSPORT LAYER: Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP.

**OBJECTIVE**

Recent developments in portable devices and high-bandwidth, ubiquitous wireless networks has made mobile computing a reality. Indeed, it is widely predicted that within the next few years’ access to Internet services will be primarily from wireless devices, with desktop browsing the exception. Such predictions are based on the huge growth in the wireless phone market and the success of wireless data services. This course will help in understanding fundamental concepts, current developments in mobile communication systems and wireless computer networks.

**WEB REFERENCES**

2. www.bizautomation.com
3. itmanagement.earthweb.com/erp
4. www.e2-llc.com/e2_ecommerce_erp.aspx
5. e-comm.webopedia.com/TERM/e/ERP.html

**REFERENCE BOOKS**


**WEB REFERENCES**

1. http://www.it.iitb.ac.in/~it601/dep/?id=3
3. http://www.nd.edu/~surendar/teach/spr02/ubicomptutorial.shtml

**OBJECTIVE**

To provide adequate knowledge about the different types of system software available and to introduce the object oriented concepts to the programming skills.
PRE-REQUISITES
Understanding of object orientation and knowledge of software engineering

1. REVIEW OF OBJECT ORIENTED SYSTEMS: Design objects, class hierarchy, inheritance, polymorphism, object relationships and associations, aggregations and object containment, object persistence, meta classes, object oriented systems development life cycle, Software development process, object oriented systems development: a use case driven approach.

2. OBJECT ORIENTED ANALYSIS: Analysis process, use case driven object oriented analysis, use-case model, object classification, theory, different approaches for identifying classes, classes, responsibilities and collaborators, identifying object relationships, attributes and methods, super sub class relationships, A- part of relationships aggregation, class responsibilities, object responsibilities.

3. OBJECT ORIENTED DESIGN: Object oriented design process, corollaries, design axioms, design patterns, object oriented design philosophy

4. METHODOLOGY FOR OBJECT ORIENTED DESIGN: Object modeling technique as software engineering methodology, Rumbaugh methodology, Jacobson Methodology, Booch Methodology

5. UNIFIED APPROACH FOR OBJECT ORIENTED DESIGN: Patterns, Frameworks, the unified approach, unified modeling language (UML).

6. UML: Why we model, types of models, principles of modelling, object oriented modelling, object oriented concepts, UML notation, object oriented analysis: use case diagrams, interaction diagrams, activity diagrams, object oriented design: class diagrams, object diagrams, state diagrams, collaboration diagrams, post-testing: deployment diagrams, patterns, frameworks

7. USING UML FOR OOD: UML object constraint language, designing classes: the process, class visibility, refining attributes, designing methods ad protocols, packages and managing classes, designing interface objects, view layer interface design, macro and micro level interface design process

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
1. www.objectmentor.com/resources/articles/umlClassDiagram.pdf
2. uml-tutorials.trireme.com
4. www.iconixsw.com
5. www.rspa.com/spi/analysismodeling.html

OBJECTIVE
Bioinformatics is a rapidly growing field that integrates molecular biology, biophysics, statistics, and computer science. Fundamentally it is a field focused on comparison: how similar are two given proteins? What are the differences between various DNA sequences? How is the data from one microarray assay different from another? Furthermore, bioinformatics is concerned with quantifying the significance of these differences. In any of the examples above, once a metric for similarity is obtained, it must also be statistically characterized to determine the likelihood that such a relationship could occur by chance. In this course, you will learn many of the popular tools for performing bioinformatics analysis and you will be introduced to the thinking that drives the algorithms.

PRE-REQUISITES
Knowledge of fundamentals of biology, genetics, data structures and statistics

1. INTRODUCTION TO MOLECULAR BIOLOGY: Gene structure and information content; molecular biology tools, genomic information content
2. COMPUTATIONAL BIOLOGY: Data searches and pairwise alignments; gaps; scoring matrices; Needleman and Wunsch algorithm; global and local alignments; database searches.
3. PHYLOGENETICS: Molecular phylogenetics; phylogenetic trees; distance matrix methods; character-based methods of phylogenetics; parsimony.
4. GENOMICS: Patterns of substitution within genes; estimating substitution numbers; molecular clocks; ancestral sequences; searches; consensus trees; tree confidence; genomics; prokaryotic gene structure; gene density; eukariotic genomes; gene expression.
5. PROTEOMICS: Protein and RNA structure prediction, polypeptic composition, secondary and tertiary structure; algorithms for modeling protein folding; structure prediction; proteomics; protein classification; experimental techniques; ligand screening; post-translational modification prediction.
6. GENE EXPRESSION DATA: Microarrays and gene expression data; microarray design; analysis of data; application; microarray standards; clustering (SOM, PCA/SVD, k-means, hierarchical); classification (LVO, SVM); processing gene expression data using decision tree based methods (ID3, ASSISTANT, C5.0)
7. NEW AREAS OF BIOINFORMATICS:
   Metabolomics: metabolic pathways; drug target
identification; biological systems: systems of molecular network; eco-systems, elements of systems modeling; nutrigenomics; palenteoinformatics; toxicogenomics, systems biology; pharmacogenomics, synthetic biology, bio-terrorism, biological and chemical warefare, data security issues in bioinformatics, bio-ethics, cloning, transgenic organisms, bio-ethics in agriculture, ontology, standards

**TEXT BOOK**
Mount David, "Bioinformatics: Sequence and Genome Analysis", 2008

**REFERENCE BOOKS**

**WEB REFERENCES**
1. http://bioinfo.ernet.in/

**OBJECTIVE**
The main objective behind this course is to learn about the various network attacks and preventing attacks. This course is designed to cover Application security, Operating system security, Network security, Web security etc.

