

**AFFILIATED INSTITUTIONS**

**REGULATIONS 2017**  
**CHOICE BASED CREDIT SYSTEM**  
**COMMON TO ALL POST GRADUATE PROGRAMMES**

The following Regulations is applicable to the students admitted to M.E / M.Tech., M.C.A and M.B.A. Programmes at all Engineering Colleges affiliated to Anna University, Chennai (other than Autonomous Colleges) and to all the University Colleges of Engineering of Anna University, Chennai from the academic year 2017-2018.

**1 PRELIMINARY DEFINITIONS AND NOMENCLATURE**

In these Regulations, unless the context otherwise requires:

- i. **“Programme”** means Post graduate Degree Programme e.g. M.E., M.Tech. Degree Programme.
- ii. **“Branch”** means specialization or discipline of M.E. / M.Tech. Degree Programme like “Structural Engineering”, “Engineering Design”, etc.
- iii. **“Course”** means Theory or Practical subject that is normally studied in a semester, like Applied Mathematics, Advanced Thermodynamics, etc.
- iv. **“Director, Academic Courses”** means the authority of the University who is responsible for all academic activities of the University for implementation of relevant Rules and Regulations.
- v. **“Chairman”** means the Head of the Faculty.
- vi. **“Head of the Department”** means Head of the Department concerned.
- vii. **“Head of the Institution”** means the Principal of a College / Institution who is responsible for all academic activities of that College / Institution and for implementation of relevant Rules and Regulations.
- viii. **“Controller of Examinations”** means the Authority of the University who is responsible for all activities of the University Examinations.
- ix. **“University”** means ANNA UNIVERSITY, CHENNAI.

  
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## **2 PROGRAMMES OFFERED, MODES OF STUDY AND ADMISSION REQUIREMENTS**

### **2.1 P.G. PROGRAMMES OFFERED:**

1. M.E
2. M.Tech.
3. M.B.A.
4. M.C.A.

### **2.2 MODES OF STUDY:**

#### **2.2.1 Full-Time:**

Candidates admitted under 'Full-Time' should be available in the College / Institution during the entire duration of working hours (From Morning to Evening on Full-Time basis) for the curricular, co-curricular and extra-curricular activities assigned to them.

The Full-Time candidates should not attend any other Full-Time programme(s) / course(s) or take up any Full-Time job / Part-Time job in any Institution or Company during the period of the Full-Time programme. Violation of the above rules will result in cancellation of admission to the PG programme.

#### **2.2.2 Part-Time Mode:**

In this mode of study, the students are required to attend classes conducted in the evenings and complete the course in three years.

2.2.3 Conversion from one mode of study to the other is not permitted.

### **2.3 ADMISSION REQUIREMENTS:**

2.3.1 Candidates for admission to the first semester of the Post-Graduate Degree Programme shall be required to have passed an appropriate Under-Graduate Degree **Examination of Anna University** or equivalent as specified under qualification for admission as per the Tamil Nadu Common Admission (TANCA) criteria.

**Note:** TANCA releases the updated criteria during the admissions every academic year. Admission shall be offered only to the candidates who possess the qualification prescribed against each programme.

Any other relevant qualification which is not prescribed against each programme shall be considered for equivalence by the committee constituted for the purpose. Admission to such degrees shall be offered only after obtaining equivalence to such degrees.

2.3.2 However, the Syndicate of the University may decide to restrict admission in any particular year to candidates having a subset of qualifications prescribed at the time of admission.

2.3.3 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 Syndicate of the University from time to time.

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

2.3.5 All Part-Time candidates should satisfy other conditions regarding Experience, Sponsorship etc. that may be prescribed by the Syndicate from time to time.

### 3 STRUCTURE OF THE PROGRAMMES

#### 3.1 Categorization of Courses

Every Post Graduate Degree Programme will have a curriculum with syllabi consisting of theory and practical courses that shall be categorized as follows:

- i. **Foundation Courses (FC)** may include Mathematics or other basic courses
- ii. **Professional Core (PC)** courses include the core courses relevant to the chosen specialization/branch.
- iii. **Professional Elective (PE)** courses include the elective courses relevant to the chosen specialization/ branch.
- iv. **Employability Enhancement Courses (EEC)** include Project Work and/or Internship, Seminar, Professional Practices, Summer Project, Case Study and Industrial / Practical Training.

Instead of two electives in the curriculum, the student may be permitted to choose a maximum of 2 courses from other PG programmes with the approval of the Head of the Department offering such courses.

#### 3.2 Courses per Semester

Curriculum of a semester shall normally have a blend of lecture courses and practical courses including Employability Enhancement Courses. Each course may have credits assigned as per clause 3.3.

#### 3.3 Credit Assignment

Each course is assigned certain number of credits based on the following:

Contact period per week	CREDITS
1 Lecture Period	1
2 Tutorial Periods	1
2 Practical Periods (Laboratory / Seminar / Project Work etc.)	1

The Contact Periods per week for Tutorials and Practical can only be in multiples of 2.

#### 3.4 Project Work

- 3.4.1 The project work for M.E. / M.Tech. Programmes consist of Phase-I and Phase-II. The Phase-I is to be undertaken during III semester and Phase-II, which is a continuation of Phase-I is to be undertaken during IV semester.
- 3.4.2 In case of candidates of M.E. / M.Tech. Programmes not completing Phase-I of project work successfully, the candidates can undertake Phase-I again in the subsequent semester. In such cases the candidates can enroll for Phase-II, only after successful completion of Phase-I.
- 3.4.3 Project work shall be carried out under the supervision of a “qualified teacher” in the Department concerned. In this context “qualified teacher” means the faculty member possessing (i) PG degree with a minimum of 3 years experience in teaching or (ii) Ph.D. degree.

- 3.4.4 A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department Concerned. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a joint supervisor 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.
- 3.4.5 The Project work (Phase II in the case of M.E/M.Tech.) shall be pursued for a minimum of 16 weeks during the final semester.
- 3.6 The deadline for submission of final Project Report is 60 calendar days from the last working day of the semester in which project / thesis / dissertation is done. However, the Phase-I of the Project work in the case M.E. / M.Tech. Programmes shall be submitted within a maximum period of 30 calendar days from the last working day of the semester as per the academic calendar published by the University.

### 3.7 Industrial Training / Internship

The students may undergo Industrial training for a period as specified in the curriculum during summer / winter vacation. In this case the training has to be undergone continuously for the entire period.

The students may undergo Internship at Research organization / University (after due approval from the Department Consultative Committee) for the period prescribed in the curriculum during summer / winter vacation, in lieu of Industrial training.

### 3.8 Value Added Courses

*The Students may optionally undergo Value Added Courses and the credits earned through the Value Added Courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. One / Two credit courses shall be offered by a Department of an institution with the prior approval from the Head of the Institution. The details of the syllabus, time table and faculty may be sent to the Centre for Academic Courses and the Controller of Examinations after approval from the Head of the Institution concerned atleast one month before the course is offered. Students can take a maximum of two one credit courses / one two credit course during the entire duration of the Programme.*

### 3.9 Online Courses

- 3.9.1 Students may be permitted to credit only one online course of 3 credits with the approval of **Head of the Institution** and Centre for Academic Courses.
- 3.9.2 Students may be permitted to credit one online course (which are provided with certificate) subject to a maximum of three credits. The approved list of online courses will be provided by the Centre for Academic courses from time to time. The student needs to obtain certification or credit to become eligible for writing the End Semester Examination to be conducted by Controller of Examinations, Anna University. The details regarding online courses taken up by students should be sent to the Controller of Examinations, Anna University and Centre for Academic Courses one month before the commencement of end Semester Examination.

### 3.10 Medium of Instruction

The medium of instruction is English for all courses, examinations, seminar presentations and project / thesis / dissertation reports.

#### 4 DURATION AND STRUCTURE OF THE PROGRAMMES:

4.1 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.E. / M.Tech. (Full-Time)	4	8
M.E. / M.Tech. (Part Time)	6	12
M.C.A. (Full Time)	6	12
M.B.A. (Full Time)	4	8
M.B.A. (Part Time)	6	12

4.2 The Curriculum and Syllabi of all the P.G. Programmes shall be approved by the Academic Council of Anna University. The number of Credits to be earned for the successful completion of the programme shall be as specified in the Curriculum of the respective specialization of the P.G. Programme

4.3 Each semester shall normally consist of 75 working days or 540 periods of each 50 minutes duration, for full-time mode of study or 250 periods for part-time mode of study. The Head of the Institution shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught. For the purpose of calculation of attendance requirement for writing the end semester examinations (as per clause 9) by students, following method shall be used.

$$\text{Percentage of Attendance} = \frac{\text{Total no. of periods attended in all the courses per semester}}{(\text{No. of periods / week as prescribed in the curriculum}) \times 15 \text{ taken together for all courses of the semester}} \times 100$$

End Semester Examinations conducted by the University will be scheduled after the last working day of the semester.

4.5 The minimum prescribed credits required for the award of the degree shall be within the limits specified below:

PROGRAMME	PRESCRIBED CREDIT RANGE
M.E. / M.Tech.	70 to 75

Programme	Prescribed Credits
M.C.A.	120-125
M.B.A.	95-100

#### 5. COURSE REGISTRATION

5.1 The Institution is responsible for registering the courses that each student is proposing to undergo in the ensuing semester. Each student has to register for all courses to be undergone in the curriculum of a particular semester (with the facility to drop courses to a maximum of 6 credits (vide clause 6.5). The student can also register for courses for which the student has failed in the earlier semesters. In such cases the student shall do **reappearance registration** for those courses for which the attendance requirement is not compulsory. However, the student have the option to take up some other professional elective or open elective that he has

failed to pass. **But, the total number of credits that a student is allowed to register per semester cannot exceed 36.** The registration details of the candidates may be approved by the Head of the Institution and forwarded to the Controller of Examinations. This registration is for undergoing the course as well as for writing the End Semester Examinations. No course shall be offered by any department of any institution unless a minimum 5 students register for the course.

**The courses that a student registers in a particular semester may include**

- i. Courses of the current semester.
- ii. The core (Theory/Lab /EEC) courses that the student has not cleared in the previous semesters.
- iii. Elective courses which the student failed (either the same elective or a different elective instead)

**5.2 Flexibility to Drop courses**

- 5.2.1 A student has to earn the total number of credits specified in the curriculum of the respective Programme of study in order to be eligible to obtain the degree.
- 5.2.2 From the II to Final semesters, the student has the option of dropping existing courses in a semester during registration. Total number of credits of such courses cannot exceed 6 for PG (Full Time) programmes and cannot exceed 3 for PG (Part Time) programmes.

**6 EVALUATION OF PROJECT WORK**

The evaluation of Project Work for Phase-I & Phase-II in the case of M.E. / M.Tech. and project work of M.B.A and M.C.A shall be done independently in the respective semesters and marks shall be allotted as per the weightages given in Clause 6.1.

- 6.1 There shall be three assessments (each 100 marks) during the Semester by a review committee. The Student shall make presentation on the progress made before the Committee. The Head of the Institution shall constitute the review committee for each branch of study. The total marks obtained in the three assessments shall be reduced to 20 marks and rounded to the nearest integer (as per the Table given below). There will be a vice-voce Examination during End Semester Examinations conducted by a Committee consisting of the supervisor, one internal examiner and one external examiner. The internal examiner and the external examiner shall be appointed by the Controller of Examination. The distribution of marks for the internal assessment and End semester examination is given below:

Internal Assessment (20 Marks)			End Semester Examination (80 Marks)			
Review - I	Review - II	Review - III	Thesis Submission (30 Marks)	Viva – Voce (Rounded to 50 Marks)		
			External Examiner	Internal Examiner	External Examiner	Supervisor Examiner
5	7.5	7.5	30	15	20	15

- 6.2 The Project Report prepared according to approved guidelines as given by Director, Academic Courses and duly signed by the supervisor(s) and the Head of the Department concerned shall be submitted to the Head of the Institution.

- 6.3** If the candidate fails to obtain 50% of the internal assessment marks in the Phase–I and Phase–II / final project, he/she will not be permitted to submit the report for that particular semester and has to re-enroll for the same in the subsequent semester.

If a candidate fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester. This applies to both Phase–I and Phase–II in the case of M.E. / M.Tech. Project Work and the Final Project work of M.B.A. / M.C.A.

If a candidate fails in the end semester examinations of Phase–I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the End semester examination of Phase–II of Project work of M.E. / M.Tech. or the Final Project work of M.B.A. / M.C.A, he/she shall resubmit the Project Report within 60 days from the date of declaration of the results. The resubmission of a project report and subsequent viva-voce examination will be considered as reappearance with payment of exam fee. For this purpose the same Internal and External examiners shall evaluate the resubmitted report.

- 6.3.1 A copy of the approved Project Report after the successful completion of viva-voce examinations shall be kept in the library of the college / institution.
- 6.3.2 Practical / Industrial Training, Summer Project if specified in the Curriculum shall not exceed the maximum duration of 4 weeks and should be organized by the Head of the Department for every student.
- 6.3.3 At the end of Practical / Industrial Training, Summer Project the candidate shall submit a certificate from the organization where he/she has undergone training and also a brief report. The evaluation for 100 marks will be carried out internally based on this report and a Viva-Voce Examination will be conducted by a Departmental Committee constituted by the Head of the Institution. Certificates submitted by the students shall be attached to the mark list sent by the Head of the Institution to the Controller of Examination.

## **7 CLASS ADVISER**

There shall be a class advisor for each class. The class advisor will be one among the (course-instructors) of the class. He / She will be appointed by the Head of the department concerned. The class advisor is the ex-officio member and the Convener of the class committee. The responsibilities for the class advisor shall be:

- To act as the channel of communication between the HoD and the students of the respective class.
- To collect and maintain various statistical details of students.
- To help the chairperson of the class committee in planning and conduct of the class committee meetings.
- To monitor the academic performance of the students including attendance and to inform the class committee.
- To attend to the students' welfare activities like awards, medals, scholarships and industrial visits.

## **8 CLASS COMMITTEE**

- 8.1 A Class Committee consists of teachers of the concerned class, student representatives and a chairperson who is not teaching the class. It is like the 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching-learning process. The functions of the class committee include:

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the programme and the details of rules therein.
- Informing the student representatives, the “academic schedule” including the dates of assessments and the syllabus coverage for each assessment period.
- Informing the student representatives, the details of regulations regarding the weightage used for each assessment. In the case of practical courses (laboratory / project work / seminar etc.) the breakup of marks for each experiment/ exercise/ module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of improving the Students Performance
- Identifying the weak students, if any, in any specific subject and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students as frequently as possible.

8.2 The class committee for a class under a particular programme is normally constituted by the Head of the Department. However, if the students of different programmes are mixed in a class, the class committee is to be constituted by the Head of the Institution.

8.3 The class committee shall be constituted on the first working day of any semester or earlier.

8.4 At least 2 student representatives (usually 1 boy and 1 girl) shall be included in the class committee.

8.5 The chairperson of the class committee shall invite the Class adviser(s) and the Head of the Department to the meeting of the class committee.

8.6 The Head of the Institution may participate in any class committee of the institution.

8.7 The Chairperson of the Class Committee is required to prepare the minutes of every meeting, submit the same to the Head of the Institution within two days of the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the management by the Head of the Institution.

8.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester in order to inform the students about the nature and weightage of assessments within the framework of the Regulations. Two or three subsequent meetings may be held at suitable intervals. During these meetings the student members, representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

## **9 COURSE COMMITTEE FOR COMMON COURSES**

Each common 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 Assessment Test(s).



## 10 ATTENDANCE REQUIREMENTS FOR COMPLETION OF A SEMESTER

- 10.1 A candidate who has fulfilled the following conditions shall be deemed to have satisfied the attendance requirements for completion of a semester.

Ideally every student is expected to attend all classes and earn 100% attendance. However in order to allow provision for certain unavoidable reasons such as prolonged hospitalization / accident / specific illness the student is expected to earn a minimum of 75% attendance to become eligible to write the End-Semester Examinations.

Therefore, every student shall secure not less than 75% of overall attendance in that semester as per clause 4.4.

- 10.2 However, a candidate who secures overall attendance between 65% and 74% in that current semester due to medical reasons (prolonged hospitalization / accident / specific illness / participation in sports events) may be permitted to appear for the current semester examinations subject to the condition that the candidate shall submit the medical certificate / sports participation certificate to the Head of the Institution. The same shall be forwarded to the Controller of Examinations for record purposes.
- 10.3 Candidates who could secure less than 65% overall attendance and **Candidates who do not satisfy the clauses 10.1 & 10.2** will not be permitted to write the end-semester examination of that current semester and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

## 11 PROCEDURES FOR AWARDING MARKS FOR INTERNAL ASSESSMENT(IA)

The maximum marks assigned to different courses shall be as given below:

Each of the theory and practical courses (including project work) shall carry a maximum of 100 marks of which 20 marks will be through internal assessment and the End Semester Examination (ESE) will carry 80 marks.

- 11.1 The marks for the continuous assessment shall be awarded as per the procedure given below:

### (i) Theory Courses:

Three tests each carrying 100 marks shall be conducted during the semester by the Department / College concerned. The total marks obtained in all tests put together out of 300, shall be proportionately reduced for 20 marks and rounded to the nearest integer (This also implies equal weightage to all the three tests).

### (ii) Practical Courses:

The maximum marks for Internal Assessment shall be 20 in case of practical courses. Every practical exercise / experiment shall be evaluated based on conduct of experiment / exercise and records maintained. There shall be at least one test. The criteria for arriving at the Internal Assessment marks of 20 is as follows: 75 marks shall be awarded for successful completion of all the prescribed experiments done in the Laboratory and 25 marks for the test. The total mark shall be reduced to 20 and rounded to the nearest integer.

### (iii) Theory Courses with Laboratory component:

The maximum marks for Internal Assessment shall be 20 in case of theory courses with Laboratory component. For a theory course with Laboratory component, there shall be three assessments: the first two assessments (each with a maximum of 100 marks) will be from theory portions and the third assessment (maximum marks 100) will be for laboratory component. The sum of marks of all three assessments shall be reduced to 20 marks and rounded to the nearest integer.

#### (iv) Other Employability Enhancement Courses

- (a) The seminar / Case study is to be considered as purely INTERNAL (with 100% internal marks only). Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar marks can be equally apportioned. The three member committee appointed by Head of the Institution will evaluate the seminar and at the end of the semester the marks can be consolidated and taken as the final mark. The evaluation shall be based on the seminar paper (40%), presentation (40%) and response to the questions asked during presentation (20%).
- (b) The Industrial / Practical Training shall carry 100 marks and shall be evaluated through internal assessment only. At the end of Industrial / Practical training / internship / Summer Project, the candidate shall submit a certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Institution. Certificates submitted by the candidate shall be attached to the mark list sent by the Head of the Department.

#### 11.2 Assessment for Value Added Course

The one / two credit course shall carry 100 marks and shall be evaluated through **continuous assessments only**. Two Assessments shall be conducted during the semester by the Department concerned. The total marks obtained in the tests shall be reduced to 100 marks and rounded to the nearest integer. A committee consisting of the Head of the Department, staff handling the course and a senior Faculty member nominated by the Head of the Institution shall monitor the evaluation process. The list of students along with the marks and the grades earned may be forwarded to the Controller of Examinations for appropriate action at least one month before the commencement of End Semester Examinations

#### 11.3 Assessment for Online Courses

Students may be permitted to credit one online course (which are provided with certificate) subject to a maximum of three credits. The approved list of online courses will be provided by the Centre for Academic courses from time to time. **This online course of 3 credits can be considered instead of one elective course.** The student needs to obtain certification or credit to become eligible for writing the End Semester Examination to be conducted by Anna University. **The course shall be evaluated through the End Semester Examination only conducted by Controller of Examinations, Anna University.**

11.4 Internal marks approved by the Head of the Institution shall be displayed by the respective HODs within 5 days from the last working day.

11.5 Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (topics covered), separately for each course. This should be submitted to the Head of the Department periodically (at least three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the department will put his signature and date after due verification. At the end the semester, the record should be verified by the Head of the institution who will keep this document in safe custody (for five years). The university or any inspection team appointed by the University may inspect the records of attendance and assessments of both current and previous semesters.

## **12 REQUIREMENTS FOR APPEARING FOR SEMESTER EXAMINATION**

- 12.1 A candidate shall normally be permitted to appear for the University examinations of the current semester if he/she has satisfied the semester completion requirements as per clause 10.1 & 10.2 and has registered for examination in all courses of the current semester.
- 12.2 Further, registration is mandatory for all the courses in the current semester as well as for arrear(s) course(s) for the university examinations failing which, the candidate will not be permitted to move to the higher semester.
- 12.3 A student who has passed all the courses prescribed in the curriculum for the award of the degree shall not be permitted to re-enroll to improve his/her marks in a course or the aggregate marks / CGPA.

## **13 UNIVERSITY EXAMINATIONS**

- 13.1 There shall be an End- Semester Examination of 3 hours duration in each lecture based course.

The examinations shall ordinarily be conducted between October and December during the odd semesters and between April and June in the even semesters.

For the practical examinations (including project work), both internal and external examiners shall be appointed by the University.

## **13.2 WEIGHTAGE**

The following will be the weightage for different courses.

i) Lecture or Lecture cum Tutorial based course:

Internal Assessment	-	20%
End Semester Examination	-	80%

ii) Laboratory based courses

Internal Assessment	-	20%
End Semester Examination	-	80%

iii) Project work

Internal Assessment	-	20%
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Evaluation of Project Report by external examiner	-	30%
Viva-Voce Examination	-	50%

iv) Practical training / summer project / seminar

Internal Assessment	-	100%
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## **14 PASSING REQUIREMENTS**

- 14.1 A candidate who secures not less than 50% of total marks prescribed for the course with a minimum of 50% of the marks prescribed for each of the course of the End-Semester University Examination in both theory and practical courses shall be declared to have passed in the course and acquired the relevant number of credits.

- 14.2 If a student fails to secure a pass in a theory course (except electives), **the student shall do reappearance registration** for that course in the subsequent semester, when offered next, earn continuous assessment marks and attend the end semester examination.
- 14.3 If the course, in which the student has failed, is a professional elective or an open elective, the student may be permitted to register for the same or any other professional elective or open elective course in the subsequent semesters, attend the classes and fulfill the attendance requirements as per Clause 10.
- 14.4 If a student fails to secure a pass in a laboratory course, **the student shall register** for the course again, when offered next.
- 14.5 If a student fails to secure a pass in project work, **the student shall register** for the course again, when offered next.
- 14.6 The passing requirement for the courses which are assessed only through purely internal assessment (EEC courses except project work), is 50% of the internal assessment marks only.
- 14.7 If a student has failed in the final semester examination he/ she may be allowed to register for the course in the next semester itself.
- 14.8 A student can apply for revaluation of the student's semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee along with prescribed application to the COE through the Head of the Institution. The COE will arrange for the revaluation and the results will be intimated to the student concerned through the Head of the Institution. Revaluation is not permitted for laboratory course and project work.

## 15 AWARD OF LETTER GRADES

- 15.1 All assessments of a course will be evaluated on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each subject as detailed below:

Letter Grade	Grade Points	Marks Range
O (Outstanding)	10	91 - 100
A + (Excellent)	9	81 - 90
A (Very Good)	8	71 - 80
B + (Good)	7	61 - 70
B (Average)	6	50 - 60
RA	0	<50
SA (Shortage of Attendance)	0	
W	0	

A student is deemed to have passed and acquired the corresponding credits in a particular course if he/she obtains any one of the following grades: "O", "A+", "A", "B+", "B".

'SA' denotes shortage of attendance (as per clause 10.3) and hence prevention from writing the end semester examinations. 'SA' will appear only in the result sheet.

"RA" denotes that the student has failed to pass in that course. "W" denotes **withdrawal** from the exam for the particular course. The grades RA and W will figure both in Marks Sheet as well as in Result Sheet). In both cases the student has to earn Continuous Assessment marks and appear for the End Semester Examinations.

If the grade W is given to course, the attendance requirement need not be satisfied.

If the grade RA is given to a core **theory course**, the attendance requirement need not be satisfied, but if the grade RA is given to a **Laboratory Course/ Project work / Seminar and any other EEC course**, the attendance requirements (vide clause 10) should be satisfied.

**15.2** The grades O, A+, A, B+, B obtained for the one credit course shall figure in the Mark sheet under the title '**Value Added Courses**'. The Courses for which the grades are RA, SA **will not figure in the mark sheet.**

**15.3 GRADE SHEET**

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

- The college in which the candidate has studied.
- The list of courses enrolled during the semester and the grades scored.
- The Grade Point Average (GPA) for the semester and
- The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA for a semester is the ratio of the sum of the products of the number of credits for courses acquired and the corresponding points to the sum of the number of credits for the courses acquired in the semester. CGPA will be calculated in a similar manner, considering all the courses registered from first semester. RA grades will be excluded for calculating GPA and CGPA.

$$\text{GPA / CGPA} = \frac{\sum_{i=1}^n C_i GP_i}{\sum_{i=1}^n C_i}$$

where

**C<sub>i</sub>** is the number of credits assigned to the course

**GP<sub>i</sub>** is the Grade point corresponding to the grade obtained for each Course

**n** is number of all Courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of **CGPA**.

## 16 ELIGIBILITY FOR THE AWARD OF THE DEGREE

16.1 A student shall be declared to be eligible for the award of the PG Degree (M.E./ M.Tech., M.C.A., M.B.A.) provided the student has

i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

ii. **a. M.E./ M.Tech., M.B.A.(Full Time)**

Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the subjects prescribed in all the 4 semesters within a maximum period of 4 years reckoned from the commencement of the first semester to which the candidate was admitted.

**b. M.E./ M.Tech., M.B.A.(Part Time) and M.C.A.(Full Time)**

Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the subjects prescribed in all the 6 semesters within a maximum period of 6 years reckoned from the commencement of the first semester to which the candidate was admitted.

iii. Successfully passed any additional courses prescribed by the Director, Academic Courses whenever readmitted under regulations other than R-2017 (vide clause **19.3**)

iv. No disciplinary action pending against the student.

v. The award of Degree must have been approved by the Syndicate of the University.

## 17 CLASSIFICATION OF THE DEGREE AWARDED

### 17.1 FIRST CLASS WITH DISTINCTION:

A Student who satisfies the following conditions shall be declared to have passed the examination in **First class with Distinction**:

**M.E. / M.Tech. M.B.A.(Full Time)**

- Should have passed the examination in all the courses of all the four semesters in the student's First Appearance within **three** years, which includes authorised break of study of one year (if availed). Withdrawal from examination (vide Clause 18) will not be considered as an appearance.
- Should have secured a CGPA of not less than **8.50**.
- Should NOT have been prevented from writing end Semester examination due to lack of attendance in any of the courses.

**M.E. / M.Tech. M.B.A.(Part Time) and M.C.A (Full Time)**

- Should have passed the examination in all the courses of all the six semesters in the student's First Appearance within **four** years, which includes authorised break of study of one year (if availed). Withdrawal from examination (vide Clause 18) will not be considered as an appearance.
- Should have secured a CGPA of not less than **8.50**.
- Should NOT have been prevented from writing end Semester examination due to lack of attendance in any of the courses.

## 17.2 **FIRST CLASS:**

A student who satisfies the following conditions shall be declared to have passed the examination in **First class**:

### **M.E. / M.Tech. M.B.A.(Full Time)**

- Should have passed the examination in all the courses of all four semesters **within three years** , which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of not less than **7.00**

### **M.E. / M.Tech. M.B.A. (Part Time) and M.C.A (Full Time)**

- Should have passed the examination in all the courses of all six semesters **within four years** , which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of not less than **7.00**

## 17.3 **SECOND CLASS:**

All other students (not covered in clauses 17.1 and 17.2) who qualify for the award of the degree (vide Clause 16.1) shall be declared to have passed the examination in **Second Class**.

17.4 A student who is absent in End Semester Examination in a course / project work after having registered for the same shall be considered to have appeared in that examination (except approved withdrawal from end semester examinations as per clause 18) for the purpose of classification.

## 17.5 **Photocopy / Revaluation**

A candidate can apply for photocopy of his/her semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of Institutions. The answer script is to be valued and justified by a faculty member, who handled the subject and recommend for revaluation with breakup of marks for each question. Based on the recommendation, the candidate can register for the revaluation through proper application to the Controller of Examinations. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Institutions. Revaluation is not permitted for practical courses and for project work.

A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time.

## 17.6 **Review**

Candidates not satisfied with Revaluation can apply for Review of his/ her examination answer paper in a theory course, within the prescribed date on payment of a prescribed fee through proper application to Controller of Examination through the Head of the Institution.

Candidates applying for Revaluation only are eligible to apply for Review.

## **18 PROVISION FOR WITHDRAWAL FROM EXAMINATION:**

- 18.1 A student may, for valid reasons, (medically unfit / unexpected family situations / sports approved by Chairman, sports board and HOD) be granted permission to withdraw from appearing for the end semester examination in any course or courses in **ANY ONE** of the semester examinations during the entire duration of the degree programme. The application shall be sent to Director, Student Affairs through the Head of the Institutions with required documents.
- 18.2 Withdrawal application is valid if the student is otherwise eligible to write the examination (Clause 10) and if it is made within TEN days prior to the commencement of the examination in that course or courses and recommended by the Head of the Institution and approved by the Controller of Examinations.
- 18.2.1 Notwithstanding the requirement of mandatory 10 days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.
- 18.3 In case of withdrawal from a course / courses (Clause 12) the course will figure both in Marks Sheet as well as in Result Sheet. **Withdrawal essentially requires the student to register for the course/courses** The student has to register for the course, fulfill the attendance requirements (vide clause 10), earn continuous assessment marks and attend the end semester examination. However, withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.
- 18.4 Withdrawal is permitted for the end semester examinations in the final semester only if the period of study the student concerned does not exceed 3 years as per clause 17.1.

## **19 AUTHORIZED BREAK OF STUDY FROM A PROGRAMME**

- 19.1 A student is permitted to go on break of study for a maximum period of one year as a single spell.
- 19.2 Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Director, Student Affairs in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Institution stating the reasons therefore and the probable date of rejoining the programme.
- 19.3 The candidates permitted to rejoin the programme after break of study / prevention due to lack of attendance, shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new Regulations shall apply to the Director, Academic Courses in the prescribed format through Head of the Institution at the beginning of the readmitted semester itself for prescribing additional courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.
- 19.4 The authorized break of study would not be counted towards the duration specified for passing all the courses for the purpose of classification (vide Clause 17.1).
- 19.5 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 4.1 irrespective of the period of break of study in order that he/she may be eligible for the award of the degree.



19.6 If any student is prevented for want of required attendance, the period of prevention shall not be considered as authorized 'Break of Study' (Clause 19.1)

## **20 DISCIPLINE**

21.1 Every student is required to observe disciplined and decorous behavior both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the University / College. The Head of Institution shall constitute a disciplinary committee consisting of Head of Institution, Two Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline and notify the University about the disciplinary action recommended for approval. In case of any serious disciplinary action which leads to suspension or dismissal, then a committee shall be constituted including one representative from Anna University, Chennai. In this regard, the member will be nominated by the University on getting information from the Head of the Institution.

21.2 If a student indulges in malpractice in any of the University / internal examination he / she shall be liable for punitive action as prescribed by the University from time to time.

## **22 REVISION OF REGULATIONS, CURRICULUM AND SYLLABI**

The University may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and scheme of examinations through the Academic Council with the approval of Syndicate.

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**ANNA UNIVERSITY  
AFFILIATED INSTITUTIONS  
REGULATIONS – 2017  
CURRICULUM AND SYLLABUS I TO VI SEMESTERS (FULL TIME)  
MASTER OF COMPUTER APPLICATIONS  
CHOICE BASED CREDIT SYSTEM**

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :**

- I. To prepare students to excel in the computing profession by providing solid technical foundations in the field of computer applications.
- II. To provide students various computing skills like the analysis, design and development of innovative software products to meet the industry needs.
- III. To motivate students to pursue lifelong learning and to do research as computing professionals and scientists.
- IV. To motivate students to communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context.

**PROGRAM OUTCOMES (POS):**

On successful completion of the program:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual and as a member or leader in

diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAM SPECIFIC OBJECTIVES (PSOs):**

1. Enable the students to select the suitable data model, appropriate architecture and platform to implement a system with good performance.
2. Enable the students to design and integrate various system based components to provide user interactive solutions for various challenges.

**MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OBJECTIVES:**

Programme Educational Objectives	Programme Outcomes												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	1	1								3	3
2		2	3	2	1						2		3	2
3		2		3	2	1			2	2	2	3	1	1
4						3	3	2	2	3	1		2	2

			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
YEAR 1	SEM 1	Mathematical Foundations of Computer Science	3	2									1		
		Computer Organization`	3	2		1									
		Problem Solving and Programming	3	3	2	2					1				
		Database Management Systems	3	2	2	2			1	1				1	
		Data Structures	3	2											
		Data Structures Laboratory		3	2	1									
		Database Management Systems Laboratory		3	2	1			1					1	
		Communication Skills Laboratory							2	2	1	2	3		2
	SEM 2	Object Oriented Programming	3	3	2	1									
		Embedded Systems		2	2	1	2	1			1			1	1
		Software Engineering	3	3	2	2	2	1	1	1	2	2	2	2	
		Operating Systems	3	2	2				1						
		Computer Graphics and Multimedia	3	2	1		2							1	2
		Object Oriented Programming Laboratory		3	2	2	2					1		2	
Graphics and Multimedia Laboratory		3	2	2		2							1	1	
Operating Systems and Embedded Systems Laboratory			3	2	1	2	2				2		2	1	

YEAR 2	SEM 3	Advanced Data Structures and Algorithms	3	2	2	1						2		
		Computer Networks	3	2	2	2		1				2		
		Web Programming Essentials	3	2	2	2	2			1	2		2	
		Programming with Java	3	2	2	2	2				2		2	1
		Object Oriented Analysis and Design		3	2	2	3						2	
		Data Structures and Algorithms Laboratory		3	2	2	2						2	
		Web Programming Laboratory		3	2	2	2			1	2		2	
		Programming with Java Laboratory		3	2	2	2				2		2	
	SEM 4	Resource Management Techniques	3	2	2		2							
		Mobile Computing		3	2		3	1		1	1		2	2
		Advanced Databases and Data mining Techniques		3	2	2	3	1			2		2	1
		Web Application Development	3	3	2	2	2				2		2	2
		Professional Elective - I												
		Mobile Application Development Laboratory		3	2	2	2	2		1	2		2	2
Web Application Development Laboratory			3	2	2	2				2		2	2	
Technical Seminar and Report Writing								2	1	2	2	3	2	

YEAR 3	SEM V	Cloud Computing		3	2		2				2		2	1
		Big Data Analytics		3	2	2	2	1			2		2	1
		Software Testing and Quality Assurance	3	2	2	2	2			1	2			
		Professional Elective II												
		Professional Elective III												
		Cloud and Big Data laboratory		3	2	2	2	1			2		2	1
		Software Testing Laboratory		3	2	2	2	1		1	2			
		Mini Project						3		2	1	2	2	2
	SEM VI	Project Work	3	3	2	2	3	2	1	1	2	2	2	2

**ANNA UNIVERSITY, CHENNAI**  
**AFFILIATED INSTITUTIONS**  
**MASTER OF COMPUTER APPLICATIONS**  
**REGULATIONS – 2017**  
**CHOICE BASED CREDIT SYSTEM**  
**CURRICULA AND SYLLABI**

**SEMESTER I**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	MA5161	Mathematical Foundations for Computer Applications	FC	4	4	0	0	4
2.	MC5101	Computer Organization	PC	3	3	0	0	3
3.	MC5102	Problem Solving and Programming	PC	3	3	0	0	3
4.	MC5103	Database Management Systems	PC	3	3	0	0	3
5.	MC5104	Data Structures	PC	3	3	0	0	3
<b>PRACTICALS</b>								
6.	MC5111	Data Structures Laboratory	PC	4	0	0	4	2
7.	MC5112	Database Management Systems Laboratory	PC	4	0	0	4	2
8.	MC5113	Communication Skills Laboratory	EEC	3	1	0	2	2
<b>TOTAL</b>				<b>27</b>	<b>17</b>	<b>0</b>	<b>10</b>	<b>22</b>

**SEMESTER II**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	MC5201	Object Oriented Programming	PC	3	3	0	0	3
2.	MC5202	Embedded Systems	PC	3	3	0	0	3
3.	MC5203	Software Engineering	PC	3	3	0	0	3
4.	MC5204	Operating Systems	PC	3	3	0	0	3
5.	MC5205	Computer Graphics and Multimedia	PC	3	3	0	0	3
<b>PRACTICALS</b>								
6.	MC5211	Object Oriented Programming Laboratory	PC	4	0	0	4	2
7.	MC5212	Graphics and Multimedia Laboratory	PC	4	0	0	4	2
8.	MC5213	Operating Systems and Embedded Systems Laboratory	PC	4	0	0	4	2
<b>TOTAL</b>				<b>27</b>	<b>15</b>	<b>0</b>	<b>12</b>	<b>21</b>

### SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	MC5301	Advanced Data Structures and Algorithms	PC	3	3	0	0	3
2.	MC5302	Computer Networks	PC	3	3	0	0	3
3.	MC5303	Web Programming Essentials	PC	3	3	0	0	3
4.	MC5304	Programming with Java	PC	3	3	0	0	3
5.	MC5305	Object Oriented Analysis and Design	PC	5	3	2	0	4
<b>PRACTICALS</b>								
6.	MC5311	Data Structures and Algorithms Laboratory	PC	4	0	0	4	2
7.	MC5312	Web Programming Laboratory	PC	4	0	0	4	2
8.	MC5313	Programming with Java Laboratory	PC	4	0	0	4	2
<b>TOTAL</b>				<b>29</b>	<b>15</b>	<b>2</b>	<b>12</b>	<b>22</b>

### SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	MC5401	Resource Management Techniques	PC	3	3	0	0	3
2.	MC5402	Mobile Computing	PC	3	3	0	0	3
3.	MC5403	Advanced Databases and Datamining	PC	3	3	0	0	3
4.	MC5404	Web Application Development	PC	5	3	2	0	4
5.		Professional Elective - I	PE	3	3	0	0	3
<b>PRACTICALS</b>								
6.	MP5411	Mobile Application Development Laboratory	PC	4	0	0	4	2
7.	MC5412	Web Application Development Laboratory	PC	4	0	0	4	2
8.	MC5413	Technical Seminar and Report Writing	PC	2	0	0	2	1
<b>TOTAL</b>				<b>27</b>	<b>15</b>	<b>2</b>	<b>10</b>	<b>21</b>



**SEMESTER V**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	MC5501	Cloud Computing	PC	3	3	0	0	3
2.	MC5502	Big Data Analytics	PC	3	3	0	0	3
3.	MC5503	Software Testing and Quality Assurance	PC	3	3	0	0	3
4.		Professional Elective II	PE	3	3	0	0	3
5.		Professional Elective III	PE	3	3	0	0	3
<b>PRACTICALS</b>								
6.	MC5511	Cloud and Big Data Laboratory	PC	4	0	0	4	2
7.	MC5512	Software Testing Laboratory	PC	4	0	0	4	2
8.	MC5513	Mini Project	EEC	4	0	0	4	2
<b>TOTAL</b>				<b>27</b>	<b>15</b>	<b>0</b>	<b>12</b>	<b>21</b>

**SEMESTER VI**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>PRACTICALS</b>								
1.	MC5611	Project Work	EEC	24	0	0	24	12
<b>TOTAL</b>				<b>24</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**TOTAL NO. OF CREDITS:119**

**FOUNDATION COURSES (FC)**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA5161	Mathematical Foundations for Computer Applications	FC	4	4	0	0	4

**PROFESSIONAL CORE (PC)**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MC5101	Computer Organization	PC	3	3	0	0	3
2.	MC5102	Problem Solving and Programming	PC	3	3	0	0	3
3.	MC5103	Database Management Systems	PC	3	3	0	0	3
4.	MC5104	Data Structures	PC	3	3	0	0	3
5.	MC5111	Data Structures Laboratory	PC	4	0	0	4	2
6.	MC5112	Database Management Systems Laboratory	PC	4	0	0	4	2
7.	MC5201	Object Oriented Programming	PC	3	3	0	0	3
8.	MC5202	Embedded Systems	PC	3	3	0	0	3
9.	MC5203	Software Engineering	PC	3	3	0	0	3
10.	MC5204	Operating Systems	PC	3	3	0	0	3
11.	MC5205	Computer Graphics and Multimedia	PC	3	3	0	0	3
12.	MC5211	Object Oriented Programming Laboratory	PC	4	0	0	4	2
13.	MC5212	Graphics and Multimedia Laboratory	PC	4	0	0	4	2
14.	MC5213	Operating Systems and Embedded Systems Laboratory	PC	4	0	0	4	2
15.	MC5301	Advanced Data Structures and Algorithms	PC	3	3	0	0	3
16.	MC5302	Computer Networks	PC	3	3	0	0	3
17.	MC5303	Web Programming Essentials	PC	3	3	0	0	3
18.	MC5304	Programming with Java	PC	3	3	0	0	3
19.	MC5305	Object Oriented Analysis and Design	PC	5	3	2	0	4
20.	MC5311	Data Structures and Algorithms Laboratory	PC	4	0	0	4	2
21.	MC5312	Web Programming Laboratory	PC	4	0	0	4	2

22.	MC5313	Programming with Java Laboratory	PC	4	0	0	4	2
23.	MC5401	Resource Management Techniques	PC	3	3	0	0	3
24.	MC5402	Mobile Computing	PC	3	3	0	0	3
25.	MC5403	Advanced Databases and Datamining	PC	3	3	0	0	3
26.	MC5404	Web Application Development	PC	5	3	2	0	4
27.	MC5411	Mobile Application Development Laboratory	PC	4	0	0	4	2
28.	MC5412	Web Application Development Laboratory	PC	4	0	0	4	2
29.	MC5501	Cloud Computing	PC	3	3	0	0	3
30.	MC5502	Big Data Analytics	PC	3	3	0	0	3
31.	MC5503	Software Testing and Quality Assurance	PC	3	3	0	0	3
32.	MC5511	Cloud and Big Data Laboratory	PC	4	0	0	4	2
33.	MC5512	Software Testing Laboratory	PC	4	0	0	4	2

#### EMPLOYABILITY ENHANCEMENT COURSE (EEC)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MC5413	Technical Seminar and Report Writing	EEC	2	0	0	2	1
2.	MC5113	Communication Skills Laboratory	EEC	3	1	0	2	2
3.	MC5513	Mini Project	EEC	4	0	0	4	2
4.	MC5611	Project Work	EEC	24	0	0	24	12

**PROFESSIONAL ELECTIVES (PE)\*  
SEMESTER IV  
ELECTIVE I**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MC5001	Soft Computing	PE	3	3	0	0	3
2.	MC5002	Accounting and Financial Management	PE	3	3	0	0	3
3.	MC5003	Software Project Management	PE	3	3	0	0	3
4.	MC5004	Security in computing	PE	3	3	0	0	3
5.	MC5005	Adhoc and Sensor Network	PE	3	3	0	0	3

**SEMESTER V  
ELECTIVE II**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MC5006	Professional Ethics	PE	3	3	0	0	3
2.	MC5007	Health Care Management	PE	3	3	0	0	3
3.	MC5008	Geological Information Systems	PE	3	3	0	0	3
4.	MC5009	Human Resource Management	PE	3	3	0	0	3
5.	MC5010	Internet of Things	PE	3	3	0	0	3

**SEMESTER V  
ELECTIVE III**

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MC5011	Semantic Web	PE	3	3	0	0	3
2.	MC5012	Service Oriented Architecture	PE	3	3	0	0	3
3.	MC5013	Game Programming	PE	3	3	0	0	3
4.	MC5014	Computational Intelligence	PE	3	3	0	0	3
5.	MC5015	Principles of Programming Languages	PE	3	3	0	0	3



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1. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.
2. Grimaldi, R.P and Ramana, B.V. "Discrete and Combinatorial Mathematics", 5<sup>th</sup> Edition, Pearson Education, 2006.
3. Hopcroft J.E and Ullman, J.D, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002.
4. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 4<sup>th</sup> Edition, 2002.
5. Sengadir, T. "Discrete Mathematics and Combinatorics" Pearson Education, New Delhi, 2009.
6. Trembley, J.P. and Manohar, R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, New Delhi, 2007.
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MC5101

COMPUTER ORGANISATION

L T P C  
3 0 0 3

### OBJECTIVES:

- To understand the various number systems
- To become familiar with Boolean algebra
- To study the different types of combinational and sequential circuits
- To comprehend the basis operations that happen in a CPU
- To learn the data path and control path implementation
- To become familiar with the memory hierarchy design and I/O design

### UNIT I DIGITAL FUNDAMENTALS

8

Number Systems and Conversions – Boolean Algebra and Simplifications – Minimization of Boolean Functions – Karnaugh Map, Quine McClusky Method. Logic Gates – NAND NOR implementation.

### UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS

10

Design of Circuits – Adder /Subtractor – Encoder – Decoder – MUX /DEMUX – Comparators, Flip flops – Triggering – Master – Slave Flip Flop – State Diagram and Minimization – Counters - Registers

### UNIT III BASIC STRUCTURE OF COMPUTER

9

Functional Units - Basic Operational Concepts – Bus structures – Performance and Metrics – instruction and instruction sequencing – Hardware Software Interface – Addressing modes – Instruction Sets – RISC and CISC – ALU Design – Fixed point and Floating point operations

### UNIT IV PROCESSOR DESIGN

9

Processor basics – CPU Organization – Data Path Design – Control Design – Basic concepts – Hardwired control – Micro Programmed control – Pipe control – Hazards super scale operations

### UNIT V MEMORY AND I/O SYSTEMS

9

Memory technology – Memory Systems- Virtual Memory – Caches – Design Methods – Associative memories – Input /output system – Programmed I/O – DMA and interrupts – I/O devices and Interfaces

**TOTAL : 45 PERIODS**

**OUTCOMES:****At the end of this course, the students will be able to:**

- Perform conversions and arithmetic operations in various number systems
- Simplify using laws of Boolean algebra and Karnaugh map method
- Design various combinational and sequential circuits
- Differentiate between various addressing modes
- Trace the flow of execution of an instruction in a processor
- Differentiate between the various mapping policies used in cache memories
- Discuss the implementation of virtual memory
- Discuss the various types of I/O transfers

**REFERENCES:**

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
2. Carl Hamacher, Zvonko vranesic and Safwat Zaky, fifth edition, "Computer Organisation" Tata Mc Graw Hill, 2002.
3. Charles H. Roth, Jr., "Fundamentals of Logic Design", Jaico Publishing House, Mumbai, Fourth Edition 1992.
4. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Second Edition, Morgan Kaufmann , 2002. Morris Mano "Digital Design", Printice Hall of India 1997
5. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998
6. William Stallings, "Computer Organization & Architecture – Designing for Performance" 6<sup>th</sup> Edition Pearson Education, 2003.

**MC5102****PROBLEM SOLVING AND PROGRAMMING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the basic concepts of problem solving approaches and to develop the algorithms.
- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- To design, implements, test, and apply the basic C programming concepts.

**UNIT I INTRODUCTION TO COMPUTER PROBLEM SOLVING 8**

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms – Fundamental Algorithms.

**UNIT II PROGRAMMING AND ALGORITHMS 9**

Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts - Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept.

**UNIT III      BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS      9**

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators - Initialization –Expressions – Expression Evaluation – Lvalues and Rvalues – Type Conversion in C –Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go to Statement – Nested Loops- Continue and break statements.

**UNIT IV      ARRAYS, STRINGS, FUNCTIONS AND POINTERS      10**

Array – One dimensional Character Arrays- Multidimensional Arrays- Arrays of Strings – Two dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection- pointers to functions - Dynamic memory allocation.

**UNIT V      USER-DEFINED DATATYPES & FILES      9**

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

**TOTAL:    45    PERIODS**

**OUTCOMES:**

- Able to design a computational solution for a given problem.
- Able to break a problem into logical modules that can be solved (programmed).
- Able to transform a problem solution into programs involving programming constructs.
- To write programs using structures, strings, arrays, pointer and files for solving complex computational problem.
- Able to introduce modularity using functions and pointers which permit ad hoc run-time polymorphism.

**REFERENCES:**

1. Byron S Gottfried, —Programming with C++, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Brian W. Kernighan and Dennis M. Ritchie, “The C programming Language”, 2006, Prentice-Hall.
3. Cormen, Leiserson, Rivest, Stein, “ Introduction to Algorithms”, McGraw Hill, Publishers, 2002.
4. Deitel and Deitel, “C How to Program”, Pearson Education. 2013, 7th Edition.
5. How to Solve it by Computer, R.G. Dromey, Pearson education , Fifth Edition, 2007.
6. Kamthane, A.N., “Programming with ANSI and Turbo C”, Pearson Education, Delhi, 2006.
7. Mastering C- by K R Venugopal , Sudeep R Prasad McGraw Hill Education (India) Private Limited; Second edition 2015.
8. Pradip Dey, Manas Ghosh, —Computer Fundamentals and Programming in C, Second Edition, Oxford University Press, 2013.
9. Peter Norton, “Introduction to Computers”, Sixth Edition, Tata McGraw Hill Publications, 2007.
10. Reema Thareja, “Programming in C”, Oxford University Press, 2011.
11. Yashavant Kanetkar, “Understanding Pointers In C”, 4th Revised & Updated Edition, 2011, BPB Publications.



**OBJECTIVES:**

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

**UNIT I INTRODUCTION 9**

File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model – Enhanced E-R Modeling.

**UNIT II RELATIONAL MODEL AND QUERY EVALUATION 9**

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints – Relational Calculus – Tuple Relational Calculus – Domain Relational Calculus – Functional Dependencies – Normal Forms – 1NF – 2NF-3NF-BCNF – 4NF-5NF.

**UNIT III TRANSACTION PROCESSING 9**

Transaction Processing – Properties of Transactions - Serializability – Transaction support in SQL - Locking Techniques – Time Stamp ordering – Validation Techniques – Granularity of Data Items – Recovery concepts – Shadow paging – Log Based Recovery.

**UNIT IV FILES AND INDEXING 9**

File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing - Indexes on Multiple Keys.

**UNIT V SPECIAL PURPOSE DATABASES 9**

OODBMS- - Object-Based Databases - OO Data Model - OO Languages – Persistence – Object Relational Databases - XML – Structure of XML — Cloud based systems – NOSQL introduction - NOSQL key features – Hbase data model – Hbase data operations - Database Tuning -Case Study for Design and Manage the Database for any Project.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- Understand the basic concepts of the database and data models.
- design a database using ER diagrams and map ER into Relations and normalize the relations
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.
- Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

**REFERENCES:**

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan “Database System Concepts”, Sixth Edition, McGraw Hill, 2010.
2. C.J. Date, “An Introduction to Database Systems”, Eight Edition, Pearson Education Delhi, 2003.
3. Frank. P. Coyle, “XML, Web Services And The Data Revolution”, Pearson Education, 2012.
4. Lee Chao, “Database Development and Management”, Auerbach Publications, 2010
5. Peter Rob, Carlos coronel , “Database System Concepts” , Ceange Learning 2008
6. Peter Rob, Carlos Coronel, “Database System Concepts”, Cengage Learning, 2008.
7. Ramez Elamassri and Shankant B-Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education Delhi, 2010.
8. Raghu Ramakrishnan, —Database Management Systemsll, Fourth Edition, McGraw-Hill College Publications, 2015.

**L T P C****MC5104****3 0 0 3****DATA STRUCTURES****OBJECTIVES:**

- Be familiar with basic techniques of algorithm analysis.
- Be exposed to the concept of ADTs.
- Learn linear data structures-List, Stack and Queue.
- Learn nonlinear data structures-Tree and Graphs.
- Be exposed to sorting, searching and hashing algorithms

**UNIT I INTRODUCTION 9**

Introduction - Abstract Data Types (ADT) – Arrays and its representation –Structures – Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm – analysis frame work – Asymptotic notations, Properties, Recurrence Relation.

**UNIT II LINEAR DATA STRUCTURES – LIST 9**

List ADT - Array-based Implementation - Linked list implementation - Singly Linked Lists – Circularly linked lists – Doubly Linked Lists - Applications of linked list – Polynomial Addition.

**UNIT III LINEAR DATA STRUCTURES - STACK, QUEUE 9**

Stack ADT – Operations on Stack - Applications of stack – Infix to postfix conversion – evaluation of expression - Queue ADT – Operations on Queue - Circular Queue - Applications of Queue.

**UNIT IV NON LINEAR DATA STRUCTURES - TREES AND GRAPHS 9**

Trees and its representation – left child right sibling data structures for general trees- Binary Tree – Binary tree traversals -- Binary Search Tree - Graphs and its representation - Graph Traversals - Depth-first traversal – breadth-first traversal-Application of graphs.

**UNIT V SORTING, SEARCHING AND HASH TECHNIQUES 9**

Sorting algorithms: Insertion sort - Bubble sort - Quick sort - Merge sort - Searching: Linear search –Binary Search - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- Able to analyze algorithms and determines their time complexity.
- Able to understand the concepts of data types, data structures and linear structures.
- Able to apply data structures to solve various problems
- Able to understand non-linear data structures. Able to apply different Sorting, Searching and Hashing algorithms.

**REFERENCES:**

1. A.K. Sharma, "Data Structures using C", Pearson Education Asia, 2013.
2. Anany Levitin "Introduction to the Design and Analysis of Algorithms" Pearson Education 2012.
3. E. Horowitz, Anderson-Freed and S.Sahni, "Fundamentals of Data structures in C", University Press, 2007
4. E.Balagursamy," Data Structures using C", Tata McGraw Hill 2015 Reprint.
5. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2013.
6. Reema Thareja, "Data Structures Using C", Oxford University Press, 2011.
7. Robert.L.Kruce "Data Structures and Program Design in C", Pearson Education 2007.
8. Tanaenbaum A.S, Langram Y. Augestein M.J, " Data Structures using C", Pearson Education, 2004.

**MC5111****DATA STRUCTURES LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To develop skills in design and implementation of data structures and their applications
- To learn and implement linear, non linear and tree data structures
- To study, implement and analyze the sorting technique.

**LIST OF EXPERIMENTS**

1. Array- Insertion and Deletion
2. Application using array of structures
3. Array Implementation of Stack
4. Array Implementation of Queue
5. Infix to postfix conversion
6. Singly Linked List operations
7. Polynomial manipulation- addition, subtraction
8. Binary Tree Traversal
9. Quick Sort
10. Binary Search

**TOTAL: 60 PERIODS****OUTCOMES:****Upon Completion of the course, the students will be able to:**

- Work with basic data structures that are suitable for the problems to be solved efficiently.
- Design and implement linear, and tree and its applications.
- Design sorting technique, its algorithm design and analysis.

<b>MC5112</b>	<b>DATABASE MANAGEMENT SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To understand the concepts of DBMS.
- To familiarize with SQL queries.
- To write stored procedures in DBMS.
- To learn front end tools to integrate with databases.

**LIST OF EXPERIMENTS:**

1. Creation of base tables and views
2. Data Manipulation INSERT, DELETE and UPDATE in Tables. SELECT, Sub Queries and
3. Data Control Commands
4. High level language extensions – PL/SQL Or Transact SQL – Packages
5. Use of Cursors, Procedures and Functions
6. Embedded SQL or Database Connectivity
7. Oracle or SQL Server Triggers – Block Level – Form Level Triggers
8. Working with Forms, Menus and ReportWriters for a application project in any domain
9. Front-end tools – Visual Basic/Developer 2000

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Design and Implement databases
- Formulate complex queries using SQL
- Design and Implement applications that have GUI and access databases for backend connectivity

<b>MC5113</b>	<b>COMMUNICATION SKILL LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

**OBJECTIVES:**

- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

**LIST OF EXPERIMENTS:**

1. **PC based session (Weightage 40%)**  
**A. English Language Lab (15)**
  1. **Listening Comprehension:**(5) Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.
  2. **Reading Comprehension:**(5) Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. **Speaking:**(5) Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English. Conversations: Face to Face Conversation – Telephone conversation– Role play activities
2. **B. Discussion of audio-visual materials (Samples to learn and practice) (6)**
  1. **Resume / Report Preparation / Letter Writing (1)**  
Structuring the resume / report - Letter writing / Email Communication - Samples.
  2. **Presentation skills: (1)**  
Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples
  3. **Soft Skills: (2)**  
Time management – Articulation – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples
  4. **Group Discussion: (1)**  
Why is GD part of selection process? - Structure of GD – Moderator – led and other GDs Strategies in GD – Team work - Body Language - Mock GD –Video samples
  5. **Interview Skills: (1)**  
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.
3. **II. Practice Session (Weightage – 60%)**
- Resume / Report Preparation / Letter writing: (2)**
4. **SOFT SKILLS (6)**  
Hard skills & soft skills – soft skills: self-management skills & people skills - training in soft skills persuasive skills – sociability skills –interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills
5. **PRESENTATION SKILLS (6)**  
Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentation
6. **GROUP DISCUSSION SKILLS (5)**  
Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying –GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD.
7. **INTERVIEW SKILLS (5)**  
Interview etiquette – dress code – body language – mock interview --attending job interviews – answering questions confidently – technical interview – telephone/Skype interview - practice in different types of questions – one to one interview &panel interview – FAQs related to job interview- Emotional and cultural intelligence

**TOTAL: 45 PERIODS**

## OUTCOMES:

Upon Completion of the course, the students will be able to:

- Students will be able to make presentations and participate in group discussions with high level of self-confidence.
- Students will be able to perform well in the interviews
- They will have adequate reading and writing skills needed for workplace situations

<b>MC5201</b>	<b>OBJECT ORIENTED PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## OBJECTIVES:

- To learn how C++ supports Object Oriented principles such as abstraction, polymorphism etc
- To understand and apply the principles hiding, localization and modularity in software development.
- Use the generic programming features of C++ including the STL.
- Design and implement reliable and maintainable object-oriented applications of moderate complexity composed of several classes.

### **UNIT I      FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING      9**

Object–Oriented Programming concepts – Encapsulation – Programming Elements – Program Structure – Enumeration Types — Functions and Pointers – Function Invocation – Overloading Functions – Scope and Storage Class – Pointer Types – Arrays and Pointers – Call–by–Reference – Assertions.

### **UNIT II      IMPLEMENTING ADTS AND ENCAPSULATION      9**

Aggregate Type struct – Structure Pointer Operators – Unions – Bit Fields – Data Handling and Member Functions – Classes – Constructors and Destructors – Static Member – this Pointer – reference semantics – implementation of simple ADTs.

### **UNIT III      POLYMORPHISM      9**

ADT Conversions – Overloading – Overloading Operators – Unary Operator Overloading – Binary Operator Overloading – Function Selection – Pointer Operators – Visitation – Iterators – containers – Sequence Containers - List – List Iterators – Associative Containers

### **UNIT IV      TEMPLATES AND FILE HANDLING      9**

Template Class – Function Templates – RTTI Templates - Class Templates – Parameterizing – STL– Algorithms – Function Adaptors – Streams and Formatted I/O – I/O Manipulations -File handling – Random Access.

### **UNIT V      INHERITANCE      9**

Derived Class – Typing Conversions and Visibility – Code Reuse – Virtual Functions – Templates and Inheritance – Run–Time Type Identifications – Exceptions – Handlers – Standard Exceptions.

**TOTAL :    45    PERIODS**

**OUTCOMES:**

- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to use proper class protection mechanism to provide security.
- Able to demonstrate the use of virtual functions to implement polymorphism.
- Understand and implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems
- Able to reuse the code with extensible Class types, User-defined operators and function Overloading.

**REFERENCES:**

1. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
2. Bhavne , " Object Oriented Programming With C++", Pearson Education , 2004
3. E Balagurusamy, "Object oriented Programming with C++", 3 Edition, 2006, Tata McGraw Hill
4. HM Deitel and PJ Deitel "C++ How to Program", Seventh Edition, 2010, Prentice Hall
5. Ira Pohl, "Object–Oriented Programming Using C++", Pearson Education, 2 Edition, 2003
6. Kamthane," Object Oriented Programming with ANSI and Turbo C++", Pearson Education, 2003
7. Ray Lischner, "Exploring C++ : The programmer's introduction to C++" , apress, 2010
8. Stanley B.Lippman, JoseeLajoie, "C++ Primer", Pearson Education, Third Edition, 2005
9. S.B Lippman, Josee, JoseeLajoie, Barbara, " C++ Premier" 4 Edition, Pearson , 2012

**MC5202****EMBEDDED SYSTEMS****L T P C  
3 0 0 3****OBJECTIVES:**

- To understand the architecture of embedded processors, microcontrollers, and peripheral devices.
- To appreciate the nuances of programming micro-controllers in assembly for embedded systems.
- To understand the challenges in developing operating systems for embedded systems.
- To learn about programming these systems in high-level languages such as C.

**UNIT I          EMBEDDED COMPUTING****9**

Challenges of Embedded Systems – Embedded system design process. Embedded processors – 8051 Microcontroller, ARM processor – Architecture, Instruction sets and programming.

**UNIT II          MEMORY AND INPUT / OUTPUT MANAGEMENT****9**

Programming Input and Output – Memory system mechanisms – Memory and I/O devices and interfacing – Interrupt handling.

**UNIT III          PROCESSES AND OPERATING SYSTEMS****9**

Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Performance issues.

**UNIT IV        EMBEDDED C PROGRAMMING**

**9**

Programming embedded systems in C – C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

**UNIT V        EMBEDDED SYSTEM DEVELOPMENT**

**9**

Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Introduction to Internet of Things - Design issues – Design methodologies – Case studies using IoT– Complete design of example systems.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Andrew N Sloss, D. Symes, C. Wright, “ARM System Developers Guide”, Morgan Kauffman/ Elsevier,2006. (unit 4)
2. Arshdeep Bahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, Universities Press, 2015
3. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. Mc Kinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2007 (unit 1)
4. Michael J. Pont, “Embedded C”, Pearson Education , 2007.
6. Steve Heath, “Embedded System Design”, Elsevier, 2005.
7. Wayne Wolf, “Computers as Components:Principles of Embedded Computer System Design”, Elsevier, 2006.

**MC5203**

**SOFTWARE ENGINEERING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To provide an insight into software life cycle and various software process models
- To estimate the resources for developing the application and to prepare the schedule
- To know the various designing concepts and notations for modeling the software.
- To prepare the test cases for the project, apply various testing techniques, strategies and metrics to evaluate the software.
- To construct software with high quality and reliability.

**UNIT I        INTRODUCTION**

**9**

Software Engineering Paradigms – Waterfall Life Cycle Model – Spiral Model – Prototype Model – Agile Process Model – Unified Process Model - Planning – Software Project Scheduling – SRS - Case Study: Project Plan and SRS

**UNIT II        SOFTWARE DESIGN**

**9**

Designing Concepts - Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Dataflow Oriented Design - Jackson System Development - Real time and Distributed System Design – Designing for Reuse — Case Study : Design for any Application Oriented Project.

**UNIT III        SOFTWARE TESTING AND MAINTENANCE**

**9**

Software Testing Fundamentals – Software Testing Strategies – Black Box Testing – White Box Testing – System Testing – Object Orientation Testing – State Based Testing - Testing Tools – Test Case Management – Types of Maintenance – Case Study: Testing Techniques.



**UNIT IV SOFTWARE METRICS 9**

Scope – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Cost Estimation - Reliability – Software Quality Assurance – Standards – Case Study for COCOMO model.

**UNIT V SCM & WEB ENGINEERING 9**

Need for SCM – Version Control – SCM process – Software Configuration Items – Taxonomy – Re Engineering – Reverse Engineering - Web Engineering - CASE Repository – Features.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Able to understand the problem domain to choose process models and to develop SRS
- Able to model software projects using appropriate design notations
- Able to measure the product and process performance using various metrics
- Able to evaluate the system with various testing techniques and strategies
- Able to analyze, design, verify, validate, implement, and maintain software systems.

**REFERENCES:**

1. Ali Behforroz, Frederick J.Hudson, “Software Engineering Fundamentals”, Oxford Indian Reprint,2012.
2. Jibitesh Mishra, Ashok Mohanty, “Software Engineering”, Pearson Education, First Edition, 2011.
3. Kassem A. Saleh, “Software Engineering”, First Edition, J.Ross Publishing, 2009.
4. Pankaj Jalote, “An Integrated approach to Software Engineering”, Third Edition, Narosa Publications, 2011.
5. Roger S. Pressman, David Lowe, “Web Engineering: A Practitioner’s Approach”, Special Indian edition, McGrawHill, 2008.
6. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill Edition, 2008
7. Roger S. Pressman, “Software Engineering: A Practitioner Approach”, Seventh Edition, Tata McGraw – Hill International Edition, 2009.
8. Sommerville, “Software Engineering”, Tenth Edition, Pearson, 2015.

<b>MC5204</b>	<b>OPERATING SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To be aware of the evolution and fundamental principles of operating system, processes and their communication
- To understand the various operating system components like process management, memory management and
- To know about file management and the distributed file system concepts in operating systems
- To be aware of components of operating system with relevant case study.

**UNIT I INTRODUCTION 9**

Introduction -Types of operating systems-operating systems structures-Systems components- operating systems services-System calls-Systems programs-Processes-process concept- process scheduling-operation on processes-co-operating processes-Inter process communications-CPU Scheduling-Scheduling criteria-Scheduling algorithms-Multiple-processor Scheduling.

<b>UNIT II</b>	<b>PROCESS SYNCHRONIZATION</b>	<b>9</b>
Process Synchronization –Critical Section problem – Semaphores-Classical problems of synchronization-critical regions-Monitors-Deadlock Characterization-Deadlock handling-Deadlock Prevention-Deadlock avoidance-Deadlock Detection-Deadlock Recovery – Threads-Multithreading Models.		
<b>UNIT III</b>	<b>MEMORY MANAGEMENT</b>	<b>9</b>
Memory Management-Swapping-Contiguous Memory allocation-Paging-Segmentation-Virtual Memory-Demand paging-Page Replacement-Thrashing.		
<b>UNIT IV</b>	<b>DISK SCHEDULING AND DISTRIBUTED SYSTEMS</b>	<b>9</b>
Disk Structures-Disk Scheduling-File Systems Interface-File concepts-Access methods-Directory Structures-File System Implementation-File Systems structures-Directory Implementation-Allocation Methods-Free Space management-Distributed File systems-Naming and Transparency-Remote File Accesses- Stateful Versus Stateless Service-File replication.		
<b>UNIT V</b>	<b>CASE STUDIES</b>	<b>9</b>
Linux System-design Principles- process management-File Systems-Windows 7- history-design Principles –system components –Virtual machine OS.		

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Able to understand the operating system components and its services
- Implement the algorithms in process management and solving the issues of IPC
- Able to demonstrate the mapping between the physical memory and virtual memory
- Able to understand file handling concepts in OS perspective
- Able to understand the operating system components and services with the recent OS

**REFERENCES:**

1. Abraham Silberschalz Peter B Galvin, G.Gagne, "Operating Systems Concepts", 9th Edition, John Wiley & Sons, 2013.
2. Andrew S.Tanenbaum, "Modern operating Systems", Third Edition, PHI Learning Pvt. Ltd., 2008
3. D M Dhamdhere, " Operating Systems: A Concept-based Approach", Second Edition, Tata McGraw-Hill Education, 2007
4. H M Deital, P J Deital and D R Choffnes, "Operating Systems", 3rd edition, Pearson Education, 2011
5. William Stallings, "Operating Systems: Internals and Design Principles", Seventh Edition, Prentice Hall, 2011

MC5205

**COMPUTER GRAPHICS AND MULTIMEDIA**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To provide knowledge and understanding in the fundamental principles of Computer Graphics and Mathematical concepts related to Computer graphical operations.
- To provide in-depth knowledge of display systems, image synthesis and shape modelling of 3D applications.
- To understand the basic concepts related to Multimedia including data standards, algorithms and software.
- To Experience the development of Multimedia application to display their ability by using Multimedia tools.

**UNIT I BASIC CONCEPTS 9**

2D Transformations – Clipping – Point Clipping – Line Clipping – Polygon Clipping – Text Clipping – Exterior Clipping – Window to View Port Mapping – Interactive Input Methods – Picture Construction Techniques.

**UNIT II 3D GRAPHICS 9**

3D Concepts – 3D Transformations – 3D Viewing – Visible Surface Detection Methods – Back Face Detection Method – Depth Buffer Method – Scan Line Method –Virtual Reality Environment.

**UNIT III MULTIMEDIA BASICS 9**

Introduction to Multimedia – Applications– Hypermedia – Authoring — File formats –Color Models – Digital Audio– Digital Music Making – MIDI – Digital Video – Video Compression Techniques – Video Performance Measurements –Multimedia Databases–Animation.

**UNIT IV MULTIMEDIA COMMUNICATION 9**

Multimedia Network Services–Network Protocols–Requirements for Multimedia Communications – Multimedia Conferencing Architectures –QuickTime Movie File Format–MHEG–Multimedia File Sharing –Multimedia & Internet–Real-Time Interchange.

**UNIT V MULTIMEDIA APPLICATION DEVELOPMENT 9**

Design of a Multimedia System –Content Based Information Retrieval – HDTV, ATV, EDTV, IDTV Standards –Development of User Interface Design – Multimedia Broadcasting –Social Media Sharing – Multimedia Development Issues – Sample Multimedia Project.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Gain proficiency in various algorithms of 2D Computer graphics and trend their use in various real-life systems.
- Enhance the perspective of Modern computer system with modelling, analysis and interpretation of 3D visual information.
- Able to understand different forms of Multimedia and gain knowledge about Audio and Video.
- Able to understand the Networks used for Multimedia and to communicate with Multimedia Applications.
- Able to design and implement a number of Multimedia Applications and to do Research in Multimedia Industry.

## REFERENCES:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", Second Edition, Pearson Education
2. David Hillman, "Multimedia – Technology and applications", Galgotia Publications, Delhi, 2008
3. John F. KoegelBuford, "Multimedia Systems", Pearson Education, Delhi, 6<sup>th</sup> Edition, 2009
4. Mohammad Dastbaz, Designing Interactive Multimedia Systems, McGraw-Hill Publishers, 2002
5. Parag Havaldar and Gerard Medioni, "Multimedia Systems-Algorithms, Standards and Industry Practices", Cengage Learning, 2009
6. Ralf Steinmetz and Klara "Multimedia Computing, Communications and Applications", Pearson Education, 2009
7. Tom McReynolds – David Blythe, "Advanced Graphics Programming Using OpenGL", Elsevier, 2005
8. Ze-Nian Li, Mark S Drew and Jiangchuan Liu, "Fundamentals of Multimedia", Second Edition, Springer, 2014

**MC5211**

### **OBJECT ORIENTED PROGRAMMING LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

## OBJECTIVES:

- To develop skills in object oriented programming
- To learn generic data structures using templates
- To learn virtual functions and file handling in C++

## LIST OF EXPERIMENTS

1. Write a C++ Program to illustrate Enumeration and Function Overloading
2. Write a C++ Program to illustrate Scope and Storage class
3. Implementation of ADT such as Stack and Queues
4. Write a C++ Program to illustrate the use of Constructors and Destructors and Constructor Overloading
5. Write a Program to illustrate Static member and methods
6. Write a Program to illustrate Bit fields
7. Write a Program to overload as binary operator, friend and member function
8. Write a Program to overload unary operator in Postfix and Prefix form as member and friend function
9. Write a Program to illustrate Iterators and Containers
10. Write a C++ Program to illustrate function templates
11. Write a C++ Program to illustrate template class
12. Write C++ Programs and incorporating various forms of Inheritance
13. Write a C++ Program to illustrate Virtual functions
14. Exception Handling
15. File Handling – Read, Write, Update

**TOTAL: 60 PERIODS**

**OUTCOMES:****Upon Completion of the course, the students will be able to:**

- Develop programs in object oriented paradigm
- Implement data structure using C++
- Suggest appropriate data structure for any given data set
- Modify or suggest new data structure for an application.
- File handling in object oriented environment.

**MC5212****GRAPHICS AND MULTIMEDIA LABORATORY****L T P C****0 0 4 2****OBJECTIVES:**

- To study the graphics techniques and algorithms
- To understand the concept of geometric, mathematical and algorithmic concepts necessary for programming computer graphics
- To enable the students to develop their creativity using Multimedia concepts and various I/O technologies
- To apply Multimedia data processing and analysis techniques to real world applications

**LIST OF EXPERIMENTS**

1. Creation of 2Dimensional objects using Graphics functions
2. 2Dimensional Transformations
3. 2Dimensional Composite Transformations
4. Clipping and Windowing of a 2Dimensional Object
5. 3Dimensional Simple Transformations
6. 3Dimensional Composite Transformations
7. Parallel and Perspective Projections
8. Visible Surface Detection of a 3Dimensional Object
  - a) Color to Gray scale conversion of an image
9.
  - b) Image optimization
  - c) Image manipulation using Filters
  - d) Creation of GIF animated images
10.
  - a) Image Compression
  - b) Guide layer effects in an image
  - c) Frame by Frame Animation
  - d) Product Advertisement with Multimedia effects

**TOTAL: 60 PERIODS****OUTCOMES:****Upon Completion of the course, the students will be able to:**

- Function as designers, applying Mathematics knowledge for various calculations, involving tools for analyzing the world, accessing and interpreting the information and representing what they know to others.
- Gain knowledge about the creation of text, image, graphic and animation files.
- Learn about authoring tools for packaging multimedia systems and to use a variety of common software packages to complete the experiments.

**LIST OF SOFTWARE:**

1. C/C++/Java
2. OpenGL 4.1 (Precompiled GLUT libraries 4.1 – Open source)
3. Any open source software like GIMP 2.8/ Flash 11.9 /Photoshop

<b>MC5213</b>	<b>OPERATING SYSTEMS AND EMBEDDED SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To involve the students to Practice on Workbench /Software Tools/ Hardware Processor Boards with the supporting Peripherals.
- To teach the concepts of algorithm development & programming on software tools and micro controllers with peripheral interfaces.
- Learn shell programming and the use of filters in the UNIX environment.
- Learn to use the system calls and inter process communication.

**LIST OF EXPERIMENTS**

1. 8051 Microcontroller Based 8-bit Addition & Subtraction
2. 8051 Microcontroller Based 8-bit Multiplication & Division
3. 8051 Microcontroller Based I/O Interfacing to verify timer operations
4. Real Time Systems Program Using RTOS (like LED Display)
5. Basics of UNIX commands and Shell Programming
6. Implement the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
7. Process creation, Process synchronization & Interprocess communication using semaphores
8. Pipes and message in UNIX environment

**TOTAL: 60 PERIODS****OUTCOMES:****Upon Completion of the course, the students will be able to:**

- Perform arithmetic operation using 8085 microprocessor and 8051microcontroller along with I/O interfacing.
- Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design.
- Create system calls, processes and implement IPC.
- Compare the performance of various CPU Scheduling Algorithm

<b>MC5301</b>	<b>ADVANCED DATA STRUCTURES AND ALGORITHMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- Understand and apply linear data structures-List, Stack and Queue.
- Understand the graph algorithms.
- Learn different algorithms analysis techniques.
- Apply data structures and algorithms in real time applications
- Able to analyze the efficiency of algorithm

**UNIT I                      LINEAR DATA STRUCTURES                      9**

Introduction - Abstract Data Types (ADT) – Stack – Queue – Circular Queue - Double Ended Queue - Applications of stack – Evaluating Arithmetic Expressions - Other Applications - Applications of Queue - Linked Lists - Singly Linked List - Circularly Linked List - Doubly Linked lists – Applications of linked list – Polynomial Manipulation.

**UNIT II                      NON-LINEAR TREE STRUCTURES                      9**

Binary Tree – expression trees – Binary tree traversals – applications of trees – Huffman Algorithm - Binary search tree - Balanced Trees - AVL Tree - B-Tree - Splay Trees – Heap-Heap operations- -Binomial Heaps - Fibonacci Heaps- Hash set.

**UNIT III                      GRAPHS                      9**

Representation of graph - Graph Traversals - Depth-first and breadth-first traversal - Applications of graphs - Topological sort – shortest-path algorithms - Dijkstra's algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms.

**UNIT IV                      ALGORITHM DESIGN AND ANALYSIS                      9**

Algorithm Analysis – Asymptotic Notations - Divide and Conquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Optimal Binary Search Tree - Warshall's Algorithm for Finding Transitive Closure.

**UNIT V                      ADVANCED ALGORITHM DESIGN AND ANALYSIS                      9**

Backtracking – N-Queen's Problem - Branch and Bound – Assignment Problem - P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem-Amortized Analysis.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Describe, explain and use abstract data types including stacks, queues and lists
- Design and Implement Tree data structures and Sets
- Able to understand and implement non linear data structures - graphs.
- Able to understand various algorithm design and implementation.

## REFERENCES:

1. Anany Levitin "Introduction to the Design and Analysis of Algorithms" Pearson Education, 2015
2. E. Horowitz, S.Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", University Press, 2007
3. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms/C++", Second Edition, University Press, 2007
4. Gilles Brassard, "Fundamentals of Algorithms", Pearson Education 2015
5. Harsh Bhasin, "Algorithms Design and Analysis", Oxford University Press 2015
6. John R.Hubbard, "Data Structures with Java", Pearson Education, 2015
7. M. A. Weiss, "Data Structures and Algorithm Analysis in Java", Pearson Education Asia, 2013
8. Peter Drake, "Data Structures and Algorithms in Java", Pearson Education 2014
9. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Thrid Edition, PHI Learning Private Ltd, 2012
10. Tanaenbaum A.S.,Langram Y. Augestein M.J, "Data Structures using C" Pearson Education , 2004.
11. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983

**MC5302**

**COMPUTER NETWORKS**

**L T P C**

**3 0 0 3**

## OBJECTIVES:

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To acquire basic knowledge of various application protocol for internetsecurity issues and services.

## **UNIT I NETWORK FUNDAMENTALS 9**

Uses of Networks – Categories of Networks -Communication model –Data transmission concepts and terminology – Protocol architecture – Protocols – OSI – TCP/IP – LAN Topology - Transmission media .

## **UNIT II DATA LINK LAYER 9**

Data link control - Flow Control – Error Detection and Error Correction - MAC – Ethernet, Token ring, Wireless LAN MAC – Blue Tooth – Bridges.

## **UNIT III NETWORK LAYER 9**

Network layer – Switching concepts – Circuit switching – Packet switching –IP — Datagrams —IP addresses- IPV6– ICMP – Routing Protocols – Distance Vector – Link State- BGP.



**UNIT IV TRANSPORT LAYER 9**  
Transport layer –service –Connection establishment – Flow control – Transmission control protocol – Congestion control and avoidance – User datagram protocol. -Transport for Real Time Applications (RTP).

**UNIT V APPLICATIONS AND SECURITY 9**  
Applications - DNS- SMTP – WWW –SNMP- Security –threats and services - DES- RSA.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Able to trace the flow of information from one node to another node in the network
- Able to Identify the components required to build different types of networks
- Able to understand the functionalities needed for data communication into layers
- Able to choose the required functionality at each layer for given application
- Able to understand the working principles of various application protocols and fundamentals of security issues and services available.

**REFERENCES:**

1. Achyut S Godbole,AtulHahate, “ Data Communications and Networks”, Second edition 2011
2. Andrew S.Tannenbaum David J. Wetherall, “Computer Networks” Fifth Edition , Pearson Education 2011
3. Douglas E. Comer, —Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecture, Sixth Edition, Pearson Education, 2013.
4. Forouzan, “ Data Communication and Networking”, Fifth Edition , TMH 2012.
5. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition,2012.
6. John Cowley, “Communications and Networking : An Introduction”, Springer Indian Reprint, 2010.
7. Larry L. Peterson & Bruce S. Davie, “Computer Networks – A systems Approach”, Fifth Edition, Morgan Kaufmann, 2012
8. William Stallings, —Data and Computer CommunicationsII, Tenth Edition, Pearson Education, 2013
9. Wayne Tomasi, “ Introduction to Data communications and Networking” , Pearson 2011

**MC5303 WEB PROGRAMMING ESSENTIALS L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- To understand and practice embedded dynamic scripting on client side Internet Programming
- To understand and practice web development techniques on client-side.

**UNIT I INTRODUCTION TO WWW 9**  
Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response — Generation of dynamic web pages.

**UNIT II UI DESIGN 9**

**Markup Language (HTML5):** Basics of Html -Syntax and tags of Html- Introduction to HTML5 -Semantic/Structural Elements -HTML5 style Guide and Coding Convention– Html Svg and Canvas – Html API's - Audio & Video - Drag/Drop - Local Storage - Web socket API– Debugging and validating Html.

**Cascading Style Sheet (CSS3):** The need for CSS – Basic syntax and structure Inline Styles – Embedding Style Sheets - Linking External Style Sheets - Introduction to CSS3 – Backgrounds - Manipulating text - Margins and Padding - Positioning using CSS - Responsive Web Design - Introduction to LESS/SASS

**UNIT III OVERVIEW OF JAVASCRIPT 9**

Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements Functions - Objects - Array, Date and Math Related Objects - Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form validations.

**UNIT IV ADVANCED FEATURES OF JAVASCRIPT 9**

Browser Management and Media Management – Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes – Introduction to JSON – JSON Structure –Introduction to jQuery –Introduction to AJAX-Bootstrap - Bootstrap components.

**UNIT V PHP 9**

Introduction - How web works - Setting up the environment (LAMP server) - Programming basics Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML - Establishing connectivity with MySQL database.

**TOTAL :45 PERIODS**

**OUTCOMES:**

- Create a basic website using HTML and Cascading Style Sheets.
- Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
- Design rich client presentation using AJAX.
- Design and implement simple web page in PHP, and to present data in XML format.
- Design front end web page and connect to the back end databases

**REFERENCES:**

1. David Flanagan, “JavaScript: The Definitive Guide, Sixth Edition”, O'Reilly Media, 2011
2. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, “Internet and World Wide Web - How To Program”, Fifth Edition, Pearson Education, 2011
3. James Lee, BrentWare , “Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP” AddisonWesley, Pearson 2009
4. Thomas A. Powell, “HTML & CSS: The Complete Reference”, Fifth Edition, 2010
5. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013
6. Thomas A Powell, “Ajax: The Complete Reference”, McGraw Hill, 2008

**MC5304**

**PROGRAMMING WITH JAVA**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To provide an overview of working principles of internet, web related functionalities
- To understand and apply the fundamentals core java, packages, database connectivity for computing
- To enhance the knowledge to server side programming.
- To Understand the OOPS concept & how to apply in programming.

**UNIT I JAVA FUNDAMENTALS 9**

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Methods – Inheritance - Packages and Interfaces – Boxing, Unboxing – Variable-Length Arguments (Varargs), Exception Handling.

**UNIT II COLLECTIONS AND ADVANCE FEATURES 9**

Utility Packages- Introduction to collection –Hierarchy of Collection framework – Generics, Array list, LL, HashSet, TreeSet, HashMap – Comparators – Java annotations – Pre-main method.

**UNIT III ADVANCED JAVAPROGRAMMING 9**

Input Output Packages – Inner Classes – Java Database Connectivity - Introduction JDBC Drivers - JDBC connectivity with MySQL/Oracle -Prepared Statement & Result Set – JDBC Stored procedures invocation - Servlets - RMI – Swing Fundamentals - Swing Classes.

**UNIT IV OVERVIEW OF DATA RETRIEVAL & ENTERPRISE APPLICATION DEVELOPMENT 9**

Tiered Application development - Java Servers, containers –Web Container – Creating Web Application using JSP/Servlets – Web Frameworks Introduction to Spring/ Play Framework – ORM Layer – Introduction to Hibernate.

**UNIT V JAVA INTERNALS AND NETWORKING 9**

Java jar Files-Introspection – Garbage collection – Architecture and design – GC Cleanup process, Invoking GC, Generation in GC - Networking Basics Java and the Net – InetAddress – TCP/IP Client Sockets – URL –URL Connection – TCP/IP Server Sockets – A Caching Proxy HTTP Server – Datagrams.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Implement Java programs.
- Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API
- Use the frameworks JSP, Hibernate, Spring
- Design and implement server side programs using Servlets and JSP.

