B.S.ABDUR RAHMAN
U N I V E R S I T Y
B.S.ABDUR RAHMAN INSTITUTE OF SCIENCE & TECHNOLOGY
(Estd.u/s 3 of the UGC Act, 1956)
(FORMERLY B.S.ABDUR RAHMAN CRESCENT ENGINEERING COLLEGE)
Seethakathi Estate, G.S.T. Road, Vandalur, Chennai - 600 048.

REGULATIONS (2009), CURRICULUM AND SYLLABUS
FOR
M.Tech (COMPUTER SCIENCE AND ENGINEERING)
(FOUR SEMESTERS / FULL TIME)

(Updated upto June 2012)

REGULATIONS -2009 FOR M.TECH / MCA / M. Sc DEGREE PROGRAMMES

1.0 PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires

i) **"Programme"** means Post Graduate Degree Programme (M.Tech./ MCA / M.Sc.)

ii) **"Course"** means a theory or practical subject that is normally studied in a semester, like Applied Mathematics, Structural Dynamics, Computer Aided Design, etc.

iii) **"University"** means B.S.Abdur Rahman University, Chennai, 600048.

iv) **"Institution"** unless otherwise specifically mentioned as an autonomous or off campus institution means B.S.Abdur Rahman University.

v) **"Academic Council"** means the Academic Council of the University.

vi) **'Dean (Academic Courses)'** means Dean (Academic Courses) of B.S.Abdur Rahman University.

vii) **'Dean (Students)'** means Dean(Students) of B.S.Abdur Rahman University.

viii) **"Controller of Examinations"** means the Controller of Examinations of B.S.Abdur Rahman University who is responsible for conduct of examinations and declaration of results.

2.0 PROGRAMMES OFFERED, MODE OF STUDY AND ADMISSION REQUIREMENTS

2.1 P.G. Programmes Offered

The various P.G. Programmes and their modes of study are as follows:

Degree	Mode of study
M.Tech.	Full Time
M.Tech.	Part Time – Day / Evening
M.C.A.	Full Time
M. Sc.	Full Time

2.2 MODES OF STUDY

2.2.1 Full-time

Candidates admitted under "Full-Time" shall be available in the institution during the complete working hours for curricular, co-curricular and extra-curricular activities assigned to them.

2.2.2 A full time student, who has completed all non-project courses desiring to do the Project work in part-time mode for valid reasons, shall apply to the Head of the Institution through the Head of the Department, if the student satisfies the clause 2.3.5 of this Regulations. Permission may be granted based on merits of the case. Such conversion is not permitted in the middle of a semester.

2.2.3 Part time - Day time

In this mode of study, the candidates are required to attend classes for the courses registered along with full time students.

2.2.4 Part time - Evening

In this mode of study, the candidates are required to attend only evening classes.

2.2.5 A part time student is not permitted to convert to the full time mode of study.

2.3. ADMISSION REQUIREMENTS

2.3.1 Candidates for admission to the first semester of the Master's Degree Programme shall be required to have passed an appropriate degree examination of this University as specified in Table 1 or any other examination of any University or authority accepted by the University as equivalent thereto.

2.3.2 Notwithstanding the qualifying examination the candidate might have passed, he/she shall have a minimum level of proficiency in the appropriate programme/courses as prescribed by the institution from time to time.

2.3.3 Eligibility conditions for admission such as class obtained, number of attempts in qualifying examination and physical fitness will be as prescribed by the Institution from time to time.

2.3.4 All part-time candidates should satisfy other conditions regarding experience, sponsorship etc., which may be prescribed by the institution from time to time.

2.3.5 A candidate eligible for admission to M.Tech. Part Time - Day Time programmeshall have his/her permanent place of work within a distance of 65km from the campus of the institution.

2.3.6 A candidate eligible for admission to M.B.A. Part Time - Evening programme shall have a working experience of 2 years at least at supervisory level. He/ she shall have his/her place of work within a distance of 65 km from the campus of the institution.

3.0 DURATION AND STRUCTURE OF THE P.G. PROGRAMME

3.1. The minimum and maximum period for completion of the P.G. Programmes are given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
M.Tech. (Full Time)	4	8
M.Tech.(Part Time)	6	12
M.C.A. (Full Time)	6	12
M.Sc. (Full Time)	4	8

3.2 The P.G. programmes will consist of the following components as prescribed in the respective curriculum

i. Core courses

ii. Elective courses

iii. Project work / thesis / dissertation

iv. Laboratory Courses

v. Case studies

vi. Seminars

vii. Practical training

3.3 The curriculum and syllabi of all the P.G. programmes shall be approved by the Academic Council.

3.4 The number of credits to be earned for the successful completion of the programme shall be specified in the curriculum of the respective specialization of the P.G. programme.

3.5 Each academic semester shall normally comprise of 75 to 80 working days spread over sixteen weeks. End-semester examinations will follow immediately after these working days.

ELIGIBLE ENTRY QUALIFICATIONS FOR ADMISSION TO P.G. PROGRAMMES

Sl.No.	Name of the Department	P.G. Programmes offered	Qualifications for admission
01.	Civil Engineering	M.Tech. (Structural Engineering)	B.E / B.Tech. (Civil Engineering) / (Structural Engineering)
		M.Tech. (Construction Engineering and Project Management)	B.E. / B.Tech. (Civil Engineering) /(Structural Engineering)
02.	Mechanical Engineering	M.Tech. (CAD - CAM)	B.E. / B.Tech. (Mechanical / Auto /Manufacturing / Production / Industrial/Mechatronics / Metallurgy / Aerospace/Aeronautical / Material Science / Marine Engineering)
		M.Tech. (Manufacturing Engineering)	B.E. / B.Tech. (Mechanical / Auto / Manufacturing / Production / Industrial/Mechatronics / Metallurgy / Aerospace/Aeronautical / Material Science / Marine Engineering)
03.	Polymer Technology	M.Tech. (Polymer Technology)	B. E. / B. Tech. degree Mech./ Production / Polymer Science or Engg or Tech/Rubber Tech/ M.Sc(Polymer Sc./Chemistry Appl. Chemistry)
04.	Electrical and Electronics Engineering	M.Tech. (Power Systems Engg)	B.E/B.Tech (EEE/ECE/E&I/ I&C/ Electronics / Instrumentation)
		M.Tech. (Power Electronics & Drives)	B.E/B.Tech (EEE/ECE/E&I/ I&C/ Electronics/ Instrumentation)
05.	Electronics and Communication Engineering	M.Tech. (Communication Systems)	M.Tech (Power System Engg) B.E / B.Tech (EEE/ ECE / E&I / I&C / Electronics / Instrumentation) B.E./ B.Tech. in ECE / Electronics / EIE
		M.Tech. (VLSI and Embedded Systems)	
06.	ECE Department jointly with Physics Department	M.Tech. (Optoelectronics and Laser Technology)	B.E./B.Tech. (ECE / EEE / Electronics / EIE / ICE) M.Sc (Physics / Materials Science / Electronics / Photonics)
07.	Electronics and Instrumentation Engineering	M.Tech. (Electronics and Instrumentation Engineering)	B.E./B.Tech. (EIE/ICE/Electronics/ECE/EEE)
08.	Computer Science and Engineering	M.Tech. (Computer Science and Engineering)	B.E. /B.Tech. (CSE/IT/ECE/EEE/EIE/ICE/ Electronics / MCA)
		M.Tech. (Software Engineering)	B.E. / B.Tech. (CSE / IT) MCA
09	Information Technology	M.Tech. (Information Technology)	B.E /B.Tech. (IT/CSE/ECE/EEE/EIE/ICE/ Electronics) MCA
10	Computer Applications	M.C.A.	Any degree. Must have studied Mathematics / Statistics /Computer oriented subject.
		M.Tech. (Systems Engineering and Operations Research)	Any degree. Must have studied Mathematics / Statistics /Computer oriented subject.
11	Mathematics	M.Sc. (Actuarial Science)	B.Sc. (Mathematics) of B.Sc. (Applied Science)
12	Chemistry	M.Sc.(Chemistry)	B.Sc (Chemistry) of B.Sc. (Applied Science)

3.6 The curriculum of P.G. programmes shall be so designed that the minimum prescribed credits required for the award of the degree shall lie within the limits specified below:

Programme	Minimum prescribed credit range
M.Tech.	70 to 80
M.C.A	130 to 140
M.Sc	74 to 80

3.7 Credits will be assigned to the courses for all P.G. programmes as given below:

* One credit for one lecture period per week
* One credit for one tutorial period per week
* One credit each for seminar/practical session of two or three periods per week
* One credit for four weeks of practical training

3.8 The number of credits registered by a candidate in non-project semester and project semester should be within the range specified below:

P.G. Programme	Non-project Semester	Project semester
M.Tech. (Full Time)	15 to 23	12 to 20
M.Tech. (Part Time)	6 to 12	12 to 16
M.C.A. (Full Time)	12 to 25	12 to 20
M.Sc. (Full Time)	15 to 25	12 to 20

3.9 The electives from the curriculum are to be chosen with the approval of the Head of the Department.

3.10 A candidate may be permitted by the Head of the Department to choose electives offered from other P.G. Programmes either within a Department or from other Departments up to a maximum of three courses during the period of his/her study, provided the Heads of the Departments offering such courses also agree.

3.11 To help the students to take up special research areas in their project work and to enable the department to introduce courses in latest/emerging areas in the curriculum, "Special Electives" may be offered. A candidate may be

permitted to register for a "Special Elective" up to a maximum of three credits during the period of his/her study, provided the syllabus of this course is recommended by the Head of the Department and approved by the Dean (AC) before the commencement of the semester, in which the special elective course is offered. Subsequently, such course shall be ratified by the Board of Studies and Academic Council.

3.12 The medium of instruction, examination, seminar and project/thesis/ dissertation reports will be English.

3.13 Practical training or industrial attachment, if specified in the curriculum shall be of not less than four weeks duration and shall be organized by the Head of the Department.

3.14 PROJECT WORK/THESIS/DISSERTATION

3.14.1 Project work / Thesis / Dissertation shall be carried out under the supervision of a qualified teacher in the concerned Department.

3.14.2 A candidate may however, in certain cases, be permitted to work on the project in an Industrial/Research Organization, on the recommendation of Head of the Department, with the approval of the Head of the Institution. In such cases, the project work shall be jointly supervised by a supervisor of the Department and an Engineer / Scientist from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

3.14.3 Project work / Thesis / Dissertation (Phase - II in the case of M.Tech.) shall be pursued for a minimum of 16 weeks during the final semester, following the preliminary work carried out in Phase-1 during the previous semester.

3.14.4 The Project Report/Thesis / Dissertation report / Drawings prepared according to approved guidelines and duly signed by the supervisor(s) and the Head of the Department shall be submitted to the Head of the Institution.

3.14.5 The deadline for submission of final Project Report / Thesis / Dissertation is within 30 calendar days from the last working day of the semester in which Project / Thesis / Dissertation is done.

3.14.6 If a candidate fails to submit the Project Report / Thesis / Dissertation on or before the specified deadline he / she is deemed to have not completed the Project Work / Thesis / dissertation and shall re-register the same in a subsequent semester.

3.14.7 A student who has acquired the minimum number of total credits prescribed in the Curriculum for the award of the Masters Degree will not be permitted to enroll for more courses to improve his/her cumulative grade point average (CGPA).

4.0 FACULTY ADVISER

To help the students in planning their courses of study and for getting general advice on academic programme, the concerned department will assign a certain number of students to a faculty member who will be called the Faculty Adviser.

5.0 CLASS COMMITTEE

5.1 Every class of the P.G. Programme will have a Class Committee, constituted by the Head of the Department as follows:

i. Teachers of all courses of the programme

ii. One senior faculty preferably not offering courses for the class, as chairperson.

iii. One or two students of the class, nominated by the Head of the Department.

iv. Faculty Advisers of the class - Ex-Officio Members

v. Professor in-charge of the P.G. Programme - Ex-Officio Member.

5.2 The Class Committee shall be constituted by the respective head of the department of the students.

5.3 The basic responsibilities of the Class Committee are to review periodically the progress of the classes, to discuss problems concerning curriculum and syllabi and the conduct of the classes. The type of assessment for the course will be decided by the teacher in consultation with the Class Committee and will be announced to the students at the beginning of the semester. Each Class Committee will communicate its recommendations to the Head of the Department and the Head of the Institution. The class committee, **without the student members,** will also be responsible for finalization of the semester results.

5.4 The Class Committee is required to meet at least thrice in a semester, once at the beginning of the semester, another time after the end-semester examination to finalise the grades, and once in between.

6.0 COURSE COMMITTEE

Each common theory course offered to more than one group of students shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course coordinator. The nomination of the Course coordinator shall be made by the Head of the Department / Head of the Institution depending upon whether all the teachers

teaching the common course belong to a single department or to several departments. The Course Committee shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Wherever it is feasible, the Course Committee may also prepare a common question paper for the test(s).

7.0 REGISTRATION AND ENROLMENT

7.1 For the first semester every student has to register and enroll for the courses he/she intends to undergo on a specified day notified to the student. The concerned Faculty Adviser will be present and guide the students in the registration/enrolment process.

7.2 For the subsequent semesters registration for the courses will be done by the student during a specified week before the end-semester examination of the previous semester. The curriculum gives details of the core and elective courses, project and seminar to be taken in different semester with the number of credits. The student should consult his/her Faculty Adviser for the choice of courses. The Registration form is filled in and signed by the student and the Faculty Adviser.

7.3 Late registration will be permitted with a prescribed fine up to two weeks from the last date specified for registration.

7.4 From the second semester onwards all students shall pay the prescribed fees and enroll on a specified day at the beginning of a semester.

A student will become eligible for enrolment only if he/she satisfies clause 9 and in addition he/she is not debarred from enrolment by a disciplinary action of the Institution. At the time of enrolment a student can drop a course registered earlier and also substitute it by another course for valid reasons with the consent of the Faculty Adviser. Late enrolment will be permitted on payment of a prescribed fine up to two weeks from the date of commencement of the semester.

7.5 Withdrawal from a course registered is permitted up to one week from the date of the completion of the first assessment test.

7.6 Change of a course within a period of 15 days from the commencement of the course, with the approval of Dean (AC), on the recommendation of the HOD, is permitted.

7.6.1 Courses withdrawn will have to be taken when they are offered next if they belong to the list of core courses.

7.7 SUMMER TERM COURSES

7.7.1 Summer term courses may be offered by a department on the recommendation by the Departmental Consultative Committee and approved by the Head of the Institution. No student should register for more than three courses during a summer term.

7.7.2 Summer term courses will be announced by the Head of the Institution at the end of the even semester before the commencement of the end semester examinations. A student will have to register within the time stipulated in the announcement. A student has to pay the fees as stipulated in the announcement.

7.7.3 Fast-track summer courses of 30 periods for 3 credit courses and 40 periods for 4 credit courses will be offered for students with I grades. They may also opt to redo such courses during regular semesters with slotted time-tables. Students with U grades will have the option either to write semester end arrears exam or to redo the courses during summer / regular semesters with slotted time-table, if they wish to improve their continuous assessment marks also.

The assessment procedure in a summer term course will also be similar to the procedure for a regular semester course.

7.7.4 Withdrawal from a summer term course is not permitted. No substitute examination will be held for the summer term courses.

8.0 TEMPORARY WITHDRAWAL FROM THE PROGRAMME

A student may be permitted by the Head of the Institution to temporarily withdraw from the programme up to a maximum of two semesters for reasons of ill health or other valid grounds. However the total duration for completion of the programme shall not exceed the prescribed number of semesters (vide clause 3.1).

9.0 MINIMUM REQUIREMENTS TO REGISTER FOR PROJECT / THESIS / DISSERTATION

9.1 A candidate is permitted to register for project semester, if he/she has earned the minimum number of credits specified below:

Programme	Minimum No. of credits to be earned to enrol for project semester
M.Tech. (Full time)	18 (III semester)
M.Tech. (Part-time)	18 (V semester)
M.C.A. (Full time)	45 (VI semester)
M.Sc. (Full-time)	28 (IV semester)

9.2 **M.Tech.:** If the candidate has not earned minimum number of credits specified, he/she has to earn the required credits (at least to the extent of minimum credit specified in clause 9.1) and then register for the project semester.

9.3 **M.C.A.:** If the candidate has not earned the required minimum number of credits specified he/she has to earn the required credits (at least to the extent of minimum credits specified in clause 9.1) and then register for the project work in subsequent semesters.

10.0 DISCIPLINE

10.1 Every candidate is required to observe discipline and decorous behaviour both inside and outside the campus and not to indulge in any activity, which will tend to bring down the prestige of the institution.

10.2 Any act of indiscipline of a candidate reported to the Head of the Institution will be referred to a Discipline and Welfare Committee for taking appropriate action.

10.3 Every candidate should have been certified by the HOD that his / her conduct and discipline have been satisfactory.

11.0 ATTENDANCE

11.1 Attendance rules for all Full Time Programme and Part time - day Time Programmes are given in the following sub-clauses.

11.2 A student **shall earn 100% attendance** in the contact periods of every course, subject to a **a maximum relaxation of 25%** for genuine reasons like on medical grounds , representing the University in approved events etc., to become eligible to appear for the end-semester examination in that course, failing which the student shall be awarded "I" grade in that course. If the course is a core course, the candidate should register for and repeat the course when it is offered next.

12.0 ASSESSMENTS AND EXAMINATIONS

12.1 The following rule shall apply to the full-time and part-time P.G. programmes (M.Tech./ M.C.A. / M.Sc.)

For lecture-based courses, normally a minimum of two assessments will be made during the semester. The assessments may be combination of tests and assignments. The assessment procedure as decided at the Class Committee will be announced to the students right at the beginning of the semester by the teacher and informed to Dean(AC)

12.2 There shall be one **examination** of three hours duration, at the end of the semester, in each lecture based course.

12.3 The evaluation of the Project work will be based on the project report and a Viva-Voce Examination by a team consisting of the supervisor concerned, an Internal Examiner and External Examiner to be appointed by the Controller of Examinations.

12.4 At the end of practical training or industrial attachment, the candidate shall submit a certificate from the organization where he/she has undergone training and also a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a Departmental Committee constituted by the Head of the Department.

13.0 WEIGHTAGES

13.1 The following shall be the weightages for different courses:

i) Lecture based course

Two sessional assessments	-	50%
End-semester examination	-	50%

ii) Laboratory based courses

Laboratory work assessment	-	75%
End-semester examination	-	25%

iii) Project work

Periodic reviews	-	50%
Evaluation of Project Report by External Examiner	-	20%
Viva-Voce Examination	-	30%

13.2 The markings for all tests, tutorial assignments (if any), laboratory work and examinations will be on absolute basis. The final percentage of marks is calculated in each course as per weightages given in clause 13.1.

