THE INSTITUTION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERS (IETE)

INTRODUCTION

1. The Institution of Electronics and Telecommunication Engineers (IETE) was founded in 1953 by a small group of professionals for the advancement of Telecommunication and Electronics in India. Today the Institution has grown in its status to a National Apex body and its activities are focused towards furthering the cause of development and professional development in the field of Electronics, Telecommunication, Computer Engineering, Information Technology and other allied disciplines. The emphasis of activities is on creation of a concrete base of trained manpower in these fields at various levels of competence and also to contribute gainfully towards developmental needs of aspiring professionals. The IETE also provides a platform for meaningful interaction among professionals from the Industry, R&D organizations, Educational Institutions and Government Departments.

MEMBERSHIP

2. The IETE is the National Apex Professional body of Electronics and Telecommunication Engineers and is headed by a Governing Council, elected from its corporate members. It confers professional status by way of admitting such persons as may be qualified to various classes of membership such as Honorary Fellow, Distinguished Fellow, Fellow, Member, Associate Member, Diploma Member, Associates and Student Member. Organizational Membership is also open to public/private sector companies, Institutions, R&D Laboratories and Government Organizations.

OBJECTIVES

3. The objectives of IETE are:

   (a) The IETE focuses on advancing the science and technology of Electronics, Telecommunications, Computers, Information Technology and related areas.

   (b) Organize conferences, symposia, workshops and brainstorming sessions involving all concerned professionals, students and industry associations for the advancement of the Disciplines. Provide a forum for discussion on national policies and to provide suitable inputs to policy makers.

   (c) Promote and conduct basic engineering and continuing technical education programmes for human resource development.

   (d) Stimulate research and development in the Discipline.

   (e) Bring out quality publications for all levels of readership.

   (f) Honour outstanding professionals.
CONTINUING TECHNICAL EDUCATION PROGRAM

4. The IETE conducts the AMIETE (Graduateship) Examination, in order that a student qualifies and becomes an Associate Member of the Institution. Government of India recognizes the AMIETE examination for the purposes of recruitment to superior posts and services under the Central Government. UPSC and several State Governments have given a similar recognition. A large number of Universities and Institutions have recognized AMIETE for admission to postgraduate courses conducted by them.

5. This qualification further enables a candidate to appear for GATE for postgraduate studies in India. AMIETE (ET) standard in a particular case has been evaluated by the World Education Services; a New York based Educational Credential Evaluators, who have declared that it is equivalent to a Bachelors Degree in Electronic and Telecommunication Engineering.

6. IETE also conducts a 3-year Diploma Level Examination in Electronics and Telecommunication Engineering and Computer Science & Engineering in order to make available trained technical personnel especially at the shop floor level in these fields. Pass in this Diploma Level examination is recognized by the Department of Education, Ministry of Human Resource Development, and Government of India for recruitment of subordinate posts.

7. IETE also conducts a Post Graduate Level Programme, named (Advanced Level Course in Computer Science (ALCCS)), which has been recognized by the Ministry of HRD, Government of India, for the purpose of appointment to superior posts and services under the Central Government, where M.Tech in Computer Science is a prescribed qualification for recruitment.

FACILITIES FOR STUDENTS

8. The IETE helps the students by extending library facilities, laboratory assistance and coordination of IETE Students Forums and by providing necessary guidance at its Local Centers. To spread its many fold technical activities in all the regions of the country, IETE has established 57 Centers spread all over the country including a center abroad at Kathmandu and examination centre at Abu Dhabi. Establishment of more centres is under process.
ADVANCED LEVEL COURSE IN COMPUTER SCIENCE (ALCCS).

THE COURSE (ALCCS)

9. This course is designed to impart training in various areas of software development. The course includes several advanced courses e.g. Parallel Computing, Object Oriented Programming, Multimedia Information Systems, Computer Networks and Computer Vision. It also provides adequate background for taking up advanced level studies in the area of Computer Science. After qualifying the course, one should be able to function as:

   (a) Project leader in large Computerization Projects

   (b) System Specialist/Manager in large Computer installation

   (c) Consultant

   (d) R&D Scientist.

10. Advanced Level Course in Computer Science (ALCCS) is presently being conducted at IETE centres at Delhi, Hyderabad and Ahmedabad. Lab and Library facilities appropriate to the curriculum are provided at these Centres. Bangalore, Pune and Mumbai are likely to start the course shortly.

11. The Course Curriculum has been recently revised keeping in mind the industry and academia requirements. The revised course curriculum was made effective from Sept 2009 and is attached as Annexure I.

RECOGNITION

12. The ALCCS is a Three-Year (Six Semester) Part-time Course designed for working individuals to attain M.Tech level approved qualification in Computer Science. ALCCS is NOT A DISTANCE LEARNING PROGRAM.

13. The ALCCS has been recognized by


   (b) Jawaharlal Nehru Technology University, (JNTU) Hyderabad vide their letter no.A1/1640/2008 dated 06/05/2008 (ANNEXURE-III).

   (c) Guru Gobind Singh Indraprastha University vide letter no. GGSIPU/SO(AA)/2008-09/286 dated 2nd January 2009 (ANNEXURE-(IV).

   (d) Osmania University, Hyderabad vide their letter no. 405/L/2004/Acad dated 03/06/2004 - ANNEXURE-(V).
14. Notwithstanding above, ALCCS students are generally accepted for higher education or employment by various institutions, organizations, industries and Government Departments both at Centre and State Governments level.

ELIGIBILITY

15. A candidate seeking admission to this course should have one of the following qualifications:-

   B.E./B.Tech/B.Sc (Engg)/AMIETE/AMIE
   OR
   MCA/ MSc - Computer Science, IT, Electronics, Physics, Mathematics, Statistics or Operation Research, DOEACC ‘B’ level course approved by MHRD/AICTE.
   OR
   Any other equivalent qualification recognized by the Governing Council of the IETE.

DURATION

16. The duration of the course is three years which is covered in six semesters. The first four and half semesters are spent on the course work. During the last one and half semesters, students work on a dissertation/thesis duly approved by the competent authority under the supervision of an expert who acts as a Project Guide. Since most of the students are working, students are expected to find an expert in the area in which they wish to carry out work under his supervision. Students are permitted to carry over their papers to subsequent semesters; however, they must finish all their requirements including dissertation/thesis within FIVE years. In the event of failure to complete all the requirements within 5 years from the date of admission, the student will be debarred from the Course or shall have to seek re-enrolment.

ADMISSION PROCEDURE

17. An advertisement announcing the commencement of the course and calling for application for admission are notified in the leading newspapers at New Delhi, Hyderabad and Ahmedabad (or any other Centre where the Course may start in future). The advertisement inviting applications for admission to ALCCS program usually appears in the month of May or June every year. Eligible candidates are required to appear at an Entrance Test followed by an interview/counseling on the dates notified by the Centre on its Notice Board.

18. An application Form for admission to Entrance Test is attached at the end of this booklet (ANNEXURE-VII). The candidates are advised to fill the Form with the relevant documents/certificates before submission.
ENTRANCE TEST

19. Entrance Test will be of academic nature and will cover syllabus of BE (Electrical & Electronics), BE (Computer Science). Some salient points of the Entrance test are as under:-

(a) The question paper will consist of Questions - Electronics (30), Math’s (30) and Computers/IT (30).
(b) There will be 90 objective questions of one mark each.
(c) Duration of the test will be 150 minutes.
(d) A candidate may attempt any number of questions. There will be negative marking for wrong answers.
(e) Merit list will be drawn on the basis of marks. The Candidates obtaining marks above cut off will be called for the interview.
(f) SC/ST/OBC/Defence and physically handicapped candidates will be considered at par if they get 10 percent less marks.
(g) Entrance Test is usually conducted on 2nd or 3rd Sunday in July every year. The date and time of the Test is notified in the admission notification. The venues of Entrance Tests are:-

(i) **Delhi** IETE Delhi Centre, 16/1-2 Institutional Area, Pankha Road, Janakpuri, New Delhi -110058,
(ii) **Hyderabad** IETE, Hyderabad, Near Jama-I, Osmania Post Office, O.U. Campus, Hyderabad-500 007
(iii) **Ahmedabad** IETE, Ahmedabad, 206, Umiya Vijay Shopping Centre, Satellite Road, Ahmedabad 380015.
(iv) **Pune** IETE, Pune, Raghuraj, 6 2, Indiranagar, Near Mehdale Garage, Erandwane, Pune - 411 004.
(v) **Mumbai** IETE, Mumbai, 7 3-B, IETE House, Collector’s Colony, Mahul Road, Chembur, Mumbai - 400 074.
(h) Syllabus for Entrance Test is annexed at **ANNEXURE-VIII**.
(i) The fee for entrance test is included in the cost of this prospectus. Candidates are not required to pay any additional fee for entrance test.

ADMIT CARD

20. Eligible candidates will be issued admit card for admission in the entrance test. Admit Card form is included in the Exam application Form. The student is required to fill the Admit Card form and submit along with the Exam Application form. The student
is also required to ascertain from the respective centres the date and time of the entrance Test at the time of submission of the Entrance Examination form.

21. Admit Cards are posted to the candidates’ approx 10 days before the Entrance Test. In case the Admit Card is not received in time, the candidate should report a day in advance of the date of examination notified to avoid any last minute inconvenience. The Institution shall not be responsible for non-receipt of admit card.

22. IETE shall shortly be switching over to uploading of the admit card on the web.

RESULT OF THE ENTRANCE TEST

23. The results of the Entrance Test are generally declared within 4 weeks’ time from the date of the test. The list of the candidates short-listed for interview shall be displayed on the notice board of the Institution as well as on the website (www.iete.org) of the institution. The short listed candidates are advised to remain in touch with the Institution for the date and time of the interview. Intimation is sent to all the short listed candidates by mail. However IETE will not be responsible for non-delivery or late delivery of the mail and no claim whatsoever in this regard will be entertained. In case a candidate fails to appear for interview on the said date and time, the next candidate will be given the chance and no request for another interview shall be entertained.

RIGHT OF ADMISSION

24. Right of admission is reserved. Appearing in entrance test and interview/counseling does not mean admission has been granted.

STUDENT MEMBERSHIP OF IETE

25. All students admitted to IETE A LCCS Programme are required to enrol themselves as a Post Graduate Student Member of IETE. The enrolment form is attached as ANNEXURE IX.

PAYMENT OF FEE

26. All candidates admitted to the Course are required to pay requisite fees along with other charges as applicable from time to time. For details of the fee, please refer to ANNEXURE X. The payment of fee is to be made through Demand Draft. The payment can also be made through online payment through credit card or debit card or cash card or net banking. Students are to quote the transaction ID under which the on-line payment has been made. The Demand Draft for the requisite amount is to be made in favour of the Secretary General, IETE, New Delhi and payable at New Delhi.

27. All candidates who have been cleared for admission are required to pay the requisite fee as under:

(a) **Admission Fee & Ist Semester fee:** All candidates appearing for interview are advised to bring DD for the requisite amount in favour of the Secretary General, IETE New Delhi, or cash towards admission fee and 1st
semester fee at the time of interview. Cheques are not accepted. If admission is granted, candidates are required to pay the requisite fee on the spot.

(b) **Other Semester fee:** Fee for 2\textsuperscript{nd}, 4\textsuperscript{th}, and 6\textsuperscript{th} Semester is to be paid latest by 1\textsuperscript{st} March whereas 3\textsuperscript{rd} and 5\textsuperscript{th} Semester fee is payable by 1\textsuperscript{st} September every year. A grace period of one month from the above dates is given with a late fee of Rs.100/- Thereafter, the names of the defaulters shall be displayed on the Notice Board. They will not be allowed to attend the classes and their names will be struck off from the roll of the ALCCS. A readmission fee of Rs.500/- is payable for re-enrolment.

**TIMINGS OF THE CLASSES AND ATTENDANCE**

28. Classes are usually held in the evenings from 1815 hours to 2015 hours regularly. However, the schedule of the classes will be informed by the concerned Centres from time to time. Students are to note that a **minimum of 70%** attendance is mandatory to appear in the Semester end examinations. Students not meeting the attendance requirements may not be allowed to appear for the Semester end examinations.

**COMPUTER LAB TIMINGS**

29. Details of Computer facilities available and timings to use them will be provided by the concerned Centres. Students are advised to contact their centre for the same.

**LIBRARY FACILITIES**

30. Students at Delhi are advised to find out the details of Library facilities at Delhi Centre at Janakpuri, New Delhi, whereas Students at Hyderabad, Ahmedabad, Pune and Mumbai may contact IETE Hyderabad Centre, Osmania University Campus, at 206, Umiya Vijay Shopping Centre, Satellite Road, Ahmedabad, IETE, Pune, Raghuraj, 62, Indiranagar, Near Mehdale Garage, Erandwane, Pune – 411 004 and IETE, Mumbai, 73-B, IETE House, Collector’s Colony, Mahul Road, Chembur, Mumbai – 400 074 respectively. Library facility will be available for maximum of 3 years. Beyond 3 years and up to 5 years, students desirous of using Library facilities shall have to pay library fee as applicable from time to time.