**REFERENCES:**

1. Amritendu De, “Spring 4 and Hibernate 4: Agile Java Design and Development”, McGraw-Hill Education, 2015
2. Herbert Schildt, The Complete Reference – Java 2, Ninth Edition, Tata McGraw Hill, 2014
3. Joyce Farrell, “Java Programming”, Cengage Learning, Seventh Edition, 2014

4. John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Solving Approach", Tata Mc Graw Hill, 2014.
5. Mahesh P. Matha, "Core Java A Comprehensive Study", Prentice Hall of India, 2011
6. R. Nageswara Rao, "Core Java: An Integrated Approach", DreamTech Press, 2016

<b>MC5305</b>	<b>OBJECT ORIENTED ANALYSIS AND DESIGN</b>	<b>L T P C</b>
		<b>3 2 0 4</b>

**OBJECTIVES:**

- To provide a brief, hands-on overview of object-oriented concepts and its life cycle for software development.
- To learn for modelling the software and to design them using UML diagrams
- To understand the problem domain and to identify the objects from the problem specification.
- To understand, how to apply design axioms and corollaries for the classes and object relational systems.
- To gain knowledge about open source tools for Computer Aided Software Engineering

**UNIT I INTRODUCTION 9+6**

An overview – Object basics – Object state and properties – Behaviour – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle.

**UNIT II METHODOLOGY AND UML 9+6**

Introduction – Survey – Rumbaugh, Booch, Jacobson methods – Unified modelling language – Static and Dynamic models – Rational Rose Suite - UML diagrams – Static diagram : Class diagram – Use case diagrams – Behaviour Diagram : Interaction diagram – State chart diagram – Activity diagram - Implementation diagram: Component diagram – Deployment diagram – example - Design of online railway reservation system using UML diagrams - Dynamic modelling – Model organization – Extensibility.

**UNIT III OBJECT ORIENTED ANALYSIS 9+6**

Identifying Use case – Business object analysis – Use case driven object oriented analysis – Use case model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility – construction of class diagram for generalization, aggregation – example – vehicle class.

**UNIT IV OBJECT ORIENTED DESIGN 9+6**

Design process and benchmarking – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface-OOUI - MVC Architectural Pattern and Design – Designing the system.

**UNIT V CASE TOOLS****9+6**

Railway domain : Platform assignment system for the trains in a railway station - Academic domain : Student Marks Analysing System - ATM system - Stock maintenance - Quiz System - E-mail Client system - Cryptanalysis – Health Care Systems. Use Open source CASE Tools: StarUML/ UML Graph for the above case studies.

**L : 45, T : 30 TOTAL: 75 PERIODS****OUTCOMES:**

- Able to understand the object oriented concepts and to apply object oriented life cycle model for a project.
- Able to design static and dynamic models using UML diagrams.
- Able to perform object oriented analysis to identify the objects from the problem specification.
- Able to identify and refine the attributes and methods for designing the object oriented system.
- Able learn the open source CASE tools and to apply them in various domains.

**REFERENCES**

1. Ali Bahrami, “Object Oriented System Development”, McGraw Hill International Edition, 2008
2. Brahma Dathan, Sarnath Ramnath, “Object-Oriented Analysis, Design and Implementation”, Universities Press, 2010
3. Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Patterns and Java, Pearson 2004
4. Craig Larman, Applying UML and Patterns – An Introduction to Object-Oriented Analysis and Design and Iterative Development” , 3<sup>rd</sup> Edition, Pearson Education, 2005
5. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Addison Wesley Long man, 1999
6. Martin Fowler, “UML Distilled A Brief Guide to Standard Object Modeling Language”, 3rd Edition, Addison Wesley, 2003
7. Russ Miles, Kim Hamilton, “Learning UML 2.0”, O’Reilly, 2008
8. [http://staruml.sourceforge.net/docs/StarUML\\_5.0\\_Developer\\_Guide.pdf](http://staruml.sourceforge.net/docs/StarUML_5.0_Developer_Guide.pdf)
9. <http://www.spinellis.gr/umlgraph/doc/index.html>

**MC5311****DATA STRUCTURES AND ALGORITHMS  
LABORATORY****L T P C  
0 0 4 2****OBJECTIVES:**

- To develop skills in design and implementation of data structures.
- To learn and implement linear, non linear and tree data structures.
- To learn Set ADT and Graph data structures and its applications.
- To study, implement and analyze the different sorting techniques.

**LIST OF EXPERIMENTS**

1. Array implementation of stack
2. Linked list implementation of Queue
3. Polynomial Addition using Linked List

4. Binary Search tree operations
5. AVL Tree operations
6. Graph Traversals
7. Shortest Path using Dijkstra's Algorithm
8. Minimum Spanning Tree using Prim's Algorithm
9. Dictionary application using any of the data structure
10. Divide and Conquer Method - Merge Sort
11. Back Tracking - 8-Queen's Problem

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Work with basic data structures that are suitable for the problems to be solved efficiently.
- Design and implement linear, tree, and graph structures and its applications
- Design various sorting techniques, its algorithm design and analysis

**MC5312**

**WEB PROGRAMMING LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- Try and develop the most important technologies that are being used today by web developers to build a wide variety of web applications.
- To build web applications using proven developer tools and message formats.
- To understand and practice web development techniques on client-side
- Web applications using technologies such as HTML, CSS, Javascript, AJAX, JQuery and JSON.

**LIST OF EXPERIMENTS**

1. Create your own Resume using HTML 5 Tags
2. Debug and validate your HTML document ( Resume ) using W3C validator and fix the issues.  
([https://validator.w3.org/#validate\\_by\\_upload](https://validator.w3.org/#validate_by_upload) ).
3. Add Styles to your Resume using CSS 3 Properties.
  - Add External, Internal and Inline CSS styles to know the priority.
  - Add CSS3 Animation to your profile.
4. (a) Add functionalities that use any 2 of HTML 5 API's.  
(b). Create a student Registration form for Job Application and validate the form fields using JavaScript.
5. (a) Create a CGPA Calculator in Web Brower using HTML, CSS and JavaScript. Use functions in JavaScript.  
(b) Create a Quiz Program with adaptive questions using JavaScript.
6. Create a Pan Card Validation form using Object Oriented JavaScript, consider the 10<sup>th</sup> character to be an alphabet.
  - Get the user's First Name, Last Name and other required fields as input
  - Assume the last digit of the Pan Number to be an alphabet
  - Validate the PAN Number.
7. (a) Create an online Event Registration form and validate using JQuery  
(b) Create an online video Player which will allow you to play videos from the system and also create custom playlist using JQuery.

8. Construct a JSON Structure for a bookstore and validate it using JSON Validator such as <http://jsonlint.com/> and parse the Json file to list the books under the category "Fiction". Use Javascript or JQuery for parsing.
9. Create a Single Page application allowing to search for a movie and displaying the trailer, poster for various movies.
  - Create an admin login to upload the trailer, poster, keyword and details of the movie.
  - Use Bootstrap and JQuery for designing the User Interface.
  - Form Submission should be handled through Ajax.
10. Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.
11. Develop a Social Media Web Application using HTML5, CSS3, JQuery, AJAX & PHP.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Develop simple web applications using scripting languages.
- Implement server side and client side programming develop web applications with various web technology concepts.
- Design a Web application using various technologies such as AJAX, JQuery and JSON.
- Develop an application for social media using HTML5, CSS3, JQuery, AJAX & PHP

**MC5313**

**PROGRAMMING WITH JAVA LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

Try and develop the most important technologies that are being used today by web developers to build a wide variety of web applications.

To develop Java based web programming.

To understand and apply the fundamentals core java, packages, database connectivity for computing

To enhance the knowledge to server side programming

To provide knowledge on advanced features like Swing, JavaBeans, Sockets.

**LIST OF EXPERIMENTS**

1. Writing Java programs by making use of class, interface, package, etc for the following
  - # Different types of inheritance study
  - # Uses of 'this' keyword
  - # Polymorphism
  - # Creation of user specific packages
  - # Creation of jar files and using them
  - # User specific exception handling
2. Writing window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion etc.
3. Application of threads examples
4. Create a Personal Information System using Swing





**UNIT IV SCHEDULING BY PERT AND CPM 9**  
 Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling

**UNIT V QUEUEING MODELS 9**  
 Characteristics of Queuing Models – Poisson Queues -  $(M / M / 1) : (FIFO / \infty / \infty)$ ,  $(M / M / 1) : (FIFO / N / \infty)$ ,  $(M / M / C) : (FIFO / \infty / \infty)$ ,  $(M / M / C) : (FIFO / N / \infty)$  models.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Understand and apply linear, integer programming to solve operational problem with constraints
- Apply transportation and assignment models to find optimal solution in warehousing and Travelling,
- To prepare project scheduling using PERT and CPM
- Identify and analyze appropriate queuing model to reduce the waiting time in queue.
- Able to use optimization concepts in real world problems

**REFERENCES:**

1. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, “Operations Research”, Pearson Education, Asia, 2005
2. Gross, D. and Harris, C.M., “Fundamentals of Queueing Theory”, Wiley Student, 3rd Edition, New Jersey, 2004
3. Ibe, O.C. “Fundamentals of Applied Probability and Random Processes”, Elsevier, U.P., 1st Indian Reprint, 2007
4. John W. Chinneck “Feasibility and Infeasibility in Optimization Algorithms and Computational Methods’ Springer, 2008.
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6. Prem Kumar Gupta, D.S. Hira, “Operations Research”, S.Chand& Company Ltd, New Delhi, 3rd Edition , 2008
7. Ravindran, Phillips, Solberg, ”Operations Research: Principles And Practice”, 2ND ED, John Wiley & Sons,2007
8. Taha H.A., “Operations Research : An Introduction “ 8<sup>th</sup> Edition, Pearson Education, 2008

**MC5402**

**MOBILE COMPUTING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.
- To have an exposure about wireless protocols -WLN, Bluetooth, WAP, ZigBee issues.
- To Know the Network, Transport Functionalities of Mobile communication.
- To impart knowledge about Mobile Application Development Platform
- To impart the knowledge about basic components needed for Mobile App development

**UNIT I WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE 9**  
 Frequency Spectrum- Multiplexing- Spread spectrum-GSM vs CDMA - -Comparison of 2G , 3 G, 4G - GSM Architecture-Entities-Call Routing- Address and identifiers- GSM Protocol architecture-Mobility Management-Frequency Allocation- Security –GPRS Architecture (entity and Protocol).

**UNIT II MOBILE WIRELESS SHORT RANGE NETWORKS 9**  
Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture-WLAN MAC-Security of WLAN, Power Management-Standards- WAP Architecture- Bluetooth enabled Devices Network-Layers in Bluetooth Protocol-Security in Bluetooth- IrDA- ZigBee.

**UNIT III MOBILE IP NETWORK LAYER, TRANSPORT LAYER 9**  
IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management- Registration- Tunneling and Encapsulation-Route Optimization- Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP.

**UNIT IV MOBILE APPLICATION DEVELOPMENT USING ANDROID 9**  
Mobile Applications Development - Understanding the Android Software Stack – Android Application Architecture –The Android Application Life Cycle – The Activity Life Cycle- Creating Android Activity -Views- Layout -Creating User Interfaces with basic views- linking activities with Intents.

**UNIT V MOBILE APPLICATION DEVELOPMENT USING ANDROID 9**  
Services-Broadcast Receivers – Adapters – Data Storage, Retrieval and Sharing.-Location based services- Development of simple mobile applications .

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Gain the knowledge about various types of Wireless Data Networks and Voice Networks.
- understand the architectures, the challenges and the Solutions of Wireless Communication
- Realize the role of Wireless Protocols in shaping the future Internet.
- Able to develop simple Mobile Application Using Android

**REFERENCES:**

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal “Mobile Computing”, Tata McGraw Hill Pub ,2<sup>nd</sup> Edition Aug – 2010.
2. Barry A. Burd ,’Android Application Development For Dummies All in One”, Wiley, 2015.
3. Ed Burnette, ’Hello, Android: Introducing Google’s Mobile Development Platform’ third edition’ Pragmatic Programmers, 2012.
4. Jochen Schillar “Mobile Communications” Pearson Education second Edition.
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6. Maritn Sauter, —From GSM to LTE: An Introduction to Mobile Networks and Mobile BroadbandII, John Wiley and Sons, 2011 .
7. Raj Kamal “Mobile Computing” Oxford Higher Education, Second Edition, 2012.
8. Reto Meier, Professional Android 2 Application Development, Wrox’s Programmer to Programmer series.

**OBJECTIVES:**

- To understand the underlying principles of Relational Database Management System.
- To Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- To learn to use association rule mining for handling large data
- To understand the concept of classification for the retrieval purposes
- To know the clustering techniques in details for better organization and retrieval of data
- To identify Business applications and Trends of Data mining

**UNIT I RELATIONAL MODEL 9**

Data Model – Types of Data Models: – Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Structured Query Language – Database Normalization – Transaction Management.

**UNIT II DATA MINING & DATA PREPROCESSING 9**

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

**UNIT III ASSOCIATION RULE MINING 9**

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

**UNIT IV CLASSIFICATION & PREDICTION 9**

Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures.

**UNIT V CLUSTERING 9**

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

**TOTAL : 45 PERIODS****OUTCOMES:**

- Create relational data models.
- Preprocess the data for mining applications.
- Apply the association rules for mining the data.
- Design and deploy appropriate classification techniques.
- Cluster the high dimensional data for better organization of the data.
- Discover the knowledge imbedded in the high dimensional system.
- Evolve Multidimensional Intelligent model from typical system.
- Evaluate various mining techniques on complex data objects.

**REFERENCES:**

1. Berson, Alex & Smith, Stephen J, Data Warehousing, Data Mining, and OLAP, TMH Pub. Co. Ltd, New Delhi, 2012
2. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, PrenticeHall of India, 2006
3. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Second Edition, Elsevier, Reprinted 2008
4. K.P. Soman, ShyamDiwakar and V. Ajay, "Insight into Data mining Theory and Practice", EasterEconomy Edition, Prentice Hall of India, 2006
5. Marakas, George M, Modern Data Warehousing, Mining, and Visualiza Visualization, Pearson Education, 2011
6. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", PearsonEducation, 2007
7. Prabhu Data Warehousing, PHI Learning Private Limited, New Delhi, 2012.
8. Ponniah, Paulraj, Data Warehousing Fundamentals, John Wiley & Sons, New Delhi, 2011.
9. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Addison-Wesley, 2011

**MC5404****WEB APPLICATION DEVELOPMENT**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To acquire knowledge on the usage of recent platforms in developing web applications
- To understand architecture of J2EE and design applications using J2EE, Strut and hypernet
- To understand framework of Spring, Hibernate and struts.
- To Design and develop interactive, client-side, server-side executable web applications LAMP Stack

**UNIT I****J2EE PLATFORM****9+6**

Introduction -Enterprise Architecture Styles -J2EE Architecture - Containers - J2EE Technologies -Developing J2EE Applications - Naming and directory services - Using JNDI - JNDI Service providers - Java and LDAP - LDAP operations - Searching an LDAP server - Storing and retrieving java objects in LDAP - Application Servers - Implementing the J2EE Specifications - J2EE packaging and Deployment - J2EE packaging overview - Configuring J2EE packages.

**UNIT II****SPRING****9+6**

Web Services - Consuming a RESTfull Web Service Java desktop application /JSP. Building REST Service with spring -Spring Security Architecture – Accessing relational data using JDBC with spring- Uploading Files using spring application- Validating form input - Handling form submission -Creation of Batch Service -Securing web application -Integrating Data - Accessing data with MongoDB- Creating asynchronous method-Using WebSocket to build an interactive web application.

**UNIT III STRUTS AND HIBERNATE  
STRUTS**

**9+6**

Introduction to Struts – MVC framework- Struts Architecture – Business Service – Parameter Passing – Action class & configuration files – Struts.xml Tags – Namespace & Wildcards – Model Driven Action – Value stack & OGNL – Validation – Interceptors - Inbuilt Interceptors – Custom Interceptors .

**HIBERNATE**

HIBERNATE ORM-Persistence-Relational Database-The object relational impedance mismatch -Using Native Hibernate API's and hbm.xml-Using the java persistence API's- Hibernate Validator – HIBERNATE OGM – configuration of tools -HIBERNATE SEARCH - Enabling full text search capabilities in entities -Indexing-Searching -Introduction to Full text search.

**UNIT IV PYTHON**

**9+6**

Introduction to python – Why to use python – History of python – Python IDE - Pyscripter IDE – Hello world program in python – Number & Math function – Variables & Names – String basics – String features – Conditional Statements – Functions – For & While loop – List,Tuple & Dictionaries – File handling – Debugging elements breakpoints watch and stepin – debugging step in & step out – Debugging watch variables – class & objects – Packages & Modules – Python Pip – Python MySql – Read Excel data in python.

**UNIT V DJANGO**

**9+6**

Introduction to Django-Django model layer – View layer – Template Layer – Forms – Automated admin interface – Django Security – Internationalization and localization – Django Web application tools – Core functionalities – Geographic Framework.

**L : 45, T : 30 TOTAL: 75 PERIODS**

**OUTCOMES:**

- Design and implement Internet systems for enhancing education and engineering design
- Understand functionality of Internet system
- Design a system according to customer needs using the available Internet technologies
- Design and develop interactive, client-side, server-side executable web applications.
- Develop a rapid application in many areas on most platforms.
- Build better Web apps more quickly and with less code

**REFERENCES:**

1. Ayman Hourieh, "Learning Website Development with Django", Packt Publishing, 2008.
2. Craig Walls, "Spring in Action, 4th Edition Kindle Edition, Manning Publication, 2015.
3. Jobinesh Purushothaman, "RESTful Java Web Services" Second Edition, Packt Publishing, 2015
4. James Holmes "Struts: The Complete Reference, " 2nd Edition, McGraw Hill, 2007.
5. Jeff Forcier, Paul Bissex, Wesley J Chun, "Python Web Development with Django (Developer's Library)", Pearson Education, 2009
6. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language", second edition, Pearson Education, 2010.
7. Patrick Peak and Nick Heudecker, "Hibernate Quickly", Manning Publication, 2007
8. Subrahmanyam Allamaraju and Cedric Buest , "Professional Java Server Programming (J2EE 1.3 Edition), ", Shroff Publishers & Distributors Pvt Ltd
9. Tony Dahbura, Rob Weltman "LDAP Programming with Java", Addison-Wesley Professional, 2000

<b>MP5411</b>	<b>MOBILE APPLICATION DEVELOPMENT LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- Know the components and structure of mobile application development frameworks like Android /windows /ios.
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts and issues of development of mobile applications.
- Understand the capabilities and limitations of mobile devices.
- Write applications for the platforms used, simulate them, and test them on the mobile hardware where possible.

**LIST OF EXPERIMENTS**

1. Develop an application that uses Layout Managers.
2. Develop an application that uses event listeners.
3. Develop an application that uses Adapters ,Toast.
4. Develop an application that makes use of database.
5. Develop an application that makes use of RSS Feed.
6. Implement an application that implements Multi threading.
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message.
10. Develop a game application.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Install and configure Android application development tools.
- Design and develop user Interfaces for the Android platform.
- Apply Java programming concepts to Android application development.
- Familiar with technology and business trends impacting mobile applications.
- competent with the characterization and architecture of mobile applications.

<b>MC5412</b>	<b>WEB APPLICATION DEVELOPMENT LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To design applications using J2EE, Struts and Hypernate.
- To develop a web application with n-tier architecture.
- To develop a simple application using Spring MVC.
- To develop a web service using JSON and XML formats.

**LIST OF EXPERIMENTS:**

1. Develop a car showroom inventory web application with 2-tier architecture. Use JSP and JDBC.
2. Develop a real estate web application with n-tier architecture. Use JSP, Servlets and JDBC.

The application should be able to add and search all properties such as rental/own, individual/ apartment and duplex/semi-duplex.

3. Develop a standalone java application or a web application to manage books in an online library, support CRUD operations.
4. Develop a simple Spring MVC application that take user input and checks the input using standard validation annotations.
5. Develop a simple database application using Spring JDBC/Struts with CRUD functionality.
6. Develop any web application which authenticates Spring LDAP.
7. Design a student identity management web application using struts framework. The application should be able to provide an identity such as student id, access to department assets with department id, access to lab assets with lab id.
8. Create an simple online bookstore using Spring MVC
9. Build an application that uses Spring's RestTemplate to retrieve a random Spring Boot quotation at <http://gturnquist-quoters.cfapps.io/api/random>
10. Create weather service using spring/struts which will return the temp in JSON format and XML format.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Design and develop interactive, client-side, server-side executable web applications.
- Develop a simple online application using Spring MVC
- Create applications using web services such as JSON, WSDL and SOAP
- Develop a simple database application using Spring JDBC/Struts with CRUD functionality

**MC5501**

**CLOUD COMPUTING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization and design of cloud Services
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator
- To apply different cloud programming model as per need.
- To learn to design the trusted cloud Computing system

**UNIT I                      CLOUD ARCHITECTURE AND MODEL                      9**  
Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

**UNIT II                      VIRTUALIZATION                      9**  
Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation

**UNIT III CLOUD INFRASTRUCTURE AND IoT 9**  
Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources-Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

**UNIT IV PROGRAMMING MODEL 9**  
Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

**UNIT V SECURITY IN THE CLOUD 9**  
Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – DataSecurity – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player, Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability.
- Design Cloud Services and Set a private cloud

**REFERENCES**

1. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in theCloud” O’Reilly
2. GautamShroff,Enterprise Cloud Computing,Cambridge University Press,2011
3. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005
4. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010
5. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From ParallelProcessing to the Internet of Things”, Morgan Kaufmann Publishers, 2012
6. Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India,2011
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, “Grid and Cloud Computing – A Business Perspective on Technology and Applications”, Springer
8. Michael Miller, Cloud Computing,Que Publishing,2008
9. Nick Antonopoulos, Cloud computing,Springer Publications,2010
10. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009
11. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, ‘Mastering Cloud Computing’, TMGH,2013
12. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, 2010



**OBJECTIVES:**

- To explore the fundamental concepts of big data analytics
- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts

**UNIT I INTRODUCTION TO BIG DATA 9**

Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error

**UNIT II MINING DATA STREAMS 9**

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP)Applications -- Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

**UNIT III HADOOP ENVIRONMENT 9**

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Hadoop filesystems-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop

**UNIT IV DATA ANALYSIS SYSTEMS AND VISUALIZATION 9**

Link Analysis – PageRank - Efficient Computation of PageRank- Topic-Sensitive PageRank – Link Spam- Recommendation Systems- A Model for Recommendation Systems- Content-Based Recommendations - Collaborative Filtering- Dimensionality Reduction- Visualizations - Visual data analysis techniques-interaction techniques- Systems and applications.

**UNIT V FRAMEWORKS AND APPLICATIONS 9**

IBM for Big Data –Framework - Hive – Sharding – NoSQL Databases –Mango DB-Cassandra-Hbase – Impala – Analyzing big data with twitter – Big data for Ecommerce – Big data for blogs.

**TOTAL : 45 PERIODS****OUTCOMES:**

- Work with big data platform and Understand the fundamentals of various big data analysis techniques
- Analyze the big data analytic techniques for useful business applications.
- Design efficient algorithms for mining the data from large volumes.
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics
- Explore the applications of Big Data

**REFERENCES:**

1. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CambridgeUniversity Press, 2014
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012
3. Da Ruan,Guoqing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer,2007
4. Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith Advanced Analytics", John Wiley & sons, 2012
5. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
6. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008
7. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007
8. Michael Minelli , Michele Chambers , AmbigaDhiraj, Big Data, BigAnalytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,WileyPublications,2013
9. Paul Zikopoulos ,DirkdeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw HillPublications, 2012
10. Pete Warden, "Big Data Glossary", O'Reilly, 2011
11. Tom White " Hadoop: The Definitive Guide" Fourth Edition, O'reilly Media, 2015
12. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoopand Streaming Data, Tata McGraw Hill Publications, 2011.

		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>MC5503</b>	<b>SOFTWARE TESTING AND QUALITY ASSURANCE</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To know the behavior of the testing techniques and to design test cases to detect the errors in the software
- To get insight into the levels of testing in the user environment
- To understand standard principles to check the occurrence of defects and its removal.
- To learn the functionality of automated testing tools to apply in the specialized environment.
- To understand the models and metrics of software quality and reliability.

<b>UNIT I</b>	<b>TESTING TECHNIQUES &amp; TEST CASE DESIGN</b>	<b>9</b>
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Using White Box Approach to Test design - Test Adequacy Criteria – Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Their Role in White box Based Test Design – Code Complexity Testing – Evaluating Test Adequacy Criteria. Test Case Design Strategies – Using Black Box Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis –Decision tables – Equivalence Class Partitioning – State-based testing – Cause-effect graphing – Error guessing – Compatibility testing – User documentation testing – Domain testing – Case study for Control Flow Graph and State-based Testing.

**UNIT II LEVELS OF TESTING 9**  
 The Need for Levels of Testing- Unit Test Planning –Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination. System Testing – Acceptance testing – Performance testing – Regression Testing - Internationalization testing - Ad-hoc testing – Alpha, Beta Tests- Testing OO systems – Usability and Accessibility Testing – Configuration Testing - Compatibility Testing – Testing the documentation – Website Testing - Case Study for Unit and Integration Testing.

**UNIT III TESTING FOR SPECIALIZED ENVIRONMENT 9**  
 Testing Client / Server Systems – Testing in a Multiplatform Environment - Testing Object-Oriented Software – Object Oriented Testing – Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web-based Software – Quality Aspects – Web Engineering – Testing of Web based Systems. Case Study for Web Application Testing

**UNIT IV TEST AUTOMATION 9**  
 Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using Bug Tracking Tool.

**UNIT V SOFTWARE TESTING AND QUALITY METRICS 9**  
 Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object Oriented Metrics.

**TOTAL : 45 PERIODS**

- OUTCOMES:**
- Able to test the software by applying various testing techniques.
  - Able to debug the project and to test the entire computer based systems at all levels.
  - Able to test the applications in the specialized environment using various automation tools.
  - Able to evaluate the web applications using bug tracking tools.
  - Able to apply quality and reliability metrics to ensure the performance of the software

**REFERENCES:**

1. Adithya P. Mathur, “ Foundations of Software Testing – Fundamentals algorithms and techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008
2. Boris Beizer, “ Software Testing Techniques” , Dream Tech Press, 2009
3. Dale H. Besterfield , “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint (2011).
4. Edward Kit, “ Software Testing in the Real World – Improving the Process”, Pearson Education, 1995
5. Glenford J. Myers, Tom Badgett, Corey Sandler, “The Art of Software Testing”, 3<sup>rd</sup> Edition, John Wiley & Sons Publication, 2012
6. Illene Burnstein, “ Practical Software Testing”, Springer International Edition, Chennai, 2003.
7. Naresh Chauhan , “Software Testing Principles and Practices ” Oxford University Press , New Delhi ,2010
8. Ron Patton, “Software Testing”, Second Edition, Pearson Education, 2009

9. Renu Rajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill, 2004
10. Srinivasan Desikan and Gopaldaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2009
11. Stephan Kan, "Metrics and Models in Software Quality", Addison – Wesley, Second Edition, 2004
12. William Perry, "Effective Methods of Software Testing", Third Edition, Wiley Publishing.

### **CLOUD AND BIG DATA LABORATORY**

L	T	P	C
0	0	4	2

**MC5511**

**OBJECTIVES:**

- Be exposed to tool kits for cloud and hadoop environment.
- Be familiar with migration of Virtual Machines from one node to another
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop Distributed File System(HDFS) to set up single and multi-node clusters.

**LIST OF EXPERIMENTS:**

Use Eucalyptus or Open Nebula or Open Stack or equivalent to set up the cloud and demonstrate

1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine
3. Install a C compiler in the virtual machine and execute a sample program.
4. Show the virtual machine migration based on the certain condition from one node to the other
5. Find procedure to install storage controller and interact with it
6. Find procedure to set up the one node Hadoop cluster.
7. Mount the one node Hadoop cluster using FUSE.
8. Write a word count program to demonstrate the use of Map - Reduce tasks.
9. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
10. K-means clustering using map reduce
11. Page Rank Computation

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Use the cloud and big data tool kits.
- Design and Implement applications on the Cloud environment.
- Set up and implement Hadoop clusters
- Use the map reduce tasks for various applications

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**SOFTWARE:**

Eucalyptus or Open Nebula or equivalent

**HARDWARE:**

Standalone desktops 30 Nos

MC5512

SOFTWARE TESTING LABORATORY

L	T	P	C
0	0	4	2

**OBJECTIVES:**

- To apply various testing techniques and to detect the errors in the software.
- To generate and apply the test cases using the automated testing tool.
- To learn the functionality of automated testing tools to apply in the specialized environment

**LIST OF EXPERIMENTS**

1. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
2. Install Selenium server and demonstrate it using a script in Java/PHP.
3. Write and test a program to login a specific web page.
4. Write and test a program to update 10 student records into table into Excel file.
5. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects)
6. Write and test a program to provide total number of objects present / available on the page
7. Write and test a program to get the number of list items in a list / combo box.
8. Write and test a program to count number of check boxes on the page checked and unchecked count

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Able to test the software by applying various testing techniques.
- Able to debug the project and to test the entire computer based systems at all levels.
- Able to test the applications in the specialized environment using various automation tools.
- Able to evaluate the web applications using bug tracking tools.
- Able to apply quality and reliability metrics to ensure the performance of the software

MC5001

SOFT COMPUTING

L	T	P	C
3	0	0	3

**OBJECTIVES:**

To learn the key aspects of Soft computing

To know about the components and building block hypothesis of Genetic algorithm.

To understand the features of neural network and its applications

To study the fuzzy logic components

To gain insight onto Neuro Fuzzy modeling and control.

To gain knowledge in machine learning through Support vector machines

**UNIT I**

**INTRODUCTION TO SOFT COMPUTING**

**9**

Evolution of Computing – Introduction to Artificial Intelligence – Example problems – tic – tac – toe – question answering – Turing test - Propositional and Predicate Calculus Rule Based knowledge Representation - Knowledge acquisition – Expert system – Introduction – Example – MYCIN - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics – Case study : Simple artificial intelligence programs in PROLOG for diagnosis of a disease

**UNIT II GENETIC ALGORITHMS 9**

Introduction, Building block hypothesis, working principle, Basic operators and terminologies such as individual, gene, encoding, fitness function and reproduction, Genetic modelling: Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, bitwise operator, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (Travelling Salesman Problem), Differences & similarities between GA & other traditional methods, Applications of GA.

**UNIT III NEURAL NETWORKS 9**

Machine learning using Neural Network, Adaptive Networks – Feed Forward Networks Defuzzification – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks – Case study : Identification and control of linear and nonlinear dynamic systems using MATLAB.

**UNIT IV FUZZY LOGIC 9**

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Defuzzification - Fuzzy Inference Systems – Mamdani Fuzzy Model – Takagi – Sugeno- Kang Fuzzy Model - Fuzzy Expert Systems – Fuzzy Decision Making - Case Study : implementation of fuzzy logic controller using MATLAB fuzzy logic toolbox.

**UNIT V NEURO-FUZZY MODELING 9**

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case Studies.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Implement machine learning through neural networks.
- Gain Knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.
- Write Genetic Algorithm to solve the optimization problem.
- Understand fuzzy concepts and develop a Fuzzy expert system to derive decisions.
- Able to Model Neuro Fuzzy system for data clustering and classification.

**REFERENCES:**

1. Amos Gilat, “ MATLAB : “An introduction with applications”, John Wiley & Sons Inc, 2011
2. A.E. Eiben and J.E. Smith “Introduction to Evolutionary Computing” Springer, 2003
3. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 2007
4. E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems: Soft Computing Perspectives, Advances in Fuzzy Systems - Applications and Theory", Vol. 7, River Edge, World Scientific, 1997
5. Elaine Rich, Kevin Knight, Shiva Shankar B. Nair, “Artificial Intelligence”, Tata McGraw hill Ltd, 2008
6. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995
7. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
8. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003

9. Kwang H.Lee, "First course on Fuzzy Theory and Applications", Springer-Verlag Berlin Heidelberg, 2005
10. Mitsuo Gen and Runwei Cheng, "Genetic Algorithms and Engineering Optimization", Wiley Publishers 2000
11. Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998
12. Ross Timothy J, Fuzzy Logic with Engineering Applications, Wiley India Pvt Ltd, New Delhi, 2010
13. S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2007

<b>MC5002</b>	<b>ACCOUNTING AND FINANCIAL MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the basic principles of Double entry system and preparation of balance sheet.
- To understand the process of estimating the cost of a particular product.
- To Prepare the estimate for various business activities such as purchase, sale, production and cash budgets
- To ensure decision making process of an organization.

**UNIT I FINANCIAL ACCOUNTING 9**  
 Meaning and Scope of Accounting-Principles-Concepts-Conventions-Accounting Standards-Final Accounts-Trail Balance-Trading Account-Profit and Loss Account-Balance Sheet-Accounting Ratio Analysis-Funds Flow Analysis-Cash Flow Analysis

**UNIT II ACCOUNTING 9**  
 Meaning-Objectives-Elements of Cost-Cost Sheet-Marginal Costing and Cost Volume Profit Analysis- Break Even Analysis-Applications-Limitations-Standard Costing and Variance Analysis-Material- Labor-Overhead-Sales-Profit Variances

**UNIT III BUDGETS AND BUDGETING CONTROL 9**  
 Budgets and Budgetary Control-Meaning-Types-Sales Budget-Production Budget-Cost of Production Budget-Flexible Budgeting-Cash Budget-Master Budget-Zero Base Budgeting-Computerized Accounting

**UNIT IV INVESTMENT DECISION AND COST OF CAPITAL 9**  
 Objectives and Functions of Financial Management-Risk-Return Relationship-Time Value of Money Concepts-Capital Budgeting-Methods of Appraisal-Cost of Capital Factors Affecting Cost of Capital- Computation for Each Source of Finance and Weighted Average Cost of Capital.

**UNIT V FINANCING DECISION AND WORKING CAPITAL MANAGEMENT 9**  
 Capital Structure-Factors Affecting Capital Structure-Dividend Policy-Types of Dividend Policy- Concepts of Working Capital-Working Capital Policies-Factors affecting Working Capital-Estimation of Working Capital Requirements

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Able to understand the balance sheet preparation and do analysis
- Able to understand the budget preparation and control of a company
- Helps to decide about the state of affairs of a particular firm / company.
- Ensures the preparation of fiscal policies of the organization.
- Ensures the factors to be considered in investment policies.

**REFERENCES:**

1. Aswat Damodaran, "Corporate Finance Thoery and Practice", JohnWiley & Sons, 2008
2. Brigham, Ehrhardt, "Financial Management Theory and Practice" 11th Edition, Cengage Learning, 2008
3. I.M.Pandey, "Management Accounting", Vikas Publishing House Pvt. Ltd., 3rd Edition, 2009
4. I.M.Pandey, "Financial Management", Vikas Publishing House Pvt. Ltd., 9th Edition, 2009
5. M.Y.Khan and P.K.Jain, "Financial Management, Text, Problems and Cases", Tata McGraw Hill, 5th Edition, 2008
6. S.N.Maheswari, "Financial and Management Accounting", Sultan Chand & Sons, 5 edition,2010
7. Srivatsava, Mishra, "Financial Management", Oxford University

<b>MC5003</b>	<b>SOFTWARE PROJECT MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To know of how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

**UNIT I SOFTWARE PROJECT MANAGEMENT CONCEPTS 9**  
Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- TQM, Six Sigma, Software Quality: defining software quality, ISO9126, External Standards.

**UNIT II SOFTWARE EVALUATION AND COSTING 9**  
Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.

**UNIT III SOFTWARE ESTIMATION TECHNIQUES 9**  
Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

**UNIT IV RISK MANAGEMENT 9**  
Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.



**UNIT V GLOBALIZATION ISSUES IN PROJECT MANAGEMENT 9**

Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management: Introduction – the effect of internet on project management – managing projects for the internet – effect on project management activities. Comparison of project management software’s: dot Project, Launch pad, openProj. Case study: PRINCE2.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Understand the activities during the project scheduling of any software application.
- Learn the risk management activities and the resource allocation for the projects.
- Can apply the software estimation and recent quality standards for evaluation of the software projects
- Acquire knowledge and skills needed for the construction of highly reliable software project
- Able to create reliable, replicable cost estimation that links to the requirements of project planning and managing.

**REFERENCES:**

1. Bob Hughes & Mike Cotterell, “Software Project Management”, Tata McGraw- Hill Publications, Fifth Edition 2012
2. Futrell , “Quality Software Project Management”, Pearson Education India, 2008
3. Gobalswamy Ramesh, “Managing Global Software Projects”, Tata McGraw Hill Publishing Company, 2003
4. Richard H.Thayer “Software Engineering Project Management”, IEEE Computer Society
5. S. A. Kelkar,” Software Project Management” PHI, New Delhi, Third Edition ,2013
6. [http://en.wikipedia.org/wiki/Comparison\\_of\\_project\\_management\\_software](http://en.wikipedia.org/wiki/Comparison_of_project_management_software)
7. [http://www.ogc.gov.uk/methods\\_prince\\_2.asp](http://www.ogc.gov.uk/methods_prince_2.asp)

**MC5004**

**SECURITY IN COMPUTING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the basics of cryptography
- learn to find the vulnerabilities in programs and to overcome them,
- know the different kinds of security threats in networks and its solution
- know the different kinds of security threats in databases and solutions available
- learn about the models and standards for security

**UNIT I ELEMENTARY CRYPTOGRAPHY 9**

Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms- Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures.

**UNIT II PROGRAM SECURITY 9**

Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Flaws .

**UNIT III SECURITY IN NETWORKS 9**  
Threats in networks – Virtual Private Networks – PKI – SSL – IPSec – Content Integrity – Access Controls – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

**UNIT IV SECURITY IN DATABASES 9**  
Security requirements of database systems – Reliability and Integrity in databases – Redundancy – Recovery – Concurrency/ Consistency – Monitors – Sensitive Data – Types of disclosures – Inference-finding and confirming sql injection.

**UNIT V SECURITY MODELS AND STANDARDS 9**  
Secure SDLC – Security architecture models – Bell-La Padula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Security Standards - ISO 27000 family of standards – NIST.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Apply cryptographic algorithms for encrypting and decryption for secure data transmission
- Understand the importance of Digital signature for secure e-documents exchange
- Understand the program threats and apply good programming practice
- Get the knowledge about the security services available for internet and web applications
- Understand data vulnerability and sql injection
- Gain the knowledge of security models and published standards

**REFERENCES:**

1. Education Charles P. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth Edition, Pearson, 2007
2. Michael Whitman, Herbert J. Mattord, “Management of Information Security”, Third Edition, Course Technology, 2010.
3. Michael Howard, David LeBlanc, John Viega, “24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them”, First Edition, Mc GrawHill Osborne Media, 2009.
4. Matt Bishop, “Computer Security: Art and Science”, First Edition, Addison- Wesley, 2002.
5. William Stallings, “Cryptography and Network Security : Principles and Practices”, Fifth Edition, Prentice Hall, 2010.

**OBJECTIVES:**

- To understand the basics of Ad-hoc & Sensor Networks
- To learn various fundamental and emerging protocols of all layers in ad-hoc network
- To study about the issues pertaining to major obstacles in establishment and efficient management of ad-hoc and sensor networks
- To understand the nature and applications of ad-hoc and sensor networks
- To understand various security practices and protocols of Ad-hoc and Sensor Networks

**UNIT I                    ADHOC NETWORKS FUNDAMENTALS & COMMUNICATION                    9**  
**PROTOCOLS**

Fundamentals Of WLANs – IEEE 802.11 Architecture - Self Configuration and Auto Configuration-issues in Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP Over Ad-Hoc Networks-TCP Protocol Overview - TCP and MANETs – Solutions for TCP Over Ad-Hoc Networks

**UNIT II                    ADHOC NETWORK ROUTING AND MANAGEMENT                    9**

Routing in Ad-Hoc Networks- Introduction -Topology based versus Position based Approaches – Proactive Routing - DSDV, WRP, TBRPF Reactive Routing – DSR,AODV, Hybrid Routing Approach ZRP, CBRP- Location services - DREAM – Quorums based Location Service – Forwarding Strategies – Greedy Packet Forwarding, LAR.

**UNIT III                    SENSOR NETWORK COMMUNICATION PROTOCOLS                    9**

Introduction – Architecture - Single Node Architecture – Sensor Network Design Considerations – Energy Efficient Design Principles for WSN's – Protocols for WSN – Physical Layer - Transceiver Design Considerations – MAC Protocols for wireless sensor network – IEEE 802.15.4 Zigbee – Link Layer and Error Control Issues - Routing Protocols – Gossiping and agent based unicast forwarding, Energy efficient unicast –Transport Protocols & QoS – Congestion Control Issues – Application specific Support – Target detection and tracking.

**UNIT IV                    SENSOR NETWORK MANAGEMENT AND PROGRAMMING                    9**

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time Synchronization - Localization and Positioning – Operating Systems and Sensor Network Programming – Sensor Network Simulators- Case study: Industrial automation and tsunami early warning system with wireless sensor networks.

**UNIT V                    ADHOC AND SENSOR NETWORK SECURITY                    9**

Security in Ad-Hoc and Sensor Networks – Key Distribution and Management – Software based Anti-tamper Techniques – Water Marking techniques – Defense against Routing Attacks - Secure Adhoc Routing Protocols – Broadcast Authentication WSN Protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

**Work with existing Ad-hoc and sensor network protocols and standards.**

- Create a Sensor network environment for different type of applications
- Design ad-hoc and sensor network architectures using QoS and Congestion control mechanisms

- Interpret the various control fields of the protocol in each layer
- Select appropriate routing algorithms for different network environments
- Program ad-hoc and sensor network for various applications
- Deploy security mechanisms in the wireless ad-hoc and sensor networks.