**PRE-REQUISITES**
Knowledge of data communications and computer networks, computer programming, data structures, mathematics, telecom network. Knowledge of digital signal processing is desirable

1. **INTRODUCTION:** Codes and ciphers; some classical systems; statistical theory of cipher systems: complexity theory of crypto systems; stream ciphers, block ciphers.
2. **STREAM CIPHERS:** Rotor based system; shift register based systems; design considerations for stream ciphers, crypt-analysis of stream ciphers; combined encryption and encoding; block ciphers: DES and variant, modes of use of DES: public key systems: knapsack systems, RSK, Diffie Hellman exchange; authentication and digital signatures; elliptic curve based systems.
3. **SYSTEM IDENTIFICATION AND CLUSTERING:** Cryptology of speech signals: narrow band and wide band systems; analogue and digital Systems of speech encryption.
4. **SECURITY:** HASH FUNCTION – AUTHENTICATION: Protocols; digital signature standards; electronic mail security: PGP (Pretty Good Privacy), MIME; data compression technique: IP security: architecture, authentication leader, encapsulating security; payload: key management; web security: secure socket layer & transport layer security, secure electronics transactions; firewalls design principle; established systems.
5. **TELECOMMUNICATION NETWORK ARCHITECTURE:** TMN management layers, management information model; management servicing and functions; structure of management information and TMN information model; SNMP v1, SNMP2 & SNMP3, RMON1 & 2; Broadband Network Management (ATM, HFC, DSL); ASN
6. **SECURITY IN NETWORKS:** Threats in networks, Network security control, Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example protocols: PEM, SSL, IPsec, Administrating Security: Security planning, Risk analysis, Organizational security policies, Physical security.
7. **LEGAL, PRIVACY, AND ETHICAL ISSUES IN COMPUTER SECURITY:** Protecting program and data; information and law: rights of employees and employers; software failures; computer crime, privacy; ethical issues in computer society; case studies of ethics

**TEXT BOOK**

**REFERENCE BOOKS**
WEB REFERENCES
1. www.londonexternal.ac.uk
2. crypto.stanford.edu/cs155/
4. www.networkcomputing.com

OBJECTIVE
To impart knowledge about the information security tools, techniques, procedures, standards, etc. that are essential for protection of information in an organization.

1. INTRODUCTION TO COMPUTER SECURITY:
   Protocols; passwords; access control; distributed systems security; multilevel security; multilateral protocols; monitoring systems; biometrics; physical tamper resistance; network attack and defense; protecting e-commerce systems; copyright and privacy protection.

2. CRYPTOGRAPHY:
   Basic mathematical background to cryptography; symmetric and asymmetric cryptographic algorithms; hashes; randomness; signatures; simple cryptographic protocols.

3. SOFTWARE SECURITY:
   What is software security?; Common software vulnerabilities: lack of input validation (buffer overflows, SQL injections, race conditions, access control, etc.); flaws: design flaws, implementation flaws; deployment flaws; case studies; Language level security: typing; tainting input data; untrusted code security; application level security: runtime monitoring; static analysis; verification; JML, Spec; software evaluation; case studies.

4. VERIFICATION OF SECURITY PROTOCOLS:
   Modelling of black box security protocols; intruder model; security requirements; BAN logics and other security protocol logics; process algebraic approach to security protocol verification; model checking; Spi calculus; strand spaces; operational models; security protocols in action.

5. SECURITY IN ORGANISATIONS:
   Security policies; Roles; Classifications; Assets and threats; Risk, vulnerability; control; attack; damage; Risk analysis; Methods/tools for risk analysis; CERTs; Risk assessment and risk management.

6. INFORMATION SECURITY STANDARDS:
   Code of Practice for Information Security (BS7799 and ISO 27001); evaluation of information security, like ITSEC and the Common Criteria; Security plan; attack trees; business continuity planning/incident recovery; Legal issues; patents and copyright.

7. NETWORK SECURITY:
   Principles behind network security; their main protocols as well as network security mechanisms and techniques; wired and wireless networks: IP security, Email security, Web security, secure management, Intruders, Viruses, Firewalls and Privacy.

REFERENCE BOOKS

WEB REFERENCES
1. https://www.securityforum.org
2. www.fretechbooks.com/information-security-152.html
3. csrc.nist.gov/
4. www.infsec.ethz.ch

IT-442 INFORMATION SECURITY  L T P  Cr
5 0 0  3

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.

1. 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.
2. DATA CENTER INFRASTRUCTURE: Example; key requirements of storage systems management activities.
3. STORAGE SYSTEMS ARCHITECTURE: Storage system environment; components of a host; connectivity; physical disks; RAID array; disk storage systems; data flow exercise.
4. 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)
5. BUSINESS CONTINUITY: Introduction, overview, backup and recovery, local replication, remote replication.
6. 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.
7. SECURING STORAGE AND STORAGE VIRTUALIZATION: Securing the storage infrastructure; virtualization technologies.
B.Tech. Information Technology (Regular)

TEXT BOOK
Osborne Marc Farley, “Building Storage Networks”, Tata McGraw Hill

REFERENCE BOOKS

WEB REFERENCES

IT-444 PERVERSIVE COMPUTING  L T P  Cr
5 0 0 3

OBJECTIVE
This course will study the mechanisms and environments of pervasive computing. This course will cover many of the maturing technologies in input/output, networking, information infrastructure, and ease-of-use that will become necessary as computers become small, pervasive, and in constant connection with each other. Some of the I/O interfaces that will be investigated include speech, vision, gestures, combinations of sensors, and location sensors.