14.0 SUBSTITUTE EXAMINATION

14.1 A student who has missed for genuine reasons any one of the three assessments including end-semester examination of a course may be permitted to write a substitute examination. However, permissions to take up a substitute examination will be given under exceptional circumstances, such as accident or admissions to a hospital due to illness, etc.,

14.2 A student who misses any assessment in a course shall apply in a prescribed form to the Dean(AC) through the Head of the department within a week from the date of missed assessment. However the substitute tests and examination for a course will be conducted within two weeks after the last day of the end-semester examinations.

15.0 COURSEWISE GRADING OF STUDENTS AND LETTER GRADES:

15.1 Based on the semester performance, each student is awarded a final letter grade at the end of the semester in each course. The letter grades and the corresponding grade points are as follows, but grading has to be relative grading

Letter grade	Grade points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
I	-
W	-

Flexible range grading system will be adopted

"W" denotes withdrawal from the course.

"I" denotes inadequate attendance and hence prevention from End Semester examination.

"U" denotes unsuccessful performance in a course.

15.2 A student is considered to have completed a course successfully and earned the credits if he / she secure five grade points or higher. A letter grade U in any course implies unsuccessful performance in that course. A course successfully completed cannot be repeated for any reason.

16.0 METHOD OF AWARDING LETTER GRADE:

16.1 A final meeting of the Class Committee without the student member(s) will be convened within ten days after the last day of the semester end examination. The letter grades to be awarded to the students for different courses will be finalized at the meeting.

16.2 Three copies of the results sheets for each course, containing the final grade and three copies with the absolute marks and the final grade should be submitted by the teacher to the concerned Class Committee Chairman. After finalisation of the grades at the class committee meeting the Chairman will forward two copies of each to the Controller of Examinations and the other copies to the Head of the Department in which course is offered.

17.0 DECLARATION OF RESULTS:

17.1 After finalisation by the Class Committee as per clause 16.1 the Letter Grades awarded to the students in the each course shall be announced on the departmental notice board after duly approved by the Controller of Examinations. In case any student feels aggrieved, he/she can apply for revaluation after paying the prescribed fee for the purpose, within two weeks from the commencement of the semester immediately following the announcement of results. A committee will be constituted by the Controller of Examinations comprising the Chairperson of the concerned Class Committee (Convener), the teacher concerned and another teacher of the department who is knowledgeable in the concerned course. If the Committee finds that the case is genuine, it may jointly revalue the answer script and forward the revised mark to the Controller of Examinations with full justification for the revision if any.

17.2 The **"U"** grade once awarded stays in the grade sheet of the students and is not deleted when he/she completes the course successfully later. The grade acquired by the student later will be indicated in the grade sheet of the appropriate semester.

18.0 COURSE REPETITION AND ARREARS EXAMINATION

18.1 A student should register to re-do a core course wherein "I" or "W" grade is awarded. If the student is awarded "I", or "W" grade in an elective course either the same elective course may be repeated or a new elective course may be taken.

18.2 A student who is awarded "U" grade in a course shall write the end-semester examination as arrear examination , at the end of the next semester, along with the regular examinations of next semester courses. **The marks earned earlier in the continuous assessment tests for the course, will be used for grading along with the marks earned in the end-semester arrear examination for the course.**

19.0 GRADE SHEET

19.1 The grade sheet issued at the end of the semester to each student will contain the following:

(i) the credits for each course registered for that semester.

(ii) the performance in each course by the letter grade obtained.

(iii) the total credits earned in that semester.

(iv) the Grade Point Average (GPA) of all the courses registered for that semester and the Cumulative Grade Point Average (CGPA) of all the courses taken up to that semester.

19.2 The GPA will be calculated according to the formula

$$GPA = \frac{\sum_i (Ci)(GPi)}{\sum_i Ci}$$

where C_i is the number of credits assigned for i^{th} course
GP_i - Grade point obtained in the i^{th} course
For the cumulative grade point average (CGPA) a similar formula is used except that the sum is over all the courses taken in all the semesters completed up to the point in time.

I and W grades will be excluded for GPA calculations.

U, I and W grades will be excluded for CGPA calculations.

19.3 Classification of the award of degree will be as follows:

CGPA	Classification
8.50 and above, having completed in first appearance in all courses	First class with Distinction
6.50 and above, having completed within a period of 2 semesters beyond the programme period.	First Class
All others	Second Class

However, to be eligible for First Class with Distinction, a candidate should not have obtained U or I grade in any course during his/her study and should have completed the P.G. Programme within a minimum period covered by the minimum duration (clause 3.1) plus authorized break of study, if any (clause 8). To be eligible for First Class, a candidate should have passed the examination in all courses within the specified minimum number. of semesters reckoned from his/her commencement of study plus two semesters. For this purpose, the authorized break of study will not be counted. The candidates who do not satisfy the above two conditions will be classified as second class. For the purpose of classification, the CGPA will be rounded to first decimal place. For the purpose of comparison of performance of candidates and ranking, CGPA will be considered up to three decimal places.

20 ELIGIBILITY FOR THE AWARD OF THE MASTERS DEGREE

20.1 A student shall be declared to be eligible for the award of the Masters Degree, if he/she has:

i) registered for and undergone all the core courses and completed the Project Work,

ii) successfully acquired the required credits as specified in the Curriculum corresponding to his/her programme within the stipulated time,

iii) successfully completed the field visit/industrial training, if any, as prescribed in the curriculum.

iv) has no dues to the Institution, Hostels and Library.

v) no disciplinary action is pending against him/her

20.2 The award of the degree must be approved by the University.

21.0 POWER TO MODIFY:

Notwithstanding all that have been stated above, the Academic Council has the right to modify any of the above regulations from time to time.

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M.Tech (COMPUTER SCIENCE AND ENGINEERING)

(With effect from 2011)

(Four Semesters / Full Time)

CURRICULUM

SEMESTER I

Sl. No	Subject Code	Subject	L	T	P	C	TC
Theory							
1	MA611	Mathematical Foundations of Computer Science	3	1	0	3	
2	CS601	Computer Architecture	3	1	0	3	
3	CS602	Data Structures and Analysis of Algorithms	3	0	2	4	
4	CS603	Operating Systems	3	0	2	4	
5	CS604	Software Engineering Methodologies	3	0	0	3	
6	CS605	Computer Networks and Management	3	0	2	4	
Practical							
1	CS606	Java Programming Lab	1	0	3	2	
				Total		**23**	

SEMESTER II

Theory

1	CS 607	Database Technology	3	0	0	3	
2	CS 608	Service Oriented Architecture	3	0	0	3	
3	CS 609	Mobile Computing	3	0	0	3	
4	CS 610	Grid Computing	3	0	0	3	
5		Elective -I	3	0	0	3	
6		Elective - II	3	0	0	3	

Practical

1	CS 611	DBMS Lab	1	0	3	2	
2	CS 612	Case study: Algorithmic Design and Implementation	1	0	3	2	
		Total					**22**

SEMESTER III

Theory

1	CS 701	High Speed Networks	3	0	0	3	
2	CS 702	Network Security	3	0	0	3	
3		Elective - III	3	0	0	3	
4		Elective - IV	3	0	0	3	

Practical

1	CS 703	Project - Phase I	0	0	12	6*	
		Total					**12**

* 6 credits are added with 12 credits of Phase II

SEMESTER IV

Practical

1	CS 703	Project - Phase II	0	0	35	18*

* Credits for Project Work (Phase I) of III Semester will be accounted along with Project work (Phase II) of IV Semester.

Total 18

Total Credits = 75

Total Number of Theory Courses	**16**
Total Number of Case Studies	**1**
Total Number of Practical Courses	**2**

LIST OF ELECTIVE COURSES

Sl. No	Subject Code	Subject	L	T	P	C
1	CSY 101	Theory of Computation	3	0	0	3
2	CSY 002	Soft Computing	3	0	0	3
3	CSY 003	Distributed Operating Systems	3	0	0	3
4	CSY 004	Web Technology	3	0	0	3
5	CSY 005	XML and Web Services	3	0	0	3
6	CSY 006	Bio Informatics	3	0	0	3
7	CSY 007	Multimedia Systems	3	0	0	3
8	CSY 008	Software Testing	3	0	0	3
9	CSY 009	Embedded Systems	3	0	0	3
10	CSY 010	Software Quality Assurance	3	0	0	3
11	CSY 011	Mobile Adhoc Networks	3	0	0	3
12	CSY 012	Data Warehousing and Data mining	3	0	0	3
13	CSY 013	Performance Evaluation of Computer systems and Networks	3	0	0	3
14	CSY 014	Agent Based Intelligent Systems	3	0	0	3
15	CSY 015	Complex Networks	3	0	0	3
16	CSY 016	Component Based Technology	3	0	0	3
17	CSY 017	Integrated Software Project Management	3	0	0	3
18	CSY 018	Digital Image Processing	3	0	0	3
19	CSY 019	Research Methodology for Computer Scientist	3	0	0	3
20	CSY 020	Real Time Systems	3	0	0	3
21	CSY 021	Information Security	3	0	0	3
22	CSY 022	Network Processors	3	0	0	3
23	CSY 023	Multicore Architecture	3	0	0	3
24	ECY 081	VLSI Design Techniques	3	0	0	3
25	CSZ 001	Speech Recognition	3	0	0	3

26	CSZ 002	Language Technology	3	0	0	3
27	CSZ 003	Graphics and Multimedia	3	0	0	3
28	CSZ 004	Hacking Techniques and Digital Forensics	3	0	0	3
29	CSZ 005	System Modeling & Simulation	3	0	0	3
30	CSZ 006	TCP/IP	3	0	0	3
31	CSZ 007	Fault Tolerant Systems	3	0	0	3
32	CSZ 008	Wireless Sensor Networks	3	0	0	3
33	CSZ 009	Security Issues in Cloud Computing	3	0	0	3
34	CSZ 010	Software Metrics	3	0	0	3
35	CSZ 011	Cross Language Information Retrieval	3	0	0	3
36	CSZ 012	Mobile Computing Development Technologies	3	0	0	3
37	CSZ 013	Embedded Computing with VLIW Approach	3	0	0	3
38	CSZ 014	Web Mining	3	0	0	3
39	CSZ 015	Information Retrieval Techniques	3	0	0	3
40	CSZ 016	Multiagent Systems	3	0	0	3

SEMESTER - I

		L	T	P	C
MA 611	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	3	1	0	3

OBJECTIVES:

- To motivate students on the challenge of the relevance of inference Theory to Engineering problems, Algebraic Theory to Computer Science problems.
- To explain the Discrete Mathematical concepts and develop problem solving skills like solving recurrence relations using generating functions.
- To expose students on the concepts of formal languages and automata theory.

UNIT I FUNDAMENTAL STRUCTURES 9

Set theory:- Relationships between sets - Operations on sets - Set identities - Principle of inclusion and exclusion - Minsets. Relations:- Binary relations - Partial orderings - Equivalence relations. Functions:- Properties of functions - Composition of functions - Inverse functions - Permutation functions.

UNIT II LOGIC 9

Propositional logic - Logical connectives - Truth tables - Normal form (conjunctive and disjunctive) - Predicate logic - Universal and existential quantifiers - Proof techniques - Direct and indirect - Proof by contradiction - Mathematical Induction.

UNIT III COMBINATORICS 9

Basics of counting - Counting arguments - Pigeonhole principle - Permutations and Combinations - Recursion and Recurrence relations - Generating functions.

UNIT IV ALGEBRAIC STRUCTURES 9

Introduction - Properties of an algebraic system - Morphisms -Semigroups and monoids - Sub semigroups and submonoids - Groups - Order of a group - Order of an element - Permutation groups - Subgroups - Cyclic groups - Morphism of groups - Kernel of a homomorphism - Cosets and Lagrange's Theorem - Normal subgroups - Rings and Fields.

UNIT V MODELING COMPUTATION AND LANGUAGES 9

Finite state machines - Deterministic and Non-deterministic finite state

machines - Turing Machines - Formal Languages - Classes of Grammars - Type_0 - Context Sensitive - Context Free - Regular Grammars - Ambiguity.

L : 45, T : 15

TOTAL = 60

TEXT BOOK

1. Judith L.Gersting, "Mathematical Structures for Computer Science", 5th edition, W.H. Freeman and Company, NY, 2003.

REFERENCES

1. J.P.Tremblay and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TMH, 1997.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 5th edition, TMH, 2003.
3. R.P.Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Edition, New Delhi 2002.
4. M.K. Venkataraman, N. Sridharan and N.Chandrasekaran, "Discrete Mathematics", The National Publishing Company, 2003.

CS 601 COMPUTER ARCHITECTURE

L	T	P	C
3	1	0	3

Course Objective

- To make students learn the fundamentals of computer design and ILP.
- To explain the compiler techniques for exposing ILP.
- To introduce multiprocessors and thread level parallelism.

UNIT I FUNDAMENTALS OF COMPUTER DESIGN 9

Measuring and reporting performance - Quantitative principles of computer design - Classifying instruction set architecture - Memory addressing - Addressing modes - Type and size of operands - Operations in the instruction set - Operands and operations for media and signal processing - Instructions for control flow - Encoding an instruction set - Example architecture - MIPS and TM32.

UNIT II INSTRUCTION LEVEL PARALLELISM 9

Pipelining and hazards - Concepts of ILP - Dynamic scheduling - Dynamic hardware prediction - Multiple issues - Hardware based speculation - Limitations of ILP - Case studies: IP6 Micro architecture.

UNIT III INSTRUCTION LEVEL PARALLELISM WITH SOFTWARE APPROACHES 9

Compiler techniques for exposing ILP - Static branch prediction - Static multiple issue: VLIW - Advanced compiler support - Hardware support for exposing parallelism -Hardware Vs software speculation. Mechanism - IA 64 and Itanium processor.

UNIT IV MEMORY AND I/O 9

Cache performance - Reducing cache miss penalty and miss rate - Reducing hit time - Main memory and performance - Memory technology. Types of storage devices - Buses - RAID - Reliability, availability and dependability - I/O performance measures -Designing I/O system.

UNIT V MULTIPROCESSORS AND THREAD LEVEL PARALLELISM 9

Symmetric and distributed shared memory architectures - Performance issues - Synchronization - Models of memory consistency - Multithreading.

L : 45, T : 15

TOTAL= 60

TEXTBOOK

1. John L. Hennessey and David A. Patterson," Computer Architecture: A Quantitative Approach", 3rd edition, Morgan Kaufmann, 2003.

REFERENCES

1. D.Sima, T. Fountain and P. Kacsuk, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.

2. Kai Hwang, "Advanced Computer Architecture Parallelism Scalability Programmability", Tata McGraw Hill, 2001.

3. Vincent P. Heuring and Harry F. Jordan, "Computer System Design and Architecture", Addison Wesley, 2nd edition, 2004

CS 602 DATA STRUCTURES AND ANALYSIS OF ALGORITHMS L T P C
3 0 2 4

Course Objective

- To make students understand and analyze the complexity and efficiency of algorithms in terms of time and space.
- To explain the need of abstract data types and various basic data structures such as Stacks, Queues, Trees and Graphs.
- To train them on various algorithm design techniques so that they develop the ability to solve a given problem using these design techniques.
- To bring out the essential differences between the nature of the classes P, NP, and NP-complete.

UNIT I GENERAL CONCEPTS AND LINEAR DATA STRUCTURES 12

Algorithm analysis techniques - Abstract data structure - Time and space analysis of algorithms - Big - oh and theta notations - Average, best and worst case analysis - Simple recurrence relations - Arrays, lists, stacks, queues - Array and linked structure implementations of lists, stacks, queues - Array of nodes and dynamic pointer implementations of linked structures.

UNIT II TREES 10

General and binary trees - Representations and traversals - General trees as binary trees - Binary search trees - Applications - The concept of balancing and its advantages - AVL trees - 2-3 trees - Red-black trees - Self-adjusting trees - Graphs and digraphs - Representations - Breadth and depth first searches - Connectivity algorithms - Shortest path - Minimal spanning tree - The union find problem - Hamiltonian path and travelling salesperson problems - Network flow - Articulation points and Bi-connected components.

UNIT III HASHING AND SORTING 8

Hash functions - Collision resolution - Expected behavior - Elementary sorts: Selection - Insertion - Bubble sort -Quick sort - Merge sort - Heap sort - Bucket sorting -External sorting - Worst case and average behavior - Lower bound for sorting using comparisons.

UNIT IV ALGORITHM DESIGN TECHNIQUES 8

Greedy methods - Application to bin packing, loading, and knapsack problems -Divide and conquer - Knapsack and min-max problem - Dynamic

programming - 0/1 knapsack problem, recursive and iterative solutions - Local Search Algorithms - Influence of data structure on algorithm performance.

UNIT V NP vs. P **7**

The spaces P and NP - Polynomial reduction - NP complete problems - Boolean satisfiability and Cook's theorem - Bin packing - Knapsack - Hamiltonian path -TSP - Independent set - Max clique - Graph coloring - Approximation algorithms.

L : 45, P : 15

TOTAL= 60

REFERENCES

1. Aho, J. Hopcroft and J. Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley, 1974.
2. Baase and Gelder, "Computer Algorithms: Introduction to Design and Analysis", 3rd edition, Addison Wesley, 2000.
3. Gilles Brassard and Paul Bratley, "Algorithmics", Prentice Hall, 1988.
4. Donald Knuth, "The Art of Computer Programming", 3 volumes, various editions, Addison Wesley, 1973-81.
5. Robert Kruse, "Data Structures and Program Design ", Prentice Hall, 1984.
6. Udi Manber, "Introduction to Algorithms", Addison Wesley, 1989.
7. Robert Sedgewick, "Algorithms", 2nd edition, Addison Wesley, 1988.
8. Thomas H. Cormen (CLRS), "Introduction to Algorithms", 2nd edition, Prentice Hall of India, 2003.
9. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft," Data Structures and Algorithms", Addison Wesley, 1983.
10. Horowitz and Sahni, "Fundamentals of Computer Algorithms", Computer Science Press, 1984.

CS 603 OPERATING SYSTEMS **L T P C**
3 0 2 4

Course Objective

- To introduce the basic components of operating systems and bring out the briefly the implementation details.
- To make students learn the importance of process managements and techniques for effective implementation of process management.
- To explain important aspects of memory managements and intricate of file management systems.
- To bring out essential design issues in distributed operating system.

UNIT I INTRODUCTION **7**

Main frame systems, Desktop systems - Multiprocessor systems - Distributed systems - Clustered systems - Real time systems - Hand held Systems, Operating systems structures: System components - Operating system services - System calls - System programs - System design and implementation - CPU scheduling: Basic concepts - Scheduling algorithms.