**REFERENCES:**

1. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006.
2. Amiya Nayak, Ivan Stojmenovic, : Wireless Sensor and Actuator Networks : Algorithm and Protocols for Scalable Coordination and Data communication John Wiley & Sons 2010
3. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", Second Edition, World Scientific Publishing, 2011.
4. C.Siva Ram Murthy and B.S.Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2011.
5. C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2007
6. Erdal Çayırıcı , Chunming Rong, "Security in Wireless Ad Hoc and Sensor Networks", John Wiley and Sons, 2009
7. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers, 2004.
8. Feng Zhao, Leonidas Guibas, " Wireless Sensor Networks : An information processing Approach " , Elsevier 2004.
9. Holger Karl, Andreas willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Inc .2007.
10. Kazem Sohraby, Daniel Minoli, Taieb Znati , Wireless Sensor Networks: Technology, Protocols and Applications, Wiley Interscience A John Wiley & sons, Inc., Publication 2007.
11. Walteneagus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks Theory and Practice", John Wiley and Sons, 2010

**MC5006**

**PROFESSIONAL ETHICS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To Understand the concepts of computer ethics in work environment.
- To understand the threats in computing environment
- To Understand the intricacies of accessibility issues
- To ensure safe exits when designing the software projects

**UNIT I                    COMPUTER ETHICS INTRODCUTION AND COMPUTER HACKING                    9**

A general Introduction – Computer ethics: an overview – Identifying an ethical issue – Ethics and law – Ethical theories - Professional Code of conduct – An ethical dilemma – A framework for ethical decision making - Computer hacking – Introduction – definition of hacking – Destructive programs – hacker ethics - Professional constraints – BCS code of conduct – To hack or not to hack? – Ethical positions on hacking.

**UNIT II                    ASPECTS OF COMPUTER CRIME AND INTELLECTUAL PROPERTY                    9**  
**RIGHTS**

Aspects of computer crime - Introduction - What is computer crime – computer security measures – Professional duties and obligations - Intellectual Property Rights – The nature of Intellectual property – Intellectual Property – Patents, Trademarks, Trade Secrets, Software Issues, Copyright - The extent and nature of software piracy – Ethical and professional issues – free software and open source code.

**UNIT III REGULATING INTERNET CONTENT, TECHNOLOGY AND SAFETY 9**

Introduction – In defence of freedom expression – censorship – laws upholding free speech – Free speech and the Internet - Ethical and professional issues - Internet technologies and privacy – Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk.

**UNIT IV COMPUTER TECHNOLOGIES ACCESSIBILITY ISSUES 9**

Introduction – Principle of equal access – Obstacles to access for individuals – professional responsibility - Empowering computers in the workplace – Introduction – computers and employment – computers and the quality of work – computerized monitoring in the work place – telecommuting – social, legal and professional issues - Use of Software, Computers and Internet-based Tools - Liability for Software errors - Documentation Authentication and Control – Software engineering code of ethics and practices – IEEE-CS – ACM Joint task force.

**UNIT V SOFTWARE DEVELOPMENT AND SOCIAL NETWORKING 9**

Software Development – strategies for engineering quality standards – Quality management standards – Social Networking – Company owned social network web site – the use of social networks in the hiring process – Social Networking ethical issues – Cyber bullying – cyber stalking – Online virtual world – Crime in virtual world - digital rights management - Online defamation – Piracy – Fraud.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.
- Develop a responsible attitude towards the use of computer as well as the technology.
- Able to envision the societal impact on the products/ projects they develop in their career
- Understanding the code of ethics and standards of computer professionals.
- Analyze the professional responsibility and empowering access to information in the work place.

**REFERENCES:**

1. Caroline Whitback, "Ethics in Engineering Practice and Research", Cambridge University Press, 2011.
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 2011.
3. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press, 1997.
4. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and professional issues in computing", Middlesex University Press, 2008.
5. Richard Spinello, "Case Studies in Information and Computer Ethics", Prentice Hall, 1997.
6. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet", 3rd Edition, Prentice Hall, 2008.
7. [http://www.infosectoday.com/Articles/Intro\\_Computer\\_Ethics.html](http://www.infosectoday.com/Articles/Intro_Computer_Ethics.html)

**OBJECTIVES:**

- To understand the basic concepts of health care system.
- To know about creating and maintaining health care information systems
- To ensure access of clinical information system on the fly
- To know social media analytics for health care data.
- To learn temporal data mining and visual data analytics for health care.

**UNIT I INTRODUCTION 9**

Introduction to health care information – Health care data quality – Health care information regulations, laws and standards.

**UNIT II HEALTH CARE INFORMATION SYSTEMS 9**

History and evolution of health care information systems – Current and emerging use of clinical information systems – system acquisition – System implementation and support.

**UNIT III INFORMATION TECHNOLOGY 9**

Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.

**UNIT IV MINING AND SOCIAL MEDIA ANALYTICS FOR HEALTH CARE DATA 9**

Resources – Terminology Acquisition and Management – Information Extraction – Text Mining Environments – Applications – Social Media Analysis for Public Health Research – Analysis of Social Media use in Healthcare

**UNIT V TEMPORAL DATA MINING AND VISUAL ANALYTICS FOR HEALTH CARE 9**

Association Analysis – Temporal Pattern Mining – Sensor Data Analysis – Introduction to Visual Analysis and Medical Data Visualization – Visual Analytics in Health care – Visual Analytics for Clinicians.

**TOTAL : 45 PERIODS****OUTCOMES:**

- Develop an understanding of basic research skills applicable to the design, evaluation and implementation of appropriate Healthcare Information Systems (HIS) ;
- Define and analyse the impact, strengths and weaknesses of various HIS in any healthcare settings
- Extract health care data in temporal data mining.
- Perform sensor data and visual data analytics.

**REFERENCES:**

1. Chandan K. Reddy, Charu C. Aggarwal, "Healthcare Data Analytics", CRC Press, Taylor & Francis Group, 2015.
2. Kevin Beaver, Healthcare Information Systems, Second edition Best Practices, CRC Press, 2002
3. Karen A Wager, Frances Wickham Lee, John P Glaser, " Managing Health Care Information Systems: A Practical Approach for Health Care Executives", John Wiley, 2 nd edition 2009.
4. Marion J. Ball Healthcare Information Management Systems: A Practical Guide Springer-Verlag GmbH, 1995

5. Marion J. Ball, Charlotte Weaver, Joan Kiel ,”Healthcare Information Management Systems: Cases, Strategies, and Solutions”, Springer, 2010, 3rd edition
6. Rudi Van De Velde and Patrice Degoulet, “Clinical Information Systems: A Component based approach”, Springer 2005

<b>MC5008</b>	<b>GEOLOGICAL INFORMATION SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- Understand the basic concepts of Geological information systems.
- To provide an exposure to spatial database structures and their utility in GIS.
- Understand the process of scanning, digitizing and georeferencing.
- To introduce the raster and vector geoprocessing capabilities of GIS.

**UNIT I                      SPATIAL DATA REPRESENTATION                      9**

GIS – Definition and related terminology- Digital representation of geospatial data – raster – vector – object oriented – geo database model-analysis.

**UNIT II                      DATA - DIGITIZATION AND PREPARATION                      9**

Data – Sources and types. Maps and scales – advantages and limitations. Coordinates, Datum and projection system. Raster data. Characteristics and file formats. Vector data characteristics. Scanner: Principles, On Screen Digitization-post scanning-importing- data editing . Linking digital databases: ODBC – GPS data integration.

**UNIT III                      RASTER DATA ANALYSIS                      9**

Raster Geospatial Data Analysis-Local operations: Reclassification, Logical and Arithmetic overlay operations – Neighbourhood operations: Aggregation, Filtering, Slope and Aspect map – Extended neighbourhood operations: - Statistical Analysis, Proximity, Connectivity operations, Buffering, Viewshed analysis – Regional operations: Area, Perimeter, Shape, Identification of region and Classification-output functions of Raster geoprocessing.

**UNIT IV                      VECTOR DATA PROCESSING                      9**

Non-topological analysis: Attribute database query, SQL, Summary statistics-statistical computation-calculation-quantification- Address geocoding, -Topological analysis Feature based topological functions-overlay-buffering- Layer based topological function- Reclassification, Aggregation, Overlay analysis- Point-in-polygon, Line-in-polygon, Polygon-on-polygon: Clip, Erase, Identity, Union, Intersection – Network based Geoprocessing – Output functions.

**UNIT V                      GIS MODELLING AND APPLICATIONS                      9**

Spatial indexing. Spatial modelling – External, Conceptual, Logical, Internal –GIS Modeling with case study- spatial data mining-DEM- introduction and applications.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Understand GIS concepts and spatial data representation.
- Able to design spatial data input in raster form as well as vector form.
- Understand vector data analysis and output functions.
- Understand raster data geo processing.
- Able to design a GIS model for real world problem.

**REFERENCES:**

1. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall, 2/E,2009
2. Kang-Tsung Chang ,Introduction to Geographic Information Systems, 6<sup>th</sup> Edition, McGraw-Hill Higher Education, 2011
3. Peter A. Burrough, Rachael A. McDonnell, Principles of GIS, 3<sup>rd</sup> Edition, Oxford University Press, 2015
4. Paul A. Longley, Mike Goodchild, David J. Maguire, Geographic Information Systems and Science, 4<sup>th</sup> Edition, John Wiley & Sons Inc ,2015
5. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1992

**MC5009**

**HUMAN RESOURCE MANAGEMENT**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the importance of human resources.
- To describe the steps involved in the human resource planning process
- To understand the stages of employee socialization and training needs.
- To know about the purposes of performance management systems and appraisal.
- To know the list of occupational safety and health administration enforcement priorities

**UNIT I UNDERSTANDING HRM WITH LEGAL & ETHICAL CONTEXT 9**  
 Introduction- Importance of HRM – functions – Structure of HRM Department-Trends and opportunities – External Influences Affect HRM- HRM in global environment – The Changing World of Technology- HR & Corporate Ethics – Equal Employment Opportunities -Laws Affecting discriminatory practices – Enforcing Equal Opportunity Employment-Discipline & Employee Rights.

**UNIT II STAFFING, RECRUITING AND FOUNDATIONS OF SELECTION 9**  
 Introduction – An Organizational Framework- Job analysis -Methods -Purpose– Recruiting Goals – Recruiting Sources – Recruiting A Global Perspective- Selection Process – Selection from Global Perspective- job offers – Avoiding hiring mistakes - key element for successful predictors.

**UNIT III TRAINING AND DEVELOPMENT 9**  
 Introduction – Socialization Process-Purpose of New employee orientation, Employee training- Employee Development– Organization development Calm Waters Metaphor – White-Water Rapids Metaphor – Evaluating training and Development Effectiveness-international training and development issues – Career Development -Value for organization and individual – mentoring and coaching – traditional career stages.

**UNIT IV PERFORMANCE EVALUATION, REWARDS AND BENEFITS 9**  
 Appraisal process – methods – factors distort appraisal – team appraisal – international appraisal –rewards –Theories of motivation - compensation administration – job evaluation and pay structure – special cases of compensation – executive compensation programs – employee benefits Voluntary Benefits- International Compensation.



**UNIT V SAFE AND HEALTHY WORK ENVIRONMENT****9**

Occupational safety and health act -Contemporary Health and Safety Issues –Employee assistance program – International Safety & Health -labor management - employee unions – labor legislation- Unionizing Employees- Collective Bargaining.

**TOTAL : 45 PERIODS****OUTCOMES:**

- Identify the primary external influences affecting HRM.
- Outline the components and the goals of staffing, training and development.
- Understand the selection procedure in various organizations.
- Understand the practices used to retain the employees and able to evaluate their performance.
- Able to identify the stress and the cause of burn out

**REFERENCES:**

1. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India, 2001
2. Decenzo and Robbins, Human Resource Management, Wilsey, 10th edition, 2010
3. Dessler Human Resource Management, Pearson Education Limited, 2002
4. Human Resource Management, Eugence Mckenna and Nic Beach, Pearson Education Limited, 2002
5. Ivancevich, Human Resource Management, McGraw Hill 2002.
6. Mamoria C.B. and Mamoria S. Personnel Management, Himalaya Publishing Company, 1997.
7. Wayne Cascio, Managing Human Resource, McGraw Hill, 1998.

**MC5010**

**INTERNET OF THINGS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario

**UNIT I INTRODUCTION TO IoT 9**

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific Iots - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

**UNIT II IoT ARCHITECTURE 9**

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

**UNIT III IoT PROTOCOLS 9**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

**UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO 9**

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

**UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS 9**

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

**TOTAL :45 PERIODS**

**OUTCOMES:**

**Upon completion of the course, the student should be able to:**

- Analyze various protocols for IoT
- Develop web services to access/control IoT devices.
- Design a portable IoT using Rasperry Pi
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario

## REFERENCES:

1. Arshdeep Bahga, Vijay Madiseti, "Internet of Things – A hands-on approach", Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012

**MC5011**

**SEMANTIC WEB**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## OBJECTIVES:

- To learn the importance of semantic web.
- To appreciate the merits of semantic web over traditional web.
- To know the methods to discover, classify and build ontology for more reasonable results in searching.
- To learn and appreciate RDF and its taxonomy.
- To describe OWL and its usage in semantic web.
- To implement applications that can access, use and manipulate the ontology

## **UNIT I INTRODUCTION 9**

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies – Semantic Modeling -Potential of semantic web solutions and challenges of adoption.

## **UNIT II ONTOLOGICAL ENGINEERING 9**

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts,terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions–Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building –Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Developmentprocess and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning.

## **UNIT III DESCRIBING WEB RESOURCES 9**

RDF Overview-The basic elements of RDF-RDF triples-Fundamental rules of RDF-Aggregation and distributed information-RDF tools-RDFS, Taxonomy, and Ontology-Need for RDFS-Core elements of RDFS .

## **UNIT IV WEB ONTOLOGY LANGUAGE 9**

Requirements for Ontology Languages-OWLSublanguages-Description of the OWL Language-Layering of OWL-Examples for OWL-OWL in OWL-Namespaces, Classes of Classes, Class Equivalence, Building Classes from Other Classes, Restricting Properties of Classes.

**UNIT V REAL-WORLD EXAMPLES AND APPLICATIONS 9**

Swoogle- architecture, usage and examples-FOAF: Friend of a Friend-Basic FOAF vocabulary and examples-Applications-Information publishing, data integration, knowledge management, e-learning, web-services.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Understand semantic web basics, architecture and technologies.
- Compare conventional web with semantic web.
- Able to understand the semantic relationships among the data elements using Resource Description Framework (RDF)
- Able to design and implement real-world applications that “discovers” the data and/or other web services via the semantic web

**REFERENCES:**

1. Grigoris Antoniou, Frank Van, “Semantic Web Primer”, MIT Press
2. Karin K. Breitman, Marco Antonio Casanova and Walter Truszkowski, “Semantic Web Concepts: Technologies and Applications”, Springer, 2007
3. LiyangYu , “Introduction to the Semantic Web and Semantic web services” Chapman & Hall/CRC, Taylor & Francis group, 2007
4. Peter Mika, “Social networks and the SemanticWeb”, Springer, 1st edition 2007.
5. Robert M. Colomb, “Ontology and the Semantic Web”, Volume 156 ,Frontier in Artificial Intelligence and Applications, IOS Press, 2007

<b>MC5012</b>	<b>SERVICE ORIENTED ARCHITECTURE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To learn XML concepts and exposed to build applications based on XML
- To gain knowledge about SOAP, HTTP and UDDI to create web services
- To understand the SOA architecture and principles of Service Oriented Architecture.
- To learn about the role of SOA in J2EE, .NET and web services.
- To know about the Cloud Computing architecture and services.

**UNIT I XML AND WEB SERVICES 9**

XML structure – Elements – Creating Well-formed XML - Name Spaces – Schema Elements, Types, Attributes – XSL Transformations – Parser – Web Services Overview – Architecture.

**UNIT II WSDL, SOAP and UDDI 9**

WSDL - Overview Of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure – Intermediaries – Actors – Design Patterns And Faults – SOAP With Attachments – UDDI.

**UNIT III SOA BASICS 9**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation – Service Layers.

**UNIT IV SOA in J2EE and .NET 9**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) – JAX-RS SOA support in .NET – ASP.NET web services.

**UNIT V CLOUD COMPUTING 9**

Vision of Cloud computing – Cloud Definition – Characteristics and Benefits – Virtualization – Cloud computing Architecture – Cloud Reference Model, Types of Clouds – Cloud Platforms in Industry.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Able to know the structure of XML and to design and store data in XML
- Able to apply SOAP , HTTP and UDDI services in the web applications.
- Able to apply SOA architecture and the underlying design principles for the web projects
- Able to understand the role of SOA in J2EE and .NET.
- Able to know the cloud computing architecture and the types of clouds

**REFERENCES**

1. Dan woods and Thomas Mattern, “Enterprise SOA designing IT for Business Innovation”, O’REILLY, First Edition, 2006.
2. Frank. P. Coyle, “XML, Web Services And The Data Revolution”, Pearson Education, 2002
3. Heather Williamson, “XML, The Complete Reference”, McGraw Hill Education, 2012.
4. Newcomer, Lomow, “Understanding SOA with Web Services”, Pearson Education, 2009.
5. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education, 2013.
6. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services. An Architect’s Guide”, Pearson Education, 2009
7. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2008.

<b>MC5013</b>	<b>GAME PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To get subsequent understanding of game design and development, which includes the processes, mechanics, issues in game design, game engine development, modeling, techniques, handling situations, and logic.
- To create interactive games

**UNIT I GRAPHICS FOR GAME PROGRAMMING 9**

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation.

**UNIT II GAME DESIGN PRINCIPLES 9**  
Game Logic, Game AI, Path Finding, Game Theory, Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection.

**UNIT III GAMING ENGINE DESIGN 9**  
Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics.

**UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9**  
Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity.

**UNIT V GAME DEVELOPMENT 9**  
Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Illustrate an understanding of the concepts behind game programming techniques.
- Implement game programming techniques to solve game development tasks.
- Construct a basic game engine using open-source programming libraries.

**REFERENCES:**

1. Andy Harris, "Beginning Flash Game Programming For Dummies", For Dummies; Updated Edition, 2005.
2. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" Morgan Kaufmann, 2nd Edition, 2006
3. Dino Dini, "Essential 3D Game Programming", Morgan Kaufmann, 1st Edition, 2012
4. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall 1st Edition, 2006
5. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011
6. Jason Gregory, "Game Engine Architecture", A K Peters, 2009.
7. JungHyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 1st Edition, 2011
8. Mike McShaffry, "Game Coding Complete", 3<sup>rd</sup> Edition, Charles River Media, 2009.
9. Jonathan S. Harbour, "Beginning Game Programming", Course Technology PTR, 3rd Edition, 2009
10. Jeannie Novak, "Game Development Essentials", 3rd Edition, Delmar Cengage Learning, 2011.
11. John Hattan, "Beginning Game Programming: A GameDev.net Collection", Course Technology PTR, 1st Edition, 2009
12. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, "Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer", 1st Edition, Wiley, 2007.
13. Roger E. Pedersen, "Game Design Foundations", Edition 2, Jones & Bartlett Learning, 2009.
14. Scott Rogers, "Level Up!: The Guide to Great Video Game Design", Wiley, 1st Edition, 2010.

**OBJECTIVES:**

- To understand the fundamentals of computational intelligence
- To know about the various knowledge representation methods
- To understand the features of neural network and its implementation
- To study about various data clustering methods
- To gain knowledge in evolutionary computation and neuro – fuzzy systems

**UNIT I INTRODUCTION TO COMPUTATIONAL INTELLIGENCE 9**

Evolution of Computing – Introduction to Artificial Intelligence — Turing test - Propositional and Predicate Calculus - Expert system – Introduction – MYCIN – PROSPECTOR – Robotics – From Conventional AI to Computational Intelligence – Issues in Artificial Intelligence - Machine Learning Basics – Intelligence of ants - Artificial Life – BOTS – Comparison of various expert systems

**UNIT II KNOWLEDGE REPRESENTATION METHODS 9**

Introduction – rough sets – set approximation – analysis of decision tables – Application of LERS software – Type – 1 fuzzy sets – definition – basic operations on fuzzy sets – The extension principle – Triangular norms and negations – Fuzzy Relations – Approximate reasoning – fuzzy Inference systems – Application of fuzzy sets – Type – 2 fuzzy sets – Footprint of uncertainty – basic operations on fuzzy sets – Type – 2 fuzzy relations – Type reduction – type 2 fuzzy Inference systems – Comparison of Fuzzy Inference systems.

**UNIT III NEURAL NETWORKS AND LEARNING ALGORITHMS 9**

Machine learning using Neural Network, Adaptive Networks – Feed Forward Networks Defuzzification – Supervised Learning Neural Networks – backpropagation Algorithm – Levenberg- Marquardt algorithm – Recurrent neural networks – BAM networks - Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Case Study : Neural Network explanation facility.

**UNIT IV DATA CLUSTERING METHODS AND ALGORITHMS 9**

Introduction – Hard and fuzzy partitions – Distance Measures – Hard C- Means algorithm – Fuzzy C- Means algorithm – Possibilistic C- Means algorithm - Fuzzy Maximum Likelihood Estimates (FMLE) algorithm – Neuro Fuzzy systems - Mamdani Fuzzy Model – modelling problems - - Logical type - Takagi – Sugeno- Kang Fuzzy Model – comparison of neuro – fuzzy systems – Model evaluation criteria, complexity. Fuzzy Expert Systems – Fuzzy Decision Making – Case study: EEG spike detection.

**UNIT V EVOLUTIONARY COMPUTATION AND NEURO-FUZZY SYSTEMS 9**

Evolutionary computation – GA – Particle Swarm Optimization – Ant colony Optimization – Artificial Immune Systems – Honey- Bee Optimization – Memetic Algorithms - Optimization problems – TSP, JSSP - evolutionary algorithms – Flexible neuro – fuzzy systems – Introduction – soft triangular norms – Parameterized triangular norms – Adjustable triangular norms – Flexible systems – Learning algorithms – Simulation examples –Hybrid Techniques - Neuro-Fuzzy Control – Case study : Evolutionary medical diagnosis

A simple project using any one of the above domains with tools like MATLAB, Python 2 and Weka tool 3.7 .

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Implement computational intelligence through applications
- Understand knowledge representation methods and apply approximate reasoning
- Apply evolutionary algorithm to solve the optimization problem
- Gain research Knowledge to develop applications using hybrid systems
- Able to Model Flexible Fuzzy Inference systems for dynamic nonlinear data sets

**REFERENCES:**

1. A.E. Eiben and J.E. Smith “Introduction to Evolutionary Computing” Springer, 2003
2. Andries Engelbrecht, Computational Intelligence: An Introduction, 2007
3. Amos Gilat, “ MATLAB : “An introduction with applications”, John Wiley & Sons Inc, 2011.
4. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 2007
5. Elaine Rich, Kevin Knight, Shiva Shankar B. Nair, “Artificial Intelligence”, Tata McGraw hill Ltd, 2008.
6. E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems: Soft Computing Perspectives, Advances in Fuzzy Systems - Applications and Theory", Vol. 7, River Edge, World Scientific, 1997.
7. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995
8. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003
9. Kwang H.Lee, “First course on Fuzzy Theory and Applications”, Springer–Verlag Berlin Heidelberg, 2005
10. Kaluza, B. INSTANT Weka How-to, Packt Publishing, 2013.
11. Leszek Rutkowski, “ Computational Intelligence – Methods and Techniques”, Springer, 2008.
12. Mitsuo Gen and Runwei Cheng, “Genetic Algorithms and Engineering Optimization”, Wiley, Publishers 2000.
13. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998
14. Ross Timothy J, Fuzzy Logic with Engineering Applications, Wiley India Pvt Ltd, New Delhi, 2010.
15. S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.

<b>CP5015</b>	<b>PRINCIPLES OF PROGRAMMING LANGUAGES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand and describe syntax and semantics of programming languages.
- To understand Data, Data types, and Bindings.
- To learn the concepts of functional and logical programming.
- To explore the knowledge about concurrent Programming paradigms.



**UNIT I                    ELEMENTS OF PROGRAMMING LANGUAGES                    9**

Reasons for studying, concepts of programming languages, Language Evaluation Criteria, influences on Language design, Language categories. Programming Language Implementation – Compilation, Hybrid Implementation, Pure Interpretation and Virtual Machines. Describing Syntax and Semantics -Introduction - The General Problem of Describing Syntax-Formal Methods of Describing Syntax - Attribute Grammars - Describing the Meanings of Programs: Dynamic Semantics.

**UNIT II                    DATA TYPES-ABSTRACTION                    9**

Introduction - Primitive Data Types- Character String Types- User-Defined Ordinal Types- Array types- Associative Arrays-Record Types- Tuple Types-List Types -Union Types - Pointer and Reference Types -Type Checking- Strong Typing -Type Equivalence - Theory and Data Types-Variables-The Concept of Binding -Scope - Scope and Lifetime - Referencing Environments - Named Constants- The Concept of Abstraction- Parameterized Abstract Data Types- Encapsulation Constructs- Naming Encapsulations

**UNIT III                    FUNCTIONAL PROGRAMMING                    9**

Introduction- Mathematical Functions- Fundamentals of Functional Programming Languages- The First Functional Programming Language: LISP- An Introduction to Scheme- Common LISP- Haskell-F# - ML : Implicit Types- Data Types- Exception Handling in ML. Functional Programming with Lists- Scheme, a Dialect of Lisp- The Structure of Lists- List Manipulation- A Motivating Example: Differentiation- Simplification of Expressions- Storage Allocation for Lists.

**UNIT IV                    LOGIC PROGRAMMING                    9**

Relational Logic Programming- Syntax- Basics- Facts- Rules- Syntax- Operational Semantics- Relational logic programs and SQL operations- Logic Programming- Syntax-Operational semantics- Data Structures-Meta-tools: Backtracking optimization (cuts); Unify; Meta-circular interpreters- The Origins of Prolog- Elements- of Prolog-Deficiencies of Prolog- Applications of Logic Programming.

**UNIT V                    CONCURRENT PROGRAMMING                    9**

Parallelism in Hardware- Streams: Implicit Synchronization-Concurrency as Interleaving- Liveness Properties- Safe Access to Shared Data- Concurrency in Ada- Synchronized Access to Shared Variables- Synthesized Attributes- Attribute Grammars- Natural Semantics- Denotational Semantics -A Calculator in Scheme-Lexically Scoped Lambda Expressions- An Interpreter-Recursive Functions.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**Upon completion of this course, the students will be able to**

- Describe syntax and semantics of programming languages
- Explain data, data types, and basic statements of programming languages
- Design and implement subprogram constructs, Apply object - oriented, concurrency, pro
- and event handling programming constructs
- Develop programs in LISP, ML, and Prolog.

**REFERENCES:**

1. Ghezzi, "Programming Languages", 3rd Edition, John Wiley, 2008
2. John C. Mitchell, "Concepts in Programming Languages", Cambridge University Press, 2004.
3. Louden, "Programming Languages", 3rd Edition, 2012.
4. Ravi Sethi, "Programming Languages: Concepts and Constructs", 2nd Edition, Addison Wesley, 1996.
5. Robert .W. Sebesta, "Concepts of Programming Languages", 10th Edition, Pearson Education, 2002.

**ANNA UNIVERSITY, CHENNAI**

**REGULATIONS 2013**

**CREDIT SYSTEM**

**AFFILIATED COLLEGES**

**POST-GRADUATE PROGRAMMES**

The following Regulations is applicable to the students admitted to M.E / M.Tech., M.C.A and M.B.A. Programmes at all Engineering Colleges affiliated to Anna University, Chennai (other than Autonomous Colleges) and to all the University Colleges of Engineering of Anna University, Chennai from the academic year 2013-2014.

**1 PRELIMINARY DEFINITIONS AND NOMENCLATURE**

In these Regulations, unless the context otherwise requires:

- i. **“Programme”** means Post graduate Degree Programme e.g. M.E., M.Tech. Degree Programme.
- ii. **“Branch”** means specialization or discipline of M.E. / M.Tech. Degree Programme like “Structural Engineering”, “Engineering Design”, etc.
- iii. **“Course”** means Theory or Practical subject that is normally studied in a semester, like Applied Mathematics, Advanced Thermodynamics, etc.
- iv. **“Director, Academic Courses”** means the authority of the University who is responsible for all academic activities of the University for implementation of relevant Rules and Regulations.
- v. **“Chairman”** means the Head of the Faculty.
- vi. **“Head of the Department”** means Head of the Department concerned.
- vii. **“Head of the Institution”** means the Principal of a College / Institution who is responsible for all academic activities of that College / Institution and for implementation of relevant Rules and Regulations.
- viii. **“Controller of Examinations”** means the Authority of the University who is responsible for all activities of the University Examinations.
- ix. **“University”** means ANNA UNIVERSITY, CHENNAI.

  
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## **2 PROGRAMMES OFFERED, MODES OF STUDY AND ADMISSION REQUIREMENTS**

### **2.1 P.G. PROGRAMMES OFFERED:**

1. M.E
2. M.Tech.
3. M.B.A.
4. M.C.A.

### **2.2 MODES OF STUDY:**

#### **2.2.1 Full-Time:**

Candidates admitted under 'Full-Time' should be available in the College / Institution during the entire duration of working hours (From Morning to Evening on Full-Time basis) for the curricular, co-curricular and extra-curricular activities assigned to them.

The Full-Time candidates should not attend any other Full-Time programme(s) / course(s) or take up any Full-Time job / Part-Time job in any Institution or Company during the period of the Full-Time programme. Violation of the above rules will result in cancellation of admission to the PG programme.

#### **2.2.2 Part-Time – Day Time Mode:**

This mode of study is applicable to those candidates admitted under sponsored category (Teacher candidates only). In this mode of study, the candidates are required to attend classes along with Full-Time students for the required number of courses and complete the programme in three years.

**2.2.3** Conversion from one mode of study to the other is not permitted.

### **2.3 ADMISSION REQUIREMENTS:**

**2.3.1** Candidates for admission to the first semester of the Post-Graduate Degree Programme shall be required to have passed an appropriate Under-Graduate Degree **Examination of Anna University** or equivalent as specified under qualification for admission as per the Tamil Nadu Common Admission (TANCA) criteria.

**Note:** TANCA releases the updated criteria during the admissions every academic year. Admission shall be offered only to the candidates who possess the qualification prescribed against each programme. Any other relevant qualification which is not prescribed against each programme shall be considered for equivalence by the committee constituted for the purpose. Admission to such degrees shall be offered only after obtaining equivalence to such degrees.

**2.3.2** However, the Syndicate of the University may decide to restrict admission in any particular year to candidates having a subset of qualifications prescribed at the time of admission.

- 2.3.3** 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 Syndicate of the University from time to time.
- 2.3.4** Eligibility conditions for admission such as the class obtained, the number of attempts in qualifying examination and physical fitness will be as prescribed by the Syndicate of the University from time to time.
- 2.3.5** All Part-Time (Day-Time mode) candidates should satisfy other conditions regarding Experience, Sponsorship etc. that may be prescribed by the Syndicate from time to time.

### **3 DURATION AND STRUCTURE OF THE PROGRAMMES:**

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

<b>Programme</b>	<b>Min. No. of Semesters</b>	<b>Max. No. of Semesters</b>
M.E. / M.Tech. (Full-Time)	4	8
M.E. / M.Tech. (Part Time)	6	12
M.C.A. (Full Time)	6	12
M.B.A. (Full Time)	4	8
M.B.A. (Part Time)	6	12

- 3.2** Every **Programme** will have a curriculum and syllabus consisting of core courses, elective courses and project work. The Programme may also include seminar, practical, practical / Industrial training, Summer project if they are specified in the curriculum.
- 3.3** The Curriculum and Syllabi of all the P.G. Programmes shall be approved by the Academic Council of Anna University. The number of Credits to be earned for the successful completion of the programme shall be as specified in the Curriculum of the respective specialization of the P.G. Programme
- 3.4** Each semester shall normally consist of 90 working days or 350 periods of each 50 minutes duration, for full-time mode of study (400 Periods for M.B.A.) or 200 periods for part-time mode of study. The Head of the Institution shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught. For the purpose of calculation of attendance requirement for writing the end semester examinations (as per clause 9) by students, following method shall be used.

$$\text{Percentage of Attendance} = \frac{\text{Total no. of periods attended in all the courses per semester}}{(\text{No.of periods / week as prescribed in the curriculum}) \times 15 \text{ taken together for all courses of the semester}} \times 100$$

End Semester Examinations conducted by the University will be scheduled after the last working day of the semester.

- 3.5** The minimum prescribed credits required for the award of the degree shall be within the limits specified below:

<b>PROGRAMME</b>	<b>PRESCRIBED CREDIT RANGE</b>
M.E. / M.Tech.	65 to 75

<b>Programme</b>	<b>Prescribed Credits</b>
M.C.A.	119
M.B.A.	96

- 3.6** Credits will be assigned to the courses for different modes of study as given below:

- 3.6.1** The following will apply to all modes of P.G. Programmes.

- One credit for each lecture period allotted per week
- One credit for each tutorial period allotted per week
- One credit for each seminar/practical session/project work of two periods designed per week (2 credits for 3 or 4 periods of practical).

- 3.6.2** Two weeks of practical training in any industrial / research laboratory correspond to one credit, and is applicable to all modes of study.

- 3.6.3** Practical training or Industrial Training if specified in the Curriculum should be organized by the Head of the Department / Institution for a duration not exceeding 4 weeks.

- 3.6.4** Summer project if specified in the Curriculum, should be organized by the Head of the Department / Institution for a duration not exceeding 6 weeks.

- 3.7** The electives from the curriculum are to be chosen with the approval of the Head of the Department. A candidate may be permitted by the Head of the Department to choose a maximum of two electives from other P.G. Programmes offered in the Department /any other Department of the Institutions during the period of his/her study, provided the Head of the Department offering such course also approves such requests subject to no clash in the time-table for the lecture classes of both departments.

- 3.8** The medium of instruction shall be English for all courses, examinations, seminar presentations and project thesis/dissertation reports.

#### **4. PROJECT WORK**

- 4.1** The project work for M.E. / M.Tech. Programmes consist of Phase-I and Phase-II. The Phase-I is to be undertaken during III semester and Phase-II, which is a continuation of Phase-I is to be undertaken during IV semester.

- 4.2** In case of candidates of M.E. / M.Tech. Programmes not completing Phase-I of project work successfully, the candidates can undertake Phase-I again in the subsequent semester. In such cases the candidates can enroll for Phase-II, only after successful completion of Phase-I.

- 4.3** Project work shall be carried out under the supervision of a “qualified teacher” in the Department concerned. In this context “qualified teacher” means the faculty member possessing (i) PG degree with a minimum of 3 years experience in teaching or (ii) Ph.D. degree.
- 4.4** A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department Concerned. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a joint supervisor 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.
- 4.5** The Project work (Phase II in the case of M.E/M.Tech.) shall be pursued for a minimum of 16 weeks during the final semester.
- 4.6** The deadline for submission of final Project Report is 60 calendar days from the last working day of the semester in which project / thesis / dissertation is done. However, the Phase-I of the Project work in the case M.E. / M.Tech. Programmes shall be submitted within a maximum period of 30 calendar days from the last working day of the semester as per the academic calendar published by the University.

## **5 EVALUATION OF PROJECT WORK**

The evaluation of Project Work for Phase-I & Phase-II in the case of M.E. / M.Tech. and project work of M.B.A and M.C.A shall be done independently in the respective semesters and marks shall be allotted as per the weightages given in Clause 5.1.

- 5.1** There shall be three assessments (each 100 marks) during the Semester by a review committee. The Student shall make presentation on the progress made before the Committee. The Head of the Institution shall constitute the review committee for each branch of study. The total marks obtained in the three assessments shall be reduced to 20 marks and rounded to the nearest integer (as per the Table given below). There will be a vice-voce Examination during End Semester Examinations conducted by a Committee consisting of the supervisor, one internal examiner and one external examiner. The internal examiner and the external examiner shall be appointed by the Controller of Examination. The distribution of marks for the internal assessment and End semester examination is given below:

<b>Internal Assessment (20 Marks)</b>			<b>End Semester Examination (80 Marks)</b>			
<b>Review - I</b>	<b>Review - II</b>	<b>Review - III</b>	<b>Thesis Submission (30 Marks)</b>	<b>Viva – Voce (Rounded to 50 Marks)</b>		
			External Examiner	Internal Examiner	External Examiner	Supervisor Examiner
5	7.5	7.5	30	15	20	15

- 5.2** The Project Report prepared according to approved guidelines as given by Director, Academic Courses and duly signed by the supervisor(s) and the Head of the Department concerned shall be submitted to the Head of the Institution.
- 5.3** If the candidate fails to obtain 50% of the internal assessment marks in the Phase–I and Phase–II / final project, he/she will not be permitted to submit the report for that particular semester and has to re-enroll for the same in the subsequent semester.

If a candidate fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester. This applies to both Phase–I and Phase–II in the case of M.E. / M.Tech. Project Work and the Final Project work of M.B.A. / M.C.A.

If a candidate fails in the end semester examinations of Phase–I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the End semester examination of Phase–II of Project work of M.E. / M.Tech. or the Final Project work of M.B.A. / M.C.A, he/she shall resubmit the Project Report within 60 days from the date of declaration of the results. The resubmission of a project report and subsequent viva-voce examination will be considered as reappearance with payment of exam fee. For this purpose the same Internal and External examiners shall evaluate the resubmitted report.

- 5.3.1** A copy of the approved Project Report after the successful completion of viva-voce examinations shall be kept in the library of the college / institution.
- 5.3.2** Practical / Industrial Training, Summer Project if specified in the Curriculum shall not exceed the maximum duration of 4 weeks and should be organized by the Head of the Department for every student.
- 5.3.3** At the end of Practical / Industrial Training, Summer Project the candidate shall submit a certificate from the organization where he/she has undergone training and also a brief report. The evaluation for 100 marks will be carried out internally based on this report and a Viva-Voce Examination will be conducted by a Departmental Committee constituted by the Head of the Institution. Certificates submitted by the students shall be attached to the mark list sent by the Head of the Institution to the Controller of Examination.

## **6 CLASS ADVISER**

There shall be a class advisor for each class. The class advisor will be one among the (course-instructors) of the class. He / She will be appointed by the Head of the department concerned. The class advisor is the ex-officio member and the Convener of the class committee. The responsibilities for the class advisor shall be:

- To act as the channel of communication between the HoD and the students of the respective class.
- To collect and maintain various statistical details of students.
- To help the chairperson of the class committee in planning and conduct of the class committee meetings.



- To monitor the academic performance of the students including attendance and to inform the class committee.
- To attend to the students' welfare activities like awards, medals, scholarships and industrial visits.

## **7 CLASS COMMITTEE**

**7.1** A Class Committee consists of teachers of the concerned class, student representatives and a chairperson who is not teaching the class. It is like the 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching-learning process. The functions of the class committee include:

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the programme and the details of rules therein.
- Informing the student representatives, the "academic schedule" including the dates of assessments and the syllabus coverage for each assessment period.
- Informing the student representatives, the details of regulations regarding the weightage used for each assessment. In the case of practical courses (laboratory / project work / seminar etc.) the breakup of marks for each experiment/ exercise/ module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of improving the Students Performance
- Identifying the weak students, if any, in any specific subject and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students as frequently as possible.

**7.2** The class committee for a class under a particular programme is normally constituted by the Head of the Department. However, if the students of different programmes are mixed in a class, the class committee is to be constituted by the Head of the Institution.

**7.3** The class committee shall be constituted on the first working day of any semester or earlier.

**7.4** At least 2 student representatives (usually 1 boy and 1 girl) shall be included in the class committee.

**7.5** The chairperson of the class committee shall invite the Class adviser(s) and the Head of the Department to the meeting of the class committee.

**7.6** The Head of the Institution may participate in any class committee of the institution.

**7.7** The Chairperson of the Class Committee is required to prepare the minutes of every meeting, submit the same to the Head of the Institution within two days of the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the management by the Head of the Institution.

- 7.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester in order to inform the students about the nature and weightage of assessments within the framework of the Regulations. Two or three subsequent meetings may be held at suitable intervals. During these meetings the student members, representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

## 8 COURSE COMMITTEE FOR COMMON COURSES

Each common 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 Assessment Test(s).

## 9 ATTENDANCE REQUIREMENTS FOR COMPLETION OF A SEMESTER

- 9.1 A candidate who has fulfilled the following conditions shall be deemed to have satisfied the attendance requirements for completion of a semester.

Ideally every student is expected to attend all classes and earn 100% attendance. However in order to allow provision for certain unavoidable reasons such as prolonged hospitalization / accident / specific illness the student is expected to earn a minimum of 75% attendance to become eligible to write the End-Semester Examinations.

Therefore, every student shall secure not less than 75% of overall attendance in that semester as per clause 3.4.

- 9.2 However, a candidate who secures overall attendance between 65% and 74% in that current semester due to medical reasons (prolonged hospitalization / accident / specific illness / participation in sports events) may be permitted to appear for the current semester examinations subject to the condition that the candidate shall submit the medical certificate / sports participation certificate to the Head of the Institution. The same shall be forwarded to the Controller of Examinations for record purposes.

- 9.3 Candidates who could secure less than 65% overall attendance and **Candidates who do not satisfy the clauses 9.1 & 9.2** will not be permitted to write the end-semester examination of that current semester and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

## **10 PROCEDURES FOR AWARDING MARKS FOR INTERNAL ASSESSMENT(IA)**

The maximum marks assigned to different courses shall be as given below:  
Each of the theory and practical courses (including project work) shall carry a maximum of 100 marks of which 20 marks will be through internal assessment and the End Semester Examination (ESE) will carry 80 marks.

**10.1** The marks for the continuous assessment shall be awarded as per the procedure given below:

### **(i) Theory Courses:**

Three tests each carrying 100 marks shall be conducted during the semester by the Department / College concerned. The total marks obtained in all tests put together out of 300, shall be proportionately reduced for 20 marks and rounded to the nearest integer (This also implies equal weightage to all the three tests).