PRE-REQUISITES
Knowledge of networking and mobile computing

1. INTRODUCTION: The Computer for the 21st century; wireless technologies, signal propagation, multiplexing, modulation, and spread spectrum techniques; challenges and issues in ubiquitous computing; disconnected operation, update propagation, update conflicts, synchronization, replication, bandwidth adaptation, power adaptation, context awareness, location tracking, migration, system support, security, smart spaces, invisibility, localized scalability, uneven conditioning
2. DEVICE TECHNOLOGY: Compaq iPAQ 5400 series, iPAQ 5450 specs, Tiqit Eightythree, Eighty three specs, Palm Tungsten-T, Tungsten-T specs, Bluetooth qualified products.
3. WIRELESS NETWORKING AND SATELLITE SYSTEMS: Overview of the IEEE 802.11b wireless Ethernet standard. The Bluetooth radio system, Wi-Fi (802.11b), General Packet Radio Service in GSM, 802.11a, b & g Comparison, 802.11a & b Comparison, 802.11a Official Standard, WAP and WML, Satellite Systems: basic routing, localization, and handoff issues
5. SENSOR NETWORKS AND AD HOC ROUTING: System architecture for networked sensors; making sharing pervasive: Ubiquitous computing, multi-hop wireless ad hoc network routing protocols; TAG: tiny aggregation service

6. LANGUAGES, PROTOCOLS AND INFORMATION MANAGEMENT: Jini, Sync, UDDI, Universal Plug-and-Play (UPnP), Simple Object Access Protocol (SOAP) 1.1, MobileIP and TCP over wireless, information management: location-independent and location-dependent computing models
7. USER INTERFACES AND APPLICATION EXAMPLES: Coordination infrastructure for interactive workspaces; ICrafter: a service framework for ubiquitous computing environments, The Interactive Workspaces project, Ubiquitous Computing Rooms; context-aware design and interaction; fluid Interaction; overview of the PARCTAB ubiquitous computing experiment

TEXT BOOK

REFERENCE BOOKS

WEB REFERENCES
www.upnp.org/resources/documents/CleanUPnPD\nA1012031202s.pdf.
7. http://searchnetworking.techtar get.com/sDefinition/\n0,,sid7_gci759337,00.html

IT-445 HUMAN COMPUTER\nINTERACTION L T P Cr\n5 0 0 3

OBJECTIVE
To acquaint with the analysis, design and development\naspects of enhancing interactions between human and\ncomputer system keeping in view the behavioural and\npsychological factors of any human

PRE-REQUISITES
Knowledge of computer organization and architecture,\nsoftware engineering, computer graphics and\nmultimedia technologies

1. INTRODUCTION: Introduction to Human-\nComputer Interaction (HCI); history; human factors of\ninteractive software – goals of software\nengineering, goals of user interface design;\nmotivation for human factors in design;\naccommodation of human diversity.

2. HUMAN INFORMATION PROCESSING: Human\nmemory; thinking – reasoning and problem solving;\nskill acquisition; mental models; decision making;\ncomputer system interfaces: mechanics of input\nand output devices, review of computer\narchitecture; performance characteristics of\nhumans and systems; review of computer graphics

3. PRINCIPLES BEHIND HUMAN – SYSTEM\nINTERACTION: Paradigms of interaction;\nprinciples to support usability

4. USER CENTERED DESIGN OVERVIEW: Software development life cycle – actual, three\npillars of design; usability engineering; iterative\ndesign and prototyping; design rationale; usability\ntesting

5. TASK ANALYSIS: Basic concepts, task\ndecomposition; knowledge based analysis; entity-\nrelationship based analysis; sources of\ninformation; uses of task analysis

6. SYSTEM DESIGN: Use cases; scenarios;\nstructuring information; information architecture;\nprocess flows, wireframes, mock-ups, comps.

7. DESIGN FOR UNIVERSAL ACCESS: Access\nconcepts; accessible software; factors driving\nsoftware accessibility; universal accessibility\nprinciples, guidelines and recommendations; case\nstudies

TEXTBOOK

REFERENCE BOOKS
2. Clark Ruth Colvin and Mayer Richard Pfeiffer, “e-\nLearning and the Science of Instruction: Proven\nGuidelines for Consumers and Designers of\nMultimedia Learning”, 2002
3. Fulleton Tracy, Swain Christopher, and Hoffman\nSteve, “Game Design Workshop: Designing,\nPrototyping, and Playtesting Games”, CMP Books,\nUSA, 2004

WEB REFERENCES
1. http://www.cc.gatech.edu/classes/AY2003/cs6750\nb_fall/syllabus.html
3. http://hci-journal.co

IT-451 SYSTEM & NETWORK\nADMINISTRATION LAB L T P Cr\n0 0 2 1

LIST OF EXPERIMENTS
1. Management of the users and the domain.
2. Configuring DHCP.
3. Setting up the local security policy.
4. Start and stop services from user window and\ncommand prompt.
5. Use of event viewer.
6. Use of the performance monitor.
7. Management of the IIS and FJP server.
8. Setting up of local area network.
10. Use of utilities: Ping, Tracert, Netstat, Net, IP\nconfiguration, Path ping
11. Use of network monitor.
12. Setting up of a DNS.
13. Setting up and use “Terminal Clnet Services”.