**EVALUATION PROCESS**

31. The assessment of ALCCS subjects consists of two parts - **Internal Assessment and External Assessment.** The weightage of assessment is as follows:

(a) Internal Assessment : 40%

(b) External Assessment : 60%

32. **Internal Assessment**

(a) This comprises of Minor Tests and Lab Practice/Assignments. The weightage of Minor tests is 15% and for Lab Practice/assignments 25%.
(b) Two Minor Tests are conducted during the semester and best of two is counted for computing the final results. First Minor test is conducted usually after 16 hours (8 lectures of 2 hours each) and second after 32 hours (16 lectures of 2 hours each). Assignments (both the Theory and Lab) are evaluated by the concerned faculty from time to time. Appearing in the internal examination is mandatory.

(c) Internal assessment marks are carried forward till the time student passes that subject.

(d) To pass a subject, a student has to obtain minimum of ‘C’ grade individually in Internal Assessment as well as external examination.

33. **External assessment**: This assessment is made through major examinations held at the end of the semester. The major examinations are conducted in January/February and July/August every year. Examinations are held only during day time i.e. between 1000 hrs to 1700 hrs. Conduct of Major Examinations is the responsibility of the IETE HQs. To pass, a student must score a minimum of ‘C’ grade in the external examination.

34. **Grading System**

(a) Passing grade (both internal and external assessment) will be ‘C’ grade in the individual subject and CGPA of ‘C’ (C-plus) grade in aggregate to pass the ALCCS programme.

(b) After each semester end examination, all candidates will be given an interim grade sheet showing all papers appeared for whether pass or fail on the following basis:-

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;= 80</td>
<td>A+</td>
<td>10</td>
</tr>
<tr>
<td>70 to &lt;80</td>
<td>A</td>
<td>9</td>
</tr>
<tr>
<td>65 to &lt;70</td>
<td>B+</td>
<td>8</td>
</tr>
<tr>
<td>60 to &lt;65</td>
<td>B</td>
<td>7</td>
</tr>
<tr>
<td>50 to &lt;60</td>
<td>C+</td>
<td>6</td>
</tr>
<tr>
<td>45 to &lt;50</td>
<td>C</td>
<td>5</td>
</tr>
<tr>
<td>&lt; 45</td>
<td>FAIL</td>
<td>--</td>
</tr>
</tbody>
</table>
(c) CGPA (Cumulative Grade Point Average) will be calculated as under only for the subjects where a student has passed:

\[
CGPA = \frac{C_1 G_1 + C_2 G_2 + \cdots + C_u G_u}{C_1+C_2+C_3 + \cdots + C_n}
\]

Where \( G_1, G_2, \ldots \) denote the grade point scored and \( C_1, C_2, \ldots \) denote the credits of subjects.

(d) Credits for each subject/Lab/Project(s) have been given in the course curriculum (Refer Annexure I)

(e) Once a student passes all papers his final result will be declared. The final result will indicate the division/class as under:

(i) CGPA of 9 or more - Distinction
(ii) CGPA 6.5 or more but less than 9 - First Division
(iii) CGPA 5 or more but less than 6.5 - Second Division
(iv) Less than 5 - FAIL (No award will Be given)

IMPROVEMENT OF GRADES

35. There is no provision to improve the grades once the subject is passed. A candidate who does not pass in a paper may be permitted to reappear in that paper in the subsequent examinations subject to payment of examination fee as applicable from time to time.

UNFAIR MEANS

36. Any student found using unfair means will be penalized as per prevailing rules of the Institution.

PROJECT WORK

37. All students who register for 5th Semester are also eligible to register for Project work subject to the condition that they have cleared all the subjects’ upto 4th Semester and there is no back paper. Special dispensation could be given at the discretion of the competent authority. Project work is to be carried out in two parts

(a) Project Work I - Analysis and Design.

(b) Project Work II - Implementation.

38. Project Work I is to be carried out during 5th Semester and Project Work II during 6th Semester. All students registered for the project work are to look for an area in which they are interested and also look for a guide who is an expert in that area and willing to supervise the project. The expert is expected to be having sufficient
experience in software development and should be at a Professor/Asst Professor level at any Institution/University or at a very senior managerial level in Industry.

39. The candidate has to put up a project proposal for approval of the authority on a prescribed format. The proposal should have a synopsis of about 200 words and biodata of the Project Supervisor with a letter of consent from him. The Project proposal will be presented by the student before a committee for its approval. At times, the project may be approved provisionally and final approval granted at the time of mid term evaluation. The approval for project guide will be given by IETE HQ.

40. Mid term evaluation of the project is done after about 2 months after the date of approval of the project wherein the experts examine the progress made so far by the candidate. The Project can also be rejected at this stage and the candidate may be advised to change the Project/guide.

41. Unbound Project Report (in a prescribed format) is to be submitted before/on the expiry of 6 months from the date of approval. Once Project Report is submitted, the candidate will be called for final evaluation. If the report is not submitted within the stipulated time, the candidate shall have to re-register for the project subject to eligibility by remitting the applicable fee.

42. **Distribution of Marks for Project Work.**

   The marks for Project work are distributed as follows.

<table>
<thead>
<tr>
<th>(a)</th>
<th>Mid Term Evaluation</th>
<th>Weightage</th>
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</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Supervisors assessment</td>
<td>20%</td>
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<tr>
<td>(ii)</td>
<td>Depth of knowledge</td>
<td>20%</td>
</tr>
<tr>
<td>(iii)</td>
<td>Presentation cum viva</td>
<td>20%</td>
</tr>
<tr>
<td>(iv)</td>
<td>Work done</td>
<td>40%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(b)</th>
<th>Final Evaluation</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Supervisors assessment</td>
<td>20%</td>
</tr>
<tr>
<td>(ii)</td>
<td>Thesis/report</td>
<td>15%</td>
</tr>
<tr>
<td>(iii)</td>
<td>Presentation cum viva</td>
<td>25%</td>
</tr>
<tr>
<td>(i)</td>
<td>Work done</td>
<td>40%</td>
</tr>
</tbody>
</table>

**EXAMINATION FEE**

43. Students are to submit their Examination Application Form along with a Demand Draft of Rs. 700/- per subject at least 45 days before the commencement of examinations. (Examination Form enclosed with the prospectus.)
RESULTS

44. Results are made available within 3 months from the date of last examination at IETE web site and at respective Centres.

RECOUNTING

45. There is no provision of re-evaluation of answer books. Therefore, request for re-evaluation are out rightly rejected.

46. Recounting of marks, if requested, can be done on a payment of Rs.200/- per subject. Requests for recounting of marks must be received at IETE HQ within 30 days from the date of announcement of results on a prescribed application form.

SEMESTER LEAVE

47. Semester leave is generally not granted. However, under special circumstances, leave may be granted on merit of the case, in accordance with the rules laid down by the Institution from time to time. The candidate has to put up an application justifying the reasons with necessary supporting documents before leaving. No request for re enrolment will be considered after leave has been availed. Whether a leave has been granted or not, no additional time beyond 5 years will be given for completion of the course.

AWARD OF CONSOLIDATED GRADESHEET AND CERTIFICATE

48. Consolidated grade sheet showing internal and external examination is issued on successful completion of course.

49. A certificate will be awarded after successful completion of all the requirements of the prescribed programme and enrollment as Life Associate/Associate Member/Member of the Institution.

TIME LIMIT TO COMPLETE ALCCS PROGRAM

50. The total period to complete ALCCS including project work will not exceed FIVE YEARS from the date of admission.

AWARD OF ACADEMIC EXCELLENCE

51. Shri Gopal M Dandekar Memorial Award has been instituted which is awarded to a girl student securing highest percentage with A+ and above Grade and Completing ALCCS Program in 3 years time.

CHANGE OF RULES/PROCEDURE

52. The Institution reserves the right to change/alter/amend various procedures of Admissions, Examinations, Syllabus, Fees and/or any other proposals concerning the Advanced Level Course in Computer Science. The Institution also reserves the right for admission for this course.
LEGAL MATTERS

53. Adjudication in respect of legal cases concerning IETE HQ will be as per byelaw 95 of the Institution which is reproduced below:

“All Legal cases concerning IETE HQ shall lie within jurisdiction of Delhi courts only”

DISCIPLINE

54. All students while undergoing training at IETE are required to adhere to timing of classes and have regular attendance. They should be properly dressed and behave in a manner befitting the organization. The Institution reserves the right to suspend students from the course for indiscipline or misbehavior.

CORRESPONDENCE WITH IETE HQ

55. All correspondence must be addressed to the Secretary General of the Institution by designation and not by name.

DETAILED SYLLABI

56. Detailed syllabi are attached at ANNEXURE XI
## Course Curriculum

<table>
<thead>
<tr>
<th>Semester 1</th>
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<tbody>
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<td><strong>Credits</strong></td>
<td><strong>Marks</strong></td>
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<td></td>
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</tr>
<tr>
<td>CT11 Data Structure through ‘C’</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
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<tr>
<td>LA11</td>
<td></td>
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<tr>
<td>CT12 Computer Architecture</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
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<tr>
<td>LA12</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>CT13 Data Base Management Systems</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
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<tr>
<td>LA13</td>
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<td><strong>Marks</strong></td>
<td></td>
<td></td>
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<td>CT21 Object Oriented Programming</td>
<td>3</td>
<td>1</td>
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<td>100</td>
</tr>
<tr>
<td>using Java</td>
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<tr>
<td>LA21</td>
<td></td>
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</tr>
<tr>
<td>CT22 Discrete Mathematical Structure</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>LA22</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>CT - ECS1</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
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<tr>
<td><strong>Total Semester 2</strong></td>
<td>12</td>
<td>300</td>
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<table>
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<td><strong>Credits</strong></td>
<td><strong>Marks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT31 Operating System</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>CT32 Computer Networks</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>CT - ECS 2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total Semester 3</strong></td>
<td>12</td>
<td>300</td>
<td></td>
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<tr>
<td>Semester 4</td>
<td></td>
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</tr>
<tr>
<td>CT41 Software Engineering</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>CT42 Design and Analysis of Algorithm</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>CT43 IT Management</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total Semester 4</strong></td>
<td><strong>12</strong></td>
<td><strong>300</strong></td>
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<table>
<thead>
<tr>
<th>Semester 5</th>
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<tbody>
<tr>
<td>CT51 Web Technology</td>
</tr>
<tr>
<td>CT - ECS3</td>
</tr>
<tr>
<td>CT 53 Project 1</td>
</tr>
<tr>
<td><strong>Total Semester 5</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT - ECS 4</td>
</tr>
<tr>
<td>PROJECT II</td>
</tr>
<tr>
<td><strong>Total Semester 6</strong></td>
</tr>
</tbody>
</table>

**Grand Total 72 Credits**

**Electives**

- CT71 Artificial Intelligence
- CT72 Computer Graphics
- CT73 Digital Image Processing
- CT74 Embedded Systems
- CT75 Data Ware Housing and Data Mining
- CT76 Micro Electronics and VSI Design
- CT77 Telecom Management
- CT78 Mobile Computing
- CT79 Soft Computing
No./405  T/L/2004/Acad.  
Date: 03.06.2004.

To
The Chairman,
IETE,
O.U. Campus,
Hyderabad.

Sir,

Sub: - Recognition of Advanced Level course in Computer Science (ALCCS) as equivalent to M.Tech course in Computer Science of Osmania University - Regarding.

This has reference to your proposal for recognition of Advanced Level course in Computer Science (ALCCS) examination conducted by your institute. I am to inform you that the Academic Senate at its meeting held on 26.03.2004 has RESOLVED

"that ALCCS course offered by IETE be recognized as equivalent to M.Tech (CSE) for the purpose of Ph.D admission only".

You are, therefore, requested to take necessary action in the matter.

Yours faithfully,

[Signature]

DEPUTY REGISTRAR
(Academic)
Ref. No.: GGSIPU/SO(AA)/2008-09/286

Dated: 02\textsuperscript{nd} January 2009

To,

Secretary General,
The Institution of Electronics and Telecommunication Engineers,
2, Institutional Area, Lodi Road,
New Delhi – 110 003.

Sub: Recognition of ALCCS(CS) Course of IETE as equivalent to M.Tech (CS).

Sir,

This is in reference to your letter no. IETE/769/Recog/2008 dated 03\textsuperscript{rd} October 2008 on the subject cited above,

In response, it is informed that the matter concerning with the recognition of ALCCS (Computer Science) course of the Institute of Electronics & Telecommunication Engineers (IETE) as equivalent to M-Tech (Computer Science & Engineering) was considered by the Academic Council in its 25\textsuperscript{th} Meeting held on 10.11.2008 and it has accorded its approval.

Thanking you,

Yours sincerely,

(Rajesh Kumar)
Section Officer(Acad. Affairs)

Copy forwarded for information to:
1. Director(Academic Affairs), GGS IP University.
2. Controller of Examination, GGS IP University.
3. Office Copy.
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
(Established by an Act No.16 of 1972 of A.P. State Legislature)
KUKATPALLY, HYDERABAD - 500 072 - ANDHRA PRADESH- INDIA.

Dr. K. LAL KISHORE
PH.D. MIEE MITE MONT, MISMIL
REGISTRAR

Date 06.05.2008

To

The Chairman,
The Institute of Electronics and Telecommunication Engineers,
Hyderabad Centre,
Osmania University Campus, Hyderabad-500 007.

Sir

Sub:- JNTU, Hyderabad - Academic & Planning - Recognition of the ALCCS conducted by IETE is equivalent to M. Tech. Computer Science course conducted by JNTU- Orders - Issued.