UNIT II PROCESS MANAGEMENT **11**

Process concepts - Process scheduling - Operation on process - Co-operating process - Inter process communication - Threads: Multithreading models - Process synchronization: The Critical section problem - Synchronization hardware - Semaphores - Classical problem of synchronization - Monitors - Deadlock: Deadlock characterization - Methods for handling deadlocks - Deadlock prevention - Deadlock avoidance - Deadlock detection - Recovery from deadlock.

UNIT III MEMORY MANAGEMENT **9**

Background - Swapping - Contiguous memory allocation - Paging - Segmentation - Segmentation with paging - Virtual memory: Demand paging - Page replacement - Thrashing.

UNIT IV FILE SYSTEMS **9**

File concepts - Access methods - Directory structure - File protection - File system implementation: File system structure and implementation - Directory implementation - Allocation methods free space management - Recovery - Disk structure - Disk scheduling.

UNIT V DISTRIBUTED OPERATING SYSTEM 9

Design issues in distributed operating system - Distributed file systems - Naming and transparency - Remote file access - Stateful versus Stateless service - Distributed coordination - Event ordering - Mutual exclusion - Atomicity - Concurrency control- Deadlock handling - Election algorithms - Case study - Linux.

L : 45, P : 15

TOTAL= 60

TEXTBOOKS

1. Silberschatz, Galvin and Gagne, "Operating System Concepts", 6th edition, 2003.
2. Pradeep K.Sinha, "Distributed OS Concepts and Design", IEEE Computer Society Press, Prentice hall of India, 1998.

REFERENCES

1. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, 2nd edition, 2001.
2. Achut S. Godbole and Kahate Atul, "Operating Systems & Systems Programming", Tata Mcgraw Hill, 2003.
3. Charles Crowley, "Operating systems: A Design Oriented Approach", Tata McGraw Hill, 1999.

CS 604 SOFTWARE ENGINEERING METHODOLOGIES

L	T	P	C
3	0	0	3

Course Objective

- To highlight the importance of various software development life cycle models and system engineering hierarchy.
- To make them learn several techniques for software requirements elicitation and feasibility studies.
- To train on software design concepts and principles.
- To comprehend and explain the various software testing strategies and debugging techniques.
- To bring out essential principles of software project management.

UNIT I SOFTWARE PROCESS **11**

A generic view of processes - Process maturity - Process models - Agile process - Extreme programming - Software cost estimation - Risk analysis - Software project planning & scheduling.

UNIT II REQUIREMENT ANALYSIS **6**

System engineering hierarchy - Requirement engineering: Tasks, Initiating the process, eliciting requirements, Developing use cases - Negotiating requirements - Validating requirements - Building the analysis models: Concepts - Object Oriented Analysis - Scenario based modeling - Data & control flow oriented model - Class based model - Behavioral model.

UNIT III SOFTWARE DESIGN **8**

Design concepts - Design models - Pattern based design - Architectural design - Component level design - Class based and conventional components design - Real-time system design - User interface : Analysis and design.

UNIT IV SOFTWARE TESTING **7**

Software testing - Strategies - Issues - Test strategies for conventional and object oriented software - Validation and system testing - Testing tactics: White box testing, Basis path testing - Control structure testing - Black box testing - Object oriented testing - Testing GUI - Testing Client/Server - Documentation testing.

UNIT V SOFTWARE QUALITY ASSURANCE 13

Software quality concepts - Quality assurance - Software technical reviews - Formal approach to software quality assurance - Reliability - Quality standards - Software quality assurance plan - Software maintenance - Software configuration management - Reverse engineering and reengineering - CASE tools.

TOTAL = 45

TEXTBOOK

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", 6th edition, McGraw Hill, 2005.

REFERENCES

1. I. Sommerville, "Software Engineering", 5th edition, Addison Wesley, 1996.
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer Verlag, 1997.
3. James F Peters and Witold Pedryez, "Software Engineering - An Engineering Approach", John Wiley and Sons, New Delhi, 2000.

CS 605 COMPUTER NETWORKS AND MANAGEMENT **L T P C**
3 0 2 4

Course Objective

- To make students understand the organization and functioning of computer networks.
- To explain the basic concepts of protocol design including algorithms for congestion control and flow control.
- To provide background knowledge on the basic concepts of link layer properties.
- To give some exposure on the basic concepts of wireless networks and the multimedia networks
- To prepare the students on the basic concepts of network security.

UNIT I COMPUTER NETWORKS AND THE INTERNET **9**

Network edge - Network core - Delay, loss and throughput in Packet-switched networks - Protocol layers and their service models - Networks under attack - History of computer networking and the Internet.

UNIT II APPLICATION AND TRANSPORT LAYER **9**

Principles of network applications - The Web and HTTP - File transfer: File transfer protocol - DNS - Peer-to-Peer applications - Socket programming - Transport - layer and services - Multiplexing and de-multiplexing - Connectionless transport: User datagram protocol - Principles of reliable data transfer - Connection-oriented transport: Principles of congestion control - Congestion control mechanism.

UNIT III THE NETWORK LAYER, THE LINK LAYER AND LOCAL AREA NETWORKS **9**

Introduction - Virtual circuit and datagram networks - Internet Protocol (IP): Routing algorithms - Routing in the Internet - Broadcast and multicast routing - Link layer : Services - Error-detection and correction techniques - Multiple access protocols - Link-layer addressing - Ethernet - Link-layer switches - Point-to-Point protocol - Link virtualization: A Network as a Link Layer.

UNIT IV WIRELESS AND MOBILE NETWORKS AND MULTIMEDIA NETWORKING **9**

Introduction - Wireless links and network characteristics - WiFi: 802.11 Wireless LANs - Cellular internet access - Mobility management: Mobile IP - Managing mobility in cellular networks - Impact on higher-layer protocols - Multimedia networking applications - Streaming stored audio and video - Making the best of the Best-effort service - Protocols for real-time interactive applications - Quality of service guarantees.

UNIT V SECURITY IN COMPUTER NETWORKS & NETWORK MANAGEMENT **9**

Introduction - Principles of cryptography - Message integrity - End-point authentication - Securing e-mail - Securing TCP Connections: SSL - Network layer security: Ipsec - Securing wireless LANs - Operational security: Firewalls and intrusion detection systems - Network management - The infrastructure for network management - The Internet-Standard management framework - ASN.1.

L : 45, P : 15

TOTAL = 60

TEXT BOOK

1. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", 4th edition, Addison-Wesley, 2007.

REFERENCES

1. Larry Peterson and Bruce Davie, "Computer Networks: A System Approach", 4th edition, Morgan Kaufmann, 2007.
2. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall, 2004.
3. William Stallings, "Wireless Communications & Networks", 2nd edition, Prentice Hall, 2005.
4. Jochen Schiller, "Mobile Communications", 2nd edition, Addison-Wesley, 2003.

CS 606	JAVA PROGRAMMING LAB	L	T	P	C
		1	0	3	2

Course Objective

- To explain students the business logic with middleware architecture.
- To discuss the concept of network programming using Java
- To study in detail about different types of inheritance , multi threading and Exception handling.
- To provide knowledge on the concept of applet and graphical programming methods.
- To discuss some web based applications

LIST OF EXPERIMENTS :

1. Study of simple Java programs using threading.
2. Create simple application using Applet.
3. Create simple application using UDP, TCP Sockets.
4. Implement the concept of Java Message Services.
5. Implement the concept of Swing.
6. Implement RMI.
7. Implement server side programming.
8. Implement the concept of JDBC.
9. Implement JAR file creation and Java Scripts.

SEMESTER - II

CS 607	DATA BASE TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Objective

- To emphasize basic concepts of database management system, its functionalities and components.
- To describe the advantages of using a database environment for the management of data rather than conventional file structures and outline the main activities and factors affecting performance when a DBMS is involved.
- To analyze organizational information requirements using the entity-relationship approach and model them as Entity-Relationship Diagrams (conceptual database design).
- To explain how a DBMS enforces security, recovery from failure, and concurrency control.

UNIT I DATABASE MANAGEMENT **9**

Relational data model - SQL - Database design - Entity-Relationship model - Relational normalization - Embedded SQL - Dynamic SQL - JDBC - ODBC.

UNIT II ADVANCED DATABASES **10**

Object databases - Conceptual object data model - XML and Web data - XML schema - Distributed data bases - OLAP and Data mining - ROLAP and MOLAP.

UNIT III QUERY AND TRANSACTION PROCESSING **8**

Query processing basics - Heuristic optimization - Cost, size estimation - Models of transactions - Architecture - Transaction processing in a centralized and distributed system - TP monitor.

UNIT IV IMPLEMENTING AND ISOLATION **9**

Schedules - Concurrency control - Objects and Semantic commutativity - Locking -Crash, abort and media failure - Recovery - Atomic termination - Distributed deadlock - Global serialization - Replicated databases - Distributed transactions in Real world.

UNIT V DATABASE DESIGN ISSUES **9**

Security - Encryption - Digital signatures - Authorization - Authenticated RPC - Integrity - Consistency - Database tuning - Optimization and research issues.

TOTAL = 45

REFERENCES

1. Philip M. Lewis, Arthur Bernstein and Michael Kifer, "Databases and Transaction Processing: An Application-Oriented Approach", Addison-Wesley, 2002.
2. R. Elmasri and S.B. Navathe, "Fundamentals of Database Systems", 3rd edition, Addison Wesley, 2004.
3. Abraham Silberschatz, Henry. F. Korth and S.Sudharsan, "Database System Concepts", 4th edition, Tata McGraw Hill, 2004.
4. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd edition, TMH, 2003.

CS 608 SERVICE ORIENTED ARCHITECTURE

L	T	P	C
3	0	0	3

Course Objective

- To introduce the importance, basic concepts and characteristics of Service Oriented Architecture.
- To highlight the impact Service Oriented Architecture Business Applications.
- To give exposure on various technologies and layered architecture design concepts in SOA.
- To provide the knowledge about SOA support in J2EE and .Net platform.

UNIT I SOA AND WEB SERVICES FUNDAMENTALS 5

Fundamentals of SOA - Characteristics - Common misperception - Benefits - Pitfalls of adopting SOA - Transition from XML to web service to SOA - Reshaping of XML and web service through SOA - Standards for SOA - Comparison of SOA vs Past architecture - Web services frame work - Service description - Messaging with SOA.

UNIT II SECOND GENERATION WEB SERVICES 9

Activity management and comparison - Message exchange patterns - Service activity - Coordination - Atomic transactions - Business activities - Business protocols - Process definitions - Process services - Orchestration and coordination - Collaboration. Addressing - Reliable messaging - WS policy framework - Policy assertions and alleviates policies relationship to activity management - Metadata exchange security - WS notification and eventing.

UNIT III SERVICE ORIENTATION 9

Service oriented architecture - Components - Common principles of service - Orientation - Interrelationship among principles - Service orientation VS object orientation - Service layers - Different services layers - Configuration scenarios of service layers. SOA delivery life cycle phases - Agile strategy - SOA analysis - Service modeling - guidelines - Classifications of service models.

UNIT IV TECHNOLOGIES AND DESIGN FOR SOA 11

Service oriented design - Web service description language (WSDL) - Related XML schema - WSDL language basis - SOAP language basis - Service interface design tools - SOA comparison guide lines - Industry standards - XML AWSOA - WSDL and SOA - SOAPAWAOA - SOA extension.

UNIT V SERVICE DESIGN AND SECURITY 11

Service design - Guidelines - Business process design - WS - BPEL language basics - WS - BPEL elements - WS coordination - Service oriented process design - WS addressing language and messaging basis - WS - Meta data exchange - Security language basis - WSOA platform - SOA support in J2EE and.NET.

TOTAL = 45

TEXT BOOK

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology & Design", Prentice Hall / Pearson, 2005.

REFERENCES

1. Thomas Erl , "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services ", The Prentice Hall, Service-Oriented Computing Series, 2004.
2. Thomas Erl, "SOA Principles of Service Design", Prentice Hall Service-Oriented Computing Series, 2007.
3. Shankar Kambhampaty, "Service Oriented Architecture for Enterprise Applications", 1st edition, Wiley India Private Limited, 2008.
4. Mike Rosen, Boris Lublinsky, Kevin T. Smith and Marc J. Balcer, "Applied SOA Service Oriented Architecture And Design Strategies", Wiley India Private Limited, 2008.
5. Eric Newcomer Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2nd edition, 2008.
6. Paul. C. Brown, "Implementing SOA Total Architecture in Practice", Pearson Education, 2009.
7. Nicolai M. Josuttis, "SOA in Practice, The Art of Distributed System Design", 2nd edition, 2008.

CS 609 MOBILE COMPUTING L T P C
3 0 0 3

Course Objective

- To provide the knowledge about various networks like wireless network, ATM network, Cellular network and Mobile IP.
- To understand how the spectrum allocation is being done and various IEEE standards for wireless communication.
- To provide the understanding of how the mobile IP is used in wireless and mobile communication.
- To find out the difference between traditional TCP and the issues with mobile TCP and other forms of TCPs.

UNIT I INTRODUCTION 9

Medium access control : Motivation for specialized MAC - SDMA - FDMA - TDMA - CDMA - Comparison of access mechanisms - Tele communications : GSM - DECT- TETRA - UMTS - IMT-200 - Satellite Systems: Basics - Routing - Localization - Handover - Broadcast systems: Overview - Cyclic repetition of data - Digital audio broadcasting - Digital video broadcasting.

UNIT II WIRELESS NETWORKS 9

Wireless LAN: Infrared Vs Radio transmission - Infrastructure networks - Ad hoc networks - IEEE 802.11 - HIPERLAN - Bluetooth - Wireless ATM: Working group - Services- Reference model - Functions - Radio access layer - Handover - Location management - Addressing mobile quality of service - Access point control protocol.

UNIT III MOBILE NETWORK LAYER 9

Mobile IP : Goals - Assumptions and requirement - Entities - IP packet delivery- Agent advertisement and discovery - Registration - Tunneling and encapsulation - Optimization - Reverse tunneling - IPv6 - DHCP - Ad hoc networks.

UNIT IV MOBILE TRANSPORT LAYER 9

Traditional TCP - Indirect TCP- Snooping TCP - Mobile TCP - Fast retransmit/ Fast recovery - Transmission/Timeout freezing - Selective retransmission - Transaction oriented TCP.

UNIT V WAP **9**

Architecture - Datagram protocol - Transport layer security - Transaction protocol - Session protocol - Application environment - Wireless Telephony application - Latest wireless technologies: 3G - WiMax.

TOTAL = 45

REFERENCES

1. J.Schiller, "Mobile Communication", Addison Wesley, 2000.
2. William Stallings, "Wireless Communication and Networks", Pearson Education, 2003.
3. Singhal, "WAP-Wireless Application Protocol", Pearson Education, 2003.
4. Lother Merk, Martin S. Nicklaus and Thomas Stober, "Principles of Mobile Computing", 2nd Edition, Springer, 2003.
5. William C. Y. Lee, "Mobile Communication Design Fundamentals", John Wiley, 1993.

CS 610	GRID COMPUTING	L	T	P	C
		3	0	0	3

Course Objective

- To explain grid computing standards and protocols
- To learn and understand the recent trends in the field of computation to optimize the utilization of resources.
- To give the recent trends in the field of computation to optimize the utilization of resources.
- To tell about resource sharing across the heterogeneous entities.
- To integrate heterogeneous computing elements and data resources to provide a global computing space.
- To explain techniques to manage and schedule the resources in grid environments.

UNIT I GRID COMPUTING **9**

Introduction - Definition - Scope of grid computing.

UNIT II GRID COMPUTING INITIATIVES **9**

Grid computing organizations and their roles - Grid computing analog - Grid computing road map.

UNIT III GRID COMPUTING APPLICATIONS **9**

Merging the grid sources - Architecture with the Web devices architecture.

UNIT IV TECHNOLOGIES **9**

OGSA - Sample use cases - OGSA platform components - OGSI - OGSA basic services.

UNIT V GRID COMPUTING TOOL KITS **9**

Globus Toolkit - Architecture, Programming model, High level services - OGSI. Net middleware Solutions.

TOTAL = 45

REFERENCES

1. Joshy Joseph and Craig Fellenstein, "Grid Computing", Prentice Hall of India, 2003.
2. Ahmar Abbas, "Grid Computing: A Practical Guide to technology and Applications", Charles River media, 2003.

CS 611	DBMS LAB	L	T	P	C
		1	0	3	2

Course Objective

- To give hands on training on how several algorithms work, particularly those concerned with the creation and updation of tables.
- To make students do experiments on the new database and modify existing ones for new applications and reason about the efficiency of the result

Student should carryout exercises applying the following concepts

1. Data Definition Language (DDL) commands in RDBMS.
2. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
3. High-level language extension with Cursors.
4. High level language extension with Triggers
5. Procedures and Functions.
6. Embedded SQL.
7. Database design using E-R model and Normalization.
8. Any other real time applications such as Payroll Processing System, Banking System, Library Information System.

CS 612	CASE STUDY: ALGORITHMIC DESIGN AND IMPLEMENTATION	L	T	P	C
		1	0	3	2

Course Objective

- To make students understand the fundamental concepts and techniques for algorithm design
- To teach how to write algorithms in a formal way
- To give some ideas on the implementation of devised algorithms using programming languages so that students will be able to design effectively.

1. The basic idea of this case study is to encourage problem solving, logical thinking and analytical capability attacking real time problems. The concepts focused are problem decomposition, problem definition, analysis, synthesis and methodology to solve complex problems.
2. The student will work on new algorithms or modify the existing algorithms suitable to the problem that is given to him/her.
3. The student will also implement the algorithmic design that he/she has made and show some output after implementation.

SEMESTER - III

CS 701	HIGH SPEED NETWORKS	L	T	P	C
		3	0	0	3

Course Objective

- To provide an in-depth understanding, in terms of architecture, protocols and applications, of major high-speed networking technologies
- To make students understand design issues of the internet as a high-speed network, ATM networks, and high-speed LANs and MANs.
- To explain issues such as end system and network traffic management and routing will also be dealt with.
- To describe some Protocols for Quality of Service implementation.

UNIT I HIGH SPEED NETWORKS **8**

Frame relay networks - Asynchronous transfer mode - ATM protocol architecture, ATM logical connection, ATM cell - ATM service categories - AAL. High speed LAN's: Fast Ethernet, Gigabit Ethernet, fiber channel - Wireless LAN's applications, requirements - Architecture of 802.11.

UNIT II CONGESTION AND TRAFFIC MANAGEMENT **8**

Queuing analysis - Queuing models - Single server queues - Effects of congestion - Congestion control - Traffic management - Congestion control in packet switching networks - Frame relay congestion control.