REFERENCE BOOKS
LIST OF EXPERIMENTS
1. Program to Program for printing Hello World and find the sum of odd integers between 1 and 99.
2. Program from getting input from keyboard.
3. Program for calling a method using class instance, and create a class fruit with the following attributes:
   - Name of the fruit
   - Single fruit or bunch fruit
   - Price
   Define a suitable constructor and displayFruit() method that displays values of all the attributes. Write a program that creates 2 objects of fruit class and display their attributes.
4. Program that calculates and prints the simple interest using the formula: simple interest=P x N x R.
5. Program (a) that prints prime numbers between 1 to n. Number n should be accepted as command line input,(b) for getting address and name of the computer.
6. Program to sort the elements of an array in ascending order.
7. Program that will contain two arrays on containing the products and the other containing the prices and to display the same
8. Create a user-defined exception class using the extends keyword. Write a constructor for this class that takes a string argument and stores it inside the object with a string handle. Write a method that prints out the stored string. Create a try-catch clause to exercise the created exception.
9. Create a Java program using thread
10. Program to accept two names as command line parameters. Check whether each of them exist in c:\java directory. If it exists, display its name and size, else, display the message that it does not exist. Further, if the extension of the file is “html” then it has to be deleted.
11. Create an Applet to display a string “I am in the centre” in Courier font, with size 30 and style and italic. This text should be centered both horizontally and vertically.
12. Create a simple, non-editable combo box with a list of items, when selected one of the items, will display the string to the console and also printing the string which is being deselected, i.e., the string which already been selected.
13. Program through which the insert statement can be given at runtime. Use it to insert the following test data in the master and details tables.
14. Write a Echoserver and Echoclient program that displays whatever is typed in the server on to the client using sockets.
15. Use socket programming to design a client/server application that takes the password as input and checks whether it is correct. The program should print the appropriate message.
16. Using servlet develop a Java program (database connectivity)
17. Using RMI develop a client-server frame

REFERENCE BOOKS

OBJECTIVE
To provide an opportunity to the students to take up experiments/programs that would help strengthen their knowledge in the discipline in a broader sense.

LIST OF EXPERIMENTS
1. Plan and workout a method to implement a software system that connects chemists to computers, which can be used to bring out formulae of various organic and inorganic chemical reactions
2. Develop a system for monitoring and analyzing of the progress/performance of students during the B. Tech. over each year and plan for the strategy for the next year.
3. Use clustering techniques such as k-means, SOM, hierarchical clustering, etc. and group the details of students into 5 groups based on 20 different parameters (such as height, weight, hobbies, age, percentage, etc.)
4. Work out a Linux based firewall system and list out the steps, parameters, methods and other settings done for its implementation
5. Implement RSA cryptographic algorithm
6. Automate the time table generation system for the University
7. Use prediction tools such as SVM for forecasting sales of various products of a multinational company
8. Develop a touch screen kiosk for providing student services of the University
9. Plan and workout a method of handling reservations of all hotels of the city through an integrated system that provides facility like LateRooms.com
10. Chalk out complete strategy for computerization of a chain of shopping malls like Shopper’s Stop or Reliance Mart that has over 300 store across the nation. How will the data backup and daily data analysis be managed?
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.

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

Refer to IT-481 for details.

IT-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.

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

Refer to IT-483 for details

IT-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.

IT-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.

IT-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.

IT-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.

IT-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.

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

Refer to IT-494 for details

67
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.

1. **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.

2. **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.

3. **APPLICATIONS OF DIFFERENTIATION:** Taylor's and Maclaurin's series; asymptotes; curvature.

4. **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**

**REFERENCE BOOKS**

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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.

1. **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.

2. **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.

3. **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.

4. **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.

5. **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.

6. **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.

7. **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**

**REFERENCE BOOKS**
1. Ross, S. L., "Differential Equation", Wiley India Publishers
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.

PRE-REQUISITES
Knowledge of mathematical operations such as integration, differentiation

1. PARTIAL DIFFERENTIAL EQUATIONS:
   Formation of partial differential equations; Lagrange’s linear partial differential equations; first order non-linear partial differential equation; Charpit’s method; method of separation of variables and its applications to wave equation and one dimensional heat equation, two dimensional heat flow, steady state solutions only.

2. SPECIAL FUNCTIONS:
   Special functions, Bessel’s equation and Legendre’s equation and its recurrence formulae.

3. TESTING OF HYPOTHESIS:
   Testing of hypothesis; tests of significance for large formulation; Student’s t-distribution (application only); Chi-Square test of goodness of fit.

4. LIMIT AND CONTINUITY:
   Limit and continuity of a complex function, differentiability and analyticity; Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic; polar form of Cauchy-Riemann equations; harmonic functions; application to flow problems.

5. COMPLEX FUNCTIONS:
   Integration of complex function; Cauchy-Integral theorem and formula; power series; radius and circle of convergence; Taylor’s, Maclaurin’s and Laurent’s series; zeros and singularities of complex functions.

6. RESIDUE THEOREM:
   Residue theorem, evaluation of real integrals using residues (around unit and semi circle only); bilinear transformation and conformal mapping.

7. LINEAR PROGRAMMING:
   Formulation of linear programming problems; solving linear programming problems using (i) graphical method (ii) simplex method (iii) dual simplex method.