Ref.: Lr. No. IETE Hyd. ALCCS/2007, dt. 28.9.2007, of the Chairman, the Institute of Electronics and Telecommunication Engineers. OU, Campus, Hyderabad
3. Lr.No.405/L/2004/Acad., dated 03.06.2004 of the Osmania University.
4. Lr. dated 24.10.2007 of the Chairman BOS in CSE

With reference to your letter cited above, for recognition of Advanced Level Course in Computer Science (ALCCS) conducted by IETE as equivalent to M. Tech (CSE) conducted by JNTU, after careful examination of the facts, the Vice - Chancellor is pleased to recognize the Advanced Level Course in Computer Science (ALCCS) conducted by IETE New Delhi as equivalent to the M.Tech. Computer Science being offered by JNTU, subject to approval of the Academic Senate of the University.

Yours faithfully,

[Signature]

REGISTRAR
Government of India
Ministry of Human Resource Development
Department of Education

New Delhi, the 4th May, 1990.

Notification No. (26)

On the recommendation of the Board of Assessment for Educational Qualifications, the Government of India has been pleased to recognise provisionally the three year part-time Advanced Level Course in Computer Science (A.L.C.S.S) awarded by the Institute of Electronics and Telecommunication Engineers, New Delhi for appointment to superior posts and services under the Central Government where M.Tech. Degree in Computer Science is the prescribed qualification for recruitment, effective from 1997.

(M.M. Choudhury)
Asstt. Educational Adviser(T)

The Manager,
Government of India Press,
Faridabad.

Copy to:
1. All State Govt. and Union Territories (Education Department).
2. All Regional Offices of the Ministry of Human Resource Development (Department of Education).
3. All Directors of Technical Education.
4. Union Public Service Commission, Dholpur House, Shahjahan Road, New Delhi (with 5 spare copies).
5. Staff Selection Commission, Lok Nayak Bhawan, Khan Market, New Delhi.
6. All State Public Service Commission.
7. Association of Indian Universities, 16, Kotla Marg, New Delhi.
9. All Board of Apprenticeship Training.
10. All Ministries and Departments of Government of India.
11. The Secretary, the Institution of Electronics & Telecommunication Engg., 2 Institutional Area, Lodhi Road, New Delhi-3

(M.M. Choudhury)
Asstt. Educational Adviser(T)
Shri S R Aggarwal  
Secretary General  
Institute of Electronics &  
Telecommunication Engineering  
2 Institutional Area, Lodhi Road  
New Delhi 110003.

Dear Sir,

This has reference to your letter No.IETE/724/2010/Recog-ALCCS dated 24th February, 2011 seeking clarification on the parity of Associate Membership Examination of Institution of Electronics and Telecommunication, New Delhi.

We would like to mention that `Associate Membership (Graduateship) Examination of Institution of Electronics and Telecommunication Engineers (IETE), Lodhi Road, New Delhi has been recognized by the Government of India for purpose of employment where Bachelor degree in Engineering is prescribed qualification.

As IETE Examinations are recognized by the Government of India, we do not foresee any difficulty in acceptance of the qualifications at Indian Universities, on merits of admission to higher courses.

GGS Indraprastha University and Osmania University too vide their letter No.GGSIPU/GO/2008-09/286 dated 2nd January, 2009 and No.405/L/2004/Acad dated 3rd June, 2004 have also accorded equivalence to the ALCSS programme conducted by the Institute as equivalent to M Tech. Degree for purpose of admission to higher courses.

Thanking you,

Yours faithfully,

(Sambhav Srivastava)  
Section Officer (Evaluation)
Regn.No.

Place of Joining: Delhi/Hyderabad/Ahmedabad

Name(Mr/Mrs/Miss)

Occupation

Father’s/Husband Name

Address for correspondence

Phone(s)Office..............Residence

E mail ID

Permanent Address

Personal Information:

Belong to SC/ST Yes/No

Please attach appropriate Certificate)

Date of Birth

Nationality

Are you a member of IETE Yes/No

Class & Mem.No. of IETE

Academic Record (Attach Photostat copies of Sec. School, Qualifying degree/Marksheets)

<table>
<thead>
<tr>
<th>Examination Passed</th>
<th>University attended with period</th>
<th>Year of passing</th>
<th>Class Obtained</th>
</tr>
</thead>
</table>

AMIETE

B.Tech/B.E./B.Sc.(Engg)

M.Sc.

AMIE

Others

Note: The Application form duly completed along with two self-addressed envelopes & accompanied by attested/photostat copies of degrees/diplomas should reach the Institution on or before the closing date.
ANNEXURE VIII

SYLLABUS FOR THE ENTRANCE TEST
FOR ADMISSION TO ALCCS PROGRAMME

Mathematics


Real Analysis: Sequences and series, Continuity, Differentiability, Reimann integral, Power series, Fourier series, Functions of several variables, Maxima, Minima, Multiple integrals, Line, Surface and volume integrals, Laplace transforms.

Complex Analysis: Analytic functions, Conformal mapping, Bilinear transformation, Cauchy's integral formula, Maximum modulus principle, Taylor's and Laurent's series, Residue theorem and applications.


Electronics


---

**Computer Science**

**Computer Hardware:** Logic families, flip-flops, logic function minimization techniques, design of combinational and sequential circuits, design with integrated circuits, A /D and D/A converters, microprocessor architecture, programming, interfacing with memory and devices, digital filters, analog to digital and digital to analog conversion, serial and parallel communication interfaces (detailed knowledge of Intel 8085 will be assumed).

**Computer Organization:** Number representation and arithmetic, functional organization, machine instructions and addressing modes, ALU, hardwired and microprogrammed control, memory organization, input/output, concepts of assembly language (8085).

**Data Structures & Algorithms:** Structured programming with Pascal/C, arrays, stacks, strings, queues, lists, graphs, trees and set structures, graph and tree traversals, connected components, spanning trees, shortest paths,tree balancing, hashing, file structures, sorting and searching, algorithm design techniques, O notation, solution of simple recurrence relations that arise in the analysis of algorithms.

**System Programming:** Assemblers, loaders, linkers, macroprocessor, text editors, programming languages: lexical analysis, parsing, scope rules and parameter passing mechanisms, syntax directed translation, run time environment, machine code generation, interpreters.

**Operating Systems:** Batch, multi-programming and time-sharing systems, processor, memory, device management, virtual memory, processor scheduling, interprocessor communication I/O redirection and pipes process synchronization and concurrency, deadlocks, protection.
**Discrete Structures**: Propositional logic, Principle of mathematical induction, sets, relations, functions, groups, partial orders, lattices and Boolean algebra.

**Theory of Computation**: Regular and context free languages, finite state machines and pushdown automata, turning machines and undecidability.
THE INSTITUTION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERS
2, INSTITUTIONAL AREA, LODHI ROAD,
NEW DELHI - 110 003

ADVANCED LEVEL COURSE IN COMPUTER SCIENCE

ENTRANCE TEST - 200
ADMIT CARD
(To be filled in by the candidate)

Name

Examination Centre

Date

Time

Specimen Signature

IMPORTANT
The candidate is advised to report at the Examination Centre 15 minutes before the schedule time and produce this admit card when asked for.

SECRETARY GENERAL

THE INSTITUTION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERS
2, INSTITUTIONAL AREA, LODHI ROAD,
NEW DELHI - 110 003

ADVANCED LEVEL COURSE IN COMPUTER SCIENCE

ENTRANCE TEST - 200
CENTRE CHECK
(To be filled in by the candidate)

Name

Examination Centre

Date

Time

Specimen Signature

IMPORTANT
The candidate is advised to report at the Examination Centre 15 minutes before the schedule time and produce this admit card when asked for.

SECRETARY GENERAL
POST GRADUATE STUDENT MEMBERSHIP FORM

THE INSTITUTION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERS

2, Institutional Area, Lodhi Road
New Delhi – 110 003
Phones : 011 – 43538855/58
E-mail : membership@iete.org

Signature of Candidate ______________________

To
The Secretary General, IETE
2, Institutional Area
Lodhi Road
New Delhi – 110 003

1. I wish to enroll myself as student member of Advanced level course in Computer Science (ALCCS).

2. Place of Joining___________________ Name of Centre_____________________

3. Name _____________________________________________________________
   (In Capital letters) (Name should be written as per High School Certificate)

4. Date of Birth_______________ 5. Father’s/Husband Name________________
   ______________________________________

6. Correspondence Address________ 7. Permanent Address____________________
   (In Capital letters). ______________ (In Capital letters).____________________
   ____________________________ ____________________________
   Dist_________________ Dist__________
   State_________ Pin__________ State_________________ Pin______________

8. Phone No_________(R)__________ Fax_________________ E. mail___________
   Mobile________________________

24
9. Educational Qualifications

(Attach attested copies of certificates Age/Qualifications/Training/Study etc.)

<table>
<thead>
<tr>
<th>Examination Passed</th>
<th>Subject</th>
<th>Board/University</th>
<th>Year of Passing</th>
<th>Initial of Proposer(S)</th>
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<tbody>
<tr>
<td>10+2/Intermediate</td>
<td>(Physics, Chemistry, Maths)</td>
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<tr>
<td>B.Sc</td>
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<tr>
<td>M.Sc</td>
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</table>

FOR OFFICE USE ONLY

1. Accepted
2. Withheld/Rejected with reason
3. Remarks

Student Member ALCCS
## Employment Record

<table>
<thead>
<tr>
<th>Name of Employer</th>
<th>Period of Employment From...........To............</th>
<th>Designation/Rank</th>
<th>Level of Responsibilities In Orgn./ Dep</th>
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<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

### Description of your duties / responsibilities:

______________________________________________________________________________

### Details of Projects/Publications

(Attach Separate sheet, if necessary)

______________________________________________________________________________

### SPONSORSHIP FROM THE EMPLOYER

(where applicable)

This organization hereby sponsors.................................................................for 3 year Advanced Level Course in Computer Science & undertakes to be responsible for paying dues for the entire course.

Date:  

Signature & Seal of the sponsoring authorities
DECLARATION

I……………………………………………………………………………………………… the undersigned agreed will accept as final and binding, the decision of the IETE Council in all matters. I further undertake to abide professional ethics, maintain integrity, endeavour to the objective in judgment and strive for enrichment human values and thoughts.

Date: __________________________________________________ Signature of Candidate

For OFFICE USE ONLY

Recommendations of the Selection Committee……………… Account /DEP

Recommended/ not recommended………………………… Reg. No………………………………………

Date of Selection………………………………………………… Batch No…………………………………

Remarks………………………………………………………….. Amt received……………………………

Date of Regn.
ANNEXURE X

**FEE DETAILS**

1. Entrance Examination fee - Nil (Included in the cost of Prospectus)

2. Fee Payable at the time of admission (including 1st Semester fee)

<table>
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<th>Payable at</th>
<th>HQ Rs.</th>
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<th>Total Rs.</th>
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<tr>
<td>Registration fee</td>
<td>200</td>
<td>400</td>
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<tr>
<td>Application + Admission fee</td>
<td>500</td>
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<tr>
<td>Building-cum-Library fee</td>
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<tr>
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<tr>
<td>Tuition fee -do-</td>
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<td><strong>Total</strong></td>
<td>5300</td>
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<td>16700.00</td>
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3. Fee payable at centre - 2nd semester to 6th Semester (each semester)

<p>| | | |</p>
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<tbody>
<tr>
<td>Tuition Fee (Payable at Centre)</td>
<td>Rs.7500/-</td>
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<td>Lab fee</td>
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<td>Library fee</td>
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<td><strong>Total</strong></td>
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<tr>
<td>Project Examination Fee</td>
<td>(Rs.3,000/-)</td>
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<tr>
<td>Examination Fee</td>
<td>(Rs.700/- per subject)</td>
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</table>
1. Introduction to C Programming
   1.1 A Tutorial Introduction
   1.2 Types, Operators, and Expressions
   1.3 Control Flow
   1.4 Functions and Program Structure
   1.5 Pointers and Arrays
   1.6 Structures
   1.7 Recursion
   1.8 Input and Output

2. Arrays
   2.1 Representation of arrays - single and multidimensional arrays
   2.2 Address calculation using column and row major ordering

3. Linked lists
   3.1 Singly linked lists - operations on list
   3.2 Circular and Doubly linked lists with header node
   3.3 Polynomial representation and manipulation using linked lists
   3.4 Generalized lists
   3.5 Sparse matrix representation using generalized list structure
4. **Stacks and Queues**

4.1 Representation of stacks and queues using arrays
4.2 Circular Queues
4.3 Conversion from infix to postfix and prefix expressions
4.4 Evaluation of postfix expression using stacks.
4.5 Linked Stacks and Queues
4.6 Multiple Stacks and Queues
4.7 Deque (Double Ended Queue)
4.8 Priority Queues

5. **Trees**

5.1 Binary tree traversal methods
5.2 Recursive and non recursive algorithms for tree traversal methods
5.3 Threaded Binary trees
5.4 Binary Search trees
5.5 Height balanced (AVL) trees
5.6 Huffman trees
5.7 General Ordered Trees and Forest - traversal

6. **Searching and Sorting**

6.1 Searching
   6.1.1 Sequential and Binary searches
   6.1.2 Indexed search
   6.1.3 Hashing schemes
6.2 Sorting
   6.2.1 Insertion, Selection and Bubble sort
   6.2.2 Quick sort, Heap sort and Merge sort
   6.2.3 Radix and Shell sort
6.3 Analysis of searching and sorting algorithms