UNIT III TCP AND ATM CONGESTION CONTROL **12**

TCP Flow control - TCP Congestion control - Retransmission - Timer management - Exponential RTO backoff - KARN's algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic management frame work, Traffic control - ABR traffic management - ABR rate control, RM cell formats, ABR capacity allocations - GFR traffic management.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES **8**

Integrated services architecture - Approach, Components, Services - Queuing discipline, FQ, PS, BRFQ, GPS, WFQ - Random early detection, Differentiated services.

UNIT V PROTOCOLS FOR QOS SUPPORT 9

RSVP - Goals and characteristics, Data flow, RSVP operations, Protocol mechanisms - Multiprotocol label switching - Operations, Label stacking, Protocol details - RTP - Protocol architecture, Data transfer protocol, RTCP.

TOTAL = 45

TEXTBOOK

1. William Stallings, "High Speed Networks and Internet" , Pearson Education, 2nd edition, 2002.

REFERENCES

1. Warland and Pravin Varaiya , "High Performance Communication Networks", Jean Harcourt Asia Private Limited, 2nd edition, 2001.

2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003.

CS 702 NETWORK SECURITY L T P C
3 0 0 3

Course Objective

- To provide an in-depth understanding of how important are issues related to network security.
- To teach students basic issues, concepts, principles and mechanisms in network security.
- To make them study and examine the various techniques and standards in symmetric ciphers.
- To explain the understanding of the principles of public key cryptosystems and hash functions.
- To discuss different access controls and authentication protocols.
- To tell students about various threats and vulnerabilities to specific architectures and protocols

UNIT I SYMMETRIC CIPHERS (Techniques and Standards) - I 9

Introduction - Services, mechanisms and attacks - OSI security architecture - Model for network security. Classical encryption techniques - Symmetric cipher model - Substitution techniques - Transposition techniques - Rotor machines - Stenography. Block ciphers and data encryption standard - Simplified DES - Block cipher principles - Data encryption standard - Strength of DES - Differential and linear Crypt Analysis - Block cipher design principles - Block cipher modes of operation.

UNIT II SYMMETRIC CIPHERS (Techniques and Standards) - II 9

Advanced encryption standard - Evaluation criteria for AES, AES Cipher. Contemporary symmetric ciphers - Triple DES, Blowfish, RC5 - Characteristics of advanced symmetric block ciphers - RC4 stream cipher. Confidentiality using symmetric encryption - Placement of encryption function - Traffic confidentiality, Key Distribution, and Random Number Generation.

UNIT III PUBLIC- KEY ENCRYPTION AND HASH FUNCTIONS 9

Public key cryptography and RSA - Principles of public key cryptosystems, RSA Algorithm. Key management and other public key cryptosystems - Key management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography. Message Authentication and Hash Functions -

Authentication requirements, Authentication functions, Message authentication codes, Hash functions and MACs. Hash algorithms - MD5 Message Digest algorithm. Secure hash algorithm- RIPEMD-160- HMAC. Digital signatures and Authentication protocols - Digital signatures, Authentication protocols, Digital signature standards.

UNIT IV NETWORK SECURITY PRACTICE 9

Authentication applications - Kerberos - X.509 Authentication Service. Electronic Mail Security - Pretty Good Privacy, S/MIME. IP Security - IP Security Overview, IP Security Architecture, Authentication header, Encapsulating security payload, Combining security associations. Web security - Web security considerations - Secure sockets layer and Transport layer security - Secure electronic transaction.

UNIT V SYSTEM SECURITY 9

Intruders - Intruder detection, Password management. Malicious software - Virus and related threats - Virus Counter Measures. Firewalls - Firewall design principles- Trusted Systems.

TOTAL = 45

REFERENCES

1. William Stallings, "Cryptography and Network Security", 3rd edition, Prentice Hall of India, New Delhi, 2004.
2. William Stallings, "Network Security Essentials", 2nd edition, Prentice Hall of India, New Delhi, 2004.
3. Charlie Kaufman, "Network Security: Private Communication in Public World", 2nd Edition, Prentice Hall of India, New Delhi, 2004.

ELECTIVES

CSY 001 THEORY OF COMPUTATION

L	T	P	C
3	0	0	3

Course Objective

The objective of this course is to

- To highlight the concepts, proofs, and algorithms related to the patterns of strings in formal and programming languages.
- To prove simple results in the theory of computation using mathematical arguments.
- To explain various programming techniques for Turing machines and essential features of NP hard and NP Complete problem.

UNIT I FINITE AUTOMATA AND REGULAR LANGUAGES 9

Finite automata and Regular languages - Regular expressions and Regular languages - Non determinism and Kleene's theorem, Equivalence of DFA and NFA, Finite automation with e-moves, Equivalence of regular expression and NFA with e-moves - Pumping lemma for regular sets.

UNIT II CONTEXT FREE LANGUAGES 9

Context free languages - Derivation and languages - Relationship between derivation and derivation trees - Simplification of context free grammars - Normal forms for context free grammars - CNF and GNF.

UNIT III PUSH DOWN AUTOMATA (PDA) 9

Acceptance by PDA - Pushdown automata and context free languages - Pumping lemma for CFL and Deterministic pushdown automata.

UNIT IV TURING MACHINE 9

Turing machine (Definition and examples) - Programming techniques of turing machine - Computable languages and functions - Church turing hypothesis - Universal turing machine - P and NP problems - NP-complete.

UNIT V UNSOLVABLE PROBLEMS 9

Unsolvable problems - Rice Theorem - Post's correspondence problem - Recursive and recursively enumerable languages.

TOTAL = 45

TEXT BOOKS

1. Hopcroft and Ullman, "Introduction to Automata, Languages and Computation", Narosa Publishers, 2nd edition, 2000.

2. John.C.Martin, "Introduction to languages and the Theory of Computation", 2nd edition, McGraw Hill,1997.

REFERENCES

1. A.M.Natarajan, A.Tamilarasi and P.Balasubramani, "Theory of Computation", New Age International Publishers, 2002.

2. K.L.P.Mishra and N.Chandrasekaran, "Theory of Computation", IEEE, Prentice Hall of India, 2nd edition, 1998.

3. Peter Linz, "An Introduction to Formal Languages and Automata", Narosa Publishing House, 2001.

4. Harry R. Lewis and Christos H. Papadimitriou, "Elements of Theory of Computation", Prentice Hall, 2002.

CSY 002	SOFT COMPUTING	L	T	P	C
		3	0	0	3

Course Objective

The objective of this course is to

- To bring out the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To explain how to deal with uncertainty and how it is solved using Neuro Fuzzy networks.
- To discuss various applications of computational intelligence.

UNIT I FUZZY SET THEORY **10**

Introduction to neuro-fuzzy and soft computing - Fuzzy sets - Basic definition and terminology - Set-theoretic operations - Member function formulation and parameterization - Fuzzy rules and Fuzzy reasoning - Extension principle and Fuzzy relations - Fuzzy If-then rules - Fuzzy reasoning - Fuzzy inference systems - Mamdani fuzzy models - Sugeno fuzzy models - Tsukamoto fuzzy models - Input space partitioning and fuzzy modeling.

UNIT II OPTIMIZATION **8**

Derivative-based optimization - Descent methods - Method of steepest descent - Classical Newton's method - Step size determination - Derivative-free optimization - Genetic algorithms - Simulated annealing - Random search - Downhill simplex search.

UNIT III NEURAL NETWORKS **10**

Supervised learning neural networks - Perceptrons - Adaline - Backpropagation Multilayer perceptrons - Radial basis function networks - Unsupervised learning and Other neural networks - Competitive learning networks - Kohonen self - Organizing networks - Learning vector quantization - Hebbian learning.

UNIT IV NEURO FUZZY MODELING **9**

Adaptive neuro-fuzzy inference systems - Architecture - Hybrid learning algorithm - learning methods that cross-fertilize ANFIS and RBFN - Coactive neuro - Fuzzy modeling - Framework - Neuron functions for adaptive networks - Neuro fuzzy spectrum.

UNIT V APPLICATION OF COMPUTATIONAL INTELLIGENCE 8

Printed character recognition - Inverse kinematics problems - Automobile fuel efficiency prediction - Soft computing for color recipe prediction.

TOTAL= 45

REFERENCES

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, Pearson Education, 2004.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Application", McGraw Hill, 1977.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. R.Eberhart, P.Simpson and R. Dobbins, "Computional Intelligence, PC Tools", AP Professional, Boston, 1996.

CSY 003 DISTRIBUTED OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Course Objective

- To provide an insight about communication in the distributed computing system.
- To make students understand about managing the resources and processes in a distributed setup.
- To teach several issues of memory management, file management and security.

UNIT I **9**

Fundamentals: Distributed computing system - Introduction - Computer networks. Message Passing: Introduction - Desirable features of a good message passing system - Group communication.

UNIT II **9**

Remote Procedure Calls: Introduction and implementation - Distributed shared memory.

UNIT III **9**

Synchronization - Resource management - Process management.

UNIT IV **9**

Distributed file systems: Introduction, models, semantics - Naming: Introduction and schemes.

UNIT V **9**

Security: Introduction and attacks. Case Studies: Amoeba, Mach, Chorus - Comparative study

TOTAL = 45

REFERENCE

1. Pradeep K. Sinha ,"Distributed Operating Systems Concepts and Design" , Prentice Hall of India Private Limited, 2003.

CSY 004 WEB TECHNOLOGY L T P C
3 0 0 3

Course Objective

- To highlight the different technologies of web technology and various scripting languages.
- To train them on java programming and server side programming.

UNIT I INTRODUCTION 9

Introduction - Network concepts - Web concepts - Internet addresses - Retrieving data with URL - HTML - DHTML: Cascading style sheets - Scripting languages: Javascript - Vbscript.

UNIT II COMMON GATEWAY INTERFACE 9

Common gateway interface: Programming CGI Scripts - HTML Forms - Custom database query scripts - Server side includes - Server security issues - XML.

UNIT III JAVA PROGRAMMING 9

Java fundamentals: Classes - Inheritance - Packages - Interfaces - Exceptions Handling - Multi threading - Applets.

UNIT IV SERVER SIDE PROGRAMMING 9

Server side programming - Active server pages - Java server pages - Java servlets: Servlet container - Exceptions - Sessions and session tracking - Using servlet context - Dynamic content generation - Servlet chaining and communications.

UNIT V APPLICATIONS 9

Simple applications - Internet commerce - Database connectivity - Online databases - EDI Applications in business - Plug-ins - Firewalls.

TOTAL= 45

REFERENCES

1. Deitel, Deitel and Neito, "Internet And World Wide Web - How to program", Pearson Education Asia, 2001.
2. D.Norton and H. Schildt, "Java 2: The complete Reference", Tata McGraw-Hill publications, 2000.
3. Elliotte Rusty Herold, "Java Network Programming", O'Reilly Publications, 3rd edition, 2004.
4. Eric Ladd and Jim O'Donnell, "Using HTML 4, XML, and JAVA1.2", Prentice hall of India publications, 2003.
5. Jeffy Dwight, Michael Erwin and Robert Nikes, "Using CGI", Prentice hall of India publications, 1997.

CSY 005	XML AND WEB SERVICES	L	T	P	C
		3	0	0	3

Course Objective

- To teach basic concepts of the language, styles and schemas.
- To give an idea of how to write XML messages and its applications.
- To study how to integrate XML with databases.
- To explain how to build XML web services and server components.

UNIT I INTRODUCTION **9**

Current standards - XML parsers - creation and description of elements - adding attributes - XML Namespaces - Defining DTDs - Validation - working with attributes

UNIT II STYLING - CSS AND XSL **9**

Need for style sheets - CSS basics - selections - controlling of fonts, text and object boxes - XSL basics - XSL transformations - simple applications

UNIT III XML SCHEMAS **9**

Schemas - DTDs and schemas - Elements, types and groups - Schema attributes - groups - annotations and constraints - schemas and namespaces

UNIT IV XML QUERY **9**

Query requirement - query algebra - XLinks - XPointers - Resource Description Framework - Implementation of RDF - Using RDF Containers

UNIT V BUILDING OF XML BASED APPLICATIONS **9**

Integrating XML with Databases - XHTML - Manipulating XML with JavaScript - Simple application development with XML

TOTAL= 45

REFERENCES

1. Heather Williamson, "XML - The Complete Reference", Tata McGraw-Hill Edition, 2001
2. Ron Schmelzer et al. "XML and Web Services Unleashed", Pearson Education, 2002

CSY 006 BIO INFORMATICS L T P C
3 0 0 3

Course Objective

- To explain commercial and academic perspectives on bioinformatics.
- To bring out the database and network support for bioinformatics.
- To describe several data mining and pattern matching techniques.
- To tell them about modeling and simulation techniques.

UNIT I INTRODUCTION 7

Central dogma - Killer application - Parallel universes - Watson's definition - Top down Vs bottom up approach - Information flow - Conversance - Communications.

UNIT II DATABASE AND NETWORKS 9

Definition - Data management - Data life cycle - Database technology - Interfaces - Implementation - Networks: Communication models - Transmission technology - Protocols - Bandwidth - Topology - Contents - Security - Ownership - Implementation.

UNIT III SEARCH ENGINES AND DATA VISUALIZATION 10

Search process - Technologies - Searching and Information theory - Computational methods - Knowledge management - Sequence visualizations - Structure visualizations - User interfaces - Animation Vs simulation.

UNIT IV STATISTICS, DATA MINING AND PATTERN MATCHING 11

Statistical concepts - Micro arrays - Imperfect data - Basics - Quantifying - Randomness - Data analysis - Tools selection - Alignment - Clustering - Classification - Data mining methods - Technology - Infrastructure pattern recognition - Discovery - Machine learning - Text mining - Pattern matching fundamentals - Dot matrix analysis - Substitution matrix - Dynamic programming - Word method - Bayesian method - Multiple sequence alignment tools.

UNIT V MODELING SIMULATION AND COLLABORATION 8

Drug discovery fundamentals - Protein structure - System biology tools - Collaboration and communication - Standards - Issues - Case study.

TOTAL = 45

REFERENCES

1. Bryan Bergeron, "Bio Informatics Computing", Prentice Hall of India, 2003.
2. T.K. Affward and D.J. Parry Smith, "Introduction to Bio Informatics", Pearson Education, 2001.
3. Pierre Baldi and Soren Brunak, "Bio Informatics - The Machine Learning Approach", 2nd edition, First East West Press, 2003.

CSY 007 MULTIMEDIA SYSTEMS

L	T	P	C
3	0	0	3

Course Objective

- To learn about QOS requirements for a multimedia systems.
- To study how operating system concepts are used for multimedia applications.
- To provide an insight about synchronization and communication in multimedia applications.

UNIT I INTRODUCTION AND QOS **9**

Introduction - QOS Requirements and constraints - Concepts - Resources - Establishment phase-run - Time phase - Management architectures.

UNIT II OPERATING SYSTEMS **9**

Real-time processing - Scheduling - Interprocess communication - Memory and management - Server architecture - Disk management.

UNIT III FILE SYSTEMS AND NETWORKS **9**

Traditional and multimedia file systems - Caching policy - Batching - Piggy backing -Ethernet - Gigabit Ethernet - Token ring - 100VG AnyLAN-Fiber Distributed Data Interface (FDDI) - ATM networks - MAN - WAN.

UNIT IV COMMUNICATION **9**

Transport subsystem - Protocol support for QOS - Transport of multimedia - Computer supported cooperative work - Architecture - Session management - MBone applications.

UNIT V SYNCHRONIZATION **9**

Synchronization in multimedia systems - Presentation - Synchronization types-Multimedia synchronization methods - Case studies - MHEG - MODE - ACME.

TOTAL= 45

REFERENCES

1. Ralf Steinmetz and Klara Nahrstedt, "Multimedia systems", Springer, 1st edition, 2004.
2. Ralf Steinmetz and Klara Nahrstedt , "Media Coding and Content Processing", Prentice Hall of India, 2002.
3. Vaughan T, "Multimedia", Tata McGraw Hill, 1999.
4. Mark J.B. and Sandra K.M., "Multimedia Applications Development using DVI technology", Tata McGraw Hill, 1992.
5. K.R.Rao, Zoran S. Bojkovic, Dragorad A. Milovacovic and D. A. Milovacovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Prentice Hall of India, 1st edition, 2002.
6. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", Pearson Education, 2004.

CSY 008	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

Course Objective

The objective of this course is

- To explain the importance of testing and the different types of testing.
- To give basic knowledge of implementing testing in the development process.
- To make them develop quality project.

UINT I INTRODUCTION **9**

Purpose of testing - A model for testing - A taxonomy of bugs - Path testing - Predicates, path predicates and achieving paths - Path sensitizing - Path instrumentation - Implement and application of path testing.

UNIT II TRANSACTION-FLOW TESTING **9**

Transaction flows - Transaction-flow testing techniques - Data-flow testing basics - Data-flow testing strategies - Domain and paths - Domain testing - Domain and interface testing - Domains and testability.

UNIT III METRICS **9**

Metrics - Linguistic metrics - Structural metrics - Hybrid metrics - Metrics implementation.

UNIT IV SYNTAX TESTING **9**

A grammar for formats - Test case generation - Implementation and application - Logic based testing - Overview - Decision tables - Path expression - KV charts - Specifications.

UNIT V IMPLEMENTATION **9**

Overview - Strategies for programmers - Strategies for independent testers - Tests as software products - Tools.

TOTAL = 45

REFERENCES

1. Boris Beiser, "Software Testing Techniques", 2nd edition, Dreamtech press, New Delhi, 2003.
2. Edward Kit, "Software Testing in the Real World - Improving the Process", Pearson Education, 2004.
3. William E. Perry , "Effective Methods for Software Testing", 2nd edition, Wiley publications, 2000.

CSY 009 EMBEDDED SYSTEMS L T P C
3 0 0 3

Course Objective

- To provide basic understanding about embedded systems.
- To provide the hardware and support required for embedded system.
- To discuss about real time operating system and its use in the development of embedded systems.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Definition and classification - Overview of processors and hardware units in an embedded system - Software embedded into the system - Exemplary embedded systems - Embedded systems on a chip (SoC) and the use of VLSI designed circuits.

UNIT II DEVICES AND BUSES FOR DEVICES NETWORK 9

I/O devices - Device I/O types and examples - Synchronous - Iso-Synchronous and asynchronous communications from serial devices - Examples of internal serial-communication devices - UART and HDLC - Parallel port devices - Sophisticated interfacing features in devices/ports - Timer and counting devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses - ISA, PCI, PCI-X, cPCI and advanced buses.