TEXT BOOK

REFERENCE BOOKS
LIST OF EXPERIMENTS
1. To find the roots of non-linear equation using Bisection method.
2. To find the roots of non-linear equation using Secant method.
3. To find the roots of non-linear equation using Newton's method.
4. To solve the system of linear equations using Gaussian Elimination method.
5. To solve the system of linear equation using Gauss-Seidal iteration method.
6. To find the values of function at a particular point using Newton's forward formula.
7. To find the values of function at a particular point using Newton's backward formula.
8. To find the values of function at a particular point using Lagrange's interpolation formula.
9. To integrate numerically using Trapezoidal rule.
10. To integrate numerically using Simpson's rule.
11. To find the solution of o.d.e (ordinary differential equation) by Euler's method.
12. To find the solution of o.d.e by Runge-Kutta method.
13. To find the numerical solution of Laplace equation.
14. To find the numerical solution of heat equation.
15. To find the numerical solution of wave equation.

REFERENCE BOOKS
3. Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India

LIST OF EXPERIMENTS
1. To study various forces and moments.
2. To prove polygon law of coplanar forces, experiments with pulley systems.

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.

1. 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.
2. 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.
3. 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.
4. 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.
5. TORSION OF CIRCULAR SHAFTS, TORSION FORMULA POWER TRANSMISSION
6. 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

REFERENCE BOOKS

WEB REFERENCES
www.eCourses.ou.edu
3. Find support reactions for simply supported beam
4. Find Forces in Truss elements
5. Measuring forces in members of jib crane.
6. Finding C.G. and MOI of various parts like connecting rod. Flywheel using various methods
7. To find mechanical advantage and mechanical efficiency of compound screw jack.
8. To study various simple machines including gear trains e.g. Wedge; clock; sewing machine, etc.
9. To conduct tensile test and determining ultimate tensile strength percentage elongation of steel specimen
10. To conduct compression test and determine compressive strength of specimen
11. To calculate VR, MA and efficiency of single, doubles and triple start worm and worm wheel
12. To study slider crank mechanism of 2 stroke and 4 stroke IC engine models
13. To study and analyze gear trains

**ME-152 WORKSHOP PRACTICE**

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**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.

1. **INTRODUCTION:** Basic manufacturing processes and safety in workshop.
2. **ENGINEERING MATERIALS:** Classification of materials–their general mechanical properties and their selection.
3. **CASTING PROCESSES:** Sand casting process; pattern making; types of moulding sands, cores, mould making, melting and pouring of metal; Casting defects.
4. **MACHINING PROCESSES:** Production of components involving turning; facing; taper turning; milling; shaping; planning and drilling operations.
5. **METAL FORMING PROCESSES:** Sheet metal forming operations; shearing, bending, punching and blanking, forging processes as upsetting, drawing down, bending etc.
6. **JOINING PROCESSES:** Metal arc welding; gas welding; resistance welding; soldering and mechanical fastening processes.
7. **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**

**REFERENCE BOOK**

**ME-153 ENGINEERING GRAPHICS**

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**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

REFERENCE BOOKS
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:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Details of the sheet</th>
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<tbody>
<tr>
<td>1.</td>
<td>Basic Geometrical Constructions including the curves, ellipse, parabola, Hyperbola, and cycloidal curves.</td>
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<td>2.</td>
<td>Projection of Lines including traces.</td>
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<td>3.</td>
<td>Projection of Planes.</td>
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<td>4.</td>
<td>Projection of Solids.</td>
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<td>5.</td>
<td>Section of solids.</td>
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<td>6.</td>
<td>Developments of surfaces</td>
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<tr>
<td>7.</td>
<td>Isometric and Perspective views.</td>
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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

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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.

5. 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.

6. 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.

7. ULTRASONICS: Production of ultrasonics by magnetostriction and piezoelectric oscillator methods; detection of ultrasonics by Kundt's tube and acoustic grating method.

TEXT BOOK

REFERENCE BOOKS
1. Sears, F.W., “Electricity and Magnetism”, Narosa
7. Wehr, Richards and Adair, “Physics of the Atom”, Narosa

72
OBJECTIVE
To educate the students with the present day physical sciences through concepts like nanotechnology, quantum physics, thermal physics, super conductivity, etc.

1. 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.

2. QUANTUM PHYSICS: Failure of classical concepts; black body radiation; Planck’s radiation law; wave packets; group velocity and phase velocity; Schrödinger wave equations: time dependent and time independent equations; significance of wave function; wave function for a particle in a box.

3. 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 \( \frac{3}{2} kT \) of free electrons (3D); Fermi-Dirac distribution function; thermionic emission; Richardson’s equation.

4. 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.

5. THERMAL PHYSICS: Gas law; iso-thermal and isentropic process; Rankin cycle; Carnet cycle; principal of equipartition of energy; specific heat of monatomic gases; Maxwell’s velocity distribution; mean velocity; RMS velocity; most probable speed; Joule Thomson’s expansion; liquefaction of He I and He II Stefan Boltzmann’s law; Newton’s law of cooling.

6. MAGNETIC PROPERTIES OF SOLIDS: Atomic magnetic moments; orbital diamagnetism; classical Langevin’s theory of dia–magnetism and paramagnetism; ferro-magnetic domains; antiferromagnetism; ferrimagnetism (simple ideas).

7. SUPERCONDUCTIVITY: Introduction (experimental survey); Meissner effect; Type I and Type II superconductor; London equation.