7. **Graphs**

7.1 Graph representation schemes: Adjacency Matrix, Adjacency List and Linked representation
7.2 Graph Traversal schemes: DFS, BFS
7.3 Minimum spanning trees: Kruskal Algorithm, Prim’s Algorithm
7.4 Dijkstra’s Shortest path algorithm
7.5 Scheduling Problem

8. **General Search Trees**

8.1 Multiway Search Trees
8.2 B-trees
9. Dynamic Memory Management

9.1 Firstfit and bestfit approaches
9.2 Boundary Tag method
9.3 Buddy systems

Text Books


Reference Books

CT12 COMPUTER ARCHITECTURE

Structure

1. Introduction to Computer Structure 3
2. Computer Arithmetic and Their Hardware Implementation 6
3. Instruction Set Architecture 5
4. Introduction to Computer Organization 6
5. Micro Sequencer & Micro Programmed Control Unit Design 4
6. Memory Organization 6
7. Input/Output Organization 5
8. Advanced Processor Architectures and Parallel Computers 7

Detailed contents of the course

1. Introduction to Computer Structure
   1.1 Programmer’s view of computer system
   1.2 Hardware designer’s view of computer system
   1.3 Objectives of computer architecture
   1.4 Principles in computer design
   1.5 Computer types
   1.6 Computer performance

2. Computer Arithmetic and Their Hardware Implementation
   2.1 Unsigned notation arithmetic
   2.2 Signed notation arithmetic
   2.3 BCD arithmetic
   2.4 Floating point arithmetic
   2.5 Design of sequential 2’s complement circuit, Carry look ahead adder, Wallace tree multiplier

3. Instruction Set Architecture
   3.1 Instruction set architecture design
   3.2 Addressing modes
   3.3 Instruction set & Instruction format
   3.4 Working of assembler and macro assembler
   3.5 Stacks & subroutines
4. Introduction to Computer Organization

4.1 Basic computer organization
4.2 CPU organization
4.3 Memory subsystem organization & interfacing
4.4 I/O subsystem organization & interfacing
4.5 Micro operation & RTL
4.6 Implementation of digital systems by using RTL
4.7 Design of ALU
4.8 Design of CPU

5. Micro Sequencer & Micro Programmed Control Unit Design

5.1 Generic micro instruction format
5.2 Basic micro sequencer design
5.3 Design of control unit horizontal & vertical micro code
5.4 Micro subroutine

6. Memory Organization

6.1 Classification of memory
6.2 Organization of memory chips and memory interleaving
6.3 Hierarchical memory system
6.4 Cache memory & mapping techniques
6.5 Virtual memory concept & its mapping techniques
6.6 Page replacement policies

7. Input/Output Organization

7.1 Interfacing of I/O devices
7.2 Program control data transfer
7.3 Interrupt controlled data transfer
7.4 DMA based data transfer
7.5 Serial and parallel data communication
7.6 RS-232-C standard

8. Advanced Processor Architectures & Parallel Computers

8.1 General principles of governing the design of processor architecture and performance enhancement strategies
8.2 RISC and CISC processor
8.3 Instruction pipelining in RISC
8.4 Delay in pipeline execution
8.5 Super-scalar processor
8.6 VLIW and EPIC architecture
8.7 Parallelisms in uni-processor
8.8 Classification of parallel computers
8.9 Vector computers and Array processor
Text Books


Reference Books:

1. Basic Concepts
   1.1. Database & Database Users
       1.1.1 File Systems and Databases
       1.1.2 Characteristics of the Database Approach
   1.2. Database Systems, Concepts & Architecture
       1.2.1 Data Models, schemes & instances
       1.2.2 DBMS Architecture and Data Independence
       1.2.3 Data Base Languages and Interfaces

2. Entity-Relationship Model
   2.1. Entities, Attributes and Entity Sets
   2.2. Relationship and Relationship Sets
   2.3. Additional features
       2.3.1 Key Constraints
       2.3.2 Participation Constraints
       2.3.3 Weak Entities
       2.3.4 Class Hierarchies
       2.3.5 Aggregations
   2.4. Conceptual database Design

3. The Relational Model
   3.1. Relational Model Concepts
   3.2. Relational Model Constraints
   3.3. Mapping ER diagram to Tables
4. **Relational Algebra and Calculus**

4.1. Relational Algebra
4.2. Relational Calculus
   4.2.1 Tuple Relational Calculus
   4.2.2 Domain Relational Calculus

5. **SQL - A Relational Database Language**

5.1. Form of basic SQL query
5.2. Nested Queries
5.3. Aggregate Operators
5.4. Views
5.5. Data Definition in SQL
5.6. Specifying Constraints

6. **Data Base Design**

6.1. Functional Dependencies
6.2. Normal forms based on primary keys(INF, 2NF, 3NF and BCNF, 4NF, 5NF)

7. **Concurrency Control and Recovery Techniques**

7.1. Concurrency Control Techniques
   7.1.1 Locking Techniques
   7.1.2 Time stamp ordering
   7.1.3 Granularity of Data Items
7.2. Recovery Techniques
   7.2.1 Recovery Concepts-Deferred Update, Immediate Update, Shadow Paging
   7.2.2 Database backup and recovery from catastrophic failures

8. **Query Optimization**

8.1. Translating SQL queries into Relational Algebra
8.2. Heuristics based optimization

9. **Assorted Topics**

9.1. Distributed databases
9.2. Web Databases

**Text Books**

Reference Books

CT21 OBJECT-ORIENTED PROG. USING JAVA

Structure

1. Introduction to Object-Oriented Paradigm  1
2. An Overview of Java 3
3. Classes, Methods and Constructors 4
4. Inheritance and Interfaces 6
5. Packages 4
6. Multithreaded Programming 5
7. Exception Handling 5
8. I/O and Applet Programming 3
9. AWT and Networking 4
10. Event handling 3
11. Software Development using Java 4

Defined contents of the course

1. Introduction to Object-Oriented Paradigm
   1.1 Meaning of OOP
   1.2 Benefits of OOP
   1.3 Applications of OOP

2. An Overview of Java
   2.1 OOP through Java: The Three OOP Principles
   2.2 Java features
   2.3 Java and Internet
   2.4 Java and World Wide Web
   2.5 Web Browser
   2.6 JVM: Importance of Bytecode
   2.7 Constants, Variables and Data Types
   2.8 Operators and Expression
   2.9 Decision making- Looping and Branching
   2.10 Arrays and Strings

3. Classes, Methods and Constructors
   3.1 Class Fundamentals
   3.2 Objects
   3.3 Method Overloading
   3.4 Static Members
   3.5 Garbage Collection
   3.6 Constructors
   3.7 Overloading Constructors
4. **Inheritance and Interfaces**
   4.1 Defining a subclass
   4.2 Subclass constructors
   4.3 Multilevel Inheritance
   4.4 Hierarchical Inheritance
   4.5 Overriding methods
   4.6 Final variables and methods
   4.7 Final classes, abstract methods & classes, Visibility control
   4.8 Multiple Inheritance-Defining Interfaces
   4.9 Extending interfaces
   4.10 Implementing interfaces
   4.11 Accessing Interfaces variables

5. **Packages**
   5.1 Java API packages
   5.2 Using system packages
   5.3 Naming conventions
   5.4 Creating packages & accessing a package
   5.5 Using a package & adding a class to a package
   5.6 Hiding classes, static import

6. **Multithreaded Programming**
   6.1 Java thread model
   6.2 Creating threads
   6.3 Extending the thread class
   6.4 Stopping and blocking a thread
   6.5 Life cycle of a thread
   6.6 Using thread methods, thread exceptions & thread priority
   6.7 Synchronization
   6.8 Implementing the Runnable interface

7. **Exception Handling**
   7.1 Fundamentals
   7.2 Exception types
   7.3 Uncaught exceptions
   7.4 Using try and catch
   7.5 Multiple catch clauses, nested try statements
   7.6 Throw, throws, finally
   7.7 Java’s built-in exceptions
   7.8 Creating your own exception subclasses
   7.9 Using exceptions

8. **I/O and Applet Programming**
   8.1 I/O Basics, Streams
8.2 Reading and Writing Files
8.3 Applet Fundamentals
8.4 Applet Class, Architecture and Skeleton
8.5 Creating Applets
8.6 Transient, volatile, instanc eof, strictfp and Native Methods

9. AWT and Networking
9.1 AWT classes
9.2 Working with Windows, graphics and text
9.3 Using AWT Controls
9.4 Layout Managers
9.5 Menus
9.6 Handling Images
9.7 Animation, Sound and video
9.8 Networking basics
9.9 Java and the Net
9.10 Internet Address, URL
9.11 TCP/IP and Datagrams

10. Event handling
10.1 The Delegation Event Model
10.2 Two Event Handling Mechanisms
10.3 Event Classes and Event Listener Interfaces
10.4 Handling Mouse and Keyboard Events
10.5 Adapter Classes
10.6 Inner Classes and Anonymous Inner Classes

11. Software Development using Java
11.1 Java Beans
11.2 Swings
11.3 Servlets

Text Books:

Reference Books:
CT22 Discrete Mathematical Structures

<table>
<thead>
<tr>
<th>Structure</th>
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</thead>
<tbody>
<tr>
<td>1. Introduction</td>
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<td>2. Formal Logic</td>
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<tr>
<td>3. Boolean Algebra</td>
<td>6</td>
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<tr>
<td>4. Graph Theory</td>
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<tr>
<td>5. Trees</td>
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<tr>
<td>6. Weighted Graphs</td>
<td>5</td>
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<tr>
<td>7. Introductory Computability Theory</td>
<td>8</td>
</tr>
<tr>
<td>8. Notations of Syntax Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Detailed contents of the course

1. Introduction
   1.1 Sets and Operations on sets
   1.2 Binary relations
   1.3 Partitions and Equivalence relations
   1.4 Partial orders
   1.5 Principle of Inclusion-Exclusion
   1.6 Pigeon hole principle
   1.7 Mathematical Induction

2. Formal Logic
   2.1 Proof Statements
   2.2 Symbolic representation
   2.3 Predicates & Quantifiers
   2.4 Well formed formulas
   2.5 Tautologies
   2.6 Validity
   2.7 Propositional Logic
   2.8 Normal forms
   2.9 Principal CNF
   2.10 Principal DNF

3. Boolean Algebra
   3.1 Lattices as partially ordered sets
   3.2 Lattices as Algebraic Systems
   3.3 Distributive and complemented lattices
   3.4 Boolean Algebras as Lattices - Definitions
3.5 Examples and properties

4. Graph Theory

4.1 Graphs
4.2 Paths
4.3 Circuits
4.4 Subgraphs
4.5 Induced subgraphs
4.6 Degree of a vertex
4.7 Euler Path and graphs
4.8 Hamiltonian path and circuits
4.9 Connected graph
4.10 Complete graphs
4.11 Isomorphism of graphs
4.12 Planar graphs - Definitions
4.13 Examples and properties
4.14 Euler’s formula for connected Planar graphs
4.15 Kuratowski’s theorem and its applications

5. Trees

5.1 Spanning trees, Cut-sets
5.2 Fundamental cut-sets
5.3 Minimal spanning trees
5.4 Kruskal’s and Prim’s algorithms
5.5 Directed graph, In-degree and out-degree of a vertex
5.6 Weighted graphs
5.7 Dijkstra’s algorithm
5.8 Strong connectivity and Warshall’s algorithm
5.9 Binary search trees
5.10 Tree traversal procedures with examples

6 Introductory Computability Theory

6.1 Finite State Machines and their transition table diagrams
6.2 Equivalence of Finite State Machines
6.3 Finite Automata
6.4 Acceptors
6.5 Non-Deterministic Finite Automata
6.6 Conversion of Non-Deterministic Finite Automata into Deterministic Automata and their equivalence

7 Notations of Syntax Analysis

7.1 Polish Notations
7.2 Conversion of Infix expressions to Polish notation
Text Books

1. J.L. Hein, Discrete Structures, Logic and Computability, Jones and Bartlett Publishers, 3rd Edition

Reference Books

5. J. E.Hopcrat and J.D. Ullman, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House
7. N.Deo, Graph Theory with Applications to Engineering and Computer Sciences, Prentice Hall of India
CT 31 Operating Systems

Structure No. of Hours (42)

1. Overview 2
2. System Structure 3
3. Process Management 5
4. Process Coordination 4
5. Memory Management 5
6. Storage Management 5
7. Distributed Systems 6
8. Protection and Security 4
9. Special Purpose Systems 3
10. Case Studies 5

__________________________________________________________________________

Detailed contents of the course

1. Overview

1.1 Introduction
   1.1.1 What operating systems do
   1.1.2 Computer systems organization
   1.1.3 Architecture
   1.1.4 Structure
   1.1.5 Operations
   1.1.6 Process Management
   1.1.7 Memory Management
   1.1.8 Storage Management
   1.1.9 Protection and security
   1.1.10 Distributed systems,
   1.1.11 Special Purpose systems
   1.1.12 Computing environments

1.2 System Structures

   1.2.1 OS services
   1.2.2 User OS interface
   1.2.3 System calls,
   1.2.4 System programs
   1.2.5 OS design
   1.2.6 Design and Implementation
   1.2.7 OS Structure,
   1.2.8 Virtual Machines
   1.2.9 OS generation
   1.2.10 System boot
2. Process Management

2.1 Process Concept
   2.1.1 Process Scheduling
   2.1.2 Interprocess Communication
   2.1.3 Communication in client server systems