UNIT III EMBEDDED PROGRAMMING 9

Programming in assembly language (ALP) vs. High level language - C program elements, Macros and functions - Use of pointers - Null pointers - Use of function calls - Multiple function calls in a cyclic order in the main function pointers - Function queues and interrupt service routines queues pointers - Concepts of embedded programming in C++ - Objected Oriented Programming - Embedded programming in C++, 'C' program compilers - Cross compiler - Optimization of memory codes.

UNIT IV REAL TIME OPERATING SYSTEMS - PART - 1 9

OS services - Interrupt routines handling, Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics - Inter

process communication and synchronisation - Shared data problem - Use of semaphore(s) - Priority inversion problem and deadlock situations - Inter process communications using signals - Semaphore flag or mutex as resource key - Message queues - Mailboxes - Pipes - Virtual (Logical) sockets - RPCs.

UNIT V REAL TIME OPERATING SYSTEMS - PART - 2 9

Study of RTOS, VxWorks - Basic features - Task management library at the system - Library header file - VxWorks system functions and system tasks - Inter process (Task) communication functions - Case study of coding for sending application layer byte streams on a TCP/IP network using RTOS Vxworks.

TOTAL = 45

REFERENCES

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", TATA McGraw Hill, 1st reprint , 2003.
2. David E.Simon, "An Embedded Software Primer", Pearson Education Asia, 1st Indian reprint , 2000.

CSY 010 SOFTWARE QUALITY ASSURANCE

L	T	P	C
3	0	0	3

Course Objective

- To give adequate knowledge on software quality assurance and standards.
- To make them understand metrics used to measure software quality.
- To teach more about planning and development of software quality.

UNIT I FUNDAMENTALS **9**

Introduction - Background - Concepts of quality control - Quality assurance - Quality management - Total quality management - Cost of quality - Seven tools - Holding the gains - Six new tools.

UNIT II TOOLS & TECHNIQUES **9**

Process and product metrics - Seven wastes - Statistical process control - Statistical quality assurance - Benchmarking - Best demonstrated practices - Quality function deployment - Business process Re-engineering - Overview of- Defects per million opportunities - Design of experiments - FMEA - Kaizen.

UNIT III QUALITY ASSURANCE MODELS **9**

Models for quality assurance - ISO-9000 Series - Process Models - CMMs - SW -CMM, CMMI, PCMM - Malcolm Baldrige Award.

UNIT IV SOFTWARE QUALITY ASSURANCE RELATED TOPICS **9**

Software Quality Assurance (SQA) function and responsibilities - Software process - Definition and implementation - Software Engineering Process Group (S.E.P.G.) - Software testing - Configuration management - Project management - SQA plan - Quality goals- Internal auditing and assessments - Inspections & walkthroughs.

UNIT V ADVANCED TOPICS **9**

Overview of PSP - TSP - Six Sigma and formal methods of verification - Zero defects- Defect prevention and planning - Software reliability models.

TOTAL= 45

REFERENCES

1. John Bicheno and M.R Gopalan, "Management Guide to Quality and Productivity", Wiley Publications, 2nd edition, 2004.
2. Watts S. Humphery, "Managing The Software Process ", Pearson Education, 2008.
3. Philip B. Crosby, " Quality is Free: The Art of Making Quality Certain ", Mass Market, 1992.
4. Roger Pressman, "Software Engineering ", 6th edition, Tata McGraw Hill, 2005.
5. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education, 2002.

CSY 011 MOBILE ADHOC NETWORKS **L T P C**
3 0 0 3

Course Objective

- To teach the design issues and different routing protocols for unicast and multicast routing protocols.
- To give an idea about different transport layer and security solutions.
- To make them understand the different energy management schemes and wireless sensor network architecture.
- To analyze the different parameters using the network simulator.

UNIT I INTRODUCTION **9**

Introduction - Fundamentals of wireless communication technology - The Electromagnetic spectrum - Radio propagation mechanisms - Characteristics of the wireless channel - IEEE 802.11a,b standard - Origin of Ad hoc: Packet radio networks - Technical challenges - Architecture of PRNETs - Components of packet radios - Adhoc wireless networks - Heterogeneity in mobile devices - Wireless sensor networks - Traffic profiles - Types of Ad hoc mobile communications - Types of mobile host movements - Challenges facing Ad hoc mobile networks - Ad hoc wireless internet.

UNIT II AD HOC ROUTING PROTOCOLS **9**

Introduction - Issues in designing a routing protocol for Ad hoc wireless networks - Classifications of routing protocols - Table-Driven routing protocols - Destination Sequenced Distance Vector (DSDV) - Wireless Routing Protocol (WRP) - Cluster Switch Gateway Routing (CSGR) - Source-Initiated On-Demand approaches - Ad hoc On-Demand Distance Vector Routing (AODV) - Dynamic Source Routing (DSR) -Temporally Ordered Routing Algorithm (TORA) - Signal Stability Routing (SSR) -Location-Aided Routing (LAR) - Power-Aware Routing (PAR) - Zone Routing Protocol (ZRP).

UNIT III MULTICAST ROUTING IN AD HOC NETWORKS **9**

Introduction - Issues in designing a multicast routing protocol - Operation of multicast routing protocols - An architecture reference model for multicast routing protocols -Classifications of multicast routing protocols - Tree-Based multicast routing protocols - Mesh-based multicast routing protocols - Summary of tree and mesh based protocols - Energy-efficient multicasting - Multicasting with quality of service guarantees - Application-dependent multicast routing - Comparisons of multicast routing protocols.

UNIT IV TRANSPORT LAYER, SECURITY PROTOCOLS 9

Introduction - Issues in designing a transport layer protocol for Ad hoc wireless networks - Design goals of a transport layer protocol for Ad hoc wireless networks -Classification of transport layer solutions - TCP over Ad hoc wireless networks - Other transport layer protocols for Ad Hoc wireless networks - Security in Ad hoc wireless networks - Network security requirements - Issues and challenges in security provisioning - Network security attacks - Key management - Secure routing in Ad hoc wireless networks.

UNIT V QoS AND ENERGY MANAGEMENT 9

Introduction - Issues and challenges in providing QoS in Ad hoc wireless networks -Classifications of QoS solutions - MAC layer solutions - Network layer solutions - QoS frameworks for Ad hoc wireless networks energy management in Ad hoc wireless networks -Introduction - Need for energy management in Ad hoc wireless networks - Classification of energy management schemes - Battery management schemes - Transmission power management schemes - System power management schemes.

TOTAL= 45

REFERENCES

1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson Prentice-Hall, 2004.
2. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols and Systems", Prentice-Hall of India ,2001.
3. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000.

CSY 012 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

Course Objective

- To explain important Data mining techniques and algorithms.
- To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.
- To give adequate concepts on OLTP and developing a Data Warehouse.
- To bring out the impact of Data Mining environments and applications.

UNIT I INTRODUCTION **9**

Relation to statistics, Databases - Data mining functionalities - Steps in data mining process - Architecture of a typical data mining systems - Classification of data mining systems - Overview of data mining techniques.

UNIT II DATA PREPROCESSING AND ASSOCIATION RULES **9**

Data preprocessing - Data cleaning, Integration, Transformation, Reduction, Discretization concept hierarchies-Concept description: Data generalization and summarization based characterization - Mining association rules In large databases.

UNIT III PREDICTIVE MODELING **9**

Classification and Prediction: Issues regarding classification and prediction -Classification by decision tree induction - Bayesian classification - Other classification methods - Prediction - Clusters analysis: Types of data in Cluster analysis - Categorization of major clustering methods: Partitioning methods - Hierarchical methods.

UNIT IV DATA WAREHOUSING **9**

Data warehousing components - Multi-dimensional data model - Data warehouse architecture - Data warehouse implementation - Mapping the data warehouse to multiprocessor architecture - OLAP- Need - Categorization of OLAP tools.

UNIT V APPLICATIONS **9**

Applications of data mining - Social impacts of data mining - Tools:An

introduction to DB Miner - Case studies - Mining WWW - Mining text database - Mining spatial databases.

TOTAL= 45

REFERENCES

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata Mcgraw Hill, 2004.
3. Usama M.Fayyad, Gregory Piatetsky-Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
5. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.

CSY 013 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS AND NETWORKS

L	T	P	C
3	0	0	3

Course Objective

- To give an idea on the performance metrics and evaluation criteria of computer systems and networks.
- To teach various methods and concepts of computer and communication network modeling.
- To study the techniques for the evaluation of the system performance.

UNIT I INTRODUCTION **9**

Need for performance evaluation - Role of performance evaluation - Performance evaluation methods - Performance metrics and evaluation criteria - CPU and I/O architectures - Distributed and network architectures- Secondary storage - Topologies - Computer architecture - Fundamental concepts and performance measures.

UNIT II PROBABILITY AND STOCHASTIC PROCESSES **9**

Scheduling algorithms - Workloads - Random variables - Probability distributions - Densities - Expectation - Stochastic processes - Poisson process - Birth-Death process - Markov process.

UNIT III QUEUING THEORY **9**

Queuing systems - Networks of queues - Estimating parameters and distributions - Computational methods - Simulation process - Time control - Systems and modeling.

UNIT IV PETRI NETS AND SYSTEM PERFORMANCE **9**

Petri nets - Classical petri nets - Timed petri nets - Priority-based petri nets - Colored petri nets - Generalized petri nets - Tool selection - Validation of results - Performance metrics - Evaluation - Multiple server computer system analysis.

UNIT V ANALYSIS **9**

OS components - System architecture - Workloads - Design - Simulation - Analysis - Database system performance - Computer networks components - Simulation modeling of LAN.

TOTAL = 45

REFERENCES

1. Paul J. Fortier and Howard E. Michael, "Computer Systems Performance Evaluation and Prediction", Elsevier Science, USA, 2003.
2. Thomas G. Robertazzi, "Computer Networks and Systems: Queing theory and Performance Evaluation", 3rd edition, Springer, 2000.
3. Domenico Ferrari, Giuseppe Serazzi and Alexandro Zeijher, "Measurement & Tuning of Computer Systems ",Prentice Hall Inc, 1983.
4. Michael F.Mories and Paul F.Roth,. "Tools and techniques, Computer Performance Evaluation", Van Nostrand, New York, 1982.

CSY 014 AGENT BASED INTELLIGENT SYSTEMS

L	T	P	C
3	0	0	3

Course Objective

- To introduce basic concepts of intelligent agents and its applications.
- To explain necessary background for solving problem through agent technology.
- To give an account of learning techniques and grammars required for implementing agents.

UNIT I INTRODUCTION **9**

Definitions - Foundations - History - Intelligent agents- Problem solving - Searching - Heuristics -Constraint satisfaction problems - Game playing.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING **9**

Logical agents - First order logic - First order inference - Unification - Chaining - Resolution strategies - Knowledge representation - Objects - Actions - Events.

UNIT III PLANNING AGENTS **9**

Planning problem-State space search - Partial order planning - Graphs - Nondeterministic domains - Conditional planning - Continuous planning - Multiagent planning.

UNIT IV AGENTS AND UNCERTAINITY **9**

Acting under uncertainty - Probability notation - Bayes rule and use - Bayesian networks - Other approaches - Time and uncertainty-Temporal models- Utility theory - Decision network - Complex decisions.

UNIT V HIGHER LEVEL AGENTS **9**

Knowledge in learning - Relevance information - Statistical learning methods -Reinforcement learning - Communication-Formal grammar - Augmented grammars - Future of AI.

TOTAL = 45

REFERENCES

1. Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", 2nd edition, Prentice Hall of India, 2002.

2. Michael Wooldridge, "An Introduction to Multi Agent System", John Wiley publications, 2002.

3. Patrick Henry Winston, "Artificial Intelligence", 3rd edition, Addison-Wesley publications, 1999.

4. Nils.J.Nilsson, " Principles of Artificial Intelligence", Narosa Publishing House, 1992.

CSY 015 COMPLEX NETWORKS **L T P C**
3 0 0 3

Course Objective

- To explain important concepts relating to cross-fertilization of graph theory and complex networks.
- To give adequate background for better understanding of dynamical systems.
- To make them understand the various types of graphs and their applications in large scale networks.

UNIT I TYPES AND PROPERTIES OF NETWORK **9**

Social networks - Information networks - Technological networks - Biological networks - Small world effect - transitivity and clustering - degree distribution - scale free networks - Maximum degree - Network resilience - Mixing patterns - Degree correlations - Community structures - Network navigation.

UNIT II RANDOM GRAPHS **9**

Poisson random graphs - Generalized random graphs - The configuration model - power - Law degree distribution - directed graph - bipartite graph - degree correlations.

UNIT III MODELS OF NETWORK GROWTH **9**

Price's model - Barabasi and Albert's model - Other growth models - Vertex copying models.

UNIT IV PROCESSES TAKING PLACE ON NETWORKS **9**

Percolation theory and network resilience - Epidemiological processes.

UNIT V APPLICATIONS **9**

Search on networks - Exhaustive network search - Guided network search - Network navigation- Network visualization.

TOTAL = 45

REFERENCES

1. S.N.Dorogovtsev and J.F.F.Mendes, "Evolution of Networks", Oxford University Press,2003.
2. Narsingh Deo, "Graph Theory With Applications To Engineering And Computer Science", Prentice Hall of India, 2007.

CSY 016 COMPONENT BASED TECHNOLOGY **L T P C**
3 0 0 3

Course Objective

- To give the depth knowledge in principles of software component technology.
- To introduce concepts of distributed computing using Java, CORBA and .Net components.
- To discuss about the importance and issues in distributed object systems and component technology.
- To help them to identify current areas of research latest development in CBT.

UNIT I INTRODUCTION **9**

Software components - Objects - Fundamental properties of component technology - Modules - Interfaces - Callbacks - Directory services - Component architecture -Components and middleware.

UNIT II JAVA COMPONENT TECHNOLOGIES **9**

Threads - Java Beans - Events and connections - Properties - Introspection - JAR files - Reflection - Object serialization - Enterprise Java Beans - Distributed object models - RMI and RMI-IIOP.

UNIT III CORBA TECHNOLOGIES **9**

Java and CORBA - Interface definition language - Object request broker - System object model - Portable object adapter - CORBA services - CORBA component model - Containers - Application server - Model driven architecture.

UNIT IV COM AND .NET TECHNOLOGIES **9**

COM - Distributed COM - object reuse - interfaces and versioning - dispatch interfaces - connectable objects - OLE containers and servers - Active X controls- .NET components - assemblies - app domains - contexts - reflection remoting.

UNIT V COMPONENT FRAMEWORK AND DEVELOPMENT **9**

Connectors - contexts - EJB containers - CLR contexts and channels - Black box component framework - Directory objects - Cross-development

environment- Component-Oriented programming - Component design and Implementation tools - Testing tools - Assembly tools.

TOTAL = 45

TEXTBOOK

1. Gruntz, "Component Software: Beyond Object-Oriented Programming ", Pearson Education publishers, 2004.

REFERENCE

1. Ed Roman, "Enterprise Java Beans", 3rd edition, Wiley publications, 2004.

CSY 017 INTEGRATED SOFTWARE PROJECT MANAGEMENT L T P C
3 0 0 3

Course Objective

- To make them understand the software management process frameworks and software management disciplines.
- To introduce the importance of software estimation, risk management and software metrics in software development process.
- To explain how to effectively manage the human resources also how to provide a better environment for both customer and organizations' staff members.

UNIT I PROJECT MANAGEMENT CONCEPTS 9

Evolution of software economics - Software management process framework (phases, artifacts, workflows, checkpoints) - Software management disciplines (planning / project organization and responsibilities / automation / project control) - Modern project profiles.

UNIT II SOFTWARE ESTIMATION & COSTING 9

Problems in software estimation - Algorithmic cost estimation process - Function points, SLIM (Software Life Cycle Management) - COCOMO II (Constructive Cost Model) - Estimating web application development - Concepts of finance - Activity based costing and Economic Value Added (EVA) - Balanced score card.

UNIT III RISK MANAGEMENT 9

Risk definition - Risk categories - Risk assessment (identification / analysis / prioritization) - Risk control (planning / resolution / monitoring) - Failure Mode and Effects Analysis (FMEA).

UNIT IV METRICS 9

Need for software metrics - Classification of software metrics - Product metrics (size metrics, complexity metrics, Halstead's product metrics, quality metrics) and Process metrics (empirical models, statistical models, theory-based models, composite models, and reliability models).

UNIT V PEOPLE MANAGEMENT 9

Team management - Client relationship management - Function organization

- Project organization - Matrix organization - Staffing quality replacement - Turnover management.

TOTAL = 45

REFERENCES

1. McConnell, S. "Software Project: Survival Guide", Microsoft Press, 1998.
2. Royce. W, "Software Project management: A Unified Framework", Addison Wesley, 1998.
3. Cooper. R, "The Rise of Activity-Based Costing-Part One: What is an Activity-Based Cost System?", Journal of Cost Management, Vol.2, No.2 ,Summer, 1988.
4. Grant J.L, "Foundations of Economic Value Added", John Wiley & Sons, 1997.
5. Kaplan R.S and Norton D.P, "The Balanced Scorecard: Translating Strategy into Action", Harvard Business School Press, 1996.
6. Boehm B. W, "Software Risk Management: Principles and Practices", IEEE Software, 1991.
7. Fenton N.E, and Pfleeger S.L, "Software Metrics: A Rigorous and Practical Approach, Revised", Brooks Cole, 1998.
8. Demarco .T and Lister .T, "Peopleware: Productive Projects and Teams, 2nd edition", Dorset House, 1999.
9. Bob Hughes and Mike Cotterell, "Software Project Management ", 4th edition, Tata McGraw Hill Publishing Company Ltd., New Delhi,2005.

CSY 018 DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

Course Objective

- To teach students the fundamentals of digital image processing.
- To introduce basic principles of digital images, image data structures, and image processing algorithms.
- To explain important pattern recognition techniques and feature detection approaches

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems - Elements of visual perception - psycho visual model, brightness, contrast, hue, saturation, mach band effect - Color image fundamentals - RGB,HSI models, Image sampling, Quantization, dither, Two -dimensional mathematical preliminaries.

UNIT II IMAGE TRANSFORMS 9

1D DFT- 2D transforms - DFT- DCT -Discrete sine - Walsh - Hadamard - Slant- Haar - KLT - SVD - Wavelet Transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION 9

Histogram modification and specification techniques - Noise distributions - Spatial averaging - Directional smoothing - Median - Geometric mean - Harmonic mean - Contra harmonic and Yp mean filters - Homo morphic filtering - Color image enhancement. Image restoration - Degradation model - Unconstrained and constrained restoration - Inverse filtering - Removal of blur caused by uniform linear motion -Wiener filtering - Geometric transformations - Spatial transformations - Gray-level interpolation.