TEXT BOOK

REFERENCE BOOKS
5. Ghatak and Loknathan, “Quantum Mechanics”, McMillan

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

LIST OF EXPERIMENTS
1. To find the low resistance by Carey – Foster’s bridge.
2. To find the resistance of a galvanometer by Thomson’s constant deflection method using a post office box.
3. To find the value of high resistances by Substitution method.
4. To find the value of high resistances by Leakage method.
5. To study the characteristics of a solar cell and to find the fill factor.
6. To find the value of e/m for electrons by Helical method.
7. To find the ionization potential of Argon/Mercury using a thyratron tube.
8. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee’s apparatus.
9. To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
10. To find the value of Planck’s constant by using a photo electric cell.
11. To find the value of co-efficient of self-inductance by using a Raleigh bridge.
12. To find the value of Hall co-efficient of semi-conductor.
13. To study the V-I characteristics of a p-n diode.
14. To find the band gap of intrinsic semi-conductor using four probe method.
15. 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.
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.

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<tr>
<th>EN-291</th>
<th>ESSENTIALS OF COMMUNICATION OBJECTIVE (BRIDGE COURSE)</th>
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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 counterparts. 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.

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

REFERENCE BOOKS
2. Tikku M. C., "An Intermediate Grammar Book"

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<tr>
<th>MA-191</th>
<th>MATHEMATICS (MAKEUP COURSE)</th>
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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 upgradation 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.

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

REFERENCE BOOKS

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<th>MA-291</th>
<th>MATHEMATICS (BRIDGE COURSE)</th>
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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**

**REFERENCE BOOKS**
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.

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<tr>
<th>PD-151</th>
<th>BASICS OF COMPUTER FUNDAMENTALS</th>
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OBJECTIVE
To understand fundamentals of computer applications, networking and building projects.

1. MS-WORLD: Introduction to MS-Word: Menus, toolbars, ruler, scroll bars, creating, saving, importing, exporting and inserting files, formation, indents/outdents, 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, changing task relationships and constraints, adding and assigning resources, developing the project calendar, assigning project 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:
3. Sandler, “Teach Yourself MS Office”, BPB Publications
8. Ahmand Tabrez, “Cyber law , E-commerce & M-Commerce”

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<th>PD-191</th>
<th>CO-CURRICULAR ACTIVITIES</th>
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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.

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<th>PD-192</th>
<th>PERSONALITY SKILLS</th>
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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.
B.Tech. Information Technology (Regular)

3. SELF DISCOVERY: Importance of knowing yourself; SWOT analysis; benefits; strengths and weaknesses; exercises.
4. DEVELOPING POSITIVE ATTITUDE: Meaning; changing attitudes; power of positive thinking; overcoming negative attitude; exercises.
5. TIME MANAGEMENT: Features, time management matrix; tips for time management; effective scheduling; time wasters; time savers; exercises and time bound tasks.
6. STRESS MANAGEMENT: What is stress; causes; positive and negative stress; effects; signs; tips to overcome stress; stress busters; exercises
7. 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

REFERENCE BOOKS

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

1. GOAL SETTING: Types of goals; setting smart goals; personal goal setting; business goal setting; goal setting techniques.
2. 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.
3. CORPORATE DRESSING: The corporate fit; corporate culture; dress codes; dressing for interviews; clothing do's and don'ts.
4. 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.
5. ETIQUETTE & MANNERS: Social etiquette; party and wedding etiquette; sensitivity towards diverse cultures; respecting religions and traditions.
6. BUSINESS ETIQUETTE: Dealing with people at work place (peers, subordinates and superiors); international business; etiquette at meetings and conferences.
7. COMMUNICATION MEDIA ETIQUETTE: Telephone etiquette; email etiquette; media etiquette.

REFERENCE BOOKS

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
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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.

1. 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; custom math built-in functions; scalar variables, assignment operator; predefined variables; useful commands for managing variables; applications in problem solving.
2. 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.
3. SCRIPT FILES: Creating and saving a script file, current directory; output commands.
4. TWO – DIMENSIONAL PLOTS: Plot command; line specifiers plot of a given data; plot of a function; plotting multiple graphs in the same plot.
5. 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

REFERENCE BOOK

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<th>PD-291</th>
<th>CO-CURRICULAR ACTIVITIES</th>
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Refer to PD-191 for details.

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<th>PD-292</th>
<th>EFFECTIVE COMMUNICATION</th>
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OBJECTIVE
To acquaint the students with the basics of effective spoken and written English and enhance their reading, listening, and communication skills.

1. COMMUNICATION: Importance; barriers and types of communication; methods to develop effective communication skills.
2. GRAMMAR: Parts of speech; subject/verb agreement; tenses; error correction; business idioms; Indianism in English; frequently mispronounced words; exercises.
3. SPOKEN ENGLISH: Vowel and consonant sounds; syllables and syllabic stress; conversational skills; extempore; JAM.
4. 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.
5. WRITING SKILLS: Importance of writing skills; how to develop writing skills; writing exercises i.e., essay writing, reviews, reports, etc.
6. NON VERBAL COMMUNICATION: History; kinesics; postures; gestures; functions; importance and challenges of non verbal communication.
7. BUSINESS COMMUNICATION: Business letters and messages; business reports; presentation skills; do’s & don’ts; personal journal.

REFERENCE BOOKS

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

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<th>PD-293</th>
<th>INTRA &amp; INTER-PERSONAL SKILLS</th>
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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.

1. SELF AWARENESS: Development of our self image; social comparison; significant others; self esteem; self confidence.
2. ASSERTIVENESS & CONFIDENCE: Assertiveness; being confident; strategies to make assertive NO easier; dealing with emotions; difference between being aggressive and being assertive.
3. 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.
4. LEADERSHIP SKILLS: Leadership skills and styles; motivating people; understanding abilities; delegating tasks; managing people; overcoming hurdles; exercises.
5. 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).
6. 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.
7. THE ART OF CONVERSATION: Skills to strike a conversation; sustaining conversation; communicating across cultures; conflict management.