2.2 Multithreaded Programming
   2.2.1 Multithreading Models
   2.2.2 Thread libraries
   2.2.3 Threading issues
   2.2.4 OS Examples

2.3 Process scheduling
   2.3.1 Scheduling algorithms
   2.3.2 Multiple-Processor scheduling
   2.3.3 Thread scheduling
   2.3.4 OS examples
   2.3.5 Algorithms evaluation

3. Process Coordination

3.1 Synchronization
   3.1.1 Critical section
   3.1.2 Peterson’s solution,
   3.1.3 Synchronization Hardware
   3.1.4 Semaphores
   3.1.5 Classic problems of synchronization
   3.1.6 Monitors
   3.1.7 Synchronization examples
   3.1.8 Atomic transactions

3.2 Deadlocks
   3.2.1 Deadlock
   3.2.2 Characterization,
   3.2.3 Methods of handling deadlocks,
   3.2.4 Deadlock: Prevention, avoidance, detection, recovery

4. Memory Management

4.1 Memory-Management Strategies
   4.1.1 Contiguous Memory Allocation
   4.1.2 Paging
   4.1.3 Structure of page table
   4.1.4 Segmentation

4.2 Virtual-Memory Management
   4.2.1 Demand paging
   4.2.2 Copy-on-write
4.2.3 Page Replacement
4.2.4 Allocation of frames
4.2.5 Thrashing
4.2.6 Memory Mapped Files
4.2.7 Allocating Kernel Memory

5. Storage Management

5.1 File Systems
  5.1.1 Concepts
  5.1.2 Access methods
  5.1.3 Directory structure
  5.1.4 File System mounting
  5.1.6 File sharing
  5.1.7 Protection

5.2 Implementation File Systems:
  5.2.1 Mass-storage structure
  5.2.2 Disk Structure
  5.2.3 Disk attachment
  5.2.4 Disk scheduling
  5.2.5 Disk Management
  5.2.6 Swap-space Management
  5.2.7 RAID structure
  5.2.8 Stable-storage structure

5.3 I/O Systems
  5.3.1 I/O Hardware
  5.3.2 Application I/O interface
  5.3.3 Kernel I/O subsystems
  5.3.4 Transforming I/O requests to hardware
  5.3.5 Streams
  5.3.6 Performance operations

6. Distributed Systems

6.1 Distributed OS:
  6.1.1 Types
  6.1.2 Network Structure
  6.1.3 Network topology
  6.1.4. Communication structure
  6.1.5 Communication protocols
  6.1.6 Robustness
  6.1.7 Design issues

6.2 Distributed File systems
  6.2.1 Naming and Transparency
  6.2.2 Remote File access
  6.2.3 Statefull versus stateless service

6.3 Distributed Synchronization
  6.3.1 Event ordering
  6.3.2 Mutual Exclusion

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6.3.3 Atomicity
6.3.4 concurrency control
6.3.5 Deadlock handling
6.3.6 Election Algorithms
6.3.7 Reaching agreement

7. Protection and Security

7.1 System Protection
7.1.1 Goal of Protection
7.1.2 Principles of Protection Domain of Protection
7.1.3 Access Matrix
7.1.4 Implementation of Access Matrix
7.1.5 Access Control, Revocation and Access Rights
7.1.6 Capability-Based Systems
7.1.7 Language-Based Protection

7.2 System Security
7.2.1 Program Threats
7.2.2 System and network threats
7.2.3 Cryptography as a security tool
7.2.4 User authentication
7.2.5 Implementing Security Defences
7.2.6 Firewalling to protect systems and Networks

8. Special Purpose Systems

8.1 Real-time Systems:
8.1.1 System characteristics
8.1.2 Features, of Real-time Kernels
8.1.3 Implementing Real time OS
8.1.4 Realtime CPU Scheduling

8.2 Multimedia Systems
8.2.1 What is multimedia
8.2.2 Compression
8.2.3 Requirements of Multimedia Kernels
8.2.4 CPU Scheduling
8.2.5 Disk Scheduling
8.2.6 Network Management
8.2.7 An example: CineBlitz

9. Case Studies

9.1 The linux system
9.2 Windows XP
9.3 Influential Operating Systems
9.4 UNIX BSD (contents on line)
9.5 The Mach System (Contents on the windows 2000
Text Books:


Reference Books

CT 32 COMPUTER NETWORKS

Structure

<table>
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<td>2. Digital transmission fundamentals 06</td>
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<td>3. Data link controls 04</td>
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<td>4. Medium access Control Protocols and LAN 10</td>
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<td>5. Switched Networks 06</td>
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<td>6. Queuing Model 05</td>
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<tr>
<td>7. TCP/IP architecture 04</td>
</tr>
<tr>
<td>8. Security and Applications 04</td>
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</tbody>
</table>

Detailed contents of the course

1. Introduction: services and architecture

   1.1 Evolutions of Network Architecture and services
   1.2 Protocols, Services and Layering
   1.3 OSI Reference Model
   1.4 TCP/IP Architecture
   1.5 Application Layer Protocols

2. Digital transmission fundamentals

   2.1 Properties of Analog and Digital Communication
   2.2 Digital representation of analog signals
   2.3 Characterization communication channel
   2.4 Limits in digital transmission
   2.5 Analog and digital modulation
   2.6 Encoding Schemes
   2.7 Error Detection and Correction

3. Data link controls

   3.1 Peer-to-peer protocols and service models
   3.2 ARQ Protocols
   3.3 Point-to-Point Protocol
   3.4 HDLC Protocol
4. **Medium access Control Protocols and LAN**

4.1 Multiple access communication  
4.2 Random access protocols  
4.3 Scheduling based protocols  
4.4 Channelization Delay Performance of MAC and  
4.5 Channelization schemes  
4.6 LAN protocols  
4.7 IEEE 802.3, IEEE 802.5, IEEE 802.11, and FDDI  
4.8 LAN Bridges and Ethernet Switches

5. **Switched Networks**

5.1 Multiplexing and Circuit Switches  
5.2 Packet switched network  
5.3 Datagram and virtual circuit  
5.4 Routing in Packet Networks  
5.5 Shortest path routing  
5.6 Packet level Traffic management

6. **Queuing Model**

6.1 Data Traffic characteristics: Poisson Process  
6.2 Birth-Death Processes: Markov Chain Model  
6.3 M/M/1 Queues: Little’s Formula  
6.4 M/M/m queues: Average queue length, waiting time and blocking probability

7. **TCP/IP architecture**

7.1 Internet Protocol  
7.2 Internet routing  
7.3 User datagram protocol  
7.4 Transmission control protocol

8. **Security and Applications**

8.1 Private key and Public key cryptography  
8.2 DES and RSA algorithms  
8.3 Overview of SMTP, FTP and SNMP
Text Book


Reference Books

CT41 SOFTWARE ENGINEERING

Structure No of hours (42)

1. Introduction 4
2. Software Analysis 8
3. Software Design 6
4. Software coding 4
5. Software Testing 8
6. Software Maintenance 4
7. Software Metrics 8

Detailed contents of the course:

1. Introduction
   1.1 Evolution and historical aspects
   1.2 Software Engineering Principles
   1.3 Software product and process
   1.4 Software process models

2. Software Analysis
   2.1 Requirements Engineering
   2.2 Requirements Analysis
      2.2.1 Domain analysis
      2.2.2 Informal analysis
      2.2.3 Prototyping
      2.2.4 Structured Analysis (using DFD)
      2.2.5 Object Oriented Analysis (using UML)
   2.3 Requirements Specification
      2.3.1 Software Requirement Specification document (SRS document) - Characteristics and Components
      2.3.2 Specification tools - Structured English, Pre-Post conditions, Data Dictionary, Decision Tables
   2.4 Requirements Validation
      2.4.1 Reviews - Walkthroughs and Inspections
      2.4.2 Automated Cross-Referencing, Constructing Scenarios, Prototyping
3. **Software Design**
   3.1 Modularity - Cohesion and Coupling
   3.2 Design Strategies - Top-Down and Bottom-Up
   3.3 Structured Design (using Structure Charts)
   3.4 Object Oriented Design (using UML)
   3.5 Software Design Document (SDS) - Characteristics and Components
      3.5.1 Architectural Design
      3.5.2 Detailed Design
   3.6 Design Verification - Design Reviews, Automated Cross-Referencing

4. **Software Coding**
   4.1 Coding strategies - Top-Down and Bottom-Up
   4.2 Structured and object-oriented programming
   4.3 Coding standards and guidelines
   4.4 Code Walkthroughs and Inspections
   4.5 Code optimization

5. **Software Testing**
   5.1 Objectives, Goals, Principles, Guidelines
   5.2 Software Testing Techniques
      5.2.1 Structural Testing - Statement, Branch, Condition and Path Coverage, Basis Path Testing, Mutation Testing
      5.2.2 Functional Testing - Equivalence Partitioning, Boundary Value Analysis, Cause-Effect Graphing Technique, Comparison Testing
   5.3 Software Testing Strategies
      5.3.1 Unit, Integration, System Testing
      5.3.2 Regression Testing
      5.3.3 Validation Testing
      5.3.4 Software Debugging
      5.3.5 Debugging process and approaches

6. **Software Maintenance**
   6.1 Maintenance process and models
   6.2 Software Re-engineering
   6.3 Software Configuration Management
7. **Software Metrics**

7.1 **Project Size Metrics - Lines of Code, Function Point, Feature Point**

7.2 **Project Estimation Techniques**

7.2.1 **Empirical techniques** - Expert Judgment, Delphi-Cost Estimation

7.2.2 **Heuristic technique** - COCOMO

7.2.3 **Analytical technique** - Halstead Software Science

7.3 **Project Scheduling**

7.3.1 **Critical Path Method (CPM)**

7.3.2 **Project Evaluation and Review Technique (PERT)**

7.3.3 **Project Crashing**

7.4 **Software Reliability**

7.4.1 **Metrics**

7.4.2 **Time Dependent models** - Goel-Okumoto model, Jelenski Moranda model

7.4.3 **Time Independent models** - Input domain model, Fault seeding model

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**Text Books**


**Reference Books**

# CT42  DESIGN AND ANALYSIS OF ALGORITHMS

<table>
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<th>Structure</th>
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<tr>
<td>2. Graphs</td>
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<td>3. Sorting</td>
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<td>4. Data Structures</td>
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<tr>
<td>5. Divide and Conquer Algorithms</td>
<td>3</td>
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<tr>
<td>6. Greedy Algorithms</td>
<td>4</td>
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<tr>
<td>7. Dynamic Programming</td>
<td>6</td>
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<tr>
<td>8. String Matching</td>
<td>3</td>
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<tr>
<td>9. NP completeness</td>
<td>4</td>
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</tbody>
</table>

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**Detailed contents of the course:**

1. **Analyzing algorithms**
   - 1.1 Order of growth
   - 1.2 Worst case analysis
   - 1.3 Big Oh, Big Theta, Big Omega
   - 1.4 Recurrence relations
   - 1.5 Back tracking - 8 Queens problem

2. **Graphs**
   - 2.1 Representation of graphs
   - 2.2 Paths and cycles
   - 2.3 Breadth first search
   - 2.4 Depth first search
   - 2.5 Topological sort
   - 2.6 Strongly connected components

3. **Sorting**
   - 3.1 Quicksort
     - 3.1.1 Description
     - 3.1.2 Analysis of quicksort
   - 3.2 Counting sort
   - 3.3 Radix sort
   - 3.4 Bucket sort
   - 3.5 Heap sort
     - 3.5.1 Maintaining heap property
3.5.2 Building a heap
3.5.3 Heapsort algorithm
3.5.4 Priority queues

4. Data Structures

4.1 Hash Tables
4.1.1 Hash Functions
4.1.2 Open addressing - probing schemes
4.2 Binary Search Trees
4.2.1 AVL balanced trees
4.2.2 Insertion and deletion in AVL trees
4.2.3 Red Black trees - insertions
4.3 Other Tree structures
4.3.1 B Trees
4.3.2 B+ Trees
4.4 Disjoint sets
4.4.1 Operations on disjoint sets
4.4.2 Applications to connected components
4.4.3 Linked list representations
4.4.4 Time analysis

5. Divide and Conquer Algorithms

5.1 Merge sort
5.2 Analyzing divide and conquer algorithms
5.3 Finding closest pair of points

6. Greedy Algorithms

6.1 Kruskal’s algorithm
6.2 Prim’s algorithm
6.3 Dijkstra’s algorithm
6.4 Huffman codes
6.5 Knapsack problem

7. Dynamic Programming

7.1 Computing Fibonacci Numbers
7.2 Matrix chain multiplication
7.3 Longest common subsequence problem
7.4 Floyd-Warshall algorithm
7.5 Flow Networks - max flow min cut
8. String Matching

8.1 Simple text search
8.2 Rabin Karp algorithm
8.3 Knuth Morris Pratt algorithm

9. NP completeness

9.1 Polynomial time
9.2 NP completeness proofs
9.3 NP complete problems

Text Book :


Reference Book :

CT 43      I T MANAGEMENT

STRUCTURE            No of hours(42)
1. Information Technologies: Concepts and Management   4
2. Strategic Use of Information Technology            4
3. Enterprise Systems                                  8
4. Enterprise Computing Architecture                   6
5. Managing Information Technology Projects            6
6. Information Technology Economics                    4
7. Managing Information Resources and Security         7
8. Impact of IT on individuals, Organization and Society 3

---

Detailed Content of the Course

1. Information Technologies: Concepts and Management
   
   1.1 Information Systems
       1.1.1 Concepts and Definitions;
       1.1.2 Classification and Evolution of Information Systems
       1.1.3 Transaction Processing versus Functional Information Systems
   
   1.2 IT and Types of Organizational Activities
   1.3 IT Infrastructure and Architecture; Web-Enabled Systems; Emerging Computing Environments;

2. Strategic Applications of Information Technology
   
   2.1 Digital economy and digital enterprises, Inter-organizational and International IT Planning
   2.2 Porter’s competitive forces model, Value chain and value web models, Strategic information systems applications.
   2.3 Role of business process reengineering (BPR) in enhancing competitiveness.