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9

Edge detection - Image segmentation by region growing - Region splitting and merging - Edge linking. Image recognition - Patterns and pattern classes - Matching by minimum distance classifier - Matching by correlation - Back propagation neural network- Neural network applications in image processing.

UNIT V IMAGE COMPRESSION 9

Need for data compression - Huffman - Run length encoding - Shift codes - Arithmetic coding - Vector quantization -Block truncation coding - Transform

coding - DCT and Wavelet - JPEG - MPEG standards- Concepts of context based compression.

TOTAL = 45

REFERENCES

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, Inc., 2nd edition, 2004.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2002.
3. David Salomon, "Data Compression - The Complete Reference", Springer Verlag New York Inc., 2nd Edition, 2001.
4. Rafael C. Gonzalez, Richard E. Woods and Steven Eddins, " Digital Image Processing using MATLAB ", Pearson Education, Inc., 2004.
5. William K.Pratt, "Digital Image Processing", John Wiley, New York, 2002.
6. Milman Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis, and Machine Vision", Brooks/Cole, Vikas Publishing House, 2nd edition, 1999.
7. Sid Ahmed,M.A., "Image Processing Theory, Algorithms and Architectures", McGraw Hill, 1995.

CSY 019	RESEARCH METHODOLOGY FOR COMPUTER SCIENTIST	L	T	P	C
		3	0	0	3

Course Objective

- To make them well versed in data analytics.
- To describe the steps involved in research process
- To explain them how to formalize research problems
- To discuss clearly the approaches for research through some case studies.

UNIT I RESEARCH PROBLEM **9**

The Research problem - Sources of research problem - Information, how to deal with it - Criteria / characteristics of a good research problem - Errors in selecting a good research problem - Types of research - Nature and use of arguments.

UNIT II PROBABILITY, STATISTICAL INFERENCE AND ANALYSIS **9**

Probability - Random variables - Binomial, Poisson, Geometric, Uniform, Normal, Exponential distributions - Moments - Moments generating functions and their properties - Function of random variables.

Design of experiments: Analysis of variance - One way and two way classifications- Completely randomized design - Randomized block design - Latin square design -22 factorial design.

UNIT III OPERATIONS RESEARCH AND OPTIMIZATION TECHNIQUES **9**

Basic of operation research : Characteristic of OR -OR and Decision making -Linear programming - Stimulation and Graphical solution canonical and standard terms of Linear programming problem - Algebraic solution - Simplex method - Chrane's method of penalties - Concept of duality - properties of duality -Transportation model: Definition - Formulation and solution of transportation models. Sequencing problems - Processing each of n jobs through m machine. - Linear programming - Introduction to supervised and unsupervised learning - Graph theory- Basic definitions - Connected graph - Tree.

UNIT IV QUEUING THEORY **9**

Single and Multiple server Markovian queuing models - Customer impatience -Queuing applications.

UNIT V CASE STUDIES **9**

Presentation by students on their area of research.

TOTAL = 45

TEXT BOOKS

1. Nicholas Walliman, "Your Research Project", 2nd edition, Vistaar Publications, New Delhi ,2005.
2. Gupta, S.C. and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi ,2001.
3. Taha, H.A., "Operations Research: An Introduction", 7th edition, Pearson Education Edition, Asia, New Delhi, 2002.

REFERENCES

1. Walpole, R.E., Myer, R.H., Myer, S.L. and Ye, K., "Probability and Statistics for engineers and Scientists", 7th Edition, Pearson Education, Delhi (2002).
2. Goel, B.S. and Mittal, S.K, "Operations Research", Pragati Prakashan, Meerut (2000)
3. Freund, J.E., and Miller, I.R., "Probability and Statistics for Engineers", Prentics Hall of India, Fifth Edition, New Delhi, 1994.

CSY 020 REAL TIME SYSTEMS L T P C
3 0 0 3

Course Objective

- To explain the basic concepts of RTS and discuss the scheduling and resource allocation techniques of RTS.
- To introduce the specific operating system features for Real Time Systems.
- To discuss the various issues involved in Real Time System design and development.

UNIT I INTRODUCTION 9

Real time systems - Embedded systems - Pervasive computing - Information access devices - Smart cards - Embedded controllers - Hardware fundamentals.

UNIT II RTOS 9

Real time operating systems - Memory management - Processes, threads, interrupts, events - User interface.

UNIT III REAL TIME UML 9

Requirements analysis - Object identification strategies - Object behavior - Real-Time design patterns.

UNIT IV SOFTWARE DEVELOPMENT 9

Concurrency - Exceptions - Tools - Debugging techniques - Optimization - Case Studies.

UNIT V CONNECTIVITY 9

Wireless connectivity - Blue tooth - Other short range protocols - Wireless application environment - Service discovery - Middleware.

TOTAL = 45

REFERENCES

1. R.J.A. Buhr, D.L.Bailey, "An Introduction to Real-Time Systems", Prentice-Hall International, 1999.
2. B.P.Douglass, "Real-Time UML", 2nd edition, Addison-Wesley, 2000.
3. D.E. Simon, "An Embedded Software Primer ", Addison-Wesley, 1999.
4. J.Schiller, "Mobile Communications ", Addison-Wesley, 2000.
5. V.Hansmann, L.Merk, M.S. Nicklous and T.Stober, "Prevasive Computing Handbook", Springer, 2001.

CSY 021 INFORMATION SECURITY **L T P C**
3 0 0 3

Course Objective

- To make them understand how network security is conceptualized and carried out.
- To teach different techniques to identify and investigate threats to network security
- To analyze the standard firewall functionality and network based IDSs.
- To explain existing technologies and techniques of intrusion detection.

UNIT I **12**

Security Attacks (interruption, interception, modification and fabrication) - Security Services (confidentiality, authentication, integrity, non-repudiation, access control and availability) and mechanisms - A model for Internet work security - Internet Standards and RFCs - Buffer overflow & format string vulnerabilities - TCP session hijacking -ARP attacks- Route table modification - UDP hijacking and man-in-the-middle attacks.

Security Models: Military and civil security- vulnerability and threat models- End-end security (COMSEC) - Link encryption (TRANSEC) - Compartments - Privacy - Authentication- Denial of service - Non repudiation.

UNIT II **8**

Conventional encryption principles - Conventional encryption algorithms - Cipher block modes of operation- Location of encryption devices - Key distribution approaches of Message Authentication, Secure Hash Functions and HMAC. Public key cryptography principles - Public key cryptography algorithms - Digital signatures - Digital Certificates.

UNIT III **8**

Certificate authority and key management - Kerberos- X.509 directory authentication - Service Email privacy: Pretty Good Privacy (PGP) and S/MIME- IP security overview- IP security architecture - Authentication Header - Encapsulating security payload - Combining security associations and Key management web security requirements.

UNIT IV **8**

Secure Socket Layer (SSL) and Transport Layer Security (TLS) - Secure Electronic Transaction (SET) - Basic concepts of SNMP- SNMPv1 community facility and SNMPv3 - Intruders, viruses and related threats.

UNIT V **9**

Intruders, Viruses and related threats - Firewall design principles - Trusted systems - Intrusion detection systems - Key and certificate management - Secure binding of public and private values: DNS certificates - Making and distributing key media: randomization, lifetime issues- Key agreement protocols: STS protocol and IETF work orders- Key Escrow: the Clipper chip - One-time passwords: schemes based on S/KEY- PKI.

TOTAL = 45

TEXT BOOKS

1. William Stallings, "Network Security Essentials (Applications and Standards)", Pearson Education, 2004.
2. Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, "Hack Proofing your network", 2nd edition, Syngress, 2002.

REFERENCES

1. Eric Maiwald, "Fundamentals of Network Security", 1st edition, McGraw-Hill Osborne Media, 2003.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security - Private Communication in a Public World", Pearson Prentice Hall of India, 2004.
3. Michael E. Whitman, "Principles of Information Security", Thomson Business Information, 2009
4. Stallings, "Cryptography and network Security", 3rd edition, Prentice Hall of India, 2004.
5. Robert Bragg and Mark Rhodes, "Network Security: The complete reference", Tata Mgraw Hill, 2004
6. Buchmann ,"Introduction to Cryptography", Apress / Springer (india) Pvt Ltd., 2004
7. Schneier B., "Applied Cryptography - Protocols, Algorithms and Source Code in C", 2nd edition, John Wiley and Sons, 1995.

CSY 022 NETWORK PROCESSORS L T P C
3 0 0 3

Course Objective

- To make them understand the basic concepts of commercial network processors like RISC and CISC.
- To bring out the importance of pipelining concept and the difference between usage of homogeneous / heterogeneous processors.
- To provide hands on training on wired as well as wireless communication devices.

UNIT I INTRODUCTION 9

Traditional protocol processing systems: - Network processing hardware - Basic packet processing: Algorithms and data structures - Packet processing functions- Protocol software - Hardware architectures for protocol processing - Classification and forwarding - Switching fabrics.

OBJECTIVES

- Understand basic notions of Graph Theory
- To learn the fundamental concepts in graph theory, with a sense ofsome of its modern applications.
- Also, to learn to understand and create mathematical proofs
- Knowing Fundamental Theorems in Graph Theory
- Study of algorithmic Graph Theory

UNIT II NETWORK PROCESSOR TECHNOLOGY 9

Network processors: Motivation and purpose - Complexity of network processor design - Network processor architectures: Architectural variety, Architectural characteristics. Peripheral chips supporting network processors: Storage processors - Classification Processors - Search engines - Switch fabrics - Traffic managers.

UNIT III COMMERCIAL NETWORK PROCESSORS 9

Multi-Chip pipeline - Augmented RISC processor - Embedded processor plus coprocessors - Pipeline of homogeneous processors - Configurable instruction set processors - Pipeline of heterogeneous processors - Extensive

and diverse processors - Flexible RISC plus Coprocessors - Scalability issues - Design tradeoffs and consequences.

UNIT IV NETWORK PROCESSOR: ARCHITECTURE AND PROGRAMMING - CASE STUDY 9

Architecture:

Intel network processor: Multithreaded architecture overview - Features - Embedded RISC processor - Packet processor hardware - Memory interfaces - System and Control interface components - Bus Interface.

Programming:

Software development kit - IXP instruction set - Register formats - Micro engine programming - Intra thread and Inter-thread communication - Thread synchronization - Developing sample applications - Strong-Arm programming.

UNIT V IOS TECHNOLOGIES 9

CISCO IOS - Connectivity and scalability - High availability - IP routing - IP services - IPV6 - Mobile IP - MPLS - IP Multicast - Manageability - QoS - Security - Switching - Layer 2 VPN2.

TOTAL = 45

TEXT BOOKS

1. Douglas E. Comer, "Network Systems Design using Network Processors", Prentice Hall of India, 2003.
2. Panos C Lekkas, "Network Processors : Architectures, Protocols and Paradigms(Telecom Engineering) ", Tata McGraw-Hill Professional, 2003.

REFERENCES

1. Patrick Crowley, M A Franklin, H Hadimioglu and PZ Onufryk, "Network Processor Design, Issues and Practices Vol - I", Morgan Kaufman, 2002.
2. Patrick Crowley, M A Franklin, H Hadimioglu and PZ Onufryk, "Network Processor Design, Issues and Practices Vol - II", Morgan Kaufman, 2003.
3. Erik J. Johnson and Aaron R. Kunze, "IXP1200 Programming: The Microengine Coding Guide for the Intel IXP1200 Network Processor Family", Intel Press, 2002.
4. Bill Carlson, "Intel® Internet Exchange Architecture & Applications A Practical Guide to Intel's Network Processors", Intel Press, 2003.

CSY 023 MULTI-CORE ARCHITECTURE L T P C
3 0 0 3

Course Objective

- To provide a broad view and understanding of multi-core systems, including the current designs, challenges, and future trends.
- To explain how to develop well-optimized threaded applications to improve performance on parallel applications.
- To teach the essentials of parallel program and some standards.

UNIT I INTRODUCTION 8

Multi-core processor evolution - Moore's law - Basic system and Multicore processor architecture - Homogeneous and heterogeneous multicore - On-chip interconnect architecture - Uniform and nonuniform memory access - Cache and cache coherence - Multicore processors benchmark - Multicore processors OS module - AMP - SMP - Virtualization-MIPC- Choosing multicore OS configuration.

UNIT II SCALABILITY ISSUES AND PARALLELISM 9

Scalable design principles - Principles of processor design - Instruction level parallelism, Thread level parallelism - Parallel computer models - Symmetric and distributed shared memory architectures - Performance issues - Software and hardware multithreading - SMT and CMP architectures - Design issues - Case studies Intel Multi-core architecture - SUN CMP architecture.

UNIT III PARALLEL PROGRAMMING & OPENMP 10

Fundamental concepts - Designing for threads - Threading and parallel programming constructs - Synchronization - Critical sections - Deadlock - Threading APIs - OpenMP -Thread Vs openMP - Threading a loop - Thread overheads - Performance issues - Library functions - Solutions to parallel programming problems - Data races, deadlocks and livelocks - Non-Blocking algorithms - Memory and cache related issues - OpenMP API library calls based programs.

UNIT IV MPI PROGRAMMING 9

MPI model - MPI versions - Collective communication - Data decomposition - Communicators and topologies - Point-to-point communication - Dynamic process management - MPI library - MPI programs using Point-to-Point communication library calls - Dervied data types - Topologies - Group communicator - Dense matrix computations.

UNIT V MULTITHREADED APPLICATION DEVELOPMENT 9

Algorithms - Program development - Performance visualization tools - Characteristics- Performance tuning -Tuning and Performance of programs based on Intel TBB - Matrix computations and Numerical computations based on C++ programming.

TOTAL = 45

TEXT BOOKS

1. Kai Hwang and Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill International, 1984
2. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill, 1993
3. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.
4. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.

REFERENCES

1. John L. Hennessey and David A. Patterson, "Computer Architecture - A Quantitative Approach", 4th edition, Morgan Kaufmann / Elsevier Publishers, 2007.
2. David E. Culler and Jaswinder Pal Singh, "Parallel Computing Architecture: A Hardware/ Software Approach", Morgan Kaufmann/Elsevier Publishers, 1999.

ECY 081 VLSI DESIGN TECHNIQUES L T P C

3 0 0 3

OBJECTIVE

To make students learn

- The conceptual view of CMOS circuits and VLSI design flow
- VLSI system components circuits and analog VLSI
- Synthesis of digital VLSI systems from register-transfer level descriptions using Verilog HDL.

UNIT I MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY 9

NMOS and PMOS transistors - Threshold voltage - Body effect - Design equations - Second order effects - MOS models and small signal AC characteristics - Basic CMOS technology.

UNIT II INVERTERS AND LOGIC GATES 9

NMOS and CMOS inverters - Stick diagram - Inverter ratio - DC and transient characteristics - Switching times - Super buffers - Driving large capacitance loads - CMOS logic structures - Transmission gates - Static CMOS design - Dynamic CMOS design.

UNIT III CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION 9

Resistance estimation - Capacitance estimation - Inductance - Switching characteristics- Transistor sizing - Power dissipation and design margining - Charge sharing - Scaling.

UNIT IV VLSI SYSTEM COMPONENTS CIRCUITS AND SYSTEM LEVEL PHYSICAL DESIGN. 9

Multiplexers - Decoders - Comparators - Priority encoders - Shift registers - Arithmetic circuits - Ripple carry adders - Carry look ahead adders - High-speed adders - Multipliers - Physical design - Delay modelling - Cross talk - Floor planning - Power distribution - Clock distribution - Basics of CMOS testing.

UNIT V VERILOG HARDWARE DESCRIPTION LANGUAGE 9

Overview of digital design with Verilog HDL- Hierarchical modelling concepts-

Modules and port definitions - Gate level modelling - Data flow modelling - Behavioral modelling -Task & functions - Test bench.

TOTAL = 45

REFERENCES

1. Neil H.E. Weste and Kamran Eshraghian, "Principles of CMOS VLSI Design", Pearson Education ASIA, 2nd edition, 2000.
2. John P.Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley & Sons, Inc., 2002.
3. Samir Palnitkar, "Verilog HDL", Pearson Education, 2nd edition, 2004.
4. Eugene D.Fabricius, "Introduction to VLSI Design",McGraw Hill International Editions, 1990.
5. J.Bhasker, "A Verilog HDL Primer", 2nd edition, , B.S.Publications, 2001.
6. Pucknell, "Basic VLSI Design", Prentice Hall of India Publication, 1995.
7. Wayne Wolf, "Modern VLSI Design System on chip", Pearson Education,2002.

SPECIAL ELECTIVES

CSZ 001 SPEECH RECOGNITION

L	T	P	C
3	0	0	3

Course Objective

- To provide basic understanding of the relationship of vocal tract shapes and physical acoustics to the acoustic speech signal.
- To explain how to use a spectrum analyzer to relate the acoustic speech signal to acoustical processes.
- To teach on design and implement digital filters to synthesize speech and code speech at a low bit rate.
- To give the basic knowledge in speech technology a deeper understanding of methods for automatic recognition of speech and speakers.

UNIT I **9**

Fundamentals of speech recognition - Introduction - Speech production process - Speech in time and frequency domains - Speech sounds and features. Approaches to automatic speech recognition.

UNIT II **9**

Signal processing methods - Spectral analysis models - Speech recognition filter banks - Linear productive coding model - Autocorrelation methods - Vector quantization - Similarity or distance measures - Vector classification - Extensions of vector quantization - Auditory based spectral analysis models. Pattern comparison techniques - Distortion measures - Time alignment and normalization.

UNIT III **9**

Speech recognition system design - Source coding techniques - Template training methods - Clustering performance analysis - Effects of signal analysis parameters - Hierarchical speech clustering - Discriminative methods - Discrete time marker process - Hidden Marker models (HMM) - Autoregressive HMM - Implementation issues of HMM - HMM system for isolated word recognition.

UNIT IV **9**

Speech recognition of connected words - Two level dynamic programming - Level building algorithms - One pass algorithm - Grammar networks -

Segmented K-mean - Sub word speech units - HMM application - Language models - Context dependent sub word units.

UNIT V **9**

Task oriented application - Automatic speech recognition - Application - Characterization - Broad classification of speech recognition application - Command and control application - Implementation techniques.

TOTAL = 45

REFERENCES

1. Lawrence Rabina, Biing-Harry Jnang and B.Yeghanarayanan, "Fundamentals of Speech recognition ", Pearson Education, Delhi, 2009.

2. Claudia Beccheltr and Klucio Prina Ricoth, "Speech Recognition", Wisley student edition, India, 2004.

CSZ 002 LANGUAGE TECHONOLOGY L T P C
3 0 0 3

Course Objective

- To showcase the field of statistical language processing.
- To provide a theoretical foundation and practical experience in terms of the fundamental areas of research in Language technology.
- To give an overview of the applications of Language technology.