### **(ii) Practical Courses:**

The maximum marks for Internal Assessment shall be 20 in case of practical courses. Every practical exercise / experiment shall be evaluated based on conduct of experiment / exercise and records maintained. There shall be at least one test. The criteria for arriving at the Internal Assessment marks of 20 is as follows: 75 marks shall be awarded for successful completion of all the prescribed experiments done in the Laboratory and 25 marks for the test. The total mark shall be reduced to 20 and rounded to the nearest integer.

### **(iii) Theory Courses with Laboratory component:**

The maximum marks for Internal Assessment shall be 20 in case of theory courses with Laboratory component. For a theory course with Laboratory component, there shall be three assessments: the first two assessments (each with a maximum of 100 marks) will be from theory portions and the third assessment (maximum marks 100) will be for laboratory component. The sum of marks of all three assessments shall be reduced to 20 marks and rounded to the nearest integer.

### **(iv) Seminar / Professional Practices / Case Study:**

The seminar / Case study is to be considered as purely INTERNAL (with 100% internal marks only). Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar marks can be equally apportioned. The three member committee appointed by Head of the Institution will evaluate the seminar and at the end of the semester the marks can be consolidated and taken as the final mark. The evaluation shall be based on the seminar paper (40%), presentation (40%) and response to the questions asked during presentation (20%).

**(v)**The Industrial / Practical Training shall carry 100 marks and shall be evaluated through internal assessment only. At the end of Industrial / Practical training / internship / Summer Project, the candidate shall submit a certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Institution. Certificates submitted by the candidate shall be attached to the mark list sent by the Head of the Department.

- 10.2** Internal marks approved by the Head of the Institution shall be displayed by the respective HODs within 5 days from the last working day.
- 10.3** Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (topics covered), separately for each course. This should be submitted to the Head of the Department periodically (at least three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the department will put his signature and date after due verification. At the end the semester, the record should be verified by the Head of the institution who will keep this document in safe custody (for five years). The university or any inspection team appointed by the University may inspect the records of attendance and assessments of both current and previous semesters.

## **11 REQUIREMENTS FOR APPEARING FOR SEMESTER EXAMINATION**

- 11.1** A candidate shall normally be permitted to appear for the University examinations of the current semester if he/she has satisfied the semester completion requirements as per clause 9.1 & 9.2 and has registered for examination in all courses of the current semester.
- 11.2** Further, registration is mandatory for all the courses in the current semester as well as for arrear(s) course(s) for the university examinations failing which, the candidate will not be permitted to move to the higher semester.
- 11.3** A student who has passed all the courses prescribed in the curriculum for the award of the degree shall not be permitted to re-enroll to improve his/her marks in a course or the aggregate marks / CGPA.

## **12 UNIVERSITY EXAMINATIONS**

- 12.1** There shall be an End- Semester Examination of 3 hours duration in each lecture based course.

The examinations shall ordinarily be conducted between October and December during the odd semesters and between April and June in the even semesters.

For the practical examinations (including project work), both internal and external examiners shall be appointed by the University.

### **12.2 WEIGHTAGE**

The following will be the weightage for different courses.

- i) Lecture or Lecture cum Tutorial based course:
- |                          |   |     |
|--------------------------|---|-----|
| Internal Assessment      | - | 20% |
| End Semester Examination | - | 80% |
- ii) Laboratory based courses
- |                          |   |     |
|--------------------------|---|-----|
| Internal Assessment      | - | 20% |
| End Semester Examination | - | 80% |

iii) Project work		
Internal Assessment	-	20%
Evaluation of Project Report by external examiner	-	30%
Viva-Voce Examination	-	50%
iv) Practical training / summer project / seminar		
Internal Assessment	-	100%

### **13 PASSING REQUIREMENTS**

- 13.1** A candidate who secures not less than 50% of total marks prescribed for the course with a minimum of 50% of the marks prescribed for each of the course of the End-Semester University Examination in both theory and practical courses shall be declared to have passed in the course and acquired the relevant number of credits.
- 13.2** If the candidate fails to secure a pass in a particular course as per clause 13.1, it is mandatory that the candidate shall register and re-appear for the examination in that course during the subsequent semester when examination is conducted for that course. Further, the candidate should continue to enroll and reappear for the examination till a **pass** is secured in such arrear course.
- 13.3** The internal assessment marks obtained by the candidate in the first appearance shall be retained and considered valid for all subsequent attempts till the candidate secure a pass. However, from the third attempt onwards if a candidate fails to obtain pass marks (IA + End Semester Examination) as per clause 13.1, then the candidate shall be declared to have passed the examination if he/she secure a minimum of 50% marks prescribed for the university end semester examinations alone.

### **14 ELIGIBILITY FOR THE AWARD OF THE DEGREE**

- 14.1** A student shall be declared eligible for the award of the degree if he/she has:
- (i) Successfully passed all the courses as specified in the curriculum corresponding to his/her programme within the stipulated period. (as per clause 3.1)
  - (ii) No disciplinary action is pending against him/her.
  - (iii) The award of the degree must have been approved by the syndicate.
  - (iv) Successfully completed any additional courses prescribed by the Director, Academic Courses

### **15 AWARD OF LETTER GRADES**

- 15.1** All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points specified, will be awarded as per the range of total marks (out of 100) obtained by the candidate (Regular or Arrear), as detailed below:

Letter grade	Grade Points	Marks Range
S	10	91 – 100
A	9	81 – 90
B	8	71 – 80
C	7	61 – 70
D	6	57 – 60
E	5	50 – 56
U	0	< 50
	(or 50, but not satisfying clause 13.1)	
W	0	

A student is deemed to have passed and acquired the corresponding credits in a particular course if he / she **obtained** any one of the following grades: “S”, “A”, “B”, “C”, “D”, “E”.

‘SA’ denotes shortage of attendance (as per Clause 6) and hence prevented from writing end semester examination. ‘SA’ will appear only in the result sheet.

‘U’ denotes Reappearance (RA) is required for the examination in that particular course. ‘W’ denotes withdrawal from exam for the particular course.  
(The grades U and W will figure both in Mark Sheet as well as in Result Sheet)

## 15.2 GRADE SHEET

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

- The college in which the candidate has studied.
- The list of courses enrolled during the semester and the grades scored.
- The Grade Point Average (GPA) for the semester and
- The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA for a semester is the ratio of the sum of the products of the number of credits for courses acquired and the corresponding points to the sum of the number of credits for the courses acquired in the semester. CGPA will be calculated in a similar manner, considering all the courses registered from first semester.

$$\text{GPA / CGPA} = \frac{\sum_{i=1}^n C_i GP_i}{\sum_{i=1}^n C_i}$$

where

$C_i$  is the number of credits assigned to the course

$GP_i$  is the Grade point corresponding to the grade obtained for each Course

$n$  is number of all Courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of **CGPA**.

“U”, “I” and “W” grades will be excluded for calculating GPA and CGPA.

## 16 CLASSIFICATION OF THE DEGREE AWARDED

### 16.1 FIRST CLASS WITH DISTINCTION:

A candidate who satisfies the following conditions shall be declared to have passed the examination in **First class with Distinction**:

#### **M.E. / M.Tech. M.B.A.(Full Time)**

- Should have passed the End semester examination in all the courses of all the four semesters in his/her **First Appearance** within two years. Withdrawal from examination (vide Clause 17) will not be considered as an appearance. One year authorized break of study (if availed of) is permitted in addition to two years for award of First class with Distinction.
- Should have secured a CGPA of not less than 8.50

#### **M.E. / M.Tech. M.B.A.(Part Time) and M.C.A (Full Time)**

- Should have passed the End semester examination in all the courses of all the six semesters in his/her **First Appearance** within three years. Withdrawal from examination (vide Clause 17) will not be considered as an appearance. One year authorized break of study (if availed of) is permitted in addition to three years for award of First class with Distinction.
- Should have secured a CGPA of not less than 8.50.

### 16.2 FIRST CLASS:

A candidate who satisfies the following conditions shall be declared to have passed the examination in **First class**:

#### **M.E. / M.Tech. M.B.A.(Full Time)**

- Should have passed the End semester examination in all the courses of all the four semesters within three years. One year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the three years.
- Should have secured a CGPA of not less than 6.50.

#### **M.E. / M.Tech. M.B.A. (Part Time) and M.C.A (Full Time)**

- Should have passed the End semester examination in all the courses of all the six semesters within four years. One year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the four years.
- Should have secured a CGPA of not less than 6.50.

### **16.3 SECOND CLASS:**

All other candidates (not covered in clauses 16.1 and 16.2) who qualify for the award of the degree (vide Clause 14) shall be declared to have passed the examination in **Second Class**.

- 16.4.** A candidate who is absent in semester examination in a course / project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification.

### **16.5 Photocopy / Revaluation**

A candidate can apply for photocopy of his/her semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of Institutions. The answer script is to be valued and justified by a faculty member, who handled the subject and recommend for revaluation with breakup of marks for each question. Based on the recommendation, the candidate can register for the revaluation through proper application to the Controller of Examinations. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Institutions. Revaluation is not permitted for practical courses and for project work.

A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time.

### **16.6 Review**

Candidates not satisfied with Revaluation can apply for Review of his/ her examination answer paper in a theory course, within the prescribed date on payment of a prescribed fee through proper application to Controller of Examination through the Head of the Institution.

Candidates applying for Revaluation only are eligible to apply for Review.

### **17 PROVISION FOR WITHDRAWAL FROM EXAMINATION:**

A candidate may for valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

- 17.1** Such withdrawal shall be permitted only once during the entire period of study of the degree programme.
- 17.2** Withdrawal application is valid only if it is made within 10 days prior to the commencement of the examination in that course or courses and recommended by the Head of the Institution and approved by the Controller of Examinations.
- 17.3** Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.
- 17.4** Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. Withdrawal is not permitted in the final semester.



- 17.5 Withdrawal from the End semester examination is **NOT** applicable to arrears subjects of previous semesters
- 17.6 The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.

## **18 AUTHORIZED BREAK OF STUDY FROM A PROGRAMME**

- 18.1 Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the **Director, Student Affairs** in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Institution stating the reasons therefor and the probable date of rejoining the programme.
- 18.2 The candidates permitted to rejoin the programme after break of study / prevention due to lack of attendance, shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new Regulations shall apply to the Director, Academic Courses in the prescribed format through Head of the Institution at the beginning of the readmitted semester itself for prescribing additional courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.
- 18.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (vide Clause 16.1). However, additional break of study granted will be counted for the purpose of classification.
- 18.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 3.1 irrespective of the period of break of study (vide clause 18.1) in order that he/she may be eligible for the award of the degree.
- 18.5 If any student is detained for want of required attendance, the period spent in that semester shall not be considered as authorized 'Break of Study' is not applicable for this case.

## **19 DISCIPLINE**

- 19.1 Every student is required to observe disciplined and decorous behavior both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the University / College. The Head of Institution shall constitute a disciplinary committee consisting of Head of Institution, Two Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline and notify the University about the disciplinary action recommended for approval. In case of any serious disciplinary action which leads to suspension or dismissal, then a committee shall be constituted including one representative from Anna University, Chennai. In this regard, the member will be nominated by the University on getting information from the Head of the Institution.

19.2 If a student indulges in malpractice in any of the University / internal examination he / she shall be liable for punitive action as prescribed by the University from time to time.

**20 REVISION OF REGULATIONS, CURRICULUM AND SYLLABI**

The University may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and scheme of examinations through the Academic Council with the approval of Syndicate.

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**ANNA UNIVERSITY, CHENNAI**  
**AFFILIATED INSTITUTIONS**  
**REGULATIONS - 2013**  
**CURRICULUM AND SYLLABUS I TO VI SEMESTERS (FULL TIME)**  
**MASTER OF COMPUTER APPLICATION**

**PROGRAMME EDUCATIONAL OBJECTIVES**

- I. To excel in problem solving and programming skills in the various computing fields of IT industries
- II. To develop the ability to plan, analyze, design, code, test, implement & maintain a software product for real time system
- III. To promote students capability to set up their own enterprise in various sectors of Computer applications
- IV. To experience the students in finding solutions and developing system based applications for real time problems in various domains involving technical, managerial, economical & social constraints
- V. To prepare the students to pursue higher studies in computing or related disciplines and to work in the fields of teaching and research.

**PROGRAMME OBJECTIVES**

- a) Understand and Apply mathematical foundation, computing and domain knowledge for the conceptualization of computing model of problems.
- b) Identify, Analyze the computing requirements of a problem and Solve them using computing principles.
- c) Design and Evaluate a computer based system, components and process to meet the specific needs of applications.
- d) Use current techniques and tools necessary for complex computing practices.
- e) Use suitable architecture or platform on design and implementation with respect to performance
- f) Develop and integrate effectively system based components into user environment.
- g) Understand and commit to Cyber regulations and responsibilities in Professional computing practices.
- h) Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
- i) Apply the understanding of management principles with computing knowledge to manage the projects in multidisciplinary environments.
- j) Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
- k) Understand societal, environmental, health, legal, ethical issues within local and global contexts and the consequential responsibilities relevant to professional practice.
- l) Function effectively in a team environment to accomplish a common goal.
- m) Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.
- n) Use knowledge to analyze, interpret the data and synthesis the information to derive valid conclusions using research methods.
- o) Expertise in developing application with required domain knowledge.

  
**Dr. P. MANIARASAN**  
Principal

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**ANNA UNIVERSITY, CHENNAI**  
**AFFILIATED INSTITUTIONS**  
**REGULATIONS - 2013**  
**CURRICULUM I TO VI SEMESTERS (FULL TIME)**  
**MASTER OF COMPUTER APPLICATION**

**SEMESTER I**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MA7151	Mathematical Foundation for Computer Applications	3	1	0	4
2.	MC7101	Computer Organization	3	0	0	3
3.	MC7102	Problem Solving and Programming	3	0	0	3
4.	MC7103	Database Management Systems	3	0	0	3
5.	MC7104	Data Structures and Algorithms	3	1	0	4
<b>PRACTICAL</b>						
6.	MC7111	DBMS Laboratory	0	0	3	2
7.	MC7112	Data Structures and Algorithms Laboratory	0	0	3	2
8.	MC7113	Communication Skill Laboratory	1	0	2	2
<b>TOTAL</b>			<b>16</b>	<b>2</b>	<b>8</b>	<b>23</b>

**SEMESTER II**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MC7201	Object Oriented Programming	3	0	0	3
2.	MC7202	Web Programming Essentials	3	0	0	3
3.	MC7203	System Software	3	0	0	3
4.	MC7204	Operating Systems	3	0	0	3
5.	MC7205	Computer Graphics and Multimedia	3	0	0	3
<b>PRACTICAL</b>						
6.	MC7211	Object Oriented Programming Laboratory	0	0	3	2
7.	MC7212	Web Programming Laboratory	0	0	3	2
8.	MC7213	Graphics and Multimedia Laboratory	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>0</b>	<b>9</b>	<b>21</b>

**SEMESTER III**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MC7301	Computer Networks	3	0	0	3
2.	MC7302	Embedded Systems	3	0	0	3
3.	MC7303	Software Engineering	3	0	0	3
4.	MC7304	Professional Ethics	3	0	0	3
5.	MC7305	Internet Programming	3	0	0	3
<b>PRACTICAL</b>						
6.	MC7311	Embedded Systems Laboratory	0	0	3	2
7.	MC7312	Internet Programming Laboratory	0	0	3	2
8.	MC7313	Visual Programming Laboratory	1	0	3	2
<b>TOTAL</b>			<b>16</b>	<b>0</b>	<b>9</b>	<b>21</b>

**SEMESTER IV**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MC7401	Resource Management Techniques	3	0	0	3
2.	MC7402	Object Oriented Analysis and Design	3	0	0	3
3.	MC7403	Data Warehousing and Data Mining	3	0	0	3
4.	MC7404	Network Programming	3	0	0	3
5.		Elective I	3	0	0	3
<b>PRACTICAL</b>						
6.	MC7411	Software Development- Case Tools Laboratory	0	0	3	2
7.	MC7412	Network Programming Laboratory	0	0	3	2
8.	MC7413	Technical Seminar and Report Writing	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>0</b>	<b>9</b>	<b>21</b>

**SEMESTER V**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	MC7501	Web Application Development	3	0	0	3
2.	MC7502	Service Oriented Architecture	3	0	0	3
3.	MC7503	Mobile computing	3	0	0	3
4.		Elective II	3	0	0	3
5.		Elective III	3	0	0	3
<b>PRACTICAL</b>						
6.	MC7511	Advanced Internet Programming Laboratory	0	0	3	2
7.	MC7512	XML and Web Services Laboratory	0	0	3	2
8.	MC7513	Mini Project(Socially Relevant)	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>0</b>	<b>9</b>	<b>21</b>

**SEMESTER VI**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1.	MC7611	Project Work	0	0	24	12
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**TOTAL NO OF CREDITS:119****LIST OF ELECTIVES**

SL.NO.	COURSE CODE	L	T	P	C
<b>ELECTIVE I</b>					
MC7001	Game Programming	3	0	0	3
MC7002	Soft Computing	3	0	0	3
MC7003	Accounting and Financial Management	3	0	0	3
MC7004	Energy Aware Computing	3	0	0	3
MC7005	Security in computing	3	0	0	3
MA7071	Numerical and Statistical Methods	3	0	0	3
<b>ELECTIVE II</b>					
MC7006	M-commerce	3	0	0	3
MC7007	Health Care Management	3	0	0	3
MC7008	Geological Information Systems	3	0	0	3
MC7009	Human Resource Management	3	0	0	3
MC7010	Enterprise Application Integration	3	0	0	3
MC7011	Big Data Analytics	3	0	0	3
<b>ELECTIVE III</b>					
MC7012	Ad hoc and Sensor networks	3	0	0	3
MC7013	Semantic Web	3	0	0	3
MC7014	Software Testing and Quality Assurance	3	0	0	3
MC7015	Software Project Management	3	0	0	3
MC7016	Cloud Computing	3	0	0	3
MC7017	Network Protocols	3	0	0	3

**COURSE OBJECTIVES:**

- To understand the concepts and operations of matrix algebra needed for computing graphics modeling
- To understand and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- To impart discrete knowledge in computer engineering through finite automata and Context free grammars

**UNIT I MATRIX ALGEBRA****9**

Matrices, Rank of Matrix, Solving System of Equations-Eigen Values and Eigen Vectors-Inverse of a Matrix - Cayley Hamilton Theorem

**UNIT II BASIC SET THEORY****9**

Basic Definitions - Venn Diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion - partitions- Permutation and Combination - Relations- Properties of relations - Matrices of relations - Closure operations on relations - Functions - injective, subjective and objective functions.

**UNIT III MATHEMATICAL LOGIC****9**

Propositions and logical operators - Truth table - Propositions generated by a set, Equivalence and implication - Basic laws- Some more connectives - Functionally complete set of connectives- Normal forms - Proofs in Propositional calculus - Predicate calculus.

**UNIT IV FORMAL LANGUAGES****9**

Languages and Grammars-Phrase Structure Grammar-Classification of Grammars-Pumping Lemma For Regular Languages-Context Free Languages.

**UNIT V FINITE STATE AUTOMATA****9**

Finite State Automata-Deterministic Finite State Automata(DFA), Non Deterministic Finite State Automata (NFA)-Equivalence of DFA and NFA-Equivalence of NFA and Regular Languages

**TOTAL: 45+15= 60 PERIODS****COURSE OUTCOMES:**

- Acquire the basic knowledge of matrix, set theory, functions and relations concepts needed for designing and solving problems
- Acquire the knowledge of logical operations and predicate calculus needed for computing skill
- Able to design and solve Boolean functions for defined problems
- Apply the acquired knowledge of formal languages to the engineering areas like Compiler Design
- Apply the acquired knowledge of finite automata theory and design discrete problems to solve by computers.

**REFERENCES:**

1. Kenneth H.Rosen, " Discrete Mathematics and Its Applications", Tata McGraw Hill, Fourth Edition, 2002 (Unit 1,2 & 3).
2. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002. ( Unit 4,5)
3. A.Tamilarasi & A.M.Natarajan, "Discrete Mathematics and its Application", Khanna Publishers, 2<sup>nd</sup> Edition 2005.
4. M.K.Venkataraman "Engineering Mathematics", Volume II, National Publishing company, 2<sup>nd</sup> Edition,1989.
5. Juraj Hromkovic, "Theoretical Computer Science", Springer Indian Reprint, 2010.
6. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.

**COURSE OBJECTIVES :**

- To impart the knowledge in the field of digital electronics
- To impart knowledge about the various components of a computer and its internals.
- To design and realize the functionality of the computer hardware with basic gates and other components using combinational and sequential logic.
- To understand the importance of the hardware-software interface

**UNIT I DIGITAL FUNDAMENTALS****8**

Number Systems and Conversions – Boolean Algebra and Simplification – Minimization of Boolean Functions – Karnaugh Map, Logic Gates – NAND – NOR Implementation

**UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS****10**

Design of Combinational Circuits – Adder / Subtractor – Encoder – Decoder – MUX / DEMUX – Comparators, Flip Flops – Triggering – Master – Slave Flip Flop – State Diagram and Minimization – Counters – Registers.

**UNIT III BASIC STRUCTURE OF COMPUTERS & PARALLEL PROCESSING****9**

Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and instruction sequencing – Addressing modes – ALU design – Fixed point and Floating point operation .

**UNIT IV PROCESSOR DESIGN****9**

Processor basics – CPU Organization – Data path design – Control design – Basic concepts – Hard wired control – Micro programmed control – Pipeline control – Hazards – Super scalar operation.

**UNIT V MEMORY, I/O SYSTEM AND PARALLEL PROCESSING****9**

Memory technology – Memory systems – Virtual memory – Caches – Design methods – Associative memories – Input/Output system – Programmed I/O – DMA and Interrupts – I/O Devices and Interfaces - Multiprocessor Organization – Symmetric multiprocessors – Cache Coherence – Clusters: Non Uniform Memory Access- Vector Computation.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

- Able to design digital circuits by simplifying the Boolean functions
- Able to Understand the organization and working principle of computer hardware components
- Able to understand mapping between virtual and physical memory
- Acquire knowledge about multiprocessor organization and parallel processing
- Able to trace the execution sequence of an instruction through the processor

**REFERENCES:**

1. Morris Mano, "Digital Design", Prentice Hall of India, Fourth Edition 2007
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
3. William Stallings, "Computer Organization & Architecture – Designing for Performance" 9<sup>th</sup> Edition 2012.
4. Charles H. Roth, Jr., "Fundamentals of Logic Design", Jaico Publishing House, Mumbai, Fourth Edition, 1992.
5. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.
6. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.
7. Svetlana N. Yanushkevich, Vlad P. Shmerko, "Introduction to Logic Design", CRC Press, 2012.



**COURSE OBJECTIVES:**

- To understand the basic concepts of problem solving approaches and develop optimal program structure using conditional and iterative control structures and functions.
- To design, implement, test, and apply the basic C programming concepts.
- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.

**UNIT I INTRODUCTION TO COMPUTER PROBLEM SOLVING****8**

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithm – The analysis of algorithm.

**UNIT II PROGRAMMING, ALGORITHMS AND FLOWCHARTS****9**

Programs and Programming – building blocks for simple programs -Programming life cycle phases – pseudo code representation – flow charts - Algorithm - Programming Languages - compiler – Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept.

**UNIT III BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS****9**

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators - Initialization –Expressions – Expression Evaluation – Lvalues and Rvalues – Type Conversion in C – Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go to Statement – Nested Loops- Continue and break statements.

**UNIT IV ARRAYS, STRINGS, FUNCTIONS AND POINTERS****10**

Array – One dimensional Character Arrays- Multidimensional Arrays- Arrays of Strings - Two dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection- pointers to functions - Dynamic memory allocation.

**UNIT V USER-DEFINED DATATYPES & FILES****9**

Structures – initialization - nested structures – structures and arrays – structures and pointers - union – typedef and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

**TOTAL:45 PERIODS****COURSE OUTCOMES:**

- Able to design a computational solution for a given problem.
- Able to break a problem into logical modules that can be solved (programmed).
- Able to transform a problem solution into programs involving programming constructs
- To write programs using structures, strings, arrays, pointers and files for solving complex computational problem.
- Able to introduce modularity using functions and pointers which permit ad hoc run-time polymorphism

## REFERNCES:

1. How to solve it by computer , R.G.Dromey, Pearson education , fifth edition, 2007.
2. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009
3. Kamthane, A.N., “Programming with ANSI and Turbo C”, Pearson Education, Delhi,2006
4. Deitel and Deitel, ”C How to Program”, Pearson Education. 2010 6<sup>th</sup> edition
5. Brian W. Kernighan and Dennis M. Ritchie, “The C programming Language”,2006, Prentice-Hall
6. Yashavant Kanetkar, “Understanding Pointers In C”, 4th Revised & Updated Edition, 2008, Bpb Publications
7. Cormen,Leiserson, Rivest, Stein, “ Introduction to Algorithms”, McGraw Hill , Publishers, 2002
8. Peter Norton, “Introduction to Computers”, Sixth Edition, Tata McGraw Hill Publications, 2007.
9. Reema Thareja, “Programming in C”, Oxford University Press, 2011.

**MC7103**

**DATABASE MANAGEMENT SYSTEMS**

**L T P C**  
**3 0 0 3**

## COURSE OBJECTIVES

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram
- To make a study of SQL and relational database design.
- To know about data storage techniques an query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

### UNIT I INTRODUCTION

**9**

File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model – Enhanced E-R Modeling.

### UNIT II RELATIONAL MODEL AND QUERY EVALUATION

**9**

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints – Relational Calculus – Tuple Relational Calculus – Domain Relational Calculus – overview of commercial RDBMSs – Database Design – Functional Dependencies – Normal Forms – 1NF – 2NF-3NF-BCNF – 4NF-5NF - Algorithms for Executing Query Operations — Cost Estimation

### UNIT III TRANSACTION PROCESSING

**9**

Transaction Processing – Properties of Transactions - Serializability – Transaction support in SQL - Locking Techniques – Time Stamp ordering – Validation Techniques – Granularity of Data Items – Recovery concepts – Shadow paging – Log Based Recovery – Database Security Issues – Access control – Statistical Database Security.

### UNIT IV FILES AND INDEXING

**9**

File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing - Indexes on Multiple Keys.

### UNIT V SPECIAL PURPOSE DATABASES

**9**

OODBMS- - Object-Based Databases - OO Data Model - OO Languages – Persistence – Object Relational Databases - XML – Structure of XML - Temporal Databases – Mobile Databases – Spatial Databases – Case Study for Design and Manage the Database for any Project

**TOTAL : 45 PERIODS**

## COURSE OUTCOMES:

- Understand the basic concepts of the database and data models.
- design a database using ER diagrams and map ER into Relations and normalize the relations
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.
- Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

## REFERENCES:

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan “Database System Concepts”, Sixth Edition, McGraw Hill, 2010.
2. C.J. Date, “An Introduction to Database Systems”, Eight Edition, Pearson Education Delhi, 2003.
3. Ramez Elamassri and Shankant B-Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education Delhi, 2010.
4. Raghu Ramakrishnan, Johannes Gehrke ,’ Database management systems” McGraw Hill, 2003.
5. Peter Rob, Carlos Coronel, “Database System Concepts”, Cengage Learning, 2008.
6. Frank. P. Coyle, “XML, Web Services And The Data Revolution”, Pearson Education, 2012.
7. Lee Chao, “Database Development and Management”, Auerbach Publications, 2010.
8. Peter Rob, Carlos coronel , “Data base system concepts” , Ceange Learning 2008

MC7104

DATA STRUCTURES AND ALGORITHMS

L T P C  
3 1 0 4

## COURSE OBJECTIVES

- To understand the linear and non linear data structures available in solving problems
- To know about the sorting and searching techniques and its efficiencies
- To get a clear idea about the various algorithm design techniques
- Using the data structures and algorithms in real time applications
- Able to analyze the efficiency of algorithm

### UNIT I LINEAR DATA STRUCTURES

9+3

Introduction - Abstract Data Types (ADT) – Arrays and its representation – Structures – Stack – Queue – Circular Queue - Applications of stack – Infix to postfix conversion – evaluation of expression – Applications of Queue - Linked Lists – Doubly Linked lists – Applications of linked list – Polynomial Addition

### UNIT II TREE STRUCTURES

9+3

Need for non-linear structures – Trees and its representation – Binary Tree – expression trees – Binary tree traversals – left child right sibling data structures for general trees – applications of trees – Huffman Algorithm - Binary search tree.

### UNIT III BALANCED SEARCH TREES, SORTING AND INDEXING

9+3

AVL trees –B-Trees - Sorting – Bubble sort - Quick Sort - Insertion Sort – Heap sort – Hashing - Hashing functions - Collision Resolution Techniques - Separate chaining - Open addressing - Multiple hashing.

**UNIT IV      GRAPHS****9+3**

Definitions – Representation of graph - Graph Traversals - Depth-first traversal – breadth-first traversal - applications of graphs - Topological sort – shortest-path algorithms – minimum spanning tree – Prim’s and Kruskal’s algorithms – biconnectivity – Euler circuits.

**UNIT V      ALGORITHM DESIGN AND ANALYSIS****9+3**

Algorithm Analysis – Asymptotic Notations - Divide and Conquer – Merge Sort – Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Warshall’s Algorithm for Finding Transitive Closure – Backtracking – Sum of Subset Problem – Branch and Bound – Travelling Salesman Problem.

**TOTAL 45+15: 60 PERIODS****COURSE OUTCOMES:**

- Able to select and apply the data structure to suit any given problem.
- Able to design their own data structure according to the application need.
- Able to apply the algorithm design techniques to any of the real world problem.
- Able to develop any new application with the help of data structures and algorithms.
- Able to write efficient algorithm for a given problem and able to analyze its time complexity.

**REFERENCES:**

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education Asia, 2013.
2. Tanaenbaum A.S.,Langram Y. Augestein M.J “ Data Structures using C” Pearson Education , 2004
3. Anany Levitin “Introduction to the Design and Analysis of Algorithms” Pearson Education 2003.
4. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, 2007.
5. E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms/C++”, Second Edition, University Press, 2007.
6. Reema Thareja, “Data Structures using C”, Oxford Press, 2012.
7. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
8. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition

**MC7111****DBMS LABORATORY****L T P C  
0 0 3 2**

1. Creation of base tables and views.
2. Data Manipulation INSERT, DELETE and UPDATE in Tables. SELECT, Sub Queries and JOIN
3. Data Control Commands
4. High level language extensions – PL/SQL. Or Transact SQL – Packages
5. Use of Cursors, Procedures and Functions
6. Embedded SQL or Database Connectivity.
7. Oracle or SQL Server Triggers – Block Level – Form Level Triggers
8. Working with Forms, Menus and Report Writers for a application project in any domain
9. Front-end tools – Visual Basic/Developer 2000.

**TOTAL: 45 PERIODS**

**MC7112**

**DATA STRUCTURES AND ALGORITHMS LABORATORY**

**L T P C**  
**0 0 3 2**

1. Polynomial Addition using array
2. Array implementation of stack
3. Array implementation of Queue
4. Infix to postfix conversion
5. Singly Linked List operations
6. Binary tree traversals
7. Quick sort
8. Dictionary application using any of the data structure
9. Find the Shortest Path using Dijkstra's Algorithm – Greedy method
10. Warshall's Algorithm for finding transitive closure using Dynamic programming
11. Sum of subset problem using backtracking

**TOTAL: 45 PERIODS**

**MC7113**

**COMMUNICATION SKILL LABORATORY**

**L T P C**  
**1 0 2 2**

**I. PC based session (Weightage 40%) 21 periods**

**A. English Language Lab (15 Periods)**

1. **Listening Comprehension:** (5)  
Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.
2. **Reading Comprehension:** (5)  
Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.
3. **Speaking:** (5)  
Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English. Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

**B. Discussion of audio-visual materials (6 periods) (Samples to learn and practice)**

1. **Resume / Report Preparation / Letter Writing** (1)  
Structuring the resume / report - Letter writing / Email Communication - Samples.
2. **Presentation skills:** (1)  
Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples
3. **Soft Skills:** (2)  
Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples
4. **Group Discussion:** (1)  
Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD –Video samples

- 5. Interview Skills:** (1)  
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

## **II. Practice Session (Weightage – 60%) 24 periods**

- 1. Resume / Report Preparation / Letter writing:** Students prepare their own resume and report. (2)
- 2. Presentation Skills:** Students make presentations on given topics. (8)
- 3. Group Discussion:** Students participate in group discussions. (6)
- 4. Interview Skills:** Students participate in Mock Interviews (8)

### **REFERENCES:**

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth , Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd. Second Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
4. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
5. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.

### **LAB REQUIREMENTS:**

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

### **Guidelines for the course**

1. A batch of 60 students is divided into two groups – one group for the PC- based session and the other group for the Class room session.
2. The English Lab (2 Periods) and the Career Lab (2 Periods) may be handled by any competent teacher
3. **Record Notebook:** At the end of each session of English Lab, review exercises are given for the students to answer and the computer evaluated sheets are to be compiled as record notebook. Similar exercises for the career lab are to be compiled in the record notebook.
4. **Internal Assessment:** The 15 marks (the other 5 marks for attendance) allotted for the internal assessment will be based on the record notebook compiled by the candidate. 10 marks may be allotted for English Lab component and 5 marks for the Career Lab component.
5. **End semester Examination:** The end-semester examination carries 40% weightage for English Lab and 60% weightage for Career Lab.

**TOTAL :45 PERIODS**

**COURSE OBJECTIVES:**

- To learn how C++ supports Object Oriented principles such as abstraction, polymorphism etc
- To understand and apply the principles hiding, localization and modularity in software development.
- Use the generic programming features of C++ including the STL
- Design and implement reliable and maintainable object-oriented applications of moderate complexity composed of several classes

**UNIT I FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING 9**  
 Object–Oriented Programming concepts – Encapsulation – Programming Elements – Program Structure – Enumeration Types — Functions and Pointers – Function Invocation – Overloading Functions – Scope and Storage Class – Pointer Types – Arrays and Pointers – Call–by–Reference – Assertions – Standard template library.

**UNIT II IMPLEMENTING ADTS AND ENCAPSULATION 9**  
 Aggregate Type struct – Structure Pointer Operators – Unions – Bit Fields – Data Handling and Member Functions – Classes – Constructors and Destructors – Static Member – this Pointer – reference semantics – implementation of simple ADTs.

**UNIT III POLYMORPHISM 9**  
 ADT Conversions – Overloading – Overloading Operators – Unary Operator Overloading – Binary Operator Overloading – Function Selection – Pointer Operators – Visitation – Iterators – containers – Sequence Containers - List – List Iterators – Associative Containers.

**UNIT IV TEMPLATES AND FILE HANDLING 9**  
 Template Class – Function Templates – RTTI Templates - Class Templates – Parameterizing – STL – Algorithms – Function Adaptors – Streams and Formatted I/O – I/O Manipulations -File handling – Random Access

**UNIT V INHERITANCE 9**  
 Derived Class – Typing Conversions and Visibility – Code Reuse – Virtual Functions – Templates and Inheritance – Run–Time Type Identifications – Exceptions – Handlers – Standard Exceptions.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to use proper class protection mechanism to provide security.
- Able to demonstrate the use of virtual functions to implement polymorphism.
- Understand and implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems
- Able to reuse the code with extensible Class types, User-defined operators and function overloading

## REFERENCES:

1. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
2. HM Deitel and PJ Deitel "C++ How to Program", Seventh Edition, 2010, Prentice Hall
3. Ira Pohl, "Object-Oriented Programming Using C++", Pearson Education, 2 Edition, 2003.
4. E Balagurusamy, "Object oriented Programming with C++", 3 edition, 2006, Tata McGraw Hill
5. Stanley B.Lippman, Josee Lajoie, "C++ Primer", Pearson Education, Third Edition, 2005.
6. Kamthane," Object Oriented Programming with ANSI and Turbo C++", Person Education, 2003.
7. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004.
8. S.B Lippman, Josee, Josee Lajoie, Barbara, " C++ Premier" 4 Edition, Pearson , 2012
9. Ray Lischner, "Exploring C++ : The programmer's introduction to C++" , apress, 2010.

MC7202

WEB PROGRAMMING ESSENTIALS

L T P C  
3 0 0 3

## COURSE OBJECTIVES:

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice mark up languages
- To understand and practice embedded dynamic scripting on client side Internet Programming
- To understand and practice web development techniques on client-side

### UNIT I INTRODUCTION TO WWW

9

Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response — Generation of dynamic web pages.

### UNIT II UI DESIGN

9

**Markup Language (HTML):** Introduction to HTML and HTML5 - Formatting and Fonts -Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames - HTML Forms.

**Cascading Style Sheet (CSS):** The need for CSS, Introduction to CSS – Basic syntax and structure - Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds - Manipulating text - Margins and Padding - Positioning using CSS.

### UNIT III INTRODUCTION TO JAVASCRIPT

9

Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements - Functions - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form handling and validations.

### UNIT IV ADVANCED JAVASCRIPT

9

Browser Management and Media Management – Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes – JSON - jQuery and AJAX.

### UNIT V PHP

9

Introduction - How web works - Setting up the environment (LAMP server) - Programming basics - Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML - Establishing connectivity with MySQL database.



## COURSE OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

## REFERENCE BOOKS:

1. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.
2. Achyut S Godbole and Atul Kahate, "Web Technologies", Second Edition, Tata McGraw Hill, 2012.
3. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
4. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
5. Steven Holzner, "The Complete Reference - PHP", Tata McGraw Hill, 2008
6. Mike Mcgrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.
7. <http://php.net/manual/>

MC7203

SYSTEM SOFTWARE

L T P C  
3 0 0 3

## COURSE OBJECTIVES:

- To understand the relationship between system software and machine architecture, design and implementation of assemblers, linkers and loaders.
- To understand the design, function and implementation of assemblers, linkers and loaders
- To have an understanding of macro processors and system software tools

### UNIT I BASICS OF SYSTEM SOFTWARE AND ASSEMBLER

9

Introduction – System software and SIC/XE machine architecture - Basic assembler functions – Assembler algorithms and data structures – Machine dependent assembler features, Instruction formats and addressing modes – Program relocation – Machine independent assembler features – Literals – Symbol-defining statements – Expressions – Program Blocks – Control Sections and Program Linking-Implementation examples MASM assembler.

### UNIT II COMPILER- LEXICAL ANALYSIS, SYNTAX ANALYSIS

9

Phases of compiler-Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, Finite Automata, Designing a lexical analyzer generator, Pattern matching based on NFA's. Syntax Analysis: Role of Parser, Top-down parsing, recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers.

### UNIT III COMPILER- CODE GENERATION, OPTIMIZATION

9

Intermediate languages: graphical representations, DAGs, Three address code, types of three address statements, syntax directed translation into three address code, implementation of three address statements-Code Optimization: Machine dependent and machine independent code generation: Sources of optimization-Code Generation-Semantic stacks, evaluation of expressions, control structures, and procedure calls.

**UNIT IV LOADERS AND LINKERS****9**

Basic loader functions: Design of an Absolute Loader – A Simple Bootstrap Loader Machine dependent loader features Relocation – Program Linking – Algorithm and Data Structures for Linking Loader. Machine-independent loader features – Automatic Library Search – Loader Options Loader design options – Linkage Editors – Dynamic Linking – Bootstrap Loaders. Implementation examples: MSDOS linker.

**UNIT V MACRO PROCESSORS & OTHER SYSTEM SOFTWARE****9**

Basic macro processor functions – Macro Definition and Expansion – Macro Processor Algorithm and data structures – Implementation examples: MASM Macro Processor- Text editors – Overview of Editing Process - User Interface – Editor Structure – Interactive Debugging Systems – Debugging functions and capabilities –Relationships with Other parts of the system – User Interface Criteria. - Virtual Machines

**TOTAL: 45 PERIODS .****COURSE OUTCOMES:**

- Able to trace the path of a source code to object code and the to executable file
- To design the front end of the compiler-scanner, parser
- Understand and identify the relationship between system software and machine architecture
- Analyze the functions of assembler, compiler, linker, and loaders
- Know the design and implementation of loaders and linkers

**REFERENCES:**

1. Leland Beck - “System Software – An Introduction to Systems Programming”, Third Edition, Pearson Education, Inc., 2008
2. A.V. Aho, R. Shethi and Ulman; Compilers - Principles, Techniques and Tools, Second Edition, Pearson Education, 2002.
3. D. M. Dhamdhare, "Systems Programming and Operating Systems", Tata McGraw Hill Company, Second Edition, 2009.
4. John J. Donovan, “Systems Programming”, Tata McGraw Hill Company, Second Edition, 2000.
5. V. Raghavan, “Principles of Compiler Design”, Tata McGrawHill Education Publishers, 2010.
6. Srimanta Pal, “ Systems Programming “ , Oxford University Press, 2011.

**MC7204****OPERATING SYSTEMS****L T P C  
3 0 0 3****COURSE OBJECTIVES:**

- To be aware of the evolution and fundamental principles of operating system, processes and their communication
- To understand the various operating system components like process management, memory management and
- To know about file management and the distributed file system concepts in operating systems
- To be aware of components of operating system with relevant case study

**UNIT I INTRODUCTION****9**

Introduction -Types of operating systems-operating systems structures-Systems components-operating systems services-System calls-Systems programs-Processes-process concept- process scheduling-operation on processes-co-operating processes-Inter process communications-CPU Scheduling-Scheduling criteria-Scheduling algorithms-Multiple-processor Scheduling

<b>UNIT II</b>	<b>PROCESS SYNCHRONIZATION</b>	<b>9</b>
Process Synchronization –Critical Section problem – Semaphores-Classical problems of synchronization-critical regions-Monitors-Deadlock Characterization-Deadlock handling-Deadlock Prevention-Deadlock avoidance-Deadlock Detection-Deadlock Recovery –Threads-Multithreading Models		
<b>UNIT III</b>	<b>MEMORY MANAGEMENT</b>	<b>9</b>
Memory Management-Swapping-Contiguous Memory allocation-Paging-Segmentation-Virtual Memory-Demand paging-Page Replacement-Thrashing		
<b>UNIT IV</b>	<b>DISK SCHEDULING AND DISTRIBUTED SYSTEMS</b>	<b>9</b>
Disk Structures-Disk Scheduling-File Systems Interface-File concepts-Access methods-Directory Structures-File System Implementation-File Systems structures-Directory Implementation-Allocation Methods-Free Space management-Distributed File systems-Naming and Transparency-Remote File Accesses- Stateful Versus Stateless Service-File replication		
<b>UNIT V</b>	<b>CASE STUDIES</b>	<b>9</b>
Linux System-design Principles- process management-File Systems-Windows Vista-Systems Structures-Process management-memory management-Android OS-Virtual machine OS		

**COURSE OUTCOMES:**

- Able to understand the operating system components and its services
- Implement the algorithms in process management and solving the issues of IPC
- Able to demonstrate the mapping between the physical memory and virtual memory
- Able to understand file handling concepts in OS perspective
- Able to understand the operating system components and services with the recent OS

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Abraham Silberschalz Peter B Galvin, G.Gagne, "Operating Systems Concepts", Seventh Edition, Addison Wesley Publishing Co.,2010
2. Andrew S.Tanenbaum, "Modern operating Systems", Third Edition, PHI Learning Pvt.Ltd., 2008
3. William Stallings, "Operating Systems: Internals and Design Principles",Seventh Edition, Prentice Hall, 2011.
4. H M Deital, P J Deital and D R Choffnes, "Operating Systems" ,3<sup>rd</sup> edition, Pearson Education, 2011.
5. D M Dhamdhere, " Operating Systems: A Concept-based Approach", Second Edition, Tata McGraw-Hill Education, 2007.