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

PD-357 NETWORK SIMULATION LAB  

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OBJECTIVE
To train the students on network simulation tools so as to acquaint them about protocol design, issues related to computer networking.

LIST OF EXPERIMENTS
1. Introduction to NS2 Network Simulator.
2. Installation and configuration of NS2 on Linux and Windows.
3. Basic of TCl/TK Language.
4. Programming for a basic network simulation.
7. Simulation of network with FTP transmission.
8. Simulation of a network using CBR.
11. Programming using AWK.
12. Calculate the throughput, packet drop and end-to-end delay in wired network.
14. Calculate the throughput, packet drop and end-to-end delay in wireless network in case of CBR traffic.
15. Simulation of multimedia base traffic.

Tools Used: Opmnet/Network Simulator 2

REFERENCE BOOKS

PD-393 ADVANCED PROFESSIONAL DEVELOPMENT  

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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

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

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<th>PD-457</th>
<th>SOFTWARE ENGINEERING LAB</th>
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OBJECTIVE
To introduce to the students concepts of software engineering through various activities such as planning, requirement analysis, modeling, designing, testing, documentation, etc.

LIST OF EXPERIMENTS
1. Introduction and project definition.
2. Software process Configuration management tool overview.
3. Project planning, management tool.
4. Software requirements and Requisite tool.
5. Introduction to UML and usecase events and actigrams.
7. Flow of events and activity diagram.
8. Object Oriented analysis: discovering classes.
10. Software Design: software architecture and Object Oriented design.
11. State Transition Diagram.
12. Component and deployment.
14. Presentation on the work done.
15. Developing user manual for the software.

TOOLS USED: Rational Rose, Umbrello

REFERENCE BOOKS

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<th>PD-491</th>
<th>CO-CURRICULAR ACTIVITIES</th>
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Refer to PD-191 for details.
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.

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<thead>
<tr>
<th>Course Code</th>
<th>Transport Management</th>
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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 D.Ls; 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
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

REFERENCE BOOKS

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

REFERENCE BOOKS

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.


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.


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

**REFERENCE BOOKS**

**WEB REFERENCES**
1. syllabus.icbse.com/jntu/19-TRANSPORTATION%20ENGINEERING.pdf
2. www.nitkkr.ac.in/WebCivil/Civil_syllabus.doc

**CE-472 ELEMENTS OF TOWN PLANNING AND ARCHITECTURE**

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**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; contract; 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 Greak; 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 authors.

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; denticions 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 standers – UDPFI 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
Lingaya’s University, Faridabad

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

TEXT BOOK

REFERENCE BOOKS

REFERENCE WEB SITE
1. www.jadavpur.edu/academics/.../Architecture/archsyl.htm
3. www.unitytempleutrf.org/Unity%20Temple%20Tea...isuu.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, Pb, Hg, CO, NOx, 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.


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

REFERENCE BOOKS
1. Drago, “Physical Methods of Chemistry”.

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.

2. 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).

3. POLYGON CLIPPING ALGORITHM: Sutherland-Hodgeman polygon clipping algorithm, homogeneous coordinates system, two dimensional transformations: transformations, translation, scaling, rotation, reflection, shearing, transformation, composite transformation.

4. 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.

5. HIDDEN SURFACE REMOVAL: Introduction to hidden surface removal; the Z- buffer algorithm, scan-line algorithm, area sub-division algorithm.

6. REPRESENTING CURVES AND SURFACES: Parametric representation of curves: Bezier curves, B-Spline curves; parametric representation of surfaces; interpolation method.

7. 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

REFERENCE BOOKS

WEB REFERENCES

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

1. 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.

2. KNOWLEDGE REPRESENTATION ISSUES: predicate logic; logic programming; constraint propagation; representing knowledge using rules.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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

REFERENCE BOOKS
WEB REFERENCES

REFERENCE BOOKS

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; deniality
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

WEB REFERENCES

EC-305 EMBEDDED SYSTEM DESIGN

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 V/S Princeton; CISC V/S 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

REFERENCE BOOKS

EC-401 MOBILE COMMUNICATION | L T P Cr
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500 | 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.

1. MOBILE RADIO SYSTEM: reference model; frequencies for radio transmission; signals; antennas; signal propagation; multiplexing; modulation
2. CHARACTERISTICS OF RADIO WAVES: Multipath characteristics of radio waves; signal fading; time dispersion; Doppler spread ; coherence time; LCR; fading statistics; diversity techniques
3. WIRELESS SYSTEMS: GSM: architecture; services; frame structure; signal processing Wireless data services :RAM ;CDPD; GPRS
4. WI-FI AND THE IEEE STANDARD 802.11: 802.11 architecture; MAC layer; PHY layer; Bluetooth and the IEEE standard 802.15
5. 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
6. MOBILE TRANSPORT LAYER: Traditional TCP; classical TCP improvement; TCP over 2.5 G/3G wireless networks; performance enhancing proxies
7. 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

REFERENCE BOOK

EE-401 PROGRAMMABLE LOGIC CONTROLLERS & SCADA | L T P Cr
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500 | 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.

1. 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.
2. PROCESSOR UNIT: Processor; Memory types; Guarding against Electro Static Discharge; Peripherals; Memory Organization.
3. PROGRAMMING DEVICES: Programming Devices; Dedicated Desktop Programmes; Hard Held Programmes; Computer Programmes
4. 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
5. Program Control Instructions: Master Control Relay Instructions; Latching Relay instruction; immediate input output instruction; Jump and Label Instruction.
6. PROGRAMMING TIMER & COUNTERS: Pneumatic Timers; Cascading Timers; Allen Bradley PLCs Counters; Combining Timer & Counters.
7. 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

REFERENCE BOOKS
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.