UNIT I INTRODUCTION 9

Natural language processing - Linguistic background - Spoken language input and output technologies - Written language input - Mathematical methods - Statistical modeling and classification finite state methods grammar for natural language processing - Parsing - Semantic and logic Form - Ambiguity resolution - Semantic interpretation.

UNIT II INFORMATION RETRIEVAL 9

Information retrieval architecture - Indexing - Storage - Compression techniques - Retrieval approaches - Evaluation - Search engines - Commercial search engine - Features - Comparison - Performance measures - Document processing - NLP based information retrieval - Information extraction.

UNIT III TEXT MINING 9

Categorization - Extraction based categorization - Clustering - Hierarchical clustering - Document classification and Routing - Finding and organizing answers from text search - Use of categories and clusters for organizing retrieval results - Text categorization and efficient summarization using lexical chains - Pattern extraction.

UNIT IV GENERIC ISSUES 9

Multilinguality - Multilingual information retrieval and speech processing - Multimodality - Text and images - Modality integration - Transmission and storage - Speech coding - Evaluation of systems - Human factors and user acceptability.

UNIT V APPLICATIONS **9**

Machine translation - Transfer metaphor - Interlingual and statistical approaches - Discourse processing - Dialog conversational agents - Natural language generation - Surface realization and discourse planning.

TOTAL= 45

TEXT BOOKS

1. Daniel Jurafsky And James H.Martin , "Speech and Language Processing" , Prentice Hall , 2008.
2. Ron Cole and J.Mariani, "Survey of the state of the art in Human SSS language technology", Cambridge University Press, 1997.
3. Michal W. Berry, "Survey Of Text Mining : Clustering, Classification And Retrieval" Springer Verlag, 2003.
4. Christopher D, Manning and Hinrich Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.

REFERENCES

1. James Allen, "Natural Language Understanding ", Benjamin / Cummings Publishing Co, 1995.
2. Gerald J. Kowalski and Mark .T.Marubury, "Information Storage and Retrieval Systems", Kluwer Academic Publishers, 2000.
3. Tomek Strzalkowski, "Natural Language Information Retrieval", Kluwer Academic Publishers, 1999.

CSZ 003 GRAPHICS AND MULTIMEDIA

L	T	P	C
3	0	0	3

Course Objective

- To teach them the techniques on the production of 2D computer animation.
- To make them understand the algorithms and theories that form the basis of computer graphics and modeling
- To acquire practical knowledge and experience of modeling technologies and techniques
- To know about the production of 3D models, Projections, and Prospective.
- To explain some techniques that can be used to enhance standard composite shots
- To acquire the necessary knowledge and skills to extend core compositing work using visual effects.

UNIT I OUTPUT PRIMITIVES **9**

Introduction - Line - Curve and ellipse drawing algorithms - Attributes - Two-dimensional geometric transformations - Two-Dimensional clipping and viewing.

UNIT II THREE-DIMENSIONAL CONCEPTS **9**

Three-dimensional object representations - Three-dimensional geometric and modeling transformations - Three-dimensional viewing - Color models - Animation.

UNIT III MULTIMEDIA SYSTEMS DESIGN **9**

An Introduction - Multimedia applications - Multimedia system architecture - Evolving technologies for multimedia - Defining objects for multimedia systems - Multimedia data interface standards - Multimedia databases.

UNIT IV MULTIMEDIA FILE HANDLING **9**

Compression & decompression - Data & file format standards - Multimedia I/O technologies -Digital voice and audio - Video image and animation - Full motion video - Storage and retrieval technologies.

UNIT V MULTIMEDIA APPLICATION AND HYPERMEDIA 9

Multimedia authoring & User interface - Hypermedia messaging - Multimedia communication system - Hypermedia message component - Presentation requirements - Video on demand - Interactive video - Distributed multimedia systems.

TOTAL = 45

TEXT BOOKS

1. Donald Hearn and M.Pauline Baker, "Computer Graphics C Version", Pearson Education, 2003

2. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2003.

REFERENCES

1. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.

2. Foley, Vandam, Feiner and Huges, "Computer Graphics: Principles & Practice", Pearson Education, 2nd edition, 2003.

CSZ 004 HACKING TECHNIQUES AND DIGITAL FORENSICS

L	T	P	C
3	0	0	3

Course Objective

- To provide an overview of Web application environments and understand the basics of client and server side authentication techniques
- To give a detailed account of various types of vulnerabilities and their prevention.
- To discuss about security tools and testing applications for vulnerability and authentication flaws.

UNIT I **9**

Problem factors - Defense mechanisms - Handling user access - User input - Handling attackers - Managing the application - Web application technologies - The HTTP protocol - Web functionality - Encoding schemes.

UNIT II **9**

Mapping the application - Bypassing client side control - Transmitting data via the Client - Capturing user data , HTML forms and thick-client components - Active X controls - Prevention - Attacking authentication - Design flaws in authentication - Implementation flaws in authentication - Prevention - Attacking session management - Weakness in session management generation and handling, Its prevention - Attacking access control - Common vulnerabilities, Its prevention - Code injection - Injection into SQL, OS commands, web scripting techniques, SOAP, XPath, SMDP, LDAP - Attacking path traversal - Finding and exploiting path traversal vulnerabilities, Its prevention - Attacking application logic - Logic flaws - Attacking other users - XSS - Redirection attacks - HTTP header injection - Frame injection- Request forgery- JSON hijacking - Session fixation - Local privacy attacks - Advanced exploiting techniques -Its prevention.

UNIT III **9**

Burp proxy - Automating bespoke attacks - Uses for bespoke automation - Enumerating valid identifier - Fuzzing common vulnerabilities, Its prevention- Exploiting information disclosure - Exploiting error message, Its prevention - Attacking compiled application - Buffered overflow attacks - Integer and format string vulnerabilities, Its prevention - Architectural attacks - Tiered architecture - Shared hosting and Application service providers, Its prevention

- Server attack - Vulnerable application configuration and Software - Source code vulnerabilities - Different languages, Its prevention.

UNIT IV **9**

Hacker's toolkit - Web browsers - Integrated testing suites - Vulnerability scanners -Nikto-hydra-custom Scripts - Hacker's methodology - Mapping application content -Analyzing application-testing - Client side controls - Authentication mechanism - Session management mechanism - Access controls - Input based vulnerabilities- Logic flaws- Sharing hosting vulnerabilities- Web server vulnerabilities- Miscellaneous checks.

UNIT V **9**

Security tools and services - Time-based one-time passwords - Challenge/ response one-time password - Lamport's one-time password algorithm - Smart cards - RADIUS - SASl - Host-to-host authentication - PKI - Firewalls -Kinds of firewalls- Filtering services - Firewall engineering - Tunneling and VPNs - Secure communications over insecure networks - Kerberos authentication system - Link level encryption - Network level encryption - Application-level Encryption - Hidden markov model.

TOTAL = 45

REFERENCES

1. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws" , Wiley Publications,2007.
2. William R.Cheswick, Steven M. Bellovin and Aviel D.Rubin, "Firewalls and Internet Security - Repelling the Wily hacker", Pearson Education, 2008.

CSZ 005 SYSTEM MODELING & SIMULATION

L	T	P	C
3	0	0	3

Course Objective

- To provide basic introduction to system modeling using both computer simulation and mathematical techniques.
- To provide students with the necessary knowledge and skills to undertake core compositing work.
- To explain different simulation models.
- To teach techniques for input and output analysis.

UNIT I INTRODUCTION TO SIMULATION **9**

Advantages and Disadvantages of Simulation system - Discrete and continuous systems- Model of a system- Types of models Discrete-event system simulation-Steps in a simulation study.

UNIT II STATISTICAL MODELS IN SIMULATION **9**

Review of terminology and concepts- Useful statistical models - Discrete distributions -continuous distributions - Process- Empirical distribution - Queuing Models - Characteristics of queuing systems - queuing notation - Steady state behavior of queues- Long run measures of performance of queuing system - Steady-state behavior of infinite population- Markovian models- Steady-state behavior of finite population-models.

UNIT III RANDOM NUMBER GENERATION AND RANDOM VARIATE GENERATION **9**

Properties of Random numbers- Generation of Pseudo - Random nos. - Techniques for generating random nos. - Tests for Random nos.: Inverse transforms Technique-Direct transformation for the normal distribution - Convolution method -Acceptance-Rejection Techniques.

UNIT IV INPUT DATA ANALYSIS **9**

Data Collection-Identifying the distribution- Parameter Estimation and Goodness-of fit Tests- Bivariate data - Verification and Validation of Simulation models: Model building -Verification and validation- Verification of Simulation models - Calibration and Validation of Models.

UNIT V OUTPUT ANALYSIS FOR A SINGLE MODEL 9

Stochastic nature of output data - Types of simulation with respect to Output data - Types of simulations with respect to Output analysis- Measures of performance and their estimation - Output Analysis for Terminating Simulation- Output Analysis for steady-state simulations - Comparison and Evaluation of Alternative System Design: Comparison of Two and Several system designs - Statistical models for estimating the effect of design alternatives.

TOTAL= 45

REFERENCES

1. Jerry Banks & John S.Carson," Discrete -Event System Simulation", PHI,2nd edition, 2000.
2. Geoffrey Gordon," System Simulation",2nd edition, PHI, 1997.
3. Narsing Deo, "System Simulation with Digital Computer",2nd edition, PHI 1999

CSZ 006 **TCP/IP** **L T P C**
3 0 0 3

Course Objective

- To make them examine the current architecture and operation of the Internet.
- To provide a concise overview of TCP/IP with particular emphasis on the addressing and issues of TCP/IP networks.
- To help them an in-depth knowledge of TCP/IP aspects.
- To make them understand IPV6 addresses and the interoperation between IP4 and IpV6.

UNIT I INTRODUCTION **9**

Network architecture-Standards and underlying technologies-Internet addressing-ARP-RARP-BOOTP-DHCP.

UNIT II INTERNET PROTOCOL **9**

IP Datagram-IP Package-IP forwarding and routing algorithms-computing paths-RIP-OSPF-ICMP-IGMP.

UNIT III TCP **9**

TCP header- services- Connection establishment and termination -Interactive data flow - Bulk data flow - Flow control and Retransmission - TCP timers - Urgent Data processing - Congestion control - Extension headers.

UNIT IV IP SWITCHING AND TRAFFIC ENGINEERING **9**

Switching technology- MPLS fundamentals - signaling protocols - LDP - IP traffic engineering - ECMP - SBR - Routing extensions for traffic engineering - Traffic engineering limitations and future developments.

UNIT V IPv6 **9**

IP security protocol-IPv6 addresses - Packet format-Multicast-Anycast-ICMPv6-Interoperation between IPv4 and IPv6-QoS -Auto configuration.

TOTAL = 45

REFERENCES

1. Douglas E. Comer," Internetworking with TCP/IP Principles, Protocols, and Architecture"- 5th edition Volume-1, Prentice Hall-2006.
2. Adrian Farrel," The Internet and its Protocols- A Comparative approach" Morgan Kaufmann, 2004.

3. W.Richard Stevens "TCP/IP Illustrated, The Protocols". Volume I, Pearson Education India 2003.

4. Behrouz A.Forouzan,"TCP/IP Protocol Suite"-3rd edition-Tata McGraw Hill-2006.

5. Pete Loshin"IPv6 Theory, Protocol and Practice, 2nd edition", Morgon Kaufmann-December-2003.

6. Comer D.E & Stevens D.L "Internetworking TCP/IP- Volume III", Prentice Hall of India -1997.

CSZ 007 FAULT TOLERANT SYSTEMS

L	T	P	C
3	0	0	3

Course Objective

- To provide insight in the aspects contributing to the dependability of computer based systems.
- To make them learn different fault tolerant strategies: Fault detection, masking, containment, location, reconfiguration, and recovery.
- To teach the basic techniques to design fault tolerant systems using redundancy: hardware, information, and time and software redundancy.
- To explain the detailed analysis of different fault hardware and software architectures.
- To discuss case studies on the evaluations of FT systems.

UNIT I **9**

Definition of fault tolerance - Fault classification - Fault tolerance and dependability - Dependability concepts - Dependability attributes - Reliability - Availability - Safety - testability and maintainability - Dependability impairments - Faults, errors, failures- Dependability means - Fault tolerance - Fault removal -Fault prevention-Fault forecasting and common measures of dependability- Failure rate and the reliability function- MTTF- MTBF- MTTR and availability.

UNIT II **9**

Fault tolerant strategies - Fault detection - Masking - Containment - Location- Reconfiguration and Recovery - Fault tolerant design techniques - Hardware redundancy - Passive hardware redundancy - Hardware voters - Voting techniques -Quantitative evaluations methods for hardware fault tolerant systems - Software redundancy- Time redundancy- Information redundancy- Parity-Checksum.

UNIT III **9**

Fault tolerance in distributed systems - Building blocks - Consensus protocols - Fault diagnosis - Clock synchronization - Stable storage and RAID architectures -Check pointing and recovery - Atomic actions - Data replication and resiliency - Fault tolerant networks - Dependable communication - Dependable channels- Survivable networks-Fault-tolerant routing.

UNIT IV **9**

Dependability evaluation techniques and tools- Fault trees- Markov chains - Petri nets-Distributed systems - Ordering-Synchronizing - Fault-tolerant Agreement - Oral messages - Multi-core assignment discussion - Fault-tolerant Agreement - Signed messages - Case studies of dependable systems.

UNIT V **9**

Fault tolerance in real-time systems- Time-space tradeoff - Imprecise computation - (m,k)-firm deadline model - Fault tolerant scheduling algorithms - Recent topics in fault tolerant systems - Security - Fault tolerance in wireless/ mobile networks and Internet - Case studies of analysis of fault tolerant hardware and software architectures.

TOTAL = 45

REFERENCES

1. Anderson and Lee, "Fault Tolerant Principles and Practice", Prentice Hall, 1998.
2. Pankaj Jalote, "Fault Tolerance in Distributed Systems", PTR Prentice Hall, 1994.
3. Shem-Tov Levi and Ashok K. Agrawala, "Fault Tolerant System Design", McGraw-Hill Series on Computer Engineering, 1994.
4. Israel Koren & C.Krishna, "Fault Tolerant Systems", Elsevier Publications.
5. Pradhan, Dhiraj K., "Fault-Tolerant Computer System Design", Prentice-Hall PTR, 1996.
6. Sahner, R.A., K.S. Trivedi and A. Puliafito," Performance and Reliability Analysis of Computer Systems", Kluwer Academic Publishers, 1996.
7. Johnson, B.W., "Design and Analysis of Fault-Tolerant Systems", Addison Wesely, 1989
8. Pradhan, D.K., "Fault-Tolerant Computing - Theory and Techniques", (2 Volumes), Prentice-Hall, 1986.
9. Pradhan, Dhiraj K., "Fault-Tolerant Computer System Design", ISBN 0-13-057887-8, Prentice-Hall PTR, 1996.

CSZ 008 WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

Course Objective

- To explain the basics of Wireless Sensor Networks and its applications.
- To provide knowledge about the simulators that could be used for implementing the WSN and analyzing the performance of WSN.
- To teach basic issues in designing and implementing WSN in real time.
- To provide an understanding of problems related to self organization, mobility and energy conservation.

UNIT I WIRELESS SENSOR NETWORKS 9

Introduction - Constraints and Challenges- Advantages - Sensor Network Applications - Collaborative Processing - Canonical Problem: Localization and Tracking - Distributed Representation and Inference of states - Tracking Multiple Objects - Sensor Models - Performance Comparison and Metrics

UNIT II NETWORKING SENSORS 9

Key Assumptions - Medium Access Control - General Issues - Geographic, Energy Aware Routing - Attribute Based Routing

UNIT III INFRASTRUCTURE ESTABLISHMENT 9

Topology Control - Clustering - Time Synchronization - Localization and Localization Services - Sensor Tasking and Control - Task-Driven Sensing- Role of Sensor Nodes and Utilities - Information Based Sensor Tasking - Joint Routing and Information Aggregation

UNIT IV SENSOR NETWORK DATABASES 9

Sensor Database Challenges - Querying the Physical Environment - Query Interfaces - High-level Database Organization - In-Network Aggregation - Data -Centric Storage - Data Indices and Range Queries - Distributed Hierarchal Aggregation - Temporal Data

UNIT V SENSOR NETWORK PLATFORMS, TOOLS ANDAPPLICATIONS 9

Sensor Node Hardware - Sensor Network Programming Challenges - Node-

Level Software Platforms - Node-Level Simulators - Programming Beyond Individual Nodes: State-Centric Programming - Emerging Applications - Future Research Directions

TOTAL = 45

REFERENCES

1. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
2. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
5. Bhaskar Krishnamachari,"Networking Wireless Sensors", Cambridge Press, 2005.
6. Mohammad Ilyas and Imad Mahgaob,"Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems", CRC Press, 2005.

CSZ 009 SECURITY ISSUES IN CLOUD COMPUTING

L	T	P	C
3	0	0	3

Course Objective

- To teach them basis concept of cloud computing to strengthen them understanding.
- To explain different web services and focus on existing tools and cloud services.
- To explain several issues in cloud computing and especially on security.
- To make them understand the infrastructure needed for secure cloud.

UNIT I UNDERSTANDING CLOUD COMPUTING **6**

Cloud computing - History of cloud computing - Cloud architecture - Cloud storage - Cloud computing matters - Advantages of cloud computing - Disadvantages of cloud computing - Companies in the cloud today - Cloud services.

UNIT II DEVELOPING CLOUD S ERVICES **10**

Web - Based application - Pros and Cons of Cloud service development - Types of cloud service development - Software as a service - Platform as a service - Web services - On-Demand computing - Discovering cloud services Development services and tools - Amazon Ec2 - Google App engine - IBM clouds.

UNIT III CLOUD COMPUTING FOR EVERYONE **10**

Centralizing email communications - Collaborating on schedules - Collaborating on To - do lists - Collaborating contact lists - Cloud computing for the community - Collaborating on group projects and events - Cloud computing for the corporation.

UNIT IV CLOUD COMPUTING SECURITY **9**

Cloud computing Security Challenges - Federation - Presence - Identity - Privacy in the Cloud - SaaS Security - Secure Architecture Design - Risk Assessment - Policies - Standards and Guidelines - Secure Software Development Life Cycle - Data Security - Physical Security - Application Security

UNIT V SECURE CLOUD INFRASTRUCTURE AND MANAGEMENT 10

Infrastructure security - Network level - host level - Application level - Security Management in the Cloud - Security Management Standards - Availability Management - SaaS Availability Management - PaaS Availability Management - IaaS Availability Management - Access Control - Security Vulnerability, Patch and Configuration Management - Audit and Compliance

TOTAL = 45

REFERENCES

1. Michael Miller, "Cloud Computing: Web - Based Applications that change the way you work and Collaborate Online", Que Publishing, 2008.
2. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for on- demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pvt Limited, 2008.
3. Tim Mather, Subra Kumaraswamy, and Shahed Latif , " Cloud Security and Privacy: An Enterprise Prespective on Risks and Compliance", O'Reilly Media Inc, 2009.
4. John W. Rittinghouse, James F. Ransome, "Cloud Computing- Implementation, Management and Security", CRC Press, 2010.