3. Enterprise Systems
   
   3.1 Essentials of Enterprise Systems
   3.2 Enterprise applications and e-business architecture
   3.3 Enterprise Resource Planning (ERP) - MRP, MRP II, and SCM – and the software integration of these models
   3.4 Supply Chain Management (SCM) - Technologies, Issues, Advantages and Limitations. Integration with ERP
   3.5 Customer Relationships Management (CRM) - Technologies, Issues, Advantages and Limitations, Integration with ERP
3.6 E-business and E-Commerce - Technologies and Systems, Legal and Ethical Issues in E-Business (Aspects related to consumer protection, fraud, consumer alerts, and tools to implement buyer and seller protection. Issues such as domain names, cybersquatting, taxes, fees, and so on), Failures and Strategies for Success

3.7 Knowledge Management Systems - KM concepts, Technologies, Data Warehousing, Data, Text and Web Mining and Predictive Analytics, Data Visualization, Geographic Information Systems, Business (Corporate) Performance Management, Scorecards and Dashboards

4. Enterprise Computing Architecture

4.1 Examples of Architectures (Digital network architecture IBM's SAA
4.2 Business Architecture
4.3 Application Architecture
4.4 Data Architecture
4.5 Emerging Trends in Enterprise Computing

5. Managing Information Technology Projects

5.1 Strategies for Acquiring IT Applications
5.2 Request for Proposal (RFP) and Contracts Negotiation
5.3 Service Level Agreements (SLA’s) and stipulating best practices in contracts.
5.4 Systems Development priority setting criteria.
5.5 Quality and Productivity Process (as CMU's Competibility Maturity Model CMMi, ITIL, and ISO 9001-2000.
5.6 Identifying, Justifying, and Planning Information System Applications, Acquiring IT Applications: Available Options, Outsourcing and Application Service Providers, Vendor and Software Selection and Other Implementation Issues

6. Information Technology Economics

6.1 Financial and Economic Trends in Information Technology
6.2 Evaluating IT Investment: Benefits, Costs, and Issues
6.3 Methods for Evaluating and Justifying IT Investment
6.4 IT Strategies: Chargeback and Outsourcing,
6.5 Economics of IT Web-based Systems - This section examines cost curves for digital versus non-digital products.
7. Managing Information Resources and Security

7.1 Securing the Enterprise - IS vulnerability, threats, attack methods, and possible symptoms of attack, Intrusion Detection Systems.
7.2 Network Security Methods, SSL; Encryption; Digital Signature; Digital Certificate; Biometrics; Payment Security.

7.3 Fraud and Computer Crimes.
    Hacking, computer forensics in investigating and deterring security

7.4 Laying down security policy - IT Security management Practices -
    This section presents various plans that can be adopted to protect information systems from attacks described in the previous section. As well as auditing, are important in addressing system vulnerability.
7.5 Data Center Management, Issues of security, firewalls, access control, and authorization. Auditing and Risk management.
7.6 Business Continuity and Disaster Planning.
7.7 Information Technology Audit

8. Impact of IT on Individuals, Organizations, and Society

8.1 Perspectives of IT impacts on work, life and society.
8.2 Altering landscape of work and society vis-à-vis time and space distinction, Information from scarce to abundant resource, Information Revolution, Changing paradigms on Organisational working.
8.3 Environmental Issues, Health Issues, Net-Addiction, Stress, Privacy Issues, Impact of Quality of Work Life

Text Book:

Reference Book:
1. Management Information System, Laudon & Laudon, (Pearson Education)
2. Information Technology for Management, Turban et.al. (Wiley)
5. Management Information System, Schultheis & Sumner, (TMH)
## Structure

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<tr>
<td>1. Introduction to HTML, DHTML and JavaScript</td>
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<tr>
<td>2. Programming of Application Layer (TCP/IP Network) protocols using JAVA. These protocols are HTTP, FTP, SMTP</td>
</tr>
<tr>
<td>3. Introduction of XML, XPath, XSL, XQL and XSLT. (Parsing, Formatting and Query on XML file will be done through Java)</td>
</tr>
<tr>
<td>4. Introduction to Asynchronous Communication and AJAX. (AJAX programming through Java tool GWT/DWR)</td>
</tr>
<tr>
<td>5. Web Development Framework: Case study EJB/JSP 1. EJB/JSP (Programming of above framework will be done through Java language)</td>
</tr>
<tr>
<td>6. Introduction to Messaging (Programming will be done through open source JEE Server)</td>
</tr>
</tbody>
</table>

### Detailed contents of the course:

1. Introduction to HTML, DHTML and JavaScript
   - 1.1 Introduction to HTML, DHTML, HTML tags, attributes and events. JavaScript language syntax.

2. Application Layer Programming of TCP/IP network through Java
   - 2.1 Description of ServerSocket and Socket class.
   - 2.2 Fundamentals of protocol design.
   - 2.3 Http protocol and it’s Client and Server Program
   - 2.4 SMTP protocol and It’s Client and Server Program

3. Introduction to XML, XPath, XSL, XQL and XSLT
   - 3.1 Introduction to XML
   - 3.2 XML syntax
   - 3.3 Document type definition
   - 3.4 Data modeling and xml
   - 3.5 Document Object Model
   - 3.6 SAX 1.0 : The Simple API for XML, programming through Java
   - 3.7 Name Space and XML schema.
   - 3.8 XML Linking and Querying
   - 3.9 Transforming XML document to other format.
4 Introduction to Asynchronous Communication and AJAX
   a. Introduction to AJAX.
   b. Rich GUI development by using GWT/DWR through java language
   c. Asynchronous communication with servlet/JSP

5. Web Development Framework
   5.1 Introduction to Application Server
   5.2 Introduction to EJB
   5.3 Programming on Session Bean and Entity Bean

6. Introduction to Messaging
   6.1 Overview of the JMS
   6.2 Basic JMS API Concepts
   6.3 The JMS API Programming Model
   6.4 Writing Simple JMS Client Applications
   6.5 Creating Robust JMS Applications
   6.6 Using the JMS API in a Java EE Application

Text Books:
   by Merlin Hughes Visit Amazon's Merlin Hughes Pagesearch resultsLearn about Author Central(Author), Michael Shoffner (Author), Derek Hamner (Author)
2. Professional AJAX by Nicholas Zakas et alia, Wrox Press

Reference Book:
1. Marketing in JAVA by John Jokoski
CT71        ARTIFICIAL INTELLIGENCE

Structure        No of Hours (42)

1. Introduction to Artificial Intelligence                      2
2. Problem Solving, Search and Control Strategies               5
3. Problem Reduction and Game playing                          3
4. Logic Concepts and Prolog programming                       6
5. Advanced Problem Solving - Planning                          3
6. Knowledge Representation Techniques                          4
7. Expert Systems and Applications                              3
8. Handling Uncertainty                                         5
9. Machine Learning                                            4
10. Evolutionary Computation                                    2
11. Intelligent Agents                                          3
12. Natural Language Processing                                 2

________________________________________________________

Detailed contents of the course :

1. Introduction to Artificial Intelligence

   1.1. General Issues and overview of AI
   1.2. Intelligent Systems
   1.3. Foundations of AI
   1.4. Characteristics of AI systems
   1.5. Sub-areas of AI
   1.6. Applications

2. Problem Solving, Search and Control Strategies

   2.1. General Problem Solving
       2.1.1. Production System
       2.1.2. State Space Search
       2.1.3. Control Strategies
   2.2. Exhaustive Searches
       2.2.1. Breadth First Search
       2.2.2. Depth-First Search
       2.2.3. Depth First Iterative Deepening
       2.2.4. Bi-Directional Search
       2.2.5. Analysis of Search methods
   2.3. Heuristic Search Techniques
       2.3.1. General Purpose Heuristics
       2.3.2. Branch and Bound Search (Uniform Cost Search)
       2.3.3. Hill Climbing
       2.3.4. Beam Search
       2.3.5. Best First Search
2.3.6. A* Algorithm
2.3.7. Optimal solution by A* Algorithm
2.4. Iterative-Deepening A*
2.5. Constrained satisfaction

3. Problem Reduction and Game playing

3.1. Problem Reduction
3.2. Game Playing
  3.2.1. Game Problem verses State Space Problem
  3.2.2. Status Labeling Procedure
3.3. Bounded Look-ahead and use of Evaluation Functions
  3.3.1. Using Evaluation Function
  3.3.2. MINIMAX Procedure
3.4. Alpha-Beta Pruning
  3.4.1. Refinements to α-β pruning
  3.4.2. Alternative to α-β pruning MINMAX
  3.4.3. Iterative Deepening
  3.4.4. Two Player Perfect Information Games

4. Logic Concepts and Prolog programming

4.1. Propositional Calculus
  4.1.1. Truth table
  4.1.2. Equivalence Laws
4.2. Propositional Logic
  4.2.1. Resolution Refutation in PL
  4.2.2. Conversion of a formula into set of clauses
  4.2.3. Resolvent of Clauses
4.3. Predicate Logic
  4.3.1. Predicate Calculus
  4.3.2. Transformation of Formula into Prenex Normal Form
  4.3.3. Conversion of Formula into PNF notation
  4.3.4. Prenex Normal Form and Skolemization
  4.3.5. Resolution Refutation in Predicate Logic
4.4. PROLOG Programming
  4.4.1. General Syntax and Prolog Control Strategy
  4.4.2. Execution of a Prolog Query
4.5. Programming Techniques in Prolog
  4.5.1. Recursive Programming
  4.5.2. Iterative Programming
4.6. Lists Manipulation
4.7. Redundancy and Termination Issues
4.8. Effect of Rule and Goal orders
4.9. Cut, Fail predicates
5. **Advanced Problem Solving - Planning**

5.1. Types of Planning Systems
   - 5.1.1. Operator Based Planning
   - 5.1.2. Planning Algorithms
   - 5.1.3. Case Based Planning
   - 5.1.4. State Space Linear Planning

5.2. Block World Problem Description

5.3. Logic Based Planning

5.4. Linear Planning Using a Goal Stack

5.5. Means-Ends Analysis (MEA)

5.6. Nonlinear Planning Strategies
   - 5.6.1. Goal Set Method
   - 5.6.2. Partial Ordering Planning

6. **Knowledge Representation Techniques**

6.1. Approaches to Knowledge Representation

6.2. KR using Semantic Network
   - 6.2.1. Inheritance in Semantic Net

6.3. Knowledge Representation using Frames
   - 6.3.1. Inheritance in Frames
   - 6.3.2. Implementation of Frame Knowledge
   - 6.3.3. Representation of Frames in Prolog

6.4. Conceptual Dependency
   - 6.4.1. Conceptual Primitive Actions
   - 6.4.2. Conceptual category
   - 6.4.3. Rules for Conceptualization blocks in CD
   - 6.4.4. Generation of CD representation
   - 6.4.5. Conceptual Parsing
   - 6.4.6. Inferences Associated with Primitive Act

7. **Expert Systems and Applications**

7.1. Phases in building ES
   - 7.1.1. Knowledge Engineering
   - 7.1.2. Knowledge Representation
   - 7.1.3. Characteristics of ES

7.2. Expert System Architecture
   - 7.2.1. Knowledge base
   - 7.2.2. Inference Engine
   - 7.2.3. Knowledge acquisition
   - 7.2.4. User interfaces
   - 7.2.5. Explanation module

7.3. Rule Based Expert System
   - 7.3.1. Expert System Shell in Prolog
   - 7.3.2. Problem Independent Forward Chaining
8. Handling Uncertainty

8.1. Introduction

8.2. Probabilistic Reasoning and Uncertainty
   8.2.1. Probability theory
   8.2.2. Bayes’ Theorem
   8.2.3. Extensions of Bayes’ Theorem
   8.2.4. Probabilities in Rules and Facts of Production System

8.3. Bayesian Belief Network
   8.3.1. Formal Definition of Bayesian Belief Network
   8.3.2. Inference using Bayesian Network
   8.3.3. Example of Simple Bayesian network
   8.3.4. Structure Learning
   8.3.5. Advantages and Disadvantages of Bayesian Network

8.4. Certainty Factor

8.5. Dempster-Shafer (D-S) theory
   8.5.1. Dempster Theory Formalism
   8.5.2. Dempster’s rule of combination

8.6. Fuzzy sets and Fuzzy Logic
   8.6.1. Fuzzy Sets
   8.6.2. Various fuzzy set operations
   8.6.3. Various Types of Membership Functions
   8.6.4. Methods for Determining Membership Functions
   8.6.5. \( \alpha \)-cut and Representation of Fuzzy Set
   8.6.6. Multi-Valued Logic
   8.6.7. Fuzzy logic
   8.6.8. Linguistic Variables and Hedges
   8.6.9. Fuzzy propositions
   8.6.10. Inference Rules for Fuzzy Propositions
   8.6.11. Fuzzy Systems and Neuro Fuzzy system