1. 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.
2. 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; sequence of instructions; arithmetic functions; move function, conversion.
3. 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.
4. 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.
5. POWER SUPPLIES: Performance parameters, of power supplies, comparison of rectifier circuit; filters, regulated power supplies; switching regulators; switch mode converter.
6. 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.
7. MOTOR CONTROL: Voltage control at constant frequency; PWM control; phase control of dc motor; PLC control of a DC motor.

TEXT BOOK

REFERENCE BOOKS

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.

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.

1. 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.
2. SOLAR ENERGY: Solar radiation and its measurement; solar energy collectors; storage and applications.
3. 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.
4. 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.
5. 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.
6. 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; thermonic generation.
7. ENVIRONMENTAL IMPACT OF POWER PLANT OPERATION: Introduction; particulate emissions; gaseous pollutants; thermal pollution; solid-waste pollution.
TEXT BOOK

REFERENCE BOOKS

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

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 lightening 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: Lightening 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

REFERENCE BOOKS

OBJECTIVE

The objective of devising this course is to prepare the students or 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

The following four lessons are prescribed for textual study:
1. The Year 2050
2. Human Environment
3. The Discovery

REFERENCE BOOKS

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
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 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

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
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

1. 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
2. DATA CENTER INFRASTRUCTURE: Example; key requirements of storage systems management activities
3. STORAGE SYSTEMS ARCHITECTURE: Storage system environment; components of a host; connectivity; physical disks; RAID array; disk storage systems; data flow exercise
4. 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)
5. BUSINESS CONTINUITY: Introduction, overview, backup and recovery, local replication, remote replication.
6. 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.
7. SECURING STORAGE AND STORAGE VIRTUALIZATION: Securing the storage infrastructure; virtualization technologies.

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

REFERENCE BOOKS

WEB REFERENCES
2. www.bizautomation.com
3. itmanagement.earthweb.com/erp
4. www.e2-lic.com/e2_ecommerce_erp.aspx
5. e-comm.webopedia.com/TERM/e/ERP.html

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.

1. 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.
2. 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.
3. NUMBER THEORY: Basic properties; Divisibility theory; Congruences; Chinese remainder theorem; Fermat's little theorem; $\tau$ & $\mu$ functions.
4. COMBINATORICS: Fundamental principal of counting; Pigeonhole principal; Multinomial coefficients; Recurrence relation; Generating functions.
5. 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.
6. 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.
7. TREES: Trees and their properties; Spanning trees; Kruskal's algorithm; Prim's algorithm; Binary tree.

TEXT BOOK

REFERENCE BOOK
3. Deo, "Graph Theory", Prentice Hall of India.
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.

1. SERIES SOLUTION OF DIFFERENTIAL EQUATION: Series solution and its validity; General method; Forms of series solution.
2 & 3. CALCULUS OF VARIATIONS: Introduction; Functionals; Euler's equation; solutions of Euler's equation; Geodesics; 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.

4 & 5. 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 tensor; Covariant differentiation of a contravariant tensor.

6 & 7. 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

REFERENCE BOOKS

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.

1. EIGEN VALUE PROBLEMS: Eigen values and eigen vectors; Power methods; Jacobi's methods; Given's methods; House-holder's methods.
2 & 3. DIFFERENCE EQUATIONS: Introduction; formation of difference equations; complementary function; particular integral; difference equations reducible to linear form; simultaneous difference equations and its applications.

4. 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.

5. 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.

6. APPROXIMATION OF FUNCTION: Chebyshev polynomials; economized power series; approximation with rational functions; Fourier series; getting Fourier co efficient numerically and fast Fourier transform.

7. APPLICATION IN ENGINEERING FIELD: Application of Gaussian quadrature in evaluating stiffness and stress matrices for 2D and 3D elements.

TEXT BOOK

REFERENCE BOOKS
1. Balagurusamy E., "Numerical Methods", Tata Mcgraw Hill
2. Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India

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.

1. 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.

2. INTEGER PROGRAMMING: 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; Knapsack; 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; EOQ 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 of 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

REFERENCE BOOKS

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.

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, Halcots "Work Design - Industrial Ergonomics", Hathway, Scottsdale, AZ
3. Verma A. P., "Industrial Engineering", S. K. Kataria and Sons

ME-443 FINITE ELEMENT ANALYSIS

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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; Largrangean 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**

**REFERENCE BOOKS**

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**ME-461**

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**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 digesters; 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**
4. Sharma P. C., “Power Plant Engineering”, S. K. Kataria and Sons

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**PH-471**

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**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 my 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 limitations.

5. MAGNETIC TESTING: Magnetic testing: particle, flux leakage testing; magnetization methods; detectables. applications and limitations.

6. DYE PENETRANT TESTING: Principle, working and applications of dye penetrant testing, advantages and limitations.

7. VISUAL AND OPTICAL TESTING: Principle, working and applications of holography, optical interference techniques, advantages and limitations.

TEXT BOOK

REFERENCE BOOKS

PH-472 NANO TECHNOLOGY  L T P  Cr
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OBJECTIVE
The goal is to teach students some basic nanoscience/nanotechnology. Students are expected to learn both some basic science and technology. Students from all branches are encouraged to take this 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

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.


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.

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Lingaya’s Group of Institutions:
- Lingaya’s University (Faridabad)
- Lingaya’s Institute of Health Sciences
  - 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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