<b>MC7205</b>	<b>COMPUTER GRAPHICS AND MULTIMEDIA</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**COURSE OBJECTIVES:**

- To understand computational development of graphics with mathematics
- To provide in-depth knowledge of display systems, image synthesis, shape modeling of 3D application.
- To Understand basic concepts related to Multimedia including data standards, algorithms and software
- To Experience development of multimedia software by utilizing existing libraries and descriptions of algorithms

<b>UNIT I</b>	<b>BASIC CONCEPTS</b>	<b>9</b>
2D Transformations – Clipping – Window – View Prot Mapping – Graphical User Interfaces and Interactive Input Methods – Picture Construction Techniques – Virtual Reality Environment.		
<b>UNIT II</b>	<b>3D GRAPHICS</b>	<b>9</b>
3D Transformation – 3D Viewing – Visible Surface Detection – Back Face Detection – Depth Buffer Method – Scan Line Method.		
<b>UNIT III</b>	<b>MULTIMEDIA BASICS</b>	<b>9</b>
Introduction to Multimedia – Components – Hypermedia – Authoring – Authoring tools – File formats – Color models – Digital Audio representation – Transmission – Audio signal processing – Digital music making – MIDI – Digital video – Video compression techniques – Video performance measurements – Multimedia Databases – Animation – Key frames and tweening techniques – Principles of animation – Virtual reality – Multimedia for portable devices		
<b>UNIT IV</b>	<b>MULTIMEDIA COMMUNICATION</b>	<b>9</b>
Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions - Media Synchronization – Models for Temporal Specifications – Streaming of Audio and Video – Recovering from packet loss – RTSP — Multimedia Communication Standards –RTP/RTCP – SIP and H.263- Real time streaming and On-demand streaming		
<b>UNIT V</b>	<b>MULTIMEDIA APPLICATION DEVELOPMENT</b>	<b>9</b>
Design, Development and evaluation of multimedia a system - The development of user interface design - Design Process - MultiMedia & the Internet - Multimedia conferencing - Multimedia file sharing – Multimedia broadcasting - Multimedia Development Issues - Multimedia project - Structured Multimedia development - Multimedia project timing - Sample project		

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- Gain proficiency in 3D computer graphics API programming
- Enhance the perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information.
- Able to understand different realizations of multimedia tools
- Able to develop interactive animations using multimedia tools
- Gain the knowledge of different media streams in multimedia transmission

**REFERENCES:**

1. Donald Hearn and M. Pauline Baker, “Computer Graphics in C Version”, Second Edition, Pearson Education
2. Tom McReynolds – David Blythe “ Advanced Graphics Programming Using OpenGL” , Elsevier, 2010
3. Parag Havaldar and Gerard Medioni, “Multimedia Systems-Algorithms, Standards and Industry Practices”, Course Technology, Cengage Learning, 2010.
4. John F. Koegel Bufend , “Multimedia systems”, Pearson Education, Delhi, 2002
5. Ralf Steinmetz and Klara “Multimedia Computing, Communications and Applications”, Pearson Education,2004.
6. Kurose and Ross, ‘Computer Networks : A top down Approach’, Pearson Education, 2002
7. Mohammad Dastbaz, Desgning Interactive Multimedia Systems
8. Multimedia – Technology and applications David Hillman Galgotia Publications, Delhi
9. Ralf Steinmetz and Klara Nahrstedt “Multimedia Applications”, Springer, 2007.

**MC7211****OBJECT ORIENTED PROGRAMMING LABORATORY****L T P C**  
**0 0 3 2**

1. Write a C++ Program to illustrate Enumeration and Function Overloading
2. Write a C++ Program to illustrate Scope and Storage class
3. Implementation of ADT such as Stack and Queues
4. Write a C++ Program to illustrate the use of Constructors and Destructors and Constructor Overloading
5. Write a Program to illustrate Static member and methods
6. Write a Program to illustrate Bit fields
7. Write a Program to overload as binary operator, friend and member function
8. Write a Program to overload unary operator in Postfix and Prefix form as member and friend function
9. Write a Program to illustrate Iterators and Containers
10. Write a C++ Program to illustrate function templates
11. Write a C++ Program to illustrate template class
12. Write C++ Programs and incorporating various forms of Inheritance
13. Write a C++ Program to illustrate Virtual functions
14. Exception Handling
15. File Handling – Read, Write, Update

**TOTAL: 45 PERIODS****MC7212****WEB PROGRAMMING LABORATORY****L T P C**  
**0 0 3 2**

1. Create a web page with the following using HTML5
  - (i) To embed an image map in a web page
  - (ii) To fix the hot spots
  - (iii) Show all the related information when the hot spots are clicked.
2. Create a web page with all types of Cascading style sheets.
3. Implement Client Side Scripts for Validating Web Form Controls using JavaScript.
4. Designing Quiz Application Personal Information System/ Using JavaScript
5. Write a JavaScript for Loan Calculation.
6. Develop and demonstrate a HTML file that includes JavaScript that uses functions for the following problems:
  - a) Parameter: A string  
Output: The position in the string of the left-most vowel
  - b) Parameter: A number  
Output: The number with its digits in the reverse order
7. Develop PHP program using Arrays, control structures, looping structures and Form Handling
8. Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.
9. Write an AJAX program for parsing a JSON file and formatting the output.
10. Develop a web application for Airline Reservation System using PHP & AJAX.

**TOTAL: 45 PERIODS**

**UNIT I TWO DIMENSIONAL TRANSFORMATIONS 9**

Creation of two dimensional objects and applying simple transformations like Translation, Scaling, Rotation and applying Composite transformations.

**UNIT II CLIPPING AND WINDOWING 9**

Clipping and windowing of a part of the created two dimensional object using any one of the clipping algorithms

**UNIT III THREE DIMENSIONAL TRANSFORMATIONS 9**

Creation of simple three dimensional objects like cube, cone and cylinder and applying simple transformations like Translation, Scaling, Rotation, Composite transformations, projections –Parallel, Perspective.

**UNIT IV VISIBLE SURFACE DETECTION 9**

Finding out visible surfaces and removal of hidden surfaces in simple objects using object space and image space algorithms.

**UNIT V IMAGE EDITING 9**

Image enhancement, Image transformation from color to gray scale and vice versa, Image manipulation and Image optimization for web - Usage of editing tools, layers, filters, special effects and color modes. Creation of simple Gif animated images with textual illustrations, Image Compression.

**Software:**

1. C/C++/Java
2. OpenGL 3.7 (precompiled GLUT libraries 3.7 – Open source)
3. Any open source software like 'GIMP 2.6'/ Flash 8.0 /Photoshop

**TOTAL: 45 PERIODS****COURSE OBJECTIVES:**

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To Acquire knowledge of various application protocol standard developed for internet

**UNIT I NETWORK FUNDAMENTALS 9**

Uses of Networks – Categories of Networks -Communication model –Data transmission concepts and terminology – Protocol architecture – Protocols – OSI – TCP/IP – LAN Topology - Transmission media

**UNIT II DATA LINK LAYER 9**

Data link control - Flow Control – Error Detection and Error Correction - MAC – Ethernet, Token ring, Wireless LAN MAC – Blue Tooth - Bridges.

**UNIT III NETWORK LAYER 9**  
Network layer – Switching concepts – Circuit switching – Packet switching –IP – Datagrams – IP addresses- IPV6– ICMP – Routing Protocols – Distance Vector – Link State- BGP.

**UNIT IV TRANSPORT LAYER 9**  
Transport layer –service –Connection establishment – Flow control – Transmission control protocol – Congestion control and avoidance – User datagram protocol. -Transport for Real Time Applications (RTP).

**UNIT V APPLICATIONS 9**  
Applications - DNS- SMTP – WWW –SNMP- Security –threats and services - DES- RSA- web security -SSL

**TOTAL : 45 PERIODS**

**COURSE OUTCOMES:**

- Able to trace the flow of information from one node to another node in the network
- Able to Identify the components required to build different types of networks
- Able to understand the functionalities needed for data communication into layers
- Able to choose the required functionality at each layer for given application
- Able to understand the working principles of various application protocols
- Acquire knowledge about security issues and services available

**REFERENCES:**

1. Larry L. Peterson & Bruce S. Davie, “Computer Networks – A systems Approach”, Fourth Edition, Harcourt Asia / Morgan Kaufmann, 2007.
2. William Stallings, “Data and Computer Communications”, Ninth Edition, Prentice Hall , 2011.
3. Forouzan, “ Data Communication and Networking”, Fifth Edition , TMH 2012
4. Andrew S.Tannenbaum David J. Wetherall, “Computer Networks” Fifth Edition , Pearson Education 2011
5. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition,2012
6. John Cowley, “Communications and Networking : An Introduction”, Springer Indian Reprint, 2010.
7. Achyut S Godbole,Atul Hahate, “ Data Communications and Networks”second edition 2011
8. Wayne Tomasi, “ Introduction to Data communications and Networking” , Pearson 2011

**MC7302 EMBEDDED SYSTEMS L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

- To understand the architecture and functions of 8085 processor
- To Learn Assembly language programming
- To understand the Basic concepts of Embedded systems and 8051 microcontroller
- To gain knowledge about how the I/O devices are interfaced with 8051 microcontroller
- To understand the basics of RTOS and to learn the method of designing a real time systems

**UNIT I INTRODUCTION TO MICROPROCESSORS 9**  
Evolution Of Microprocessors - 8-Bit Processor - 8085 Architecture – Register Organization - Instruction Set – Timing Diagram- Addressing Modes – Interrupts- Interrupt Service Routines- Assembly Language Programming Using 8085

**UNIT II INTRODUCTION TO EMBEDDED SYSTEMS 9**  
 Embedded Systems- Processor Embedded Into A System-Embedded Hardware And Software Units- Applications-Design Process – Intel 8051 Architecture- Processor And Memory Organization- Interrupts Of 8051 - Assembly Language Programming Using 8051

**UNIT III INTERFACING WITH 8051 9**  
 Input-Output Interfacing – Bus Standards – PCI – ISA – Timing And Control – Input Output Devices – Serial And Parallel Communication – Motor Control-Programming Display Devices – ARM Architecture

**UNIT IV REAL – TIME OPERATING SYSTEM 9**  
 Inter Process Communication – Signal Functions – Socket Programming – Mailbox - Pipes – RTOS – OS Services – Process Management - Timer Function –Event Function – Memory Management – Device, Files And I/O Subsystem – Basic Design Of RTOS.

**UNIT V RTOS PROGRAMMING 9**  
 Basic Functions – Types Of RTOS – RTOS  $\mu$ COS – RTLinux – Real Time Linux Functions- Programming With RTLinux – Case Study

**TOTAL : 45 PERIODS**

**COURSE OUTCOMES:**

- Able to understand the functionality of 8085 microprocessor
- Able to design and control real time control systems
- Able incorporate enhanced features in the embedded systems through software
- Able to rectify minor problems by troubleshooting
- Acquire the knowledge of real time operating system and implement real time functions

**REFERENCE BOOKS:**

1. Rajkamal, “Embedded System: Architecture, Programming And Design” Tata Mcgraw-Hill Education, Second Edition, 2008.
2. B.Kanth Rao, “Embedded Systems” PHI Learning Private Limited, 2011.
3. Marilyn Wolf, “Computers As A Components” Third Edition, Morgan Kaufmann Series 2012.
4. A.P.Godse & A.O.Mulani ”Embedded Systems” Third Edition, Technical publications 2009.
5. Mohamed Rafiquzzaman, “Microprocessors and Micro computer-based system design”, CRC Press, Second Edition, 2013.

**MC7303 SOFTWARE ENGINEERING L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

- to provide an insight into the processes of software development
- To understand and practice the various fields such as analysis, design, development, testing of Software Engg .
- To develop skills to construct software of high quality with high reliability
- To apply metrics and testing techniques to evaluate the software

**UNIT I INTRODUCTION 9**  
 Software Engineering paradigms – Waterfall Life cycle model – Spiral Model – Prototype Model – fourth Generation Techniques – Planning – Software Project Scheduling, – Risk analysis and management – Requirements and Specification – Case Study for Project Plan and SRS



**UNIT II SOFTWARE DESIGN 9**  
Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Various Design Concepts and notations – Real time and Distributed System Design – Documentation – Dataflow Oriented design – Jackson System development – Designing for reuse – Programming standards – Case Study for Design of any Application Project.

**UNIT III SOFTWARE TESTING AND MAINTENANCE 9**  
Software Testing Fundamentals – Software testing strategies – Black Box Testing – White Box Testing – System Testing – Object Orientation Testing – State based Testing - Testing Tools – Test Case Management – Software Maintenance Organization – Maintenance Report – Types of Maintenance – Case Study for Testing Techniques

**UNIT IV SOFTWARE METRICS 9**  
Scope – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Cost Estimation - Reliability – Software Quality Assurance – Standards – Case Study for COCOMO model

**UNIT V SCM & WEB ENGINEERING 9**  
Need for SCM – Version Control – SCM process – Software Configuration Items – Taxonomy – CASE Repository – Features – Web Engineering

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- Get an insight into the processes of software development
- Able to understand the problem domain for developing SRS and various models of software engineering
- Able to Model software projects into high level design using DFD,UML diagrams
- Able to Measure the product and process performance using various metrics
- Able to Evaluate the system with various testing techniques and strategies

**REFERENCE BOOKS:**

1. Roger S. Pressman, “Software Engineering: A Practitioner Approach”, Seventh edition, McGrawHill, 2010.
2. Richard Fairley, “ Software Engineering Concepts”, Tata McGraw Hill Edition, 2008
3. Ali Behforroz, Frederick J.Hudson, “Software Engineering Fundamentals”, Oxford Indian Reprint, 2012
4. Sommerville, “Software Engineering”, Sixth Edition, Addison Wesley-Longman, 2004.
5. Kassem A. Saleh, “Software Engineering”, First Edition, J.Ross Publishing, 2009.
6. Pankaj Jalote, “An Integrated approach to Software Engineering”, Third Edition, Springer Verlag, 2005.
7. Roger S. Pressman, David Lowe, “Web Engineering: A Practitioner’s Approach”, Special Indian edition, McGrawHill, 2008.
8. Jibitesh Mishra, Ashok Mohanty, “Software Engineering”, Pearson Education, First Edition, 2012

**COURSE OBJECTIVES**

- To understand the concepts of computer ethics in work environment.
- To understand the threats in computing environment
- To understand the intricacies of accessibility issues
- To ensure safe exits when designing the software projects

**UNIT I            COMPUTER ETHICS INTRODCUTION AND COMPUTER HACKING            9**

A general Introduction – Computer ethics: an overview – Identifying an ethical issue – Ethics and law – Ethical theories - Professional Code of conduct – An ethical dilemma – A framework for ethical decision making - Computer hacking – Introduction – definition of hacking – Destructive programs – hacker ethics - Professional constraints – BCS code of conduct – To hack or not to hack? – Ethical positions on hacking

**UNIT II            ASPECTS OF COMPUTER CRIME AND INTELLECTUAL PROPERTY RIGHTS            9**

Aspects of computer crime - Introduction - What is computer crime – computer security measures – Professional duties and obligations - Intellectual Property Rights – The nature of Intellectual property – Intellectual Property – Patents, Trademarks, Trade Secrets, Software Issues, Copyright - The extent and nature of software piracy – Ethical and professional issues – free software and open source code

**UNIT III            REGULATING INTERNET CONTENT, TECHNOLOGY AND SAFETY            9**

Introduction – In defence of freedom expression – censorship – laws upholding free speech – Free speech and the Internet - Ethical and professional issues - Internet technologies and privacy – Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk

**UNIT IV            COMPUTER TECHNOLOGIES ACCESSIBILITY ISSUES            9**

Introduction – Principle of equal access – Obstacles to access for individuals – professional responsibility - Empowering computers in the workplace – Introduction – computers and employment – computers and the quality of work – computerized monitoring in the work place – telecommuting – social, legal and professional issues - Use of Software, Computers and Internet-based Tools - Liability for Software errors - Documentation Authentication and Control – Software engineering code of ethics and practices – IEEE-CS – ACM Joint task force

**UNIT V            SOFTWARE DEVELOPMENT AND SOCIAL NETWORKING            9**

Software Development – strategies for engineering quality standards – Quality management standards – Social Networking – Company owned social network web site – the use of social networks in the hiring process – Social Networking ethical issues – Cyber bullying – cyber stalking – Online virtual world – Crime in virtual world - digital rights management - Online defamation – Piracy – Fraud

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

- Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.
- Develop a responsible attitude towards the use of computer as well as the technology.
- Able to envision the societal impact on the products/ projects they develop in their career
- Understanding the code of ethics and standards of computer professionals.
- Analyze the professional responsibility and empowering access to information in the work place.

## REFERENCES:

1. Penny Duquenoey, Simon Jones and Barry G Blundell, "Ethical , legal and professional issues in computing", Middlesex University Press, 2008
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 2011
3. Caroline Whitback," Ethics in Engineering Practice and Research ", Cambridge University Press, 2011
4. Richard Spinello, "Case Studies in Information and Computer Ethics", Prentice Hall, 1997.
5. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press, 1997.
6. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet",3rd Edition,Prentice Hall, 2008
7. [http://www.infosectoday.com/Articles/Intro\\_Computer\\_Ethics.htm](http://www.infosectoday.com/Articles/Intro_Computer_Ethics.htm)

**MC 7305**

**INTERNET PROGRAMMING**

**L T P C**  
**3 0 0 3**

## COURSE OBJECTIVES:

- To provide an overview of working principles of internet, web related functionalities
- To understand and apply the fundamentals core java, packages, database connectivity for computing
- To enhance the knowledge to server side programming
- To provide knowledge on advanced features like Swing, JavaBeans, Sockets.

### UNIT I INTERNET APPLICATIONS

**9**

Domain Name System - Exchanging E-mail – Sending and Receiving Files - Fighting Spam, Sorting Mail and avoiding e-mail viruses – Chatting and Conferencing on the Internet – Online Chatting - Messaging – Usenet Newsgroup – Voice and Video Conferencing – Web Security, Privacy, and site-blocking – FTP.

### UNIT II JAVA FUNDAMENTAL

**9**

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Packages and Interfaces – Exception Handling.

### UNIT III PACKAGES

**9**

AWT package – Layouts – Containers – Event Package – Event Model – Painting – Garbage Collection - Multithreading  
– Language Packages.

### UNIT IV ADVANCED JAVA PROGRAMMING

**9**

Utility Packages – Input Output Packages – Inner Classes – Java Database Connectivity - Servlets - RMI – Swing Fundamentals - Swing Classes.

### UNIT V JAVA BEANS AND NETWORKING

**9**

Java Beans – Application Builder Tools - Using the Bean Developer Kit-Jar Files-Introspection- BDK-Using BeanInfo Interface – Persistence- Java Beans API – Using Bean Builder - Networking Basics - Java and the Net – InetAddress – TCP/IP Client Sockets – URL –URL Connection – TCP/IP Server Sockets – A Caching Proxy HTTP Server – Datagrams.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- Able to understand the internet standards and recent web technologies like Conferencing, newsgroup etc.
- Able to implement, compile, test and run Java program,
- Able to make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API
- Able to understand the components and patterns that constitute a suitable architecture for a web application using java servlets
- Able to demonstrate systematic knowledge of backend and front end by developing an appropriate application.

**REFERENCES:**

1. Margaret Levine Young, "Internet and WWW", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2002.
2. Paul J. Deitel, Harvey M. Deitel, "Internet & World Wide Web: How to Program", Pearson Education International, 2009
3. Herbert Schildt, The Complete Reference – Java 2, 4<sup>th</sup> Edition, Tata McGraw Hill, 2001
4. Joyce Farrell, "Java Programming", Cengage Learning, Sixth Edition, 2011
5. C. Xavier, "Java Programming: A Practical Approach", Tata McGraw Hill, 2011
6. Keyur shah, "Gateway to Java Programmer Sun Certification", Tata Mc Graw Hill 2002
7. Poomachandra Sarang, "Java Programming", McGraw Hill Professional, 2012
8. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", Tata Mc Graw Hill, 2013
9. John Dean, Raymond Dean, " Introduction to Programming with JAVA – A Problem Solving Approach", Tata Mc Graw Hill, 2012
10. Ralph Bravaco, Shai Simonson, "Java Programming : From the Ground Up", Tata McGraw Hill Edition, 2012
11. D.S.Malik, "Java Programming", Cengage Learning, 2009
12. Rashmi Kanta Das, "Core Java for Beginners" , Vikas Publishing House Pvt. Ltd., 2011

**MC7311****EMBEDDED SYSTEMS LABORATORY****L T P C  
0 0 3 2**

1. Assembly Language Programs Using 8085 – 3 Experiments
2. 8051 Microcontroller Based Simple ALP Experiments – 2 Experiments
3. 8051 Microcontroller Based I/O Interfacing - 2 Experiments
4. Real Time Systems Program Using RTOS – 2 Experiments
5. Case Study Using RTLinux

**TOTAL : 45 PERIODS**

**MC7312****INTERNET PROGRAMMING LABORATORY****L T P C  
0 0 3 2**

1. Basics - Sending and receiving mails from one or more email clients, Video Conferencing demonstration.
2. Writing Java programs by making use of class, interface, package, etc for the following
  - # Different types of inheritance study
  - # Uses of 'this' keyword
  - # Polymorphism
  - # Creation of user specific packages
  - # Creation of jar files and using them
  - # User specific exception handling
3. Writing window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion etc
4. Application of threads examples
5. Reading and writing text files
6. Writing an RMI application to access a remote method
7. Writing a Servlet program with database connectivity for a web based application such as students result status checking, PNR number enquiry etc
8. Creation and usage of Java bean
9. Create a Personal Information System using Swing
10. Event Handling in Swing
11. FTP Using Sockets.

**TOTAL : 45 PERIODS****MC7313****VISUAL PROGRAMMING LABORATORY****L T P C  
1 0 3 2****VB**

1. Database applications using data control.

**VC++**

1. SDK type programs code for GDI objects.
2. Implementation of Process management using PWCT
3. Implementation of advanced dynamic Slider & Image control applications
4. Programming for reading and writing into documents.
5. Creating DLLs and using them.
6. Data access through ODBC – Cdatabase, Crecordset.
7. Creating status bar application, static and dynamic splitter windows
8. create an application that will load the bit map dynamically with and with out wizard
9. Creating Active-x controls using .Net

**TOTAL : 45 PERIODS**

**COURSE OBJECTIVES:**

- To provide the concept and an understanding of basic concepts in Operations Research Techniques for Analysis and Modeling in Computer Applications.
- To understand , develop and solve mathematical model of linear programming problems
- To understand , develop and solve mathematical model of Transport and assignment problems
- To Understand network modeling for planning and scheduling the project activities

**UNIT I LINEAR PROGRAMMING MODELS 9**

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques- Variants of Simplex method

**UNIT II TRANSPORTATION AND ASSIGNMENT MODELS 9**

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem

**UNIT III INTEGER PROGRAMMING MODELS 9**

Formulation – Gomory's IPP method – Gomory's mixed integer method – Branch and bound technique.

**UNIT IV SCHEDULING BY PERT AND CPM 9**

Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling

**UNIT V QUEUEING MODELS 9**

Characteristics of Queuing Models – Poisson Queues - (M / M / 1) : (FIFO / / ), (M / M / 1) : (FIFO / N / ), (M / M / C) : (FIFO / / ), (M / M / C) : (FIFO / N / ) models.

**TOTAL : 45 PERIODS****COURSE OUTCOMES:**

- Understand and apply linear, integer programming to solve operational problem with constraints
- Apply transportation and assignment models to find optimal solution in warehousing and Travelling,
- To prepare project scheduling using PERT and CPM
- Identify and analyze appropriate queuing model to reduce the waiting time in queue.
- Able to use optimization concepts in real world problems

**REFERENCES:**

1. Taha H.A., "Operations Research : An Introduction " 8<sup>th</sup> Edition, Pearson Education, 2008.
2. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education, Asia, 2005.
3. Prem Kumar Gupta, D.S. Hira, "Operations Research", S.Chand & Company Ltd, New Delhi, 3rd Edition , 2008.
4. John W. Chinneck "Feasibility and Infeasibility in Optimization Algorithms and Computational Methods' Springer, 2008
5. Ravindran, Phillips, Solberg,"Operations Research: Principles And Practice", 2ND ED, John Wiley & Sons, 01-Jul-2007
6. Ibe, O.C. "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.
7. Gross, D. and Harris, C.M., "Fundamentals of Queueing Theory", Wiley Student, 3rd Edition, New Jersey, 2004.

**COURSE OBJECTIVES:**

- To provide a brief, hands-on overview of object-oriented analysis in software process
- To discuss Case studies based project specifications to develop object-oriented models and identify implementation strategies.
- To demonstrate and apply basic object oriented techniques to create and modify object oriented analysis and design models.
- To understand and apply testing techniques for object oriented software

**UNIT I INTRODUCTION****9**

An overview – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Metaclasses – Object oriented system development life cycle.

**UNIT II METHODOLOGY AND UML****9**

Introduction – Survey – Rumbaugh, Booch, Jacobson methods – Patterns – Creational - Abstract Factory – Factory Method – Behavioral – Momento – Mediator - Structural – Decorator - Facade - Concurrency Patterns –Lock – Reactor – Scheduler - Frameworks – Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Usecase diagrams – Dynamic modeling – Model organization – Extensibility.

**UNIT III OBJECT ORIENTED ANALYSIS****9**

Identifying Usecase – Business object analysis – Usecase driven object oriented analysis – Usecase model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility

**UNIT IV OBJECT ORIENTED DESIGN****9**

Design process and benchmarking – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface-OOUI - MVC Architectural Pattern and Design – Designing the system.

**UNIT V QUALITY AND TESTING****9**

Quality assurance – Testing strategies – Test cases – Automated Testing Tools – Case Study - Cryptanalysis – Health Care Systems- Inventory Control System - Rational Rose Suite.

**TOTAL : 45 PERIODS****COURSE OUTCOMES:**

- Understand the basic concepts to identify state & behavior of real world objects
- Able to learn the various object oriented methodologies and choose the appropriate one for solving the problem with the help of various case studies
- Understand the concept of analysis, design & testing to develop a document for the project
- Able to implement analysis, design & testing phases in developing a software project
- Able to understand the testing strategies and know about automated testing tools

## REFERENCES :

1. Ali Bahrami, "Object Oriented System Development", McGraw Hill International Edition, 2008.
2. Craig Larman, Applying UML and Patterns, 2<sup>nd</sup> Edition, Pearson, 2002.
3. Brahma Dathan, Sarnath Ramnath, "Object-Oriented Analysis, Design and Implementation", Universities Press, 2010.
4. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley Long man, 1999.
5. Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Patterns and Java, Pearson 2004
6. Martin Fowler, "UML Distilled A Brief Guide to Standard Object Modeling Language", 3<sup>rd</sup> Edition, Addison Wesley, 2003
7. Russ Miles, Kim Hamilton, "Learning UML 2.0", O'Reilly, 2008.

**MC7403**

**DATA WAREHOUSING AND DATA MINING**

**L T P C**  
**3 0 0 3**

## COURSE OBJECTIVES:

- To expose the students to the concepts of Data warehousing Architecture and Implementation
- To Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- To learn to use association rule mining for handling large data
- To understand the concept of classification for the retrieval purposes
- To know the clustering techniques in details for better organization and retrieval of data
- To identify Business applications and Trends of Data mining

### **UNIT I DATA WAREHOUSE**

**8**

Data Warehousing - Operational Database Systems vs. Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP Operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

### **UNIT II DATA MINING & DATA PREPROCESSING**

**9**

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

### **UNIT III ASSOCIATION RULE MINING**

**8**

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

### **UNIT IV CLASSIFICATION & PREDICTION**

**10**

Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.



## UNIT V CLUSTERING

10

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

**TOTAL : 45 PERIODS**

### COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

- Store voluminous data for online processing
- Preprocess the data for mining applications
- Apply the association rules for mining the data
- Design and deploy appropriate classification techniques
- Cluster the high dimensional data for better organization of the data
- Discover the knowledge imbibed in the high dimensional system
- Evolve Multidimensional Intelligent model from typical system
- Evaluate various mining techniques on complex data objects

### REFERENCES:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
4. BERSON, ALEX & SMITH, STEPHEN J, Data Warehousing, Data Mining, and OLAP, TMH Pub. Co. Ltd, New Delhi, 2012
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Pearson Education, 2007
6. PRABHU Data Warehousing, PHI Learning Private Limited, New Delhi, 2012, ,
7. PONNIAH, PAULRAJ, Data Warehousing Fundamentals, John Wiley & Sons, New Delhi, 2011
8. MARAKAS, GEORGE M, Modern Data Warehousing, Mining, and Visualiza Visualization, Pearson Education, 2011

**MC7404**

**NETWORK PROGRAMMING**

**L T P C  
3 0 0 3**

### COURSE OBJECTIVES :

1. To understand interprocess and inter-system communication
2. To understand socket programming in its entirety
3. To understand usage of TCP/UDP / Raw sockets
4. To understand how to build network applications

## UNIT I INTRODUCTION

9

Overview of UNIX OS - Environment of a UNIX process - Process control – Process relationships Signals – Interprocess Communication- overview of TCP/IP protocols

## UNIT II ELEMENTARY TCP SOCKETS

9

Introduction to Socket Programming –Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server.

**UNIT III APPLICATION DEVELOPMENT****9**

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

**UNIT IV SOCKET OPTIONS, ELEMENTARY UDP SOCKETS****9**

Socket options – getsockopt and setsockopt functions – generic socket options – IP socketoptions – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions.

**UNIT V ADVANCED SOCKETS****9**

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination – TCP echo server using threads – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input – ping program – trace route program.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

1. To write socket API based programs
2. To design and implement client-server applications using TCP and UDP sockets
3. To analyze network programs

**REFERENCES:**

1. W. Richard Stevens, B. Fenner, A.M. Rudoff, “Unix Network Programming – The Sockets Networking API”, 3<sup>rd</sup> edition, Pearson, 2004.
2. W. Richard Stevens, S.A Rago, “Programming in the Unix environment”, 2<sup>nd</sup> edition, Pearson, 2005.

**MC7411 SOFTWARE DEVELOPMENT – CASE TOOLS LABORATORY****L T P C  
0 0 3 2**

1. Practicing the different types of case tools such as Rational Rose / other Open Source be used for all the phases of Software development life cycle.
2. Data modeling
3. Source code generators
4. Apply the following to typical application problems:
  1. Project Planning
  2. Software Requirement Analysis
  3. Software Design
  4. Data Modeling & Implementation
  5. Software Estimation
  6. Software Testing

A possible set of applications may be the following:

- a. Library System
- b. Student Marks Analyzing System
- c. Text Editor.
- d. Create a dictionary.
- e. Telephone directory.
- f. Inventory System.

**TOTAL: 45 PERIODS**

**MC7412**

**NETWORK PROGRAMMING LABORATORY**

**L T P C  
0 0 3 2**

1. Implementation of File System Calls
2. Implementation of ICP Techniques – Pipe, Message Queue, Shared Memory
3. Socket Programming
  - a) TCP Sockets
  - b) UDP Sockets
  - c) Applications using Sockets
4. Simulation of Sliding Window Protocol
5. Simulation of Routing Protocols
6. RPC
7. Development of applications such as DNS / HTTP / E-mail / Multi-user chat

**TOTAL : 45 PERIODS**

**MC7413**

**TECHNICAL SEMIANR AND REPORT WRITING**

**L T P C  
0 0 3 2**

The goal of this course is to train the students to critically evaluate a well-defined set of research subjects and to summarize the findings concisely in a paper of scientific quality. The paper will be evaluated based on the ability to understand a topic, communicate it and identify the issues. Results from this term paper will be presented to fellow students and a committee of faculty members.

1. Every student selects a topic related to current trends and the same should be approved by the respective committee. This selection should have at least 5 distinct primary sources.
2. Every student must write a short review of the topic and present it to fellow students and faculty (discuss the topic – expose the flaws – analyze the issues) every week.
3. The faculty should evaluate the short review and award marks with respect to the following.
  - a. Has the student analyzed – not merely quoted – the most significant portions of the primary sources employed?
  - b. Has the student offered original and convincing insights?
  - c. Plagiarism to be checked.
4. Every student should re-submit and present the review article including issues/ comments/ conclusions which had arisen during the previous discussion.
5. Every student should submit a final paper as per project specifications along with all short review reports (at least 4 internal reviews) and corresponding evaluation comments.
6. Every student should appear for a final external review exam to defend themselves.

**TOTAL: 45 PERIODS**

**COURSE OBJECTIVES:**

- To acquire knowledge on the usage of recent platforms in developing web applications
- To understand architecture of J2EE and design applications using J2EE, Struts and JSP
- To understand framework of .NET and design applications using .NET, C#, Silverlight
- To Design and develop interactive, client-side, server-side executable web applications LAMP Stack.

**UNIT I J2EE Platform 9**

Introduction -Enterprise Architecture Styles - J2EE Architecture - Containers - J2EE Technologies - Developing J2EE Applications - Naming and directory services - Using JNDI - JNDI Service providers - Java and LDAP - LDAP operations - Searching an LDAP server - Storing and retrieving java objects in LDAP - Application Servers - Implementing the J2EE Specifications - J2EE packaging and Deployment - J2EE packaging overview - Configuring J2EE packages

**UNIT II STRUTS AND HIBERNATE 9**

Struts Architecture - Struts classes - Action Forward, Action Form, Action Servlet, Action classes - Understanding struts - config.xml, Understanding Action Mappings, Struts flow with an example application, Struts Tiles Framework, Struts Validation Framework – Hibernate - Architecture of Hibernate - Downloading Hibernate - Exploring HQL - Understanding Hibernate O/R Mapping.

**UNIT III LAMP STACK 9**

Overview of Lamp Stack - Features of Lamp Stack –Understanding Python Understanding LAMP and Its Effect on Web Development

**UNIT IV .Net, C# 9**

Introduction - .Net revolution - .Net framework and its architecture – CLR – What is Assembly – Components of Assembly – DLL hell and Assembly Versioning. Overview to C# - C # Compilation and Execution Process – C# Fundamentals (Data types, Operators, Programming constructs) – Inheritance –Sealed Classes – Interface - Overloading – OverRiding – Method Hiding – C# Property – Exception Handling

**UNIT V ASP.NET AND SILVERLIGHT 9**

ASP.Net- IIS - ASP.Net Page Life Cycle – ASP Vs ASP.Net - HTML Controls Vs Server side Controls – Validation Controls – Data binding in ASP.Net – Caching – Configuration in ASP.Net (web.config) – Session management – View State in ASP.Net – ASP.Net. Introduction - RIA – Silverlight – XAML – App.Xaml – XAP – How Silverlight application executes in a web browser

**TOTAL : 45 PERIODS****COURSE OUTCOMES:**

- Knows how to design and implement Internet systems for enhancing education and engineering design,
- Able to understand functionality of Internet system
- Able to design a system according to customer needs using the available Internet technologies
- Able to Design and develop interactive, client-side, server-side executable web applications.
- Explore the features of various platforms and frameworks used in web applications development

## REFERENCES:

1. James Holmes "Struts: The Complete Reference, " 2nd Edition 2007 McGraw Hill Professional
2. Patrick Peak And Nick Heudecker, Patrick Peak, Nick Heudecker Hibernate Quickly, " 2007 Dreamtech
3. Subrahmanyam Allamaraju and Cedric Buest , "Professional Java Server Programming(J2EE 1.3 Edition), ", Shroff Publishers & Distributors Pvt Ltd
4. Jesse Liberty , 'Programming C#, " , 4th Edition, O'Reilly Media
5. Mario Szpuszta, Matthew MacDonald , "Pro ASP.NET 4 in C# 2010: Includes Silverlight 2, "Apress, Third Edition
6. Jason Beres, Bill Evjen, Devin Rader , 'Professional Silverlight 4 Print", December 2012 www.free-ebooks-library.com
7. James Lee, Brent Ware , "Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP" Addison Wesley, Pearson 2009
8. Vern Ceder , "The Quick Python Book," Second Edition, Manning Publications Company, 2010

**MC7502**

**SERVICE ORIENTED ARCHITECTURE**

**L T P C**  
**3 0 0 3**

## COURSE OBJECTIVES:

- To provide fundamental concepts of Service Oriented Architecture..
- To gain knowledge about SOAP, UDDI and XML to create web services.
- To know about the Cloud Computing architecture and services.

### UNIT I SOA BASICS

**9**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation – Service Layers.

### UNIT II XML AND WEB SERVICES

**9**

XML structure – Elements – Creating Well-formed XML - Name Spaces – Schema Elements, Types, Attributes – XSL Transformations – Parser – Web Services Overview – Architecture.

### UNIT III WSDL, SOAP and UDDI

**9**

WSDL - Overview Of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure – Intermediaries – Actors – Design Patterns And Faults – SOAP With Attachments – UDDI.

### UNIT IV SOA in J2EE and .NET

**9**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) – JAX-RS SOA support in .NET – ASP.NET web services.

### UNIT V CLOUD COMPUTING

**9**

Vision of Cloud computing – Cloud Definition – Characteristics and Benefits – Virtualization – Cloud computing Architecture – Cloud Reference Model, Types of Clouds – Cloud Platforms in Industry.

**TOTAL : 45 PERIODS**

## COURSE OUTCOMES:

- Known about the basic principles of service oriented architecture , its components and techniques
- Understand the architecture of web services
- Able to design and develop web services using protocol
- Understand technology underlying the service design
- Acquire the fundamental knowledge of cloud computing

## REFERENCES:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2006.
2. Heather Williamson, "XML, The Complete Reference", McGraw Hill Education, 2012.
3. Frank. P. Coyle, "XML, Web Services And The Data Revolution", Pearson Education, 2002.
4. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services. An Architect's Guide", Pearson Education, 2005.
5. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
6. Dan woods and Thomas Mattern, "Enterprise SOA designing IT for Business Innovation", O'REILLY, First Edition, 2006.
7. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2013.

**MC7503**

**MOBILE COMPUTING**

**L T P C**  
**3 0 0 3**

## COURSE OBJECTIVES:

- To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.
- To have an exposure about wireless protocols -WLN, Bluetooth, WAP, ZigBee **issues**.
- To Know the Network, Transport Functionalities of Mobile communication
- To understand the concepts of Adhoc and wireless sensor networks.
- To impart knowledge about Mobile Application Development

### **UNIT I WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE 9**

Frequencies Spectrum- Multiplexing- Spread spectrum-GSM vs CDMA - 2G Mobile Wireless Services -Comparison of 2G and 3 G - GSM Architecture-Entities-Call Routing-PLMN-Address and identifiers-Network Aspects-Mobility Management-Frequency Allocation-Authentication and Security-SMS Architecture-Value Added Service through SMS-GPRS-GPRS and Packet Data Network-Architecture-Network Operations-Data Service-Application .