9. Machine Learning

9.1. Concept of Learning
9.2. Component of Learning System
9.3. Major Learning Paradigm
   9.3.1. Inductive Learning
   9.3.2. Example Based Learning
   9.3.3. Supervised Learning
   9.3.4. Unsupervised Learning
   9.3.5. Deductive Learning

9.4. Neural Networks
   9.4.1. Perceptrons
   9.4.2. Multilayer Feedforward Networks
   9.4.3. Back Propagation Algorithm
   9.4.4. Recurrent Network
   9.4.5. Hopfield Network
10. **Evolutionary Computation**

10.1. Genetic Algorithm
   10.1.1. Biological evolutionary process
   10.1.2. Search Space
   10.1.3. Description of Genetic Algorithm
   10.1.4. Operators of GA

10.2. Applications of GA

10.3. Genetic programming Concepts
   10.3.1. Genetic programming

10.4. Evolutionary programming

10.5. Introduction to Swarm intelligence

11. **Intelligent Agents**

11.1. Properties of Agents

11.2. Agent Classifications

11.3. Agent Architecture

11.4. Learning Agents

11.5. Multi Agents System

12. **Natural Language Processing**

12.1. Introduction

12.2. Parsing techniques

12.3. Context-free grammar

12.4. Recursive Transitions Nets (RTN)

12.5. Augmented Transition Nets (ATN)

12.6. Case Grammar

12.7. Definite Clause Grammar (Logic grammar)

**Text Books**


**Reference Books**


CT72 COMPUTER GRAPHICS

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<td>3. Geometric Transformations</td>
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Detailed contents of the course:

1. Introduction
   1.1. Applications of Computer graphics
   1.2. Use in data visualization and CAD
   1.3. Colour monitors, RGB scheme
   1.4. Introduction to OpenGL

2. Line drawing
   2.1. DDA algorithm
   2.2. Bresenham line algorithm
   2.3. Bresenham Circle generation (one octant)
   2.4. Polygon filling algorithms
       2.4.1 splitting concave polygons
   2.5. OpenGL line functions

3. Geometric Transformations
   3.1. 2 D translation
   3.2. 2 D rotation
   3.3. Scaling
   3.4. shearing
   3.5. Reflection about a line
   3.6. Composite transformation
   3.7. OpenGL functions
4. Clipping algorithms

4.1. Cohen Sutherland line clipping
4.2. Cyrus Beck clipping
4.3. Handling concave windows
4.4. Mid point subdivision method

5. Curve Drawing

5.1. $C^0$, $C^1$, $C^2$ continuities
5.2. Hermite curves
5.3. Bezier curves
   5.3.1. parametric curve representation
   5.3.2. Bezier form
   5.3.3. Joining two cubic Bezier curves
   5.3.4. Relating Bezier to Hermite curve
   5.3.5. Drawing Bezier curves by hand given slope and end point values
   5.3.6. Bezier surface generation
5.4. B-Spline Curve
   5.4.1. Curve equations
   5.4.2. Uniform periodic Curve
   5.4.3. Cubic periodic curve
   5.4.4. Open uniform curve
   5.4.5. Relating end point and slope information to draw curves
5.5. Displaying curves on computer screen
   5.5.1. Horner’s rule
   5.5.2. Forward difference calculations
5.6. OpenGL curve functions

6. 3D viewing

6.1. 3D geometric transformations
6.2. Types of projections - parallel, isometric, perspective
6.3. Parallel Projections
   6.3.1. Front view, Top view, side views
   6.3.2. Axonometric views - types
   6.3.3. Isometric view generation
6.4. Perspective projections
   6.4.1. One vanishing point perspective
   6.4.2. Two vanishing point perspective
6.5. 3D clipping - parallel and perspective
6.6. Generating solids
   6.6.1. Sweep representation
   6.6.2. CSG constructive solid geometry
7. Hidden surface elimination

7.1. Back face detection
7.2. Depth buffer method
7.3. A-buffer method
7.4. Scan line method
7.5. Painters algorithm (depth sorting)

8. Illumination Models and Rendering

8.1. Basic illumination models
8.2. Diffuse reflection
8.3. Specular reflection
8.4. Constant intensity surface rendering
8.5. Gouraud surface rendering
8.6. Phong rendering
8.7. Ray tracing method

9. Other topics

9.1. Fractals
  9.1.1. fractal dimension
  9.1.2. fractal generation
  9.1.3. self-similar fractals
  9.1.4. random midpoint displacement methods
  9.1.5. self squaring fractals

9.2. Animation
  9.2.1. Key frame systems
  9.2.2. Morphing
  9.2.3. Simulating accelerations

Text Book:


Reference Books:

## CT73  DIGITAL IMAGE PROCESSING

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<td>2. Intensity transformation and Spatial filtering</td>
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<td>3. Image segmentation</td>
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<td>4. Filtering in frequency domain</td>
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<td>5. Representation and description</td>
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<td>6. Image Compression</td>
<td>8</td>
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<tr>
<td>7. Morphological Processing</td>
<td>5</td>
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</table>

### Detailed contents of the course:

1. **Introduction**
   - 1.1 What is digital image processing?
   - 1.2 Applications – X-ray imaging, in visible band
   - 1.3 Fundamental steps in DIP (1.4)
   - 1.4 Representing digital Images
     - 1.4.1 sampling and quantization
     - 1.4.2 representation
     - 1.4.3 spatial and intensity resolution
   - 1.5 RGB and HSI color models

2. **Intensity transformation and spatial filtering**
   - 2.1 Basic transformations
   - 2.2 Histogram processing
   - 2.3 Histogram equalizing
   - 2.4 Spatial filtering
   - 2.5 Smoothing spatial filters
   - 2.6 Sharpening filters - the Laplacian
   - 2.7 Highboost filtering
   - 2.8 First order derivative for image sharpening

3. **Image Segmentation**
   - 3.1 Region segmentation
   - 3.2 Detection of isolated points
   - 3.3 Line detection
   - 3.4 Edge detection
     - 3.4.1 Sobel and Prewitt filters
     - 3.4.2 Laplace of Gaussian LoG filter
     - 3.4.3 Canny edge detector
   - 3.5 Hough Transform - line and circle detection
   - 3.6 Image Thresholding
   - 3.7 Region based Segmentation - splitting and merging
4. **Filtering in Frequency Domain**

4.1 Fourier Transform
4.2 Convolution
4.3 Discrete Fourier Transform
4.4 Image smoothing using frequency domain filters
4.5 Image sharpening

5 **Representation and Description**

5.1 Boundary following, chain codes
5.2 Boundary descriptors
  5.2.1 Shape numbers
  5.2.2 Fourier Descriptors
  5.2.3 Statistical moments
  5.2.4 Texture - graylevel co-occurrence matrix
  5.2.5 Principal Components for description

6 **Image compression**

6.1 Huffman coding
6.2 LZW coding
6.3 Bit plane coding
6.4 Block Transform coding - DCT coding
  6.4.1 DCT coding
  6.4.2 Bit allocation
  6.4.3 Zonal coding
  6.4.4 Threshold coding
  6.4.5 JPEG standard
6.5 Wavelet coding - Haar Transform

7. **Morphological Processing**

7.1 Structuring elements
7.2 Erosion and Dilation
7.3 Opening and Closing
7.4 Hit-or-Miss transformation
7.5 Boundary extraction
7.6 Hole Filling
7.7 Extraction of connected components
7.8 Thinning
7.9 Segmentation using morphological watersheds

**Text Book:**

CT74  EMBEDDED SYSTEMS

Structure               No of hours (42)

1   Introduction to embedded systems  3
2   Embedded processors             8
3   Memory sub-system               3
4   Input/output and interfacing    6
5   Embedded System Software        6
7   Networked / distributed embedded systems  4
8   System design and development   6
9   Applications / case studies      6

Detailed contents of the course :

1   Introduction to embedded systems

   1.1 Characteristics of embedded systems
   1.2 Application examples
   1.3 Building blocks

2.   Embedded processors

   2.1 Microcontrollers
   2.2 High performance embedded processors
   2.3 Digital signal processors
   2.4 SoCs

3.   Memory sub-system

   3.1 Types of memories
   3.2 Memory hierarchy
   3.3 Processor memory interface

4.   Input/output and interfacing

   4.1 Input/output devices
   4.2 Sensors and actuators
   4.3 Interfacing buses and protocols
   4.4 Interrupt and DMA
   4.5 Analog input/output
   4.6 Examples of standard parallel and serial buses
5 Embedded System Software

5.1 Program Optimization
5.2 Concurrent Programming
5.3 Real-time operating systems
5.4 I/O management

6 Networked / distributed embedded systems

6.1 Special networking protocols
6.2 Wired and wireless networks

7 System design and development

7.1 Design issues
7.2 Hardware-software co-design
7.3 Testing and debugging
7.4 Safety, reliability and fault tolerance
7.5 Power management
7.6 Design and development tools

8 Applications / case studies

8.1 Process control
8.2 Multimedia
8.3 Telecommunication

Text Books:


Reference Books:

Detailed contents of the course:

1. Overview and Concepts
   1.1. Failures of Past Decision-Support Systems
   1.2. Operational vs Decision-Support Systems
   1.3. Definition of Data Warehouse

2. The Building Blocks
   2.1. Defining features
   2.2. Data Mart
   2.3. Components
   2.4. Metadata

3. Dimensional Modeling
   3.1. Requirements to Design
   3.2. Star Schema
   3.3. Fact Tables
   3.4. Dimensions
   3.5. Changing Dimensions
   3.6. Miscellaneous Dimensions
   3.7. Snowflake Schema
   3.8. Aggregate Fact tables
   3.9. Families of stars
4. Extraction, Transformation and Loading

4.1. Data Extraction
4.2. Data Transformation
4.3. Data Loading

5. Matching Information to the Users

5.1. Information and class of Users
5.2. Information Delivery
5.3. Information Delivery Tools

6. OLAP

6.1. Demand for OLAP
6.2. Major functions
6.3. OLAP models
6.4. Implementation Considerations

7. Data Warehousing and the Web

8. Introduction to Data Mining

8.1. Data Mining and its Functionalities
8.2. Issues in Data Mining
8.3. Input: Concept, Instances, Attributes

9. Data Preprocessing

9.1. Data Cleaning
9.2. Data Integration and Transformation
9.3. Data reduction
9.4. Data Discretization and Concept Hierarchy Generation

10. Classification and Prediction

10.1. Basic Concepts, Output Knowledge Representation
10.2. Decision Tree based Classification
10.3. Classification Rule based Classification
10.4. Bayesian Classification
10.5. Neural Network based Classification
10.6. Models for Numeric Prediction
10.7. Performance Evaluation of Classifiers and Predictors

11. Mining Frequent Patterns and Association Rules

11.1. Basic Concepts
11.2. Frequent Pattern Mining Methods
11.3. Mining Various Kinds of Association Rules
12. Clustering and Cluster Analysis

12.1. Types of Data in Cluster Analysis
12.2. Partitioning Methods
12.3. Hierarchical Methods
12.4. Density based Methods
12.5. Model based Methods
12.6. Outlier Analysis

13. Applications and Trends in Data Mining

Text Books:

1. P. Ponniah, Data Warehousing Fundamentals, Wiley

Reference Books

2. R. Kimball & Ross M., The Data Warehouse Toolkit, Wiley
4. Inmon W.H., Building the Data Warehouse, Wiley
CT 76  MICROELECTRONICS AND VLSI DESIGN

Structure                      No of hours (42)
1.  Introduction                   3
2.  Fabrication and Processing Technology  24
3.  Simulation                      4
4.  Performance Estimation          10
5.  Future Trends                   1

Detailed contents of the course :

1.  Introduction
   1.1 Review of Digital Systems
   1.2 Introduction to VLSI design: Fundamentals of transistors: BJT & FET
   1.3 Introduction to MOS Circuits: NMOS, PMOS, CMOS, and BiCMOS devices, Gas technology

2.  Fabrication and Processing Technology
   2.1 Crystal growth
   2.2 Wafer preparation
   2.3 Epitaxial growth
   2.4 Oxidation
   2.5 Photo-lithography
   2.6 Diffusion
   2.7 Ion-Implementation
   2.8 Metallization
   2.9 MOS Transistor theory, V-I characteristics
   2.10 Design and detailed analysis of MOS inverters, enhancement load, and depletion load
   2.11 CMOS inverter, delay and power analysis
   2.12 Design layout of simple CMOS gates
   2.13 Operational amplifier design (OPAMP)
   2.14 Differential amplifier and Analog filters.
   2.15 Circuit implementation of combinational and sequential Circuits
   2.16 Memory system design
   2.17 Low-Power CMOS Logic Circuits

3.  Simulation
   3.1 System simulation using HDL, specification of VHDL, constructs, behavioral, structural, data flow, description.
4. Performance Estimation

4.1 Transistor Physics - Accumulation, Depletion, Inversion
4.2 Threshold Voltage, V-I Characteristics, Body Effect, Noise Margin,
4.3 Latch-up Resistance, Switching Characteristics, Power Consumption; Yield
4.4 Scaling of MOS Transistor Dimensions.
4.5 Digital logic design- optimization of combinational logic,
   synchronous sequential logic design- Mealy & Moore machine.
4.6 Basics of VLSI Testing process and Fault Modeling