CSZ 010 SOFTWARE METRICS L T P C
3 0 0 3

Course Objective

- To introduce students the importance of software measurements and basic tools of measurement.
- To explain different statistical techniques for data collection and analysis.
- To discuss software reliability growth models and explain the importance of prediction models.

UNIT I FUNDAMENTALS OF MEASUREMENT 9

Measurement - Measurement in Software engineering - The Scope of software metrics - The basics of measurement - The representational theory of measurement - Measurements and models - A goal based framework - classification of software measures - Application of the framework - Software measurement validation.

UNIT II EXPERIMENTATION 9

Empirical Investigation: Four principles of investigation - Planning formal experiments - Planning case studies - Software - Metrics data collection - Collection data - Storing and extracting data - Analysis of software measurement data - Examples of simple analysis techniques - Advanced methods for analysis - Overview of statistical tests.

UNIT III SOFTWARE ENGINEERING MEASUREMENT 9

Measuring internal product attributes: Size - functionality -complexity - structure - types of structural measures - Control flow structure - Modulatory and Information flow attributes - Object oriented Metrics - Complexity measures - External Product attributes - Modeling software quality - Measuring software quality.

UNIT IV SOFTWARE RELIABILITY - MEASUREMENT AND PREDICTION 9

Basics of reliability theory, Software reliability problem, Parametric reliability growth Models - Software reliability growth Predictions - Wider aspects of software reliability - Productivity teams, tools and methods - Making Process

Predictions - Estimations - Models of effort and cost - Estimation Methods - Implications for process predictions

UNIT V MEASUREMENT AND MANAGEMENT 9

Planning a measurement Program: Metrics plan - Developing goals, questions and metrics - Mapping measures to activities - Measurement tools - Measurement in the small - Measurement in the large - Investigating products, resources and processes trends in measurement research.

TOTAL = 45

REFERENCES

1. Norman E.Fenton, Shari Lawarance Pfleeger, "Software Metrics - A Rigorous & Practical Approach" Thomson Computer Press, 2nd Edition, 1996.
2. Stephen H.Kan, "Metrics and Models in Software Quality Engineering" Pearson, 2nd Edition, 2003.
3. Alain Abran,"Software Metrics and Software Metrology",JWiley,2010.
4. C.Ravindranath Pandian,"SOFTWARE METRICS A Guide to Planning, Analysis, and Application", AUERBACH, 2005.

CSZ 011 CROSS LANGUAGE INFORMATION RETRIEVAL

L	T	P	C
3	0	0	3

Course Objective

- To teach the students the important concepts, algorithms, and data/file structures that are necessary to specify, design, and implement Information Retrieval (IR) systems.
- To expose the students to the domain of Cross Language Information Retrieval.
- To expose the students in the fundamental concepts in Cross Language Information retrieval.

UNIT I INFORMATION RETRIEVAL MODELS **9**

General IR Problems - General IR Approaches - IR Models - Boolean Models - Vector Space Model - Probabilistic Models - Statistical Language Models - Query Expansion - System Evaluation - Web Information Retrieval: Word Stemming - DE compounding - Retrieval - Selective Crawling - Index organization - Text Categorization - Information Filtering

UNIT II SEMANTIC SEARCH AND INFORMATION RETRIEVAL **9**

Ontologies - Knowledge bases and Semantic Repositories - Semantic Web and Semantic Search - Basic Semantic Web Standards - Metadata and Annotations - Semantic Indexing and Retrieval - Semantic Indexing and Retrieval - Ontology Querying - Conceptual Querying

UNIT III ROLE OF NATURAL LANGUAGE PROCESSING IN INFORMATION RETRIEVAL **9**

Named entity recognition - Information Extraction - Word net - Word Sense disambiguation - Text Mining - Question Answering - The Problems of Cross-Language Information Retrieval - Query Translation vs. Document Translation - Using Pivot Language and Interlingua - Case study - Infact system.

UNIT IV TRANSLATION BASED ON PARALLEL AND COMPARABLE CORPORA **9**

Parallel Corpora - Paragraph/Sentence Alignment - Utilization of Translation Models in CLIR - Embedding Translation Models into CLIR Models - Alternative Approaches using Parallel Corpora - Exploiting a Parallel Corpus by Pseudo-Relevance Feedback - Using Latent Semantic Indexing (LSI) -

Using Comparable Corpora - Discussions on CLIR Methods and Resources - Mining for Translation Resources and Relations - Mining for Parallel Texts - Transliteration - Mining Translations using Hyperlinks - Mining Translations from Monolingual Web Pages.

UNIT V FUTURE TRENDS **9**

Toward a Unified View of Monolingual IR and CLIR - What has been achieved? - Inspiring from Monolingual IR - Parallel between Query Expansion and Query Translation - Inspiring Query Translation from Query Expansion- An Example

TOTAL = 45

TEXT BOOK

1. "Cross-Language Information Retrieval", Jian-Yun Nie, ISBN 1598298631, Morgan & Claypool Publications, 2010.
2. Natural Language Processing and Text Mining by Anne Kao and Steve R. Poteet (eds) Springer © 2007 ISBN:9781846281754
3. "Data-Intensive Text Processing with Map Reduce", Jimmy Lin, Chris Dyer, ISBN: 9781608453436, Morgan & Claypool Publications, 2010.
4. Information Retrieval: Searching in the 21st Century by John Davies,John Wiley & Sons (UK) © 2009, ISBN:9780470027622
5. "Data-Intensive Text Processing with Map Reduce", Jimmy Lin, Chris Dyer, ISBN: 9781608453436, Morgan & Claypool Publications, 2010.

CSZ 012 MOBILE COMPUTING DEVELOPMENT TECHNOLOGIES

L	T	P	C
3	0	0	3

Course Objective

- To prepare students to work in the area of mobile software development by introducing them to the relevant technologies
- To equip the students with skills in the design and development of mobile applications
- To expose the students in up-to-date software development tools and APIs.

UNIT I INTRODUTION **9**

Mobility of Bits and Bytes - Wireless the beginning - Mobile Computing - Dialogue Control - Networks - Middleware and Gateway - Application and Services - Developing Mobile Computing Applications- Security in Mobile Computing - Standards - Players in the Wireless Space - Architecture for Mobile Computing - Three Tire Architecture - Design Considerations for Mobile Computing - Mobile Computing through Internet

UNIT II ARCHITECTURE OF MOBILE COMPUTING APPLICATIONS **9**

Fully Centralized Frameworks and Tools - N Tier Frameworks and Tools: Mobile Operating Systems and Virtual machines - Hardware specific tools and frameworks - Application supported Programming for Wireless - Case Studies (Java or Binary Run time environment for Wireless)

UNIT III OPERATING SYSTEM BASED PROGRAMMING FOR WIRELESS DEVICES **9**

Difference between Operating System based Programming and application supported Programming - Study of fundamental concepts - Design Strategies - Tools and APIs to create advanced applications for mobile phones and occasionally connected mobile devices - Application life-cycle - Multi-threading - Inter-process communication - Data persistency - Content providers - Background services. - Case studies (Symbian OS, Windows CE or Android)

UNIT IV USER INTERFACE DEVELOPMENT FOR MOBILE DEVICES **9**

Human Factors - Factors for developing User Interfaces - Elements of user interfaces - Context - User interface components - Managing User interface components - Using UML for Modeling user interface components - Models

for Mobile devices: MVC model - PAC model - Transformation based techniques for Mobile Applications - Multimodal user interfaces for wireless Devices

UNIT V DEVELOPMENT AND TESTING OF MOBILE APPLICATIONS 9

UML- based development cycle for mobile applications: Mobile Use cases - Mobile Development process - Architectural patterns for mobile applications - Testing mobile applications - Case Study

TOTAL = 45

TEXT BOOK

1. Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML by Reza B'Far Cambridge University Press © 2005 ISBN:9780521817332
2. "Mobile Computing Technology, Applications and Service Creation" by Asoke K Talukder, Roopa R Yavagal (2005).
3. "The Busy Coder's Guide to Android Development" by Mark L. Murphy. CommonsWare Pub., 2009
4. "Professional Android Application Development" by Reto Meier. Wrox Programmer to Programmer Pub. 2009.

CSZ 013	EMBEDDED COMPUTING WITH VLIW APPROACH	L	T	P	C
		3	0	0	3

Course Objective

- To give comprehensive coverage on embedded computing
- To provide brief introduction about embedded processing, risc and its architectures and VLIW.
- To highlight principles of micro architecture design and related system architecture.
- To provide some compiling tools and technique for VLIW.

UNIT I INTRODUCTION TO EMBEDDED PROCESSING, VLIW AND ILP 9

Embedded Computing – Characterizing – Parallelism – Design Philosophies – RUSC CISE, Superscalar, VLIW – Role of Compiler – VLIW in Embedded and DSP domains – Historical Perspective

UNIT II OVERVIEW OF ISA DESIGN AND ARCHITECTURAL STRUCTURES 9

Architecture Hidden and Exposed details – VLIW Design Principles – Designing VLIW ISA – Instruction-set Encoding – VLIW Encoding – Encoding and Instruction set Extensions Architectural Structures – Data path – Registers and clusters – Memory Architecture – Branch Architecture – Speculation and Predication – System Operations.

UNIT III MICROWARCHITECTURE DESIGN, SYSTEM DESIGN AND SIMULATION 9

Register File Design – Pipeline Design – VLIW Fetch, Sequencing and Decoding – Data path – Memory Architecture – Control Unit – Control Registers – Power considerations – System – on a Chip (SoC) – Processor Cores and SoC Simulating VLIW Architecture – System Simulation – Validation and Verification.

UNIT IV COMPILING FOR VLIWs AND RUN – TIME SYSTEM 9

Significance of ILP Compiler – Embedded Cross – Development Tool chains – Structure of ILP Compiler – Code Layout – Embedded Specific Tradeoffs for Compliers – DSP Specific Compiler Optimizations – Profiling – Scheduling – Register Allocation – Speculation and Predication – Instruction Selection – Exceptions, Interrupts, and Traps – Application Binary Interface

Considerations – Code Compressions – Embedded Operating Systems – Multiprocessing and Multithreading.

UNIT V APPLICATION DESIGN AND CUSTOMIZATION 9

Programming Language Choices – Performance, Benchmarking and Tuning – Scalability and Customizability – Application Areas

REFERENCE

1. Joseph A Fisher, Paolo Faraboschi, Cliff Young “EMBEDDED COMPUTING – A VLIW Approach to Architecture, Compliers and Tools”, Morgan Kaufmann Publishers (An imprint of Elsevier), 2005.

CSZ 014 **WEB MINING** **L T P C**
3 0 0 3

Course Objective

- To give in-depth understanding of the concepts and the working principles of mining the World Wide Web.
- To make them understand supervised and unsupervised learning and its application to web mining.
- To focus on algorithms related to crawling, extraction and integration of web information.

UNIT I MINING FOUNDATION **9**

Basics of Mining – Data Mining Vs Web Mining – Concepts of Association Rules – Apriori Algorithm – Mining with Multiple Minimum Supports – Mining Class Association Rules – Mining Sequential Patterns – GSP – Prefix Span – Generating Rules from Sequential Patterns

UNIT II SUPERVISED & UNSUPERVISED LEARNING **9**

Supervised Learning : Concepts – Decision Tree Induction – Classifier Evaluation – Rule Induction – Rule Learning: Learn – One – Rule Function – Classification Using Class Association Rules – Classification Using Normal Association Rules – Naïve Bayesian Classification – Support Vector Machines – K. Nearest Neighbour Learning – Unsupervised Learning: K-means Clustering – Representation of Clusters – Hierarchical Clustering – Distance Functions – Cluster Evaluation.

UNIT III WEB MINING AND CRAWLING **9**

Basic Concepts – Information Retrieval Models – Evaluation measure – Link Analysis – HITS Algorithm – Community Discovery – Web Crawling: Crawler Algorithm – Implementation Issues – Types of Crawlers

UNIT IV WRAPPER GENERATION AND INFORMATION INTEGRATION **9**

Wrapper Induction: Extraction Rules – Examples – Instance – Based Wrapper Learning – Problems – String Matching and Tree Matching – Multiple Alignment – Extraction Based on Single List Page – Extraction Based on Multiple Pages – Information Integration: Matching Approaches – Domain and Instance – Level matching – Combing Similarities – Issues in Matching – Integration of Web Query Interfaces.

UNIT V OPINION MINING AND USAGE MINING

Opinion Mining: Sentiment Classification – Feature Based Opinion Mining and Summarization – Sentence and Relation Mining – Opinion Search – Opinion Spam Detection – Web Usage Mining: Collection and Pre-Processing – Data Modeling – Discovery and Analysis of Web Usage Patterns

TOTAL = 45

TEXT BOOKS

1. Liu. B. “Web data Mining, Exploring Hyperlinks, Contents and Usage Data”, Springer, 2010.
2. Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining, & DLAP “Tata Megrew – Hill, 2004.

REFERENCES

1. George Meghabghab, Abraham Kandel, “Search Engineers, Link Analysis, and Use Web Behavior: A Unifying Web Mining Approach”, Springer, 2008.
2. Anthony Scime, “Web Mining: Application and Techniques”, Idea Group Publishing, 2005.
3. Gordon S. Linoff, Michael J.A. Berry, “Mining the Web “ Transforming Customer Data into Customer Value”. Wiley, 2002.
4. Haralambos Marmanis, Dmitry Babenko, “Algorithms of the Intelligent Web”, Manning Publications, 2009.
5. Zdravko Markov, Daniel T. Larose, “Data Mining the Web: Uncovering Patterns in Web Content, Structure and Usage”, Wiley – Interscience, 2007.

CSZ 015 INFORMATION RETRIEVAL TECHNIQUES

L	T	P	C
3	0	0	3

Course Objective

- To give an overview of information retrieval and the various methods employed.
- To make them understand the working principle of search engines and retrieval of information from the web.
- To explain standard web search algorithms and presentation of retrieved information.
- To focus on document text mining and the techniques employed.

UNIT – I INTRODUCTION **9**

Introduction – History of IR – Components of IR – Issues – Open source Search engine Frameworks, The impact of the web on IR – The role of artificial intelligence (AL) in IR – IR Versus Web Search – Components of a Search Engine – Characterizing the Web

UNIT–II INFORMATION RETRIEVAL **9**

Boolean and vector – space retrieval models – Term weighting – TF – IDF weighting – cosine similarity – Preprocessing – Inverted indices – efficient processing with sparse vectors – Language Model based IR – Probabilistic IR – Latent Semantic Indexing – Relevance feedback and query expansion

UNIT–III WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING **9**

Web search overview, web structure, the user, paid placement, search engine optimization/spam. Web size measurement – search engine optimization/ spam – Web Search Architectures – crawling – Meta-crawlers – Focused Crawling – web indexes – Near – duplicate detection – Index Compression – XML retrieval

UNIT–IV WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH **9**

Lunk Analysis – hubs and authorities – Page Rank and HITS algorithms – Searching and Ranking – Relevance Scoring and ranking for Web – Similarity – Hadoop & Map Reduce – Evaluation – Personalized search – Collaborative filtering and content based recommendation of documents and products – handling “invisible” Web – Snippet generation, Summarization, Question Answering, Cross – Lingual Retrieval

UNIT–V DOCUMENT TEXT MINING **9**

Information filtering; organization and relevance feedback – Text Mining – Text classification and clustering – Categorization algorithms; naive Bayes; decision trees; and nearest neighbor – Clustering algorithms; agglomerative clustering; k-means; expectation maximization (EM)

Total = 45

TEXT BOOKS

1. C. Manning, P. Raghavan and H. Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Ricardo Baeza – Yates and Berthier Ribeiro-Neto, Modern Information Retrieval; The Concepts and Technology behind Search (2nd Edition) (ACM Press Books), 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines Information Retrieval in Practice, Addison Wesley; 1st edition, 2009.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, Wiley; 2nd edition, 2010.

REFERENCES

1. Stefan Buettcher, Charles L.A. Clarke, Gordon V. Cormack, Information Retrieval; Implementing and Evaluating Search Engines, the MIT Press, 2010.
2. Ophir Frieder Information Retrieval; Algorithms and Heuristics, Springer; 2nd edition, 2004.
3. Manu Konchady, Building Search Applications; Lucene, LingPipe and Gate Mustru Publishing; 1st edition, 2008.

CSZ 016 **MULTIAGENT SYSTEMS** **L T P C**
3 0 0 3

Course Objective

- To introduce advanced techniques in AI.
- To explain issues relating to communication and cooperation in multi-agent systems.
- To teach on techniques of multi-agent decision making.

Course Outcomes :

To understand the key issues in the design of a society of agents cooperating to solve specific problems as well as open societies of heterogeneous autonomous agents.

UNIT I **9**

Introduction – Abstract architectures for intelligent agents – Intelligent Autonomous Agents – Intelligent agents – Deductive Reasoning Agents – Practical Reasoning Agents – Reactive and Hybrid Agents.

UNIT – II **9**

Communication & Cooperation – Understanding Each other Speech Acts – Agent Communication Languages – Cooperative Distributed Problem Solving – Task Sharing and Result Sharing – Combining Task and Result Sharing – Handling Inconsistency – Coordination – Multiagent Planning and Synchronization.

UNIT III **9**

Multiagent Decision Making – Multiagent Interactions – Utilities and Preferences – Setting the Scene – Solution Concepts and Solution Properties – Competitive and Zero – Sum Interactions – The Prisoner's Dilemma – Other Symmetric 2 x 2 Interactions – Representing Multiagent Scenarios – Dependence Relations in Multiagent Systems.

UNIT IV **9**

Making Group Decisions – Social Welfare Functions and Social Choice Functions – Voting Procedures – Desirable Properties for Voting Procedures – Strategic Manipulation – Forming Coalitions – Allocating Scarce Resources – Bargaining – Artguing.

UNIT V **9**

Logical Foundations – Logics for Knowledge and Belief – Logics for Mental States – Logics for Cooperation – Putting Logic to Work – MultiAgents Development Frameworks and Languages – Pitfalls of Agent Development – Applications of Agents – Applications Case Studies.

Total = 45

TEXT BOOK

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