5. Future trends

5.1 Introduction to System on a Chip. Trends in VLSI technology.

Text Books:


Reference Books:

### CT-77 Telecommunications Management

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<td>5. Cable Television</td>
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<td>6. Telecommunications Economics II.</td>
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<td>7. Telephony</td>
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<td>8. Satellite and Wireless Communication</td>
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<td>9. The Internet and Electronic/Mobile Commerce</td>
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<td>10. Regulators in Telecom area</td>
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<td>11. Transnational Media &amp; Telecommunications</td>
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<td>12. Innovation &amp; Technology Management</td>
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<td>13. International issues in Telecom System</td>
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### Detailed Contents of the course

1. **Telecommunications Economics-1**  
   (Principles of Telecommunication Market Structure, Supply and Pricing)

   The Telecommunications Industry Structure
   
   Elements of Market Structure
   
   1.2.1 Seller Concentration  
   1.2.2 Product Differentiation  
   1.2.3 Barriers to Entry  
   1.2.4 Buyer Concentration  
   1.2.5 Demand Growth  
   1.3 Principles of Supply and Pricing  
   1.3.1 Factors that can influence Supply  
   1.4 Current Telecom users and growth pattern in India and other countries-Discussion
2. Telecommunications & Strategic Planning-I

2.1 What is Strategic Planning?
2.2 Environmental Scanning
   2.2.1 SWOT Model
   2.2.2 External Factors
   2.2.3 Internet Factors
2.3 Understanding Care Competency
2.4 Organizational Culture
   2.4.1 Total Quality Management and Six Sigma
2.5 Competitiveness of Telecom Service providers, Effect of development number portability etc. - Discussion

3. Telecommunications & Strategic Planning-II

3.1 Strategy Formulation in Telecom Business
   3.1.1 Corporate Growth Strategies
   3.1.2 Competitive Business Strategies
   3.1.3 Mergers & Acquisitions Strategy
3.2 Strategy implementation in Telecom Business
   3.2.1 Principles of Change Management
   3.2.2 Reengineering Process
   3.2.3 Service Benchmarking in Telecom
3.3 Evaluation and Control
3.4 Case Study of Telecom Sector in India - Discussion

4. Broadcast Television

4.1 The Business of Broadcasting
   4.1.1 Demographic Considerations
4.2 The Broadcast Industry Structure
   4.2.1 Television Networks
   4.2.2 Program Distributors
   4.2.3 Networks Affiliates
   4.2.4 Independent Television Stations
   4.2.5 Public Broadcasting
   4.2.6 The Advertisers
4.3 Broadcast Station Organization
   4.3.1 Sales
   4.3.2 Programming
   4.3.3 News Department
   4.3.4 Engineering
   4.3.5 Business
4.4 Responsibilities of the General Manager
4.5 Broadcast Program Strategies
   4.5.1 Syndication
5. **Cable Television**

The Cable Television Industry Structure  
Cable Operator  
Program Distributor  
Cable Television Distribution Network  
Hybrid-Fiber Coaxial (HFC) Network  
Principle of Cable Networking  
Cable Television Impact on Broadcast Television  
Cable Television Franchise  
The Franchise Renewal Process  
Cable System Management  
Cable Television Programming  
Basic and Expanded Cable  
Marketing Cable and Enhanced Services  
Pay per View Television  
High Speed Internet Access  
High Definition Television  
Cable Telephony  
Customer Service  
Value-aided Services (VAS) and different Business models in telecom in the - Discussion

6. **Telecommunications Economics II**  
(Principles of Public Utilities Common Carriers and Information Carriage)

Public Utilities  
Natural Monopolies  
Cyclical Patterns of Services  
Essential Services  
Public Utilities : Rights and Responsibilities  
Principle of Common Carrier Telephone Services  
Telephone Communication and Competition  
Telecommunication and Deregulation  
Management Ethics - Discussion
7. Telephony

The Divestiture of AT&T
The Telephone Industry Structure
Local Exchange Carriers
Telephony and Intelligent Networking
Basic v, Enhanced Information Services
7.4.1 Voice, DSL, VOIP and IPTV Services

8. Satellite and Wireless Communication

Satellite and Wireless Communication Carriers
General Categories of Service Requests
Billing and Customer Service issues
Telephone Maintenance and Repair
Request for Small Business Consulting
Competitive Challenges in the Telephone Market
Telecommunications and small Business Consulting
Architecture and Challenges of 3G and 4G Networks-Discussion

9. The Internet and Electronic/Mobile Commerce

Electronic/Mobile Commerce
Business-to-Consumer
Providing Information(I-Commerce)
Advertising and Marketing
Customer Support Services
Business-to-Business
Telecom supply Chain Management
Enterprise Resource Planning
Role of Telecom in Rural Development in India
Mobile Banking in India and other countries-Discussion

10. Regulators in Telecom Area

Role of TRAI in India
Other Regulatory bodies and Govt. Dept. in India and their role
Spectrum allocation in India - Discussion

11. Transnational Media & Telecommunications

What makes a Global Corporation Global?
The Transnational Media Corporation
Five Reasons for Engaging in Foreign Direct Investment
Risks Associated with Foreign Direct investment
Global Competition Issues
Global Outsourcing
12. Innovation & Technology Management

Three Kinds of Innovation
Innovation and Product Life Cycle
The Innovator’s Dilemma
Innovation and Change Management
Technology Diffusion of SMS & MMS - Discussion

13 International Issues in Telecom System

Recent global mergers and acquisitions in Telecom area.
Global players in different countries and their strategy
Security issues in Telecom Area


14.1 Recent development in Telecom technology and its applications in business
14.2 Role of Telecom in Rural Development in India
14.3 New business and revenue models supported by Telecom

Reference Books:

## CT 78 MOBILE COMPUTING

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<td>4. Wireless Transmission</td>
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<td>5. Wireless Protocols</td>
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<td>6. Information Management</td>
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<td>7. Location-independent and Location-dependent computing models</td>
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<td>8. Human-Computer Interaction</td>
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<td>9. Mobile applications and Services</td>
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<td>10. Security issues in Mobile Computing</td>
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**Detailed contents of the course:**

1. **Introduction**
   1.1 History
   1.2 Challenges In Mobile Computing,
   1.3 Mobile Computing Architecture
   1.4 Co-Channel Interference
   1.5 Frequency Reuse
   1.6 Capacity Enhancement By Cell Splitting, Sectoring Etc.
   1.7 Handoff
   1.8 Evolution Of Mobile System: SDMA, FDMA, TDMA, CDMA, GSM
   1.9 Open Research Topics

2. **Emerging Technologies**
   2.1 Bluetooth
   2.2 Radio Frequency Identification (*Rfid*)
   2.3 Wireless Broadband (*WiMAX*)
   2.4 Mobile IP
   2.5 Cellular IP
   2.6 Internet Protocol Version 4 and 6 (*IPv4, IPv6*)
3. **Mobility Management**
   
   3.1 Cellular Architecture
   3.2 Types Of Handoffs
   3.3 Channel Allocation
   3.4 Location Management
   3.5 AUC, HLR, VLR, EIR Schemes

4. **Wireless Transmission**
   
   4.1 Radio Transmission
   4.2 Signal & Antennas
   4.3 Signal Propagation
   4.4 Medium Access Control (MAC)
   4.5 Wireless LAN/WAN

5. **Wireless Protocols**
   
   5.1 Wireless TCP
   5.2 Session Mobility

6. **Information Management**
   
   6.1 Data Dissemination and Broadcast Models
   6.2 Mobile Database and Mobile Transaction

7. **Location-Independent and Location-Dependent Computing Models**
   
   7.1 Naming, Locating, and Routing
   7.2 Mobility and Handoff
   7.3 Location Awareness and Environmental Discovery

8. **Human-Computer Interactions**
   
   8.1 Reduced User Interfaces
   8.2 Wearable Computing
   8.3 Pervasive Computing

9. **Mobile Applications and Services**
   
   9.1 Mobile Agents
   9.2 Wireless Web

10. **Security Issues in Mobile Computing**
    
    9.3 Authentication in Mobile Applications
    9.4 Privacy Issues

Text Books:
1. Jochen Schiller, Mobile Communications, Pearson Education
2. William Stallings, High-Speed Networks and Internets, Performance and Quality of Service, Pearson Education

Reference Books:
2. T.G. Palanivelu, R. Nakkeeran, Wireless and Mobile Communications, PHI
3. Rappaport, Wireless Communications, Principles and Practice, Pearson Education
CT79 SOFT COMPUTING

Structure

1. Introduction to Soft Computing  2
2. Fuzzy Sets and Fuzzy Logic     8
3. Artificial Neural Network      10
4. Evolutionary Computation      12
5. Rough Sets                   6
6. Hybrid Systems               4

Detailed contents of the course:

1. Introduction to Soft Computing
   1.1. Introduction to Soft Computing Concepts
   1.2. Importance of tolerance in imprecision and uncertainty
   1.3. Soft Computing Constituents and Conventional Artificial Intelligence
   1.4. From Conventional AI to Computational Intelligence, Fuzzy Set Theory, Neural Networks and Evolutionary Computation
   1.5. Applications of Soft Computing

2. Fuzzy Sets and Fuzzy Logic
   2.1 Introduction
   2.1. Fuzzy sets versus Crisp sets
   2.2. Basic Concepts of Fuzzy Logic
      2.2.1. Introduction
      2.2.2. Fuzzy Sets
         2.2.2.1. Representation of Fuzzy Sets
         2.2.2.2. Designing Membership Functions
         2.2.2.3. Types of Membership Functions
   2.3. Operations on fuzzy sets
      2.3.1. Intersection and Union of Fuzzy Sets
      2.3.2. Complement of a Fuzzy Set
   2.4. Properties of Fuzzy Sets
      2.4.1. The cardinality of Fuzzy Sets
      2.4.2. Support and Alpha-level cuts
   2.5. A Geometric Interpretation of Fuzzy sets
   2.6. Possibility Theory
      2.6.1. Possibility Measures and Necessity Measures
   2.7. Fuzzy Relations and Fuzzy Inference
   2.8. Fuzzy Rule-based Systems
   2.9. Applications
3. **Artificial Neural Network**

3.1. Introduction
3.2. Neural Network Architectures
   3.2.1. Perceptrons
   3.2.2. Multilayer Feedforward Networks
   3.2.3. Back Propagation Algorithm
   3.2.4. Training Algorithms
3.3. Recurrent Network
   3.3.1. Hopfield Network
   3.3.2. Boltzmann Machines
3.4. Radial-Basis Function Networks
   3.4.1. RBF Architecture
   3.4.2. RBF network parameters
   3.4.3. Learning Algorithm
3.5. Learning Neural Networks
   3.5.1. Supervised Learning Neural Networks,
   3.5.2. Unsupervised Learning Neural Networks,
   3.5.3. Reinforcement Learning,
   3.5.4. Self-Organizing Maps,
   3.5.5. Adaptive Resonance Theory,
   3.5.6. Associative Memories
3.6. Neural Network Applications

4. **Evolutionary Computation**

4.1. Introduction
4.2. Applications of Evolutionary Computations
4.3. Advantages (and disadvantages) of Evolutionary Computations
4.4. Evolutionary Computations
   4.4.1. Introduction
   4.4.2. Evolutionary Programming
   4.4.3. Genetic Algorithms
   4.4.4. Evolution Strategies
   4.4.5. General Outline of Evolutionary Algorithms
4.5. Genetic Algorithm
   4.5.1. Introduction
   4.5.2. Genetic Algorithm Basics and some variations
   4.5.3. Description of Genetic Algorithm
      4.5.3.1. Encoding schemes for Chromosome
      4.5.3.2. Genetic Operators
   4.5.4. Applications of Genetic Algorithm
4.6. Genetic programming
4.7. Evolutionary programming
4.8. Learning Classifier Systems
4.9. Swarm intelligence
   4.9.1. Ant Colony Paradigm
      4.9.1.1. Biological Ant Colony System
      4.9.1.2. Ant colony optimization (ACO)
      4.9.1.3. Simulated Ant Colony Systems
4.9.1.4. Ant Intelligent Systems
4.9.2. Particle Swarm Optimization (PSO)
   4.9.2.1. Optimization algorithm
   4.9.2.2. PSO parameter control
   4.9.2.3. Particle Swarm Intelligent Systems

5. Rough Sets
   5.1. Introduction
   5.2. Imprecise Categories Approximations and Rough Sets
   5.3. Reduction of Knowledge
       5.3.1.1. The concept of Reducts
       5.3.1.2. Attribute Reduction using Rough Sets
   5.4. Decision Tables
   5.5. Applications of Rough Sets

6. Hybrid Systems
   6.1. Neural-Network-Based Fuzzy Systems
   6.2. Fuzzy Logic-Based Neural Networks
   6.3. Genetic Algorithm for Neural Network Design and Learning
   6.4. Fuzzy Logic and Genetic Algorithm for Optimization
   6.5. Applications.

Text books

Reference Books
No. F. 1-56/88 T. 13/TD-V(.) On the recommendation of the Board of Assessment for Educational Qualifications, the Government of India has been pleased to recognize provisionally the three year part time Advanced Level Course in Computer Science (ALCCS) awarded by the Institution of Electronics and Telecommunication Engineers, New Delhi for appointment to superior posts and services under the Central Government where M.Tech Degree in Computer Science is the prescribed qualification for recruitment, effective from 1987.

Sd/-
(M.M. Choudhury)
Asstt. Educational Adviser(T)