### **UNIT II MOBILE WIRELESS SHORT RANGE NETWORKS 9**

Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture-WLAN MAC-Security of WLAN, Power Management-Standards- WAP Architecture-WAP 2.0-Bluetooth enabled Devices Network-Layers in Bluetooth Protocol-Security in Bluetooth- IrDA- ZigBee

### **UNIT III MOBILE IP NETWORK LAYER, TRANSPORT LAYER 9**

IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management-Registration- Tunneling and Encapsulation-Route Optimization- Dynamic Host Configuration Protocol-VoIP -IPsec -Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP

#### **UNIT IV MOBILE AD-HOC, SENSOR NETWORKS**

**9**

Introduction to Mobile Ad hoc Network- MANET-Routing and Routing Algorithm-Security – Wireless Sensor Networks-Applications- Distributed Network and Characteristics-Communication Coverage-Sensing Coverage-Localization- Routing -Function Computation- Scheduling

#### **UNIT V MOBILE APPLICATION DEVELOPMENT**

**9**

Mobile Applications Development -Application Development Overflow-Techniques for Composing Applications - Understanding the Android Software Stack – Android Application Architecture – Developing for Android – The Android Application Life Cycle – The Activity Life Cycle – Creating Your First Android Activity – Creating Applications and Activities – Creating User Interfaces – Intents – Broadcast Receivers – Adapters – Data Storage, Retrieval, and Sharing.-Geo services- creating mobile applications like game, Clock, calendar, Convertor, phone book, Text Editor

**TOTAL: 45 PERIODS**

#### **COURSE OUTCOMES:**

- Gain the knowledge about various types of Wireless Data Networks and Wireless Voice Networks.
- understand the architectures, the challenges and the Solutions of Wireless Communication those are in use.
- realize the role of Wireless Protocols in shaping the future Internet.
- know about different types of Wireless Communication Networks and their functionalities.
- Able to develop simple Mobile Application Using Android

#### **REFERENCES**

1. Asoke K Talukder, Hasan Ahmed,Roopa R Yavagal “Mobile Computing”, Tata McGraw Hill Pub ,Aug – 2010
2. Raj Kamal “Mobile Computing” Oxford Higher Education, Second Edition, 2012
3. Pei Zheng, Larry L. Peterson, Bruce S. Davie, Adrian Farrell “Wireless Networking Complete” Morgan Kaufmann Series in Networking , 2009( introduction, WLAN MAC)
4. Vijay K Garg “Wireless Communications & Networking” Morgan Kaufmann Series, 2010
5. Jochen Schillar “Mobile Communications” Pearson Education second Edition
6. Donn Felker ,’Android Application Development For Dummies, Wiley, 2010
7. Reto Meier,Professional Android 2 Application Development, Wrox’s Programmer to Programmer series
8. Ed Burnette,’Hello, Android: Introducing Google’s Mobile Development Platform’ third edition’ Pragmatic Programmers,2012
9. Jerome(J.F) DiMarzio “Android A programmer’s Guide” Tata McGraw-Hill 2010 Edition

**MC7511**

**ADVANCED INTERNET PROGRAMMING LABORATORY**

**L T P C**  
**0 0 3 2**

1. Develop a car showroom inventory web application with 2-tier architecture. Use JSP and JDBC
2. Develop a real estate web application with n-tier architecture. Use JSP, Servlets and JDBC. The application should be able to add and search all properties such as rental/own, individual/apartment and duplex/semi-duplex
3. Develop any web application which authenticates using LDAP
4. Develop a standalone java application or a web application to add, modify and delete the LDAP attributes of the given input
5. Design a student identity management web application using struts framework. The application should be able to provide an identity such as student id, access to department assets with department id, access to lab assets with lab id.
6. Create an online bookstore that includes all validation controls available in ASP.NET
7. Create a component that receives two numbers from the user through a Web Form, and based on the user's selection add or subtract the two numbers and returns the result to the Web Form. The result should be displayed in the Web Form using ASP.NET
8. Create a Silverlight Application for the SharePoint Client Object Model
9. Create a graph using the SharePoint Object Model and Silverlight Graphing controls

**TOTAL : 45 PERIODS**

**MC7512**

**XML AND WEB SERVICES LABORATORY**

**L T P C**  
**0 0 3 2**

1. XML document creation.
2. Importing and Exporting XML document in database.
3. XSL Transformation
4. Internal and External DTD creation
5. XML Schema creation
6. Parsing XML document using DOM/SAX parser.
7. Web Service creation using JAX-WS
8. Web Service creation using JAX-RS
9. Web Service creation using .NET
10. JAXB Marshaling and Unmarshaling

A possible set of applications may be the following:

- a. Currency Conversion
- b. Temperature Conversion
- c. Ticket Booking
- d. Dictionary

**TOTAL: 45 PERIODS**



**MC7513**

**MINI PROJECT (SOCIALY RELEVANT)**

**L T P C**  
**0 0 3 2**

- Team Project with a maximum of four in a team
- Students shall select a domain and develop an application with social relevance
- Documentation is to be based on the standards
- Evaluation pattern is like Lab examination
- Need to submit a report, presentation with demo.
- User Based Testing and feedback from the benefited society required

**TOTAL: 45 PERIODS.**

**MC7001**

**GAME PROGRAMMING**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

- To understand of game design and development
- To understand the processes, mechanics, issues in game design, game engine development
- To understand modeling, techniques, handling situations, and logic.

**UNIT I 3D GRAPHICS FOR GAME PROGRAMMING**

**9**

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation

**UNIT II GAME DESIGN PRINCIPLES**

**9**

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding

**UNIT III GAMING ENGINE DESIGN**

**9**

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

**UNIT IV GAMING PLATFORMS AND FRAMEWORKS**

**9**

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity

**UNIT V GAME DEVELOPMENT**

**9**

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- Able to understand and apply 3 D concepts in Game programming.
- Gain knowledge about principles and levels of design in various game development
- Gain knowledge about gaming engine design for controlling
- Explore into various platforms and frameworks available for game development
- Able to design and develop interactive games

## REFERENCE BOOKS:

1. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" Morgan Kaufmann, 2 Edition, 2006.
2. JungHyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 1st edition, 2011.
3. Mike McShaffry, "Game Coding Complete", Third Edition, Charles River Media, 2009.
4. Jonathan S. Harbour, "Beginning Game Programming", Course Technology PTR, 3 edition, 2009.
5. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall 1st edition, 2006.
6. Roger E. Pedersen, "Game Design Foundations", Edition 2, Jones & Bartlett Learning, 2009.
7. Scott Rogers, "Level Up!: The Guide to Great Video Game Design", Wiley, 1<sup>st</sup> edition, 2010.
8. Jason Gregory, "Game Engine Architecture", A K Peters, 2009.
9. Jeannie Novak, "Game Development Essentials", 3rd Edition, Delmar Cengage Learning, 2011.
10. Andy Harris, "Beginning Flash Game Programming For Dummies", For Dummies; Updated edition, 2005.
11. John Hattan, "Beginning Game Programming: A GameDev.net Collection", Course Technology PTR, 1 edition, 2009.
12. 8. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", Third Edition, Course Technology PTR, 3rd edition, 2011.
13. Dino Dini, "Essential 3D Game Programming", Morgan Kaufmann, 1st edition 2012.
14. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, "Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer", 1st edition, Wiley, 2007.

MC7002

SOFT COMPUTING

L T P C  
3 0 0 3

## COURSE OBJECTIVES

- To learn the key aspects of Soft computing
- To know about the components and building block hypothesis of Genetic algorithm.
- To understand the features of neural network and its applications
- To study the fuzzy logic components
- To gain insight onto Neuro Fuzzy modeling and control.
- To gain knowledge in machine learning through Support vector machines.

### UNIT I INTRODUCTION TO SOFT COMPUTING

9

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

### UNIT II GENETIC ALGORITHMS

9

Introduction, Building block hypothesis, working principle, Basic operators and Terminologies like individual, gene, encoding, fitness function and reproduction, Genetic modeling: Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (Travelling Salesman Problem), Differences & similarities between GA & other traditional methods, Applications of GA.

**UNIT III NEURAL NETWORKS 9**

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks.

**UNIT IV FUZZY LOGIC 9**

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

**UNIT V NEURO-FUZZY MODELING 9**

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case Studies.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- Implement machine learning through neural networks.
- Gain Knowledge to develop Genetic Algorithm and Support vector machine based machine learning system
- Write Genetic Algorithm to solve the optimization problem
- Understand fuzzy concepts and develop a Fuzzy expert system to derive decisions.
- Able to Model Neuro Fuzzy system for data clustering and classification.

**REFERENCES:**

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003
2. Kwang H.Lee, "First course on Fuzzy Theory and Applications", Springer-Verlag Berlin Heidelberg, 2005.
3. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
4. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.
5. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2007.
6. Mitsuo Gen and Runwei Cheng,"Genetic Algorithms and Engineering Optimization", Wiley Publishers 2000.
7. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
8. S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2007.
9. A.E. Eiben and J.E. Smith "Introduction to Evolutionary Computing" Springer, 2003
10. E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems: Soft Computing Perspectives, Advances in Fuzzy Systems - Applications and Theory", Vol. 7, River Edge, World Scientific, 1997.
11. ROSS TIMOTHY J, Fuzzy Logic with Engineering Applications, Wiley India Pvt Ltd, New Delhi, 2010

**COURSE OBJECTIVES**

- To understand the basic principles of Double entry system and preparation of balance sheet.
- To understand the process of estimating the cost of a particular product.
- To Prepare the estimate for various business activities such as purchase, sale, production and cash budgets
- To ensure decision making process of an organization.
- 

**UNIT I FINANCIAL ACCOUNTING****9**

Meaning and Scope of Accounting-Principles-Concepts-Conventions-Accounting Standards-Final Accounts-Trial Balance-Trading Account-Profit and Loss Account-Balance Sheet-Accounting Ratio Analysis-Funds Flow Analysis-Cash Flow Analysis

**UNIT II ACCOUNTING****9**

Meaning-Objectives-Elements of Cost-Cost Sheet-Marginal Costing and Cost Volume Profit Analysis-Break Even Analysis-Applications-Limitations-Standard Costing and Variance Analysis-Material-Labor-Overhead-Sales-Profit Variances

**UNIT III BUDGETS AND BUDGETING CONTROL****9**

Budgets and Budgetary Control-Meaning-Types-Sales Budget-Production Budget-Cost of Production Budget-Flexible Budgeting-Cash Budget-Master Budget-Zero Base Budgeting-Computerized Accounting

**UNIT IV INVESTMENT DECISION AND COST OF CAPITAL****9**

Objectives and Functions of Financial Management-Risk-Return Relationship-Time Value of Money Concepts-Capital Budgeting-Methods of Appraisal-Cost of Capital Factors Affecting Cost of Capital-Computation for Each Source of Finance and Weighted Average Cost of Capital

**UNIT V FINANCING DECISION AND WORKING CAPITAL MANAGEMENT****9**

Capital Structure-Factors Affecting Capital Structure-Dividend Policy-Types of Dividend Policy-Concepts of Working Capital-Working Capital Policies-Factors affecting Working Capital-Estimation of Working Capital Requirements

**COURSE OUTCOMES**

- Able to understand the balance sheet preparation and do analysis
- Able to understand the budget preparation and control of a company
- Helps to decide about the state of affairs of a particular firm / company.
- Ensures the preparation of fiscal policies of the organization.
- Ensures the factors to be considered in investment policies.

**REFERENCES:**

1. S.N.Maheswari, "Financial and Management Accounting", Sultan Chand & Sons, 5 edition, 2010
2. I.M.Pandey, "Financial Management", Vikas Publishing House Pvt. Ltd., 9<sup>th</sup> Edition, 2009.
3. M.Y.Khan and P.K.Jain, "Financial Management, Text, Problems and Cases", Tata McGraw Hill, 5<sup>th</sup> Edition, 2008.
4. Aswat Damodaran, "Corporate Finance Theory and Practice", John Wiley & Sons, 2008.
5. I.M.Pandey, "Management Accounting", Vikas Publishing House Pvt. Ltd., 3<sup>rd</sup> Edition, 2009
6. Brigham, Ehrhardt, "Financial Management Theory and Practice" 11<sup>th</sup> Edition, Cengage Learning, 2008
7. Srivatsava, Mishra, "Financial Management", Oxford University

**COURSE OBJECTIVES:**

- To examines the design of power efficient architecture, power and performance tradeoffs, restructuring of software and applications and standards for energy aware Hardware and Software.
- To know the fundamental principles energy efficient devices
- To study the concepts of Energy efficient storage
- To introduce energy efficient algorithms
- Enable the students to know energy efficient techniques involved to support real-time systems.
- To study Energy aware applications.

**UNIT I INTRODUCTION****9**

Energy efficient network on chip architecture for multi core system-Energy efficient MIPS CPU core with fine grained run time power gating – Low power design of Emerging memory technologies.

**UNIT II ENERGY EFFICIENT STORAGE****9**

Disk Energy Management-Power efficient strategies for storage system-Dynamic thermal management for high performance storage systems-Energy saving technique for Disk storage systems

**UNIT III ENERGY EFFICIENT ALGORITHMS****9**

Scheduling of Parallel Tasks – Task level Dynamic voltage scaling – Speed Scaling – Processor optimization- Memetic Algorithms – Online job scheduling Algorithms.

**UNIT IV REAL TIME SYSTEMS****9**

Multi processor system – Real Time tasks- Energy Minimization – Energy aware scheduling- Dynamic Reconfiguration- Adaptive power management-Energy Harvesting Embedded system..

**UNIT V ENERGY AWARE APPLICATIONS****9**

On chip network – Video codec Design – Surveillance camera- Low power mobile storage.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

- To Design Power efficient architecture Hardware and Software.
- To analyze power and performance trade off between various energy aware storage devices.
- To implement various energy aware algorithms.
- To restructure the software and Hardware for Energy aware applications.
- To know the Energy aware applications

**REFERENCE BOOKS:**

1. Handbook of Energy Aware and Green computing, Ishfaq Ah mad, Sanjay Ranka, Chapman and Hall/CRC ,2012
2. Energy Aware system design Algorithms and Architecture, Chong-Min Kyung, Sungioo yoo, Springer,2011.
3. Energy Aware computing, Bob steiger wald ,Chris:Luero,Intel Press,2012.

**COURSE OBJECTIVES:**

- To understand the basics of cryptography
- learn to find the vulnerabilities in programs and to overcome them,
- know the different kinds of security threats in networks and its solution
- know the different kinds of security threats in databases and solutions available
- learn about the models and standards for security.

**UNIT I           ELEMENTARY CRYPTOGRAPHY****9**

Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms- Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures – Certificates

**UNIT II           PROGRAM SECURITY****9**

Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Flaws – Common Weakness Enumeration Most Dangerous Software Errors

**UNIT III          SECURITY IN NETWORKS****9**

Threats in networks – Encryption – Virtual Private Networks – PKI – SSH – SSL – IPSec – Content Integrity – Access Controls – Wireless Security – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

**UNIT IV          SECURITY IN DATABASES****9**

Security requirements of database systems – Reliability and Integrity in databases –Redundancy – Recovery – Concurrency/ Consistency – Monitors – Sensitive Data – Types of disclosures – Inference-finding and confirming sql injection

**UNIT V          SECURITY MODELS AND STANDARDS****9**

Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – Bell-LaPadula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Compliances – PCI DSS – Security Standards - ISO 27000 family of standards – NIST.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

- Apply cryptographic algorithms for encrypting and decryption for secure data transmission
- Understand the importance of Digital signature for secure e-documents exchange
- Understand the program threats and apply good programming practice
- Get the knowledge about the security services available for internet and web applications
- Understand data vulnerability and sql injection
- Gain the knowledge of security models and published standards

**REFERENCES:**

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.
2. Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.
3. William Stallings, "Cryptography and Network Security : Principles and Practices", Fifth Edition, Prentice Hall, 2010.

4. Michael Howard, David LeBlanc, John Viega, "24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them", First Edition, Mc GrawHill Osborne Media, 2009.
5. Matt Bishop, "Computer Security: Art and Science", First Edition, Addison-Wesley, 2002.
6. Wesley, 2002.
7. [https://www.owasp.org/index.php/Top\\_10\\_2010](https://www.owasp.org/index.php/Top_10_2010)
8. [https://www.pcisecuritystandards.org/security\\_standards/pci\\_dss.shtml](https://www.pcisecuritystandards.org/security_standards/pci_dss.shtml)
9. <http://cwe.mitre.org/top25/index.html>
10. Justin Clarke "SQL injection Attacks and defense" Elsevier ,2012

**MA7071**

**NUMERICAL AND STATISTICAL METHODS**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

- To understand and apply numerical methods for solving systems of linear equations
- To understand and apply numerical integration and differentiation
- To solving initial value problems of ordinary differential equations numerically
- To provide an understanding of the statistical methods and probabilistic concepts by which real-life problems are analyzed  
(Focus on problems- No derivations)

**UNIT I LINEAR SYSTEM OF EQUATIONS 9**

Solution of Systems of equations – Solution of Simultaneous linear equations – Gauss elimination methods – Gauss Jordan methods, Jacobi and Gauss Seidal iterative methods

**UNIT II NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

Interpolation, Differentiation and integration – difference table – Newton’s forward and backward interpolation –Lagrangian interpolation –Differentiation formulae– Trapezoidal and Simpson rule Gaussian – Quadrature

**UNIT III DIFFERENTIAL EQUATIONS 9**

Ordinary Differential equations–Taylor Series and Euler methods, Runge– Kutta methods – Predictor-corrector method – Milne and Adam – Bashforth methods – Error Analysis

**UNIT IV PROBABILITY DISTRIBUTIONS 9**

Probability axioms- Bayes Theorem- One dimensional Discrete random variables and Continuous random variables – Density and Distribution functions – Binomial and normal distribution

**UNIT V SAMPLING DISTRIBUTIONS 9**

Small sample, t-test, F-test,  $\chi^2$ -test, ANOVA one way classification and two way classification

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- Develop a good understanding of the various methods used for the numerical solution of scientific problems
- Able to solve system of linear equations and initial value problems of ordinary differential equations numerically
- Help to understand the value of probability and Statistics in acquiring knowledge and making decisions
- Develop an ability to apply statistical tests in experiments, as well as to analyze and interpret data

## REFERENCES:

1. Baghel Singh Grewal, "Numerical Methods in Engineering and Science, Khanna Publisher 2011
2. John.E..Freund, Irwin Miller, Marylees Miller "Mathematical Statistics with Applications ", Seventh Edition, Prentice Hall of India, 2011.
3. T.Veerarajan , "Probability, statistics and random process" third edition Tata Mcgrawhill publications,2009
4. Steven C. Chapra, Raymond P. Canale, " Numerical methods for Engineers", McGraw-Hill Higher Education, 01-Aug-2010
5. A.M.Natarajan & A.Tamilarasi, "Probability Random Processes and Queuing theory", New Age International Publishers, 2<sup>nd</sup> Edition, 2005.
6. C. Woodford, "*Numerical Methods with Worked Examples: Matlab Edition* Springer,2012.

**MC7006**

**M - COMMERCE**

**L T P C**  
**3 0 0 3**

## COURSE OBJECTIVES:

- Ñ To understand the E – commerce strategies and value chains
- Ñ To understand the M-commerce services
- Ñ To understand M – commerce infrastructure and applications.
- Ñ To know the availability of latest technology and applications of M- commerce in various domains.
- Ñ To apply mobile commerce in business-to-business application.

### **UNIT I ELECTRONIC COMMERCE**

**9**

Introduction -The e-commerce environment - The e-commerce marketplace -Focus on portals, Location of trading in the marketplace - Commercial arrangement for transactions - Focus on auctions - Business models for e-commerce - Revenue models - Focus on internet start-up companies - the dot-com - E-commerce versus E-business.

### **UNIT II MOBILE COMMERCE**

**9**

Introduction – Infrastructure Of M– Commerce – Types Of Mobile Commerce Services – Technologies Of Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications In M– Commerce – Wireless/Wired Commerce Comparisons

### **UNIT III MOBILE COMMERCE: TECHNOLOGY**

**9**

A Framework For The Study Of Mobile Commerce – NTT Docomo's I– Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks –The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks

### **UNIT IV MOBILE COMMERCE: THEORY AND APPLICATIONS**

**9**

The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption Of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – M–Commerce In The Automotive Industry – Location– Based Services: Criteria For Adoption And Solution Deployment – The Role Of Mobile Advertising In Building A Brand – M– Commerce Business Models

### **UNIT V BUSINESS– TO– BUSINESS MOBILE E-COMMERCE**

**9**

Enterprise Enablement – Email And Messaging – Field Force Automation (Insurance,Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking And Maintenance/Management – Remote IT Support –Customer Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security.

**TOTAL : 45 PERIODS**



**COURSE OUTCOMES:**

- Ñ Able to apply E – commerce principles in market place.
- Ñ Able to apply M – commerce principles to various business domains
- Ñ Understand the theory and applications of M-commerce in business domain
- Ñ Get an exposure to current technological advancements in M-commerce.
- Ñ Able to build M – commerce business models.

**REFERENCE BOOKS:**

1. Dave Chaffey, “E-Business and E-Commerce Management”, Third Edition, 2009, Pearson Education
2. Brian E. Mennecke, Troy J. Strader, “Mobile Commerce: Technology, Theory and Applications”, Idea Group Inc., IGI Global, 2003.
3. P. J. Louis, “ M-Commerce Crash Course”, McGraw- Hill Companies February 2001.
4. Paul May, “Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business” Cambridge University Press March 2001.
5. Michael P. Papazoglou, Peter M.A. Ribbers, ‘e-business organizational and Technical foundation’, Wiley India 2009
6. Dr.Pandey , Saurabh Shukla E-commerce and Mobile commerce Technologies , Sultan chand ,2011

**MC7007****HEALTH CARE MANAGEMENT****L T P C****3 0 0 3****COURSE OBJECTIVES:**

- To understand the basic concepts of health care system.
- To know about creating and maintaining health care information systems
- To ensure access of clinical information system on the fly
- To understand IT governance and assessment of health care information system

**UNIT I INTRODUCTION****9**

Introduction to health care information – Health care data quality – Health care information regulations, laws and standards.

**UNIT II HEALTH CARE INFORMATION SYSTEMS****9**

History and evolution of health care information systems – Current and emerging use of clinical information systems – system acquisition – System implementation and support.

**UNIT III INFORMATION TECHNOLOGY****9**

Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.

**UNIT IV MANAGEMENT OF IT CHALLENGES****9**

Organizing information technology services – IT alignment and strategic planning – IT governance and management.

**UNIT V IT INITIATIVES****9**

Management’s role in major IT initiatives – Assessing and achieving value in health care information systems. Case study

**TOTAL : 45 PERIODS**

**COURSE OUTCOMES:**

- Develop an understanding of basic research skills applicable to the design, evaluation and implementation of appropriate Healthcare Information Systems (HIS) ;
- Define and analyse the impact, strengths and weaknesses of various HIS in any healthcare settings
- Write reports on the roles of HIS and their impact on facilitating superior healthcare delivery
- Design a suitable HIS architecture
- Use research methods and analysis together to plan the successful implementation of an appropriate HIS solution

**REFERENCE BOOKS:**

1. Karen A Wager, Frances Wickham Lee, John P Glaser, “ Managing Health Care Information Systems: A Practical Approach for Health Care Executives”, John Wiley, 2<sup>nd</sup> edition 2009.
2. Marion J. Ball, Charlotte Weaver, Joan Kiel ,”Healthcare Information Management Systems: Cases, Strategies, and Solutions”, Springer, 2010, 3<sup>rd</sup> edition
3. Rudi Van De Velde and Patrice Degoulet, “Clinical Information Systems: A Component based approach”, Springer 2005.
4. Kevin Beaver, Healthcare Information Systems, Second edition Best Practices, CRC Press, 2002
5. Marion J. Ball Healthcare Information Management Systems: A Practical Guide Springer-Verlag GmbH, 1995

**MC7008****GEOLOGICAL INFORMATION SYSTEMS****L T P C  
3 0 0 3****COURSE OBJECTIVES:**

- Understand the basic concepts of Geological information systems.
- To provide an exposure to spatial database structures and their utility in GIS.
- Understand the process of scanning, digitizing and georeferencing.
- To introduce the raster and vector geoprocessing capabilities of GIS.

**UNIT I SPATIAL DATA REPRESENTATION****9**

GIS – Definition and related terminology- Components of GIS: Data, Technology, Application – digital representation of geospatial data – raster – vector – object oriented – geo database model-analysis .

**UNIT II DATA DIGITIZATION AND PREPARATION****9**

Characteristics of raster data processing—raster File format-Acquiring and handling raster Data – Georeferencing-Preprocessing-mosaicking– Linking digital databases: ODBC – GPS data integration Characteristics of Vector Geoprocessing -Vector Data Input – Digitizer: Principles, Co-ordinate transformation – Graphical data editing – Scanner: Principles, On Screen Digitization-post scanning-importing- data editing

**UNIT III RASTER DATA ANALYSIS****9**

Raster Geospatial Data Analysis-Local operations: Reclassification, Logical and Arithmetic overlay operations – Neighbourhood operations: Aggregation, Filtering, Slope and Aspect map – Extended neighbourhood operations: - Statistical Analysis, Proximity, Connectivity operations, Buffering, Viewshed analysis – Regional operations: Area, Perimeter, Shape, Identification of region and Classification-output functions of Raster geoprocessing

**UNIT IV VECTOR DATA PROCESSING****9**

Non-topological analysis: Attribute database query, SQL, Summary statistics-statistical computation-calculation-quantification- Address geocoding, -Topological analysis Feature based topological functions-overlay-buffering- Layer based topological function-Reclassification, Aggregation, Overlay analysis- Point-in-polygon, Line-in-polygon, Polygon-on-polygon: Clip, Erase, Identity, Union, Intersection – Network based Geoprocessing –Output functions

**UNIT V GIS MODELLING AND APPLICATIONS****9**

Spatial modelling – External, Conceptual, Logical, Internal –GIS Modeling with case study- spatial data mining-DEM- introduction and applications

**COURSE OUTCOMES:**

- Understand GIS concepts and spatial data representation
- Able to design spatial data input in raster form as well as vector form
- Understand vector data analysis and output functions
- Understand raster data geo processing
- Able to design a GIS model for real world problem

**REFERENCES:**

1. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall, 2/E,2009.
2. Peter A. Burrough, Rachael A. McDonnell, Principles of GIS, Oxford University Press, 2000
3. Kang-Tsung Chang ,Introduction to Geographic Information Systems, McGraw-Hill Higher Education, 2006
4. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996
5. Paul A. Longley, Mike Goodchild, David J. Maguire, Geographic Information Systems and Science, John Wiley & Sons Inc ,2011.

**MC7009****HUMAN RESOURCE MANAGEMENT****L T P C  
3 0 0 3****COURSE OBJECTIVES:**

- To understand the importance of human resources.
- To describe the steps involved in the human resource planning process
- To understand the stages of employee socialization and training needs.
- To know about the purposes of performance management systems and appraisal.
- To know the list of occupational safety and health administration enforcement priorities.

**UNIT I FUNDAMENTALS OF HRM****9**

Introduction- importance of HRM – functions- qualities of HR manager – evolution and growth of HRM – trends and opportunities - HRM in global environment – legal and ethical context – laws for discriminatory practices – equal opportunity employment.

**UNIT II STAFFING, RECRUITMENT AND SELECTION****9**

HR polices - need, type and scope – human resource planning – job analysis – recruiting goals – recruiting sources – global perspective – selection process – pre-employment testing – interviews – job offers – hiring mistakes - key element for successful predictors.

**UNIT III TRAINING AND DEVELOPMENT 9**  
Socialization – new employee orientation, training, development – organizational development – methods – evaluating training – international training and development issues – career development - value for organization and individual – mentoring and coaching – traditional career stages

**UNIT IV PERFORMANCE EVALUATION, REWARDS AND BENEFITS 9**  
Appraisal process – methods – factors distort appraisal – team appraisal – international appraisal – rewards – Theories of motivation - compensation administration – job evaluation and pay structure – special cases of compensation – executive compensation programs – employee benefits.

**UNIT V SAFE AND HEALTHY WORK ENVIRONMENT 9**  
Occupational safety and health act - issues – stress – assistance program – labor management - employee unions – labor legislation. Promotion, demotion, transfer and separation – employee grievances - redressal methods.

**TOTAL: 45 PERIODS**

### **OUTCOMES**

- Identify the primary external influences affecting HRM.
- Outline the components and the goals of staffing, training and development.
- Understand the selection procedure in various organizations.
- Understand the practices used to retain the employees and able to evaluate their performance.
- Able to identify the stress and the cause of burn out.

### **REFERENCES:**

1. Decenzo and Robbins, Human Resource Management, Wilsey, 10th edition, 2012.
2. Mamoria C.B. and Mamoria. S., Personnel Management, Himalaya Publishing Company, 1997.
3. Mirza S. Saiyadain Human Resource Management , Tata McGraw Hill , 4<sup>th</sup> edition 2009
4. Eugence Mckenna and Nic Beach Human Resource Management, , Pearson Education Limited, 2002.
5. Dessler, Human Resource Management, Pearson Education Limited, 2002.
6. Decenzo and Robbins, Human Resource Management, Wilsey, 6<sup>th</sup> edition, 2001.
7. Wayne Cascio, Managing Human Resource, McGraw Hill, 1998.
8. Ivancevich, Human Resource Management, McGraw Hill 2002.
9. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India, 3<sup>rd</sup> edition 2005.

**MC7010**

**ENTERPRISE APPLICATION INTEGRATION**

**L T P C  
3 0 0 3**

### **COURSE OBJECTIVES:**

- Describe approaches to enterprise application integration
- Understand the integration middleware
- Evaluate the integration approaches suitable for a given problem

**UNIT I INTRODUCTION 6**  
Requirements for EAI - Challenges in EAI – Integration with legacy systems – Integration with partners - Heterogeneous environment – Implementation approaches – Web services, messaging, ETL, direct data integration – Middleware requirements – Approaches to integration – services oriented and messaging.

**UNIT II INTEGRATION PATTERNS****6**

Introduction to integration patterns – Architecture for application integration – Integration patterns – Point to point, broker, message bus, publish/subscribe, Challenges in performance, security, reliability - Case studies

**UNIT III SERVICE ORIENTED INTEGRATION****12**

Business process integration - Composite applications-services – Web services – Service choreography and orchestration - Business process modeling - BPMN, Business process execution - BPEL – Middleware infrastructure - Case studies

**UNIT IV MESSAGING BASED INTEGRATION****9**

Messaging – Synchronous and asynchronous – Message structure – Message oriented middleware – Reliability mechanisms – Challenges – Messaging infrastructure – Java Messaging Services – Case studies

**UNIT V ENTERPRISE SERVICE BUS****12**

Enterprise Service Bus – routing, scalable connectivity, protocol and message transformations, data enrichment, distribution, correlation, monitoring – Deployment configurations – Global ESB, Directly connected, Federated, brokered ESBs – Application server based – Messaging system based – Hardware based ESBs – Support to SOA, message based and event based integrations - Case studies.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

Upon Completion of the course, the students will be able to

- Describe different approaches to integration enterprise applications
- Analyze specifications and identify appropriate integration approaches
- Develop a suitable integration design for a given problem
- Identify appropriate integration middleware for a given problem
- Evaluate the integration approaches against specified requirements

**REFERENCES**

1. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration for Business Processes: Service-oriented Frameworks", Business Science Reference, 2009
2. Waseem Roshen, "SOA Based Enterprise Integration", Tata McGrawHill, 2009.
3. G Hohpe and B Woolf, "Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions", Addison-Wesley Professional, 2003
4. D Linthicum, "Next Generation Application Integration: From Simple Information to Web Services", Addison-Wesley, 2003
5. Martin Fowler, "Patterns of Enterprise Application Architecture", Addison-Wesley, 2003
6. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2008

**COURSE OBJECTIVES:**

- To explore the fundamental concepts of big data analytics
- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.

**UNIT I INTRODUCTION TO BIG DATA****8**

Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

**UNIT II MINING DATA STREAMS****9**

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

**UNIT III HADOOP****10**

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS-Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

**UNIT IV HADOOP ENVIRONMENT****9**

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud

**UNIT V FRAMEWORKS****9**

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

**TOTAL : 45 PERIODS****COURSE OUTCOMES:**

The students will be able to:

- Work with big data platform
- Analyze the big data analytic techniques for useful business applications.
- Design efficient algorithms for mining the data from large volumes.
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics
- Explore on Big Data applications Using Pig and Hive
- Understand the fundamentals of various bigdata analysis techniques

## REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012
4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
6. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
7. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
8. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
9. Da Ruan, Guoqing Chen, Etienne E. Kerre, Geert Wets, Intelligent Data Mining, Springer, 2007
10. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012
11. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author), Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, 2013
12. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

MC7012

AD-HOC AND SENSOR NETWORKS

L T P C  
3 0 0 3

### COURSE OBJECTIVES:

- To understand the basics of Ad-hoc & Sensor Networks
- To learn various fundamental and emerging protocols of all layers in ad-hoc network
- To study about the issues pertaining to major obstacles in establishment and efficient management of ad-hoc and sensor networks
- To understand the nature and applications of ad-hoc and sensor networks
- To understand various security practices and protocols of Ad-hoc and Sensor Networks

### UNIT I ADHOC NETWORKS FUNDAMENTALS AND MAC PROTOCOLS 9

Fundamentals Of WLans – IEEE 802.11 Architecture - Self Configuration And Auto Configuration - Issues In Ad-Hoc Wireless Networks – MAC Protocols For Ad-Hoc Wireless Networks – Contention Based Protocols - TCP Over Ad-Hoc Networks-TCP Protocol Overview - TCP And MANETs – Solutions For TCP Over Ad-Hoc Networks

### UNIT II ADHOC NETWORK ROUTING AND MANAGEMENT 9

Routing in Ad-Hoc Networks- Introduction -Topology based versus Position based Approaches - Proactive, Reactive, Hybrid Routing Approach - Principles and issues – Location services - DREAM – Quorums based Location Service – Grid – Forwarding Strategies – Greedy Packet Forwarding – Restricted Directional Flooding- Hierarchical Routing- Other Routing Protocols.

**UNIT III      SENSOR NETWORK COMMUNICATION PROTOCOLS      9**

Introduction – Architecture - Single Node Architecture – Sensor Network Design Considerations – Energy Efficient Design Principles for WSN’s – Protocols for WSN – Physical Layer - Transceiver Design Considerations – MAC Layer Protocols – IEEE 802.15.4 Zigbee – Link Layer and Error Control Issues - Routing Protocols – Mobile Nodes and Mobile Robots - Data Centric & Contention Based Networking – Transport Protocols & QoS – Congestion Control Issues – Application Layer Support.

**UNIT IV      SENSOR NETWORK MANAGEMENT AND PROGRAMMING      9**

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time Synchronization - Localization and Positioning – Operating Systems and Sensor Network Programming – Sensor Network Simulators.

**UNIT V      ADHOC AND SENSOR NETWORK SECURITY      9**

Security in Ad-Hoc and Sensor Networks – Key Distribution and Management – Software based Anti-tamper Techniques – Water Marking techniques – Defense against Routing Attacks - Secure Adhoc Routing Protocols – Broadcast Authentication WSN Protocols – TESLA – Biba – Sensor Network Security Protocols - SPINS

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course the students will be able to:

- Work with existing Ad-hoc and sensor network protocols and standards.
- Create a Sensor network environment for different type of applications
- Design ad-hoc and sensor network architectures using QoS and Congestion control mechanisms
- Interpret the various control fields of the protocol in each layer
- Select appropriate routing algorithms for different network environments
- Program ad-hoc and sensor network for various applications
- Deploy security mechanisms in the wireless ad-hoc and sensor networks

**REFERENCES:**

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications”, Second Edition, World Scientific Publishing, 2011.
2. Holger Karl, Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Inc .2005.
3. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, 2004.
4. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
5. Erdal Çayırıcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009
6. Waltenege Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, John Wiley and Sons, 2010
7. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006
8. Kazem Sohraby, Daniel Minoli, Taieb Znati , Wireless Sensor Networks: Technology, Protocols and Applications, Wiley Interscience A John Wiley & sons, Inc., Publication .
9. Feng Zhao, Leonidas Guibas, “ Wireless Sensor Networks : An information processing Approach “ , Elsevier 2004 .
10. Amiya Nayak, Ivan Stojmenovic, : Wireless Sensor and Actuator Networks : Algorithm and Protocols for Scalable Coordination and Data communication John Wiley & Sons 2010 .
11. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”, Morgan Kaufman Publishers, 2004.



**COURSE OBJECTIVES:**

- To understand the need of semantic web in web services
- To know the methods to discover, classify and build ontology for more reasonable results in searching
- To build and implement a small ontology that is semantically descriptive of chosen problem domain
- To implement applications that can access, use and manipulate the ontology

**UNIT I INTRODUCTION****9**

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies –Semantic Modeling - Potential of semantic web solutions and challenges of adoption

**UNIT II ONTOLOGICAL ENGINEERING****9**

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts, terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions – Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building – Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning

**UNIT III STRUCTURING AND DESCRIBING WEB RESOURCES****9**

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing - RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modeling for Combinations and Patterns- Transitivity

**UNIT IV WEB ONTOLOGY LANGUAGE****9**

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – Owl Logic.

**UNIT V SEMANTIC WEB TOOLS AND APPLICATIONS****9**

Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web - Semantic Wikis - Semantic Web Services – Modeling and aggregating social network data - Ontological representation of social relationships, Aggregating and reasoning with social network data

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

- Understand semantic web basics, architecture and technologies
- Able to represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology
- Able to understand the semantic relationships among these data elements using Resource Description Framework (RDF)
- Able to design and implement a web services application that “discovers” the data and/or other web services via the semantic web
- Able to discover the capabilities and limitations of semantic web technology for social networks

## REFERENCES:

1. Liyang Yu, "A Developer's Guide to the Semantic Web", Springer, First Edition, 2011
2. John Hebel, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, "Semantic Web Programming", Wiley, First Edition, 2009.
3. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer", Second Edition (Cooperative Information Systems) (Hardcover), MIT Press, 2008
4. Robert M. Colomb, "Ontology and the Semantic Web", Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications), IOS Press, 2007.
5. Dean Allemang and James Hendler, "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Morgan Kaufmann", Second Edition, 2011.
6. Michael C. Daconta, Leo J. Obrst and Kevin T. Smith, "The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management", Wiley, First Edition 2003
7. Karin Breitman, Marco Antonio Casanova and Walt Truskowski, "Semantic Web: Concepts, Technologies and Applications (NASA Monographs in Systems and Software Engineering)", Springer, Softcover, 2010.
8. Vipul Kashyap, Christoph Bussler and Matthew Moran, "The Semantic Web: Semantics for Data and Services on the Web (Data-Centric Systems and Applications), Springer, 2008.
9. Peter Mika, "Social networks and the Semantic Web", Springer, 1st edition 2007.

**MC7014**

**SOFTWARE TESTING AND QUALITY ASSURANCE**

**L T P C  
3 0 0 3**

## COURSE OBJECTIVES:

- To know the behavior of the testing techniques to detect the errors in the software
- To understand standard principles to check the occurrence of defects and its removal.
- To learn the functionality of automated testing tools
- To understand the models of software reliability.

### **UNIT I TESTING ENVIRONMENT AND TEST PROCESSES**

**9**

World-Class Software Testing Model – Building a Software Testing Environment - Overview of Software Testing Process – Organizing for Testing – Developing the Test Plan – Verification Testing – Analyzing and Reporting Test Results – Acceptance Testing – Operational Testing – Post Implementation Analysis

### **UNIT II TESTING TECHNIQUES AND LEVELS OF TESTING**

**9**

Using White Box Approach to Test design - Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs –Using Black Box Approaches to Test Case Design – Random Testing – Requirements based testing –Decision tables –State-based testing – Cause-effect graphing – Error guessing – Compatibility testing – Levels of Testing - Unit Testing - Integration Testing - Defect Bash Elimination. System Testing - Usability and Accessibility Testing – Configuration Testing - Compatibility Testing - Case study for White box testing and Black box testing techniques.

### **UNIT III INCORPORATING SPECIALIZED TESTING RESPONSIBILITIES**

**9**

Testing Client/Server Systems – Rapid Application Development Testing – Testing in a Multiplatform Environment – Testing Software System Security - Testing Object-Oriented Software – Object Oriented Testing – Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web-based Software – Testing a Data Warehouse - Case Study for Web Application Testing.

#### **UNIT IV TEST AUTOMATION**

**9**

Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using Bug Tracking Tool.

#### **UNIT V SOFTWARE TESTING AND QUALITY METRICS**

**9**

Testing Software System Security - Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object Oriented Metrics.

#### **COURSE OUTCOMES:**

- Test the software by applying testing techniques to deliver a product free from bugs
- Evaluate the web applications using bug tracking tools.
- Investigate the scenario and the able to select the proper testing technique
- Explore the test automation concepts and tools
- Deliver quality product to the clients by way of applying standards such as TQM, Six Sigma
- Evaluate the estimation of cost, schedule based on standard metrics

#### **REFERENCES:**

1. William Perry, “Effective Methods of Software Testing”, Third Edition, Wiley Publishing 2007
2. Srinivasan Desikan and Gopalswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2007.
3. Naresh Chauhan , “Software Testing Principles and Practices ” Oxford University Press , New Delhi , 2010.
4. Dale H. Besterfield et al., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint (2006).
5. Stephen Kan, “Metrics and Models in Software Quality”, Addison – Wesley, Second Edition, 2004.
6. Ilene Burnstein, “ Practical Software Testing”, Springer International Edition, Chennai, 2003
7. Renu Rajani, Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, Tata McGraw Hill, 2004.
8. Edward Kit, “ Software Testing in the Real World – Improving the Process”, Pearson Education, 1995.
9. Boris Beizer, “ Software Testing Techniques” – 2<sup>nd</sup> Edition, Van Nostrand Reinhold, New York, 1990
10. Adithya P. Mathur, “ Foundations of Software Testing – Fundamentals algorithms and techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

**MC7015**

**SOFTWARE PROJECT MANAGEMENT**

**L T P C**  
**3 0 0 3**

#### **COURSE OBJECTIVES:**

- To know of how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

<b>UNIT I</b>	<b>SOFTWARE PROJECT MANAGEMENT CONCEPTS</b>	<b>9</b>
Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and Allocate resources.		
<b>UNIT II</b>	<b>SOFTWARE EVALUATION AND COSTING</b>	<b>9</b>
Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, Structured methods.		
<b>UNIT III</b>	<b>SOFTWARE ESTIMATION TECHNIQUES</b>	<b>9</b>
Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.		
<b>UNIT IV</b>	<b>RISK MANAGEMENT</b>	<b>9</b>
Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.		
<b>UNIT V</b>	<b>SOFTWARE QUALITY MANAGEMENT</b>	<b>9</b>
TQM, Six Sigma, Software Quality: defining software quality, ISO9126, External Standards, Comparison of project management software's: dot Project, Launch pad, openProj. Case study: PRINCE2		

**TOTAL ; 45 PERIODS**

**COURSE OUTCOMES:**

- Understand the activities during the project scheduling of any software application.
- Learn the risk management activities and the resource allocation for the projects.
- Can apply the software estimation and recent quality standards for evaluation of the software projects
- Acquire knowledge and skills needed for the construction of highly reliable software project
- Able to create reliable, replicable cost estimation that links to the requirements of project planning and managing

**REFERENCES:**

1. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw- Hill Publications, Fifth Edition 2012.
2. S. A. Kelkar, "Software Project Management" PHI, New Delhi, Third Edition ,2013.
3. Richard H.Thayer "Software Engineering Project Management,": IEEE Computer Society
4. Futrell , "Quality Software Project Management", Pearson Education India, 2008
5. [http://en.wikipedia.org/wiki/Comparison\\_of\\_project\\_management\\_software](http://en.wikipedia.org/wiki/Comparison_of_project_management_software)
6. [http://www.ogc.gov.uk/methods\\_prince\\_2.asp](http://www.ogc.gov.uk/methods_prince_2.asp)

**COURSE OBJECTIVES:**

- To introduce the broad perceptives of cloud architecture and model
- To understand the concept of Virtualization and design of cloud Services
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator
- To apply different cloud programming model as per need.
- To learn to design the trusted cloud Computing system

**UNIT I CLOUD ARCHITECTURE AND MODEL 9**

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture.

Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud – Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

**UNIT II VIRTUALIZATION 9**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

**UNIT III CLOUD INFRASTRUCTURE 9**

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

**UNIT IV PROGRAMMING MODEL 9**

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

**UNIT V SECURITY IN THE CLOUD 9**

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

**TOTAL:45 PERIODS****COURSE OUTCOMES:**

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player , Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability
- Design Cloud Services and Set a private cloud

## REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
4. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
6. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer.
8. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.
9. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, 'Mastering Cloud Computing', TMGH,2013.
10. Gautam Shroff,Enterprise Cloud Computing,Cambridge University Press,2011
11. Michael Miller, Cloud Computing,Que Publishing,2008
12. Nick Antonopoulos, Cloud computing,Springer Publications,2010

**MC7017**

**NETWORK PROTOCOLS**

**L T P C**  
**3 0 0 3**

## OBJECTIVES:

- To understand the existing network architecture models and analyze the their performance
- To understand the high speed network protocols and design issues.
- To learn Network Security Technologies and Protocols
- To study various protocols in wireless LAN, MAN.

## **UNIT I FUNDAMENTALS OF NETWORKING STANDARDS AND PROTOCOLS**

**9**

Network Communication Architecture and Protocols - OSI Network Architecture seven Layers Model - Definition and Overview of TCP/IP Protocols -TCP/IP Four Layers Architecture Model - Other Network Architecture Models: IBM SNA.

## **UNIT II ROUTED AND ROUTING PROTOCOLS**

**9**

Application Layer Protocols-Presentation Layer Protocols- Session Layer Protocols - Transport Layer Protocols - Network Layer Protocols - Data Link Layer Protocols - Routing Protocols - Multicasting Protocols - MPLS.

## **UNIT III ISDN AND NETWORK MANAGEMENT PROTOCOLS**

**9**

Overview of ISDN – Channels – User access – Protocols Network management requirements – Network monitoring – Network control – SNMP V<sub>1</sub>, V<sub>2</sub> and V<sub>3</sub> – Concepts, MIBs – Implementation issues-RMON.

**UNIT IV SECURITY AND TELEPHONY PROTOCOLS****9**

Network Security Technologies and Protocols - AAA Protocols - Tunneling Protocols - Security Protocols- Private key encryption – Data encryption system, public key encryption – RSA – Elliptic curve cryptography – Authentication mechanisms– Web security -Secured Routing Protocols - IP telephony -Voice over IP and VOIP Protocols –Signaling Protocols- Media/CODEC.

**UNIT V NETWORK ENVIRONMENTS AND PROTOCOLS****9**

Wide Area Network and WAN Protocols - Frame relay - ATM - Broadband Access Protocols -PPP Protocols - Local Area Network and LAN Protocols - Ethernet Protocols - Virtual LAN Protocols - Wireless LAN Protocols - Metropolitan Area Network and MAN Protocol - Storage Area Network and SAN Protocols.

**TOTAL:45 PERIODS****OUTCOME:**

- Ability to study, analyze and design seven layers of protocols of wired and wireless networks.

**REFERENCES:**

1. Javvin, “Network Protocols” , Javvin Technologies Inc , second edition, 2005
2. William Stallings, “Cryptography and Network Security”, PHI, 2000.
3. Mani Subramanian, “Network Management–Principles and Practices”, Addison Wesley, 2000.
4. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, Addison Wesley, 1999.
5. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997.

**ANNA UNIVERSITY, CHENNAI**

**AFFILIATED COLLEGES  
REGULATIONS 2009**

**CREDIT SYSTEM**

**POST-GRADUATE PROGRAMMES**

The following Regulations are **applicable to all Engineering Colleges affiliated to Anna University, Chennai (other than Autonomous Colleges) and to all the University Colleges of Engineering of Anna University, Chennai.**

**1 PRELIMINARY DEFINITIONS AND NOMENCLATURE**

In these Regulations, unless the context otherwise requires:

- i. **“Programme”** means Post graduate Degree Programme e.g. M.E., M.Tech. Degree Programme.
- ii. **“Branch”** means specialization or discipline of M.E. / M.Tech. Degree Programme like “Structural Engineering”, “Engineering Design”, etc.
- iii. **“Course”** means Theory or Practical subject that is normally studied in a semester, like Applied Mathematics, Advanced Thermodynamics, etc.
- iv. **“Head of the Department”** means Head of the Department concerned.
- v. **“Head of the Institution”** means the Principal of a College / Institution who is responsible for all academic activities of that College / Institution and for implementation of relevant Rules and Regulations.
- vi. **“Director, Academic Courses”** means the authority of the University who is responsible for all academic activities of the University for implementation of relevant Rules and Regulations.
- vii. **“Controller of Examinations”** means the Authority of the University who is responsible for all activities of the University Examinations.
- viii. **“University”** means ANNA UNIVERSITY, CHENNAI.



## **2 PROGRAMMES OFFERED, MODES OF STUDY AND ADMISSION REQUIREMENTS**

### **2.1 P.G. PROGRAMMES OFFERED:**

1. M.E
2. M.Tech.
3. M.B.A.
4. M.C.A.

### **2.2 MODES OF STUDY:**

#### **2.2.1 Full-Time:**

**Candidates admitted under 'Full-Time' should be available in the College / Institution during the entire duration of working hours (From Morning to Evening on Full-Time basis) for the curricular, co-curricular and extra-curricular activities assigned to them.**

**The Full-Time candidates should not attend any other Full-Time programme(s) / course(s) or take up any Full-Time job / Part-Time job in any Institution or Company during the period of the Full-Time programme. Violation of the above rules will result in cancellation of admission to the PG programme.**

#### **2.2.2 Part-Time – Day Time Mode:**

**This mode of study is applicable to those candidates admitted under sponsored category (Teacher candidates). In this mode of study, the candidates are required to attend classes along with Full-Time students for the required number of courses and complete the course in three years.**

**2.2.3 Conversion from one mode of study to the other is not permitted.**

### **2.3 ADMISSION REQUIREMENTS:**

**2.3.1 Candidates for admission to the first semester of the Post-Graduate Degree Programme shall be required to have passed an appropriate Under-Graduate Degree Examination of Anna University as specified under qualification for admission as per the Tamil Nadu Common Admission (TANCA) criteria.**

**Note:** TANCA releases the updated criteria during the admissions every academic year.

Admission shall be offered only to the candidates who possess the qualification prescribed against each course.

Any other relevant qualification which is not prescribed in column 3 against each programme shall be considered for equivalence by the committee constituted for the purpose. Admission to such degrees shall be offered only after obtaining equivalence to such degrees.

- 2.3.2** However, the Syndicate of the University may decide to restrict admission in any particular year to candidates having a subset of qualifications prescribed at the time of admission.
- 2.3.3** 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 Syndicate of the University from time to time.
- 2.3.4** Eligibility conditions for admission such as the class obtained, the number of attempts in qualifying examination and physical fitness will be as prescribed by the Syndicate of the University from time to time.
- 2.3.5** All Part-Time (Day-Time mode) candidates should satisfy other conditions regarding Experience, Sponsorship etc. that may be prescribed by the Syndicate from time to time.

### **3 DURATION OF THE PROGRAMMES:**

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

<b>Programme</b>	<b>Min. No. of Semesters</b>	<b>Max. No. of Semesters</b>
M.E. / M.Tech. (Full-Time)	4	8
M.E. / M.Tech. (Part Time)	6	12
M.C.A. (Full Time)	6	12
M.B.A. (Full Time)	4	8
M.B.A. (Part Time)	6	12

- 3.2** The Curriculum and Syllabi of all the P.G. Programmes shall be approved by the Academic Council of Anna University. The number of Credits to be earned for the successful completion of the programme shall be as specified in the Curriculum of the respective specialization of the P.G. Programme
- 3.3** Each semester shall normally consist of 90 working days or 350 periods of each 50 minutes duration, for full-time mode of study (400 Periods for M.B.A.) or 200 periods for part-time mode of study. The Head of the Institution shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught. End

of the Semester, University Examinations (End Semester Examination) will be scheduled after the last working day of the semester.

**3.4** Credits will be assigned to the courses for different modes of study as given below:

**3.4.1** The following will apply to all modes of P.G. Programmes.

- One credit for each lecture period allotted per week
- One credit for each tutorial period allotted per week
- One credit for each seminar/practical session of two periods designed per week.

**3.4.2** Four weeks of practical training in any industrial / research laboratory correspond to one credit, and is applicable to all modes of study.

**3.5** The minimum prescribed credits required for the award of the degree shall be within the limits specified below:

<b>PROGRAMME</b>	<b>PRESCRIBED CREDIT RANGE</b>
M.E. / M.Tech.	65 to 75

<b>Programme</b>	<b>Prescribed Credits</b>
M.C.A.	118
M.B.A.	90

## **4 STRUCTURE OF THE PROGRAMME**

**4.1** Every **Programme** will have a curriculum and syllabi consisting of core courses, elective courses and project work.

The Programme may also include seminar / practicals / practical training, if they are specified in the curriculum.

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

A candidate may be permitted by the Head of the Department to choose a maximum of two electives from P.G. Programmes offered in any other Department of the Institutions during the period of his/her study, provided the Head of the Department offering such course also approves such requests subject to no clash in the time-table for the lecture classes of both departments.

**4.1.2** Practical training or Industrial Training, if specified in the Curriculum, should be organized by the Head of the Department / Institution for a duration not exceeding 4 weeks.

**4.1.3** The medium of instruction shall be English for all courses, examinations, seminar presentations and project thesis/dissertation reports.

## **4.2 Maximum Marks**

**4.2.1** The maximum marks assigned to different courses shall be as given below:

Each of the theory and practical courses (including project work) shall carry a maximum of 100 marks of which 20 marks will be through internal assessment and the University Examination (ESE) will carry 80 marks.

**4.2.2** The Industrial Training or Seminar shall carry 100 marks and shall be evaluated through internal assessment.

## **4.3 PROJECT WORK**

The project work for M.E. / M.Tech. Programmes consists of Phase-I and Phase-II. The Phase-I is to be undertaken during III semester and Phase-II, which is a continuation of Phase-I is to be undertaken during IV semester.

**4.3.1** In case of candidates of M.E. / M.Tech. Programmes not completing Phase-I of project work successfully, the candidates can undertake Phase-I again in the subsequent semester. In such cases the candidates can enroll for Phase-II, only after successful completion of Phase-I.

**4.3.2** Project work shall be carried out under the supervision of a “qualified teacher” in the Department concerned. In this context “qualified teacher” means the faculty member possessing a Ph.D. degree or PG degree with a minimum of 3 years experience in teaching PG courses.

**4.3.3** A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department Concerned. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a joint supervisor 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.

**4.3.4** The Project work (Phase II in the case of M.E/M.Tech.) shall be pursued for a minimum of 16 weeks during the final semester.

**4.3.5** The deadline for submission of final Project Report is 60 calendar days from the last working day of the semester in which project / thesis / dissertation is done. However, the Phase-I of the Project work in the case M.E. / M.Tech. Programmes shall be submitted within a maximum period of 30 calendar days from the last working day of the semester as per the academic calendar published by the University.

## 5 EVALUATION OF PROJECT WORK

The evaluation of Project Work for Phase-I & Phase-II in the case of M.E. / M.Tech. and project work of M.B.A and M.C.A shall be done independently in the respective semesters and marks shall be allotted as per the weightages given in Clause 12.2.

There shall be two assessments (each 100 marks) during the Semester by a review committee. The Student shall make presentation on the progress made before the Committee. The Head of the Department shall Constitute the review committee for each branch of study. The total marks obtained in the two assessment shall be reduced to 15 marks and rounded to the nearest integer. There will be a vice-voce Examination during End Semester Examinations conducted by a Committee consisting of the Supervisor, one Internal Examiner and one External Examiner.

- 5.1 The project work shall be evaluated for a maximum of 100 marks of which 20 marks will be through internal assessment.

**There should be a minimum of two reviews for each phase (Phase I and Phase II) to be conducted separately with Internals 20 marks and External 80 marks for each phase which can be distributed as detailed below.**

Project work	Internal (20 Marks) 15+5 (Attendance)		External (80 Marks)			
	Review - I	Review - II	Thesis Submission (30 Marks)	Viva – Voce (50 Marks)		
			External	Internal	External	Supervisor
Phase – I	7.5	7.5	30	16.66	16.66	16.66
Phase - II	7.5	7.5	30	16.66	16.66	16.66

- 5.2 The Project Report prepared according to approved guidelines and duly signed by the supervisor(s) and the Head of the Department concerned, shall be submitted to the Head of the Institution.

- 5.3 The evaluation of the Project Work Phase - I & Phase - II (M.E. / M.Tech.) will be based on the project report submitted in each of the Phase – I & Phase - II semesters and a Viva-Voce Examination by a team consisting of the supervisor, an internal examiner (other than the supervisor) and an External Examiner for each programme. The internal examiner and the external examiner shall be appointed by the University for the evaluation.

- 5.3.1 If the candidate fails to obtain 50% of the internal assessment marks in the Phase–I and Phase–II / final project, he/she will not be permitted to submit

the report for that particular semester and has to re-enroll for the same in the subsequent semester.

If a candidate fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester. This applies to both Phase-I and Phase-II in the case of M.E. / M.Tech. Project Work and the Final Project work of M.B.A. / M.C.A.

If a candidate fails in the viva-voce examinations of Phase-I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the viva-voce examination of Phase-II of Project work of M.E. / M.Tech. or the Final Project work of M.B.A. / M.C.A, he/she shall resubmit the Project Report within 60 days from the date of declaration of the results. For this purpose the same Internal and External examiners shall evaluate the resubmitted report.

- 5.3.2** A copy of the approved Project Report after the successful completion of viva-voce examinations shall be kept in the library of the college / institution.
- 5.3.3** A student who has passed all the courses prescribed in the curriculum for the award of the degree shall not be permitted to re-enroll to improve his/her marks in a course or the aggregate marks / CGPA.
- 5.3.4** Practical Training / Summer Project if specified in the Curriculum shall not exceed the maximum duration of 4 weeks and should be organized by the Head of the Department for every student.
- 5.3.5** At the end of Practical Training / Summer Project 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 Institution. Certificates submitted by the students shall be attached to the mark list sent by the Head of the Institution.

## **6 CLASS ADVISER**

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department of the student will attach a certain number of students to a teacher of the Department who shall function as Faculty Adviser for those students throughout their period of study. Such Faculty Adviser shall advise the students and monitor the courses taken by the students, check the attendance and progress of the students attached to him/her and counsel them periodically. If necessary, the faculty adviser may also discuss with or inform the parents about the progress of the students.

## **7 CLASS COMMITTEE**

**7.1** A Class Committee consists of teachers of the concerned class, student representatives and a chairperson who is not teaching the class. It is like the 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching-learning process. The functions of the class committee include:

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the programme and the details of rules therein.
- Informing the student representatives, the "academic schedule" including the dates of assessments and the syllabus coverage for each assessment period.
- Informing the student representatives, the details of regulations regarding the weightage used for each assessment. In the case of practical courses (laboratory / project work / seminar etc.) the breakup of marks for each experiment/ exercise/ module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of improving the Students Performance
- Identifying the weak students, if any, in any specific subject and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students as frequently as possible.

**7.2** The class committee for a class under a particular programme is normally constituted by the Head of the Department. However, if the students of different programmes are mixed in a class, the class committee is to be constituted by the Head of the Institution.

**7.3** The class committee shall be constituted on the first working day of any semester or earlier.

**7.4** At least 2 student representatives (usually 1 boy and 1 girl) shall be included in the class committee.

**7.5** The chairperson of the class committee may invite the Class adviser(s) and the Head of the Department to the meeting of the class committee.

**7.6** The Head of the Institution may participate in any class committee of the institution.

- 7.7 The Chairperson of the Class Committee is required to prepare the minutes of every meeting, submit the same to the Head of the Institution within two days of the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the management by the Head of the Institution.
- 7.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester in order to inform the students about the nature and weightage of assessments within the framework of the Regulations. Two or three subsequent meetings may be held at suitable intervals. During these meetings the student members, representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

## **8 COURSE COMMITTEE FOR COMMON COURSES**

Each common 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 Assessment Test(s).

## **9 PROCEDURES FOR AWARDING MARKS FOR INTERNAL ASSESSMENT**

- 9.1 Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (topics covered), separately for each course. This should be submitted to the Head of the Department periodically (at least three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the department will put his signature and date after due verification. At the end of the semester, the record should be verified by the Head of the institution who will keep this document in safe custody (for five years). The university or any inspection team appointed by the University may inspect the records of attendance and assessments of both current and previous semesters.



## **9.2 Internal Assessment for Theory Courses:**

For all theory and practical courses the continuous assessment shall be for a maximum of 20 marks (consisting of 15 marks for tests/experiments and 5 marks for attendance). The above continuous assessment shall be awarded as per the procedure given below:

### **(a) Theory Courses:**

Three tests each carrying 100 marks shall be conducted during the semester by the Department / College concerned. The total marks obtained in all tests put together out of 300, shall be proportionately reduced for 15 marks and rounded to the nearest integer (This also implies equal weightage to all the three tests).

### **(b) Practical Courses:**

Every practical exercise / experiment shall be evaluated based on the exercise / experiment prescribed as per the syllabi and the records of work done maintained. There shall be at least one test during the semester. The criteria for arriving at the internal assessment marks (15 marks) shall be decided based on the recommendation of the class committee and shall be announced at the beginning of every semester by the Principal.

## **9.3 Seminar:**

The seminar is to be considered as purely INTERNAL (with 100% internal marks only). Every student is expected to present a minimum of 4 seminars per semester and for each seminar marks can be equally apportioned. At the end of the semester the marks can be consolidated and taken as the final mark and hence, there is no need for End Semester Examination for SEMINAR.

## **10 ATTENDANCE REQUIREMENTS FOR COMPLETION OF A SEMESTER**

### **10.1** A candidate who has fulfilled the following conditions shall be deemed to have satisfied the attendance requirements for completion of a semester.

Ideally every student is expected to attend all classes and earn 100% attendance. However in order to allow provision for certain unavoidable reasons such as prolonged hospitalization / accident / specific illness the student is expected to earn a minimum of 75% attendance to become eligible to write the End-Semester Examinations.

Therefore, every student shall secure not less than 75% of overall attendance in that semester taking into account the total number of periods in all courses attended by the candidate as against the total number of periods in all courses offered during that semester.

**10.2** However, a candidate who secures overall attendance between 65% and 74% in that current semester due to medical reasons (prolonged hospitalization / accident / specific illness / participation in sports events) may be permitted to appear for the current semester examinations subject to the condition that the candidate shall submit the medical certificate / sports participation certificate to the Head of the Institution. The same shall be forwarded to the COE, Anna University Chennai for record purposes.

**10.3** Candidates who could secure less than 65% overall attendance and **Candidates who do not satisfy the clauses 10.1 & 10.2** will not be permitted to write the end-semester examination of that current semester and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

## **11 REQUIREMENTS FOR APPEARING FOR SEMESTER EXAMINATION**

**11.1** A candidate shall normally be permitted to appear for the University examinations of the current semester if he/she has satisfied the semester completion requirements as per clause 10.1 & 10.2 and has registered for examination in all courses of the current semester.

**11.2** Further, registration is mandatory for all the courses in the current semester as well as for arrear(s) course(s) for the university examinations failing which, the candidate will not be permitted to move to the higher semester.

## **12 UNIVERSITY EXAMINATIONS**

**12.1** There shall be an End- Semester Examination of 3 hours duration in each lecture based course.

The examinations shall ordinarily be conducted between October and December during the odd semesters and between March and May in the even semesters.

For the practical examinations (including project work), both internal and external examiners shall be appointed by the University. The maximum marks for each theory and practical course shall be 100 comprising 20 marks for internal assessment.

### **12.2 WEIGHTAGES**

The following will be the weightages for different courses.

i) Lecture or Lecture cum Tutorial based course:

Internal Assessment	-	20%
End Semester Examination	-	80%

ii) Laboratory based courses

Internal Assessment	-	20%
End Semester Examination	-	80%
iii) Project work		
Internal Assessment	-	20%
Evaluation of Project Report by external examiner	-	30%
Viva-Voce Examination	-	50%

**12.3** If a student indulges in malpractice in any of the university / internal examinations, he / she shall be liable for punitive action as prescribed by the University from time to time.

### **13 PASSING REQUIREMENTS**

**13.1** A candidate who secures not less than 50% of total marks prescribed for the courses with a minimum of 50% of the marks prescribed for each of the course of the End-Semester University Examination in both theory and practical courses, shall be declared to have passed in the Examination.

**13.2** If the candidate fails to secure a pass in a particular course as per clause 13.1, it is mandatory that the candidate shall register and re-appear for the examination in that course during the subsequent semester when examination is conducted for that course. Further, the candidate should continue to enrol and reappear for the examination till a **pass** is secured in such arrear course.

The internal assessment marks obtained by the candidate in the first appearance shall be retained and considered valid for all subsequent attempts till the candidate secure a pass.

**13.2.1** The internal assessment marks obtained by the candidate in the first appearance shall be retained and considered valid for all subsequent attempts till the candidate secure a pass. However, from the 3<sup>rd</sup> attempt onwards if a candidate fails to obtain pass marks (IA + End Semester Examination) as per clause 13.1 then the passing requirement shall be as follows: The candidate should secure 50% and above the maximum marks prescribed for course in the university examinations alone irrespective of Internal Assessment marks obtained.

### **14 ELIGIBILITY FOR THE AWARD OF THE DEGREE**

**14.1** A student shall be declared eligible for the award of the degree if he/she has:

- Successfully passed all the courses as specified in the curriculum corresponding to his/her programme within the stipulated period. (as per clause 3.1)

- ii. No disciplinary action is pending against him/her.
- iii. The award of the degree must have been approved by the syndicate.

## 15 AWARD OF LETTER GRADES

**15.1** All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points specified, will be awarded as per the range of total marks (out of 100) obtained by the candidate (Regular or Arrear), as detailed below:

Letter grade	Grade Points	Marks Range
S	10	91 – 100
A	9	81 – 90
B	8	71 – 80
C	7	61 – 70
D	6	57 – 60
E	5	50 – 56
U	0	< 50
I	0	
W	0	

A student is deemed to have passed and acquired the corresponding credits in a particular course if he / she **obtained** any one of the following grades: “S”, “A”, “B”, “C”, “D”, “E”.

“U” denotes unsatisfactory grade which requires Reappearance (RA) in the examination for that particular course.

The Letter “W” denotes **withdrawal** from the course. (Clause 18)

The Letter “I” denotes inadequate attendance (as per clause 10.3) and hence prevention from writing the End Semester Examinations.

(Grade “I” and “W” will figure only in the **Result Sheets**).

### 15.2 Grade Sheet

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

- **The college in which the candidate has studied.**
- **The list of courses enrolled during the semester and the grades scored.**
- **The Grade Point Average (GPA) for the semester and**

- The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA for a semester is the ratio of the sum of the products of the number of credits for courses acquired and the corresponding points to the sum of the number of credits for the courses acquired in the semester.

$$\text{GPA} = \frac{\text{Sum of [Credits Acquired x Grade Points]}}{\text{Sum of Credits Acquired}}$$

CGPA will be calculated in a similar manner, considering all the courses registered from first semester. "U", "I" and "W" grades will be excluded for calculating GPA and CGPA.

$$\text{CGPA} = \frac{\sum_{i=1}^n C_i \text{ GP}_i}{\sum_{i=1}^n C_i}$$

where  $C_i$  – is the Credits assigned to the course  
 $\text{GP}_i$  – is the Grade point corresponding to the grade obtained for each Course  
 $n$  – is number of all Courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA

## 16 CLASSIFICATION OF THE DEGREE AWARDED

16.1 A candidate who qualifies for the award of the Degree (Vide Clause 14) having passed the examination in all the courses in his / her first appearance within the specified minimum number of semesters securing a **CGPA of not less than 8.50** shall be declared to have passed the examination in **First Class with Distinction**. For this purpose the

withdrawal from examination (vide clause 18) will not be construed as an appearance. Further, the authorized break of study (vide clause 19) will not be counted for the purpose of classification.

**16.2** A candidate who qualifies for the award of the Degree (vide clause 14) having passed the examination in all the courses within the specified minimum number of semesters plus one year (two semesters), securing a **CGPA of not less than 6.50** shall be declared to have passed the examination in **First Class**. For this purpose the authorized break of study (vide clause 19) the Withdrawal from the Examination, as well, will not be counted for the purpose of classification.

**16.3** All other candidates (not covered in clauses 16.1 and 16.2) who qualify for the award of the degree (vide clause 14) shall be declared to have passed the examination in **Second Class**.

A candidate who is absent in End Semester Examination in a course / project work after having enrolled for the same shall be considered to have appeared in that examination for the purpose of classification.

## **17 REVALUATION**

A candidate can apply for revaluation of his/her semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of Institutions. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Institutions. Revaluation is not permitted for practical courses and for project work.

## **18 PROVISION FOR WITHDRAWAL FROM EXAMINATION:**

A candidate may, for valid reasons, be granted permission to withdraw from appearing for any course(s) of only one semester examination during the entire duration of the degree programme. Also only one application for withdrawal is permitted for that semester examination in which withdrawal is sought.

Withdrawal application shall be valid only if the candidate is otherwise eligible ( as per clause 10.1 or 10.2) to write the examination and if it is made **prior to the examination** in that course(s) and also recommended by the Head of Department and Head of the Institution. A Xerox copy of the hall ticket must be enclosed along with the withdrawal application and submitted to the COE, Anna University, Chennai.

Withdrawal shall not be construed as appearance for the eligibility of a candidate for the purpose of classification, vide clause 16.1.

## 19 AUTHORIZED BREAK OF STUDY FROM A PROGRAMME

- 19.1 Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme.** However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to re-join the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the **Director, Student Affairs in advance**, but not later than the last date for registering for the End Semester Examinations of the semester in question, through the Principal of the Institution stating the reasons therefor and the probable date of re-joining the programme. However, if the candidate has not completed the first semester of the programme, Break of Study will be considered only on valid medical reasons.
- 19.2** The candidate permitted to re-join the Programme after the break shall be governed by the Curriculum and Regulations, in force, at the time of re-joining. **If the Regulations is changed**, then, those candidates may have to do additional courses as prescribed by the **Director, Academic courses**.
- 19.3** The authorized break of study will not be counted for the duration specified for passing all the courses for the purpose of classification. ( vide Clause 16.1 and 16.2).
- 19.4** The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 3 irrespective of the period of break of study in order that he/she may be eligible for the award of the degree (vide clause 16).
- 19.5** If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' and Clause 19.3 is not applicable for this case.

## 20 DISCIPLINE

Every student is expected to observe discipline and decorum both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the University / College. In the event of an act of indiscipline being reported, the Principal shall constitute a disciplinary committee consisting of Principal, two Heads of Departments of which one should be from the faculty of the student, to inquire into acts of indiscipline

and notify the University about the disciplinary action taken. The disciplinary action is subject to review by the University in case the student represents to the University. Any expulsion of the student from the college shall be done with prior concurrence of the University.

## **21 REVISION OF REGULATIONS, CURRICULUM AND SYLLABUS**

The University may from time to time revise, amend or change the Regulations, scheme of examinations and syllabi if found necessary through the Academic Council and the approval of the Syndicate.

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**AFFILIATED INSTITUTIONS  
ANNA UNIVERSITY, CHENNAI  
REGULATIONS - 2009**

**M.C.A. (MASTER OF COMPUTER APPLICATIONS)  
II TO VI SEMESTERS (FULL TIME) CURRICULUM AND SYLLABUS**

**SEMESTER II**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	MA9221	<u>Mathematical Foundations of Computer Science</u>	3	1	0	4
2	MC9222	<u>Object Oriented Programming</u>	3	0	0	3
3	MC9223	<u>Design and Analysis of Algorithms</u>	3	1	0	4
4	MC9224	<u>System Software</u>	3	0	0	3
5	MC9225	<u>Operating Systems</u>	3	0	0	3
<b>PRACTICAL</b>						
6	MC9226	<u>Object Oriented Programming Lab</u>	0	0	3	2
7	MC9227	<u>System Software Lab</u>	0	0	3	2
8	MC9228	<u>Algorithms Lab</u>	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>2</b>	<b>9</b>	<b>23</b>

**SEMESTER III**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	MC9231	<u>Computer Networks</u>	3	0	0	3
2	MC9232	<u>Microprocessors and its Applications</u>	3	0	0	3
3	MC9233	<u>Software Engineering</u>	3	0	0	3
4	MC9234	<u>Computer Graphics</u>	3	0	0	3
5	MC9235	<u>Web Programming</u>	3	0	0	3
<b>PRACTICAL</b>						
6	MC9236	<u>Graphics Lab</u>	0	0	3	2
7	MC9237	<u>Microprocessor Lab</u>	0	0	3	2
8	MC9238	<u>Web Programming Lab</u>	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>0</b>	<b>9</b>	<b>21</b>

### SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	MC9241	<u>Network Programming</u>	3	0	0	3
2	MC9242	<u>Resource Management Techniques</u>	3	0	0	3
3	MC9243	<u>Visual Programming</u>	3	0	0	3
4	MC9244	<u>Object Oriented Analysis and Design</u>	3	1	0	4
5	E1	Elective – I	3	0	0	3
<b>PRACTICAL</b>						
6	MC9245	<u>Visual Programming Lab</u>	0	0	3	2
7	MC9246	<u>Network Programming Lab</u>	0	0	3	2
8	MC9247	<u>Case Tools Lab</u>	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>1</b>	<b>9</b>	<b>22</b>

### SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	MC9251	<u>Middleware Technologies</u>	3	0	0	3
2	MC9252	<u>Software Project Management</u>	3	0	0	3
3	E2	Elective II	3	0	0	3
4	E3	Elective III	3	0	0	3
5	E4	Elective IV	3	0	0	3
<b>PRACTICAL</b>						
6	MC9253	<u>Middleware Technology Lab</u>	0	0	3	2
7	MC9254	<u>Software Development Lab</u>	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>0</b>	<b>6</b>	<b>19</b>

### SEMESTER VI

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>PRACTICAL</b>						
1	MC9261	Project Work	0	0	24	12
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**Total No of Credits to be earned for the Award of Degree 23+21+22+19+12 = 97**

**LIST OF ELECTIVES FOR M.C.A.**  
**(MASTER OF COMPUTER APPLICATIONS)**

<b>SL. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV SEMESTER</b>						
1	MA9227	<u>Numerical and Statistical Methods</u>	3	1	0	4
2	MC9271	<u>Electronic Commerce</u>	3	0	0	3
3	MC9272	<u>Information Systems</u>	3	0	0	3
4	MC9273	<u>Web Graphics</u>	3	0	0	3
5	MC9274	<u>Human Resource Management</u>	3	0	0	3
<b>V SEMESTER</b>						
6	MC9276	<u>Advanced Databases</u>	3	0	0	3
7	MC9277	<u>Software Quality Management</u>	3	0	0	3
8	MC9278	<u>TCP/IP Design and Implementation</u>	3	0	0	3
9	MC9279	<u>Distributed Systems</u>	3	0	0	3
10	MC9280	<u>Data Mining and Data Warehousing</u>	3	0	0	3
11	MC9281	<u>Component Based Technology</u>	3	0	0	3
12	MC9282	<u>Managerial Economics</u>	3	0	0	3
13	MC9283	<u>Mobile Computing</u>	3	0	0	3
14	MC9284	<u>Digital Imaging</u>	3	0	0	3
15	MC9285	<u>Enterprise Resource Planning</u>	3	0	0	3
16	MC9286	<u>Agent Based Intelligent Systems</u>	3	0	0	3
17	MC9287	<u>Natural Language Processing</u>	3	0	0	3
18	MC9288	<u>Software Agents</u>	3	0	0	3
19	MC9289	<u>Supply Chain Management</u>	3	0	0	3
20	MC9290	<u>Healthcare Systems</u>	3	0	0	3
21	MC9291	<u>Portfolio Management</u>	3	0	0	3
22	MC9292	<u>Unix Internals</u>	3	0	0	3
23	MC9293	<u>Compiler Design</u>	3	0	0	3
24	MC9294	<u>Artificial Intelligence</u>	3	0	0	3
25	MC9295	<u>Parallel and Distributed Computing</u>	3	0	0	3
26	MC9296	<u>Soft Computing</u>	3	0	0	3

**MA9221          MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE          LT P C**  
**3 1 0 4**

**UNIT I          MATRIX ALGEBRA          12**  
Matrices, Rank of Matrix, Solving System of Equations-Eigen Values and Eigen Vectors-  
Inverse of a Matrix - Cayley Hamilton Theorem

**UNIT II          BASIC SET THEORY          12**  
Basic Definitions - Venn Diagrams and set operations - Laws of set theory - Principle of  
inclusion and exclusion - partitions- Permutation and Combination - Relations-  
Properties of relations - Matrices of relations - Closure operations on relations -  
Functions - injective, surjective and bijective functions.

**UNIT III          MATHEMATICAL LOGIC          12**  
Propositions and logical operators - Truth table - Propositions generated by a set,  
Equivalence and implication - Basic laws- Some more connectives - Functionally  
complete set of connectives- Normal forms - Proofs in Propositional calculus - Predicate  
calculus.

**UNIT IV          FORMAL LANGUAGES          12**  
Languages and Grammars-Phrase Structure Grammar-Classification of Grammars-  
Pumping Lemma For Regular Languages-Context Free Languages.

**UNIT V          FINITE STATE AUTOMATA          12**  
Finite State Automata-Deterministic Finite State Automata(DFA), Non Deterministic  
Finite State Automata (NFA)-Equivalence of DFA and NFA-Equivalence of NFA and  
Regular Languages.

**TOTAL : 60 PERIODS**

**REFERENCES:**

1. Kenneth H.Rosen, " Discrete Mathematics and Its Applications", Tata McGraw Hill,  
Fourth Edition, 2002 (Unit 1,2 & 3).
2. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and  
Computation", Narosa Publishing House, Delhi, 2002. ( Unit 4,5)
3. A.Tamilarasi & A.M.Natarajan, "Discrete Mathematics and its Application", Khanna  
Publishers, 2<sup>nd</sup> Edition 2005.
4. M.K.Venkataraman "Engineering Mathematics", Volume II, National Publishing  
Company, 2<sup>nd</sup> Edition,1989.

**MC9222          OBJECT ORIENTED PROGRAMMING          LT P C**  
**3 0 0 3**

**UNIT I          FUNDAMENTALS          9**  
Object–Oriented Programming concepts – Encapsulation – Programming Elements –  
Program Structure – Enumeration Types — Functions and Pointers – Function  
Invocation – Overloading Functions – Scope and Storage Class – Pointer Types –  
Arrays and Pointers – Call–by–Reference – Assertions – Standard template library.

<b>UNIT II</b>	<b>IMPLEMENTING ADTS AND ENCAPSULATION</b>	<b>9</b>
Aggregate Type struct – Structure Pointer Operators – Unions – Bit Fields – Data Handling and Member Functions – Classes – Constructors and Destructors – Static Member – this Pointer – reference semantics – implementation of simple ADTs.		
<b>UNIT III</b>	<b>POLYMORPHISM</b>	<b>9</b>
ADT Conversions – Overloading – Overloading Operators – Unary Operator Overloading – Binary Operator Overloading – Function Selection – Pointer Operators – Visitation – Iterators – containers – List – List Iterators.		
<b>UNIT IV</b>	<b>TEMPLATES</b>	<b>9</b>
Template Class – Function Templates – Class Templates – Parameterizing – STL – Algorithms – Function Adaptors.		
<b>UNIT V</b>	<b>INHERITANCE</b>	<b>9</b>
Derived Class – Typing Conversions and Visibility – Code Reuse – Virtual Functions – Templates and Inheritance – Run–Time Type Identifications – Exceptions – Handlers – Standard Exceptions.		
<b>TOTAL: 45 PERIODS</b>		

**REFERENCES:**

1. Ira Pohl, "Object–Oriented Programming Using C++", Pearson Education, Second Edition, 2003.
2. Stanley B.Lippman, Josee Lajoie, "C++ Primer", Pearson Education, Third Edition, 2004.
3. Kamthane," Object Oriented Programming with ANSI and Turbo C++", Person Education, 2002.
4. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004.

<b>MC9223</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>	<b>LT P C</b>
		<b>3 1 0 4</b>

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>10</b>
Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm efficiency – analysis frame work – Asymptotic notations – Mathematical analysis for recursive and non-recursive algorithms.		
<b>UNIT II</b>	<b>DIVIDE AND CONQUER METHOD AND GREEDY METHOD</b>	<b>12</b>
Divide and conquer methodology – Merge sort – Quick sort – Binary search – Binary tree traversal – Multiplication of large integers – Strassen’s matrix multiplication – Greedy method – Prim’s algorithm – Kruskal’s algorithm – Dijkstra’s algorithm.		
<b>UNIT III</b>	<b>DYNAMIC PROGRAMMING</b>	<b>12</b>
Computing a binomial coefficient – Warshall’s and Floyd’ algorithm – Optimal binary search tree – Knapsack problem – Memory functions.		

**UNIT IV BACKTRACKING AND BRANCH AND BOUND 14**  
Backtracking – N-Queens problem – Hamiltonian circuit problem – Subset sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem.

**UNIT V NP-HARD AND NP-COMPLETE PROBLEMS 12**  
P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem – Knapsack problem.

**L : 45 T : 15 TOTAL : 60 PERIODS**

**REFERENCES:**

1. Anany Levitin “Introduction to the Design and Analysis of Algorithms” Pearson Education 2003.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, “Introduction to algorithms” Prentice Hall 1990.

**MC9224 SYSTEM SOFTWARE LT P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**  
Introduction – System software and machine architecture – The Simplified Instructional Computer (SIC) – Machine Architectures (SIC and SIC/XE) – Data and Instruction Formats – Addressing Modes –Instruction sets – I/O Programming.

**UNIT II ASSEMBLERS 9**  
Basic assembler functions – A simple SIC assembler – Assembler algorithms and data structures – Machine dependent assembler features, Instruction formats and addressing modes – Program relocation – Machine independent assembler features – Literals – Symbol-defining statements – Expressions – Program Blocks – Control Sections and Program Linking – One Pass Assembler and Multipass Assemblers - Implementation examples MASM assembler.

**UNIT III LOADERS AND LINKERS 9**  
Basic loader functions: Design of an Absolute Loader – A Simple Bootstrap Loader Machine dependent loader features Relocation – Program Linking – Algorithm and Data Structures for Linking Loader. Machine-independent loader features – Automatic Library Search – Loader Options Loader design options – Linkage Editors – Dynamic Linking – Bootstrap Loaders. Implementation examples: MSDOS linker.

**UNIT IV MACRO PROCESSORS 9**  
Basic macro processor functions – Macro Definition and Expansion – Macro Processor Algorithm and data structures – Machine – independent macro processor features – Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters – Macro Processor Design Options – Recursive Macro Expansion – Algorithm – General Purpose macro Processors – Macro Processing within Language Translators - Implementation examples: MASM Macro Processor – ANSI C macro language.

**UNIT V OTHER SYSTEM SOFTWARE 9**  
 Text editors – Overview of Editing Process - User Interface – Editor Structure – Interactive Debugging Systems – Debugging functions and capabilities – Relationships with Other parts of the system – User Interface Criteria.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Leland Beck - "System Software – An Introduction to Systems Programming", Third Edition, Pearson Education, Inc., 1999.

**REFERENCES:**

1. D. M. Dhamdhere, " Systems Programming and Operating Systems", Tata McGraw Hill Company, 1999.
2. John J. Donovan, "Systems Programming", Tata McGraw Hill Company, 1991.

**MC9225 OPERATING SYSTEMS LT P C  
 3 0 0 3**

**UNIT I INTRODUCTION 9**  
 Introduction – Operating Systems and services – Processes – CPU Scheduling approaches

**UNIT II PROCESS SYNCHRONIZATION 9**  
 Process synchronization – Semaphores – Deadlocks – Handling deadlocks – Multithreading

**UNIT III MEMORY MANAGEMENT 9**  
 Memory management – Paging – Segmentation – Virtual Memory – Demand paging – Replacement Algorithms

**UNIT IV DISK SCHEDULING 9**  
 Disk Scheduling approaches – File systems – Design issues – User interfaces to file systems – I/O device management.

**UNIT V CASE STUDIES 9**  
 Case study – Design and implementation of the UNIX OS, Process model and structure – Memory management – File system – UNIX I/O management and device drivers – Windows – System components – Process Management – Memory management – File Systems – Networking

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Abraham Silberschatz Peter B. Galvin, G. Gagne, "Operating System Concepts", Sixth Edition, Addison Wesley Publishing Co., 2003.
2. M. J. Bach, "Design Of The Unix Operating System", Pearson Education.
3. Willam-Stalling " Operating System" Fourth Edition, Pearson Education, 2003.

**MC9226**

**OBJECT ORIENTED PROGRAMMING LAB**

**L T P C**  
**0 0 3 2**

1. Write a C++ Program to illustrate Enumeration and Function Overloading
2. Write a C++ Program to illustrate Scope and Storage class
3. Implementation of ADT such as Stack and Queues
4. Write a C++ Program to illustrate the use of Constructors and Destructors and Constructor Overloading
5. Write a Program to illustrate Static member and methods
6. Write a Program to illustrate Bit fields
7. Write a Program to overload as binary operator, friend and member function
8. Write a Program to overload unary operator in Postfix and Prefix form as member and friend function
9. Write a Program to illustrate Iterators and Containers
10. Write a C++ Program to illustrate function templates
11. Write a C++ Program to illustrate template class
12. Write C++ Programs and incorporating various forms of Inheritance
13. Write a C++ Program to illustrate Virtual functions
14. Exception Handling

**TOTAL : 45 PERIODS**

**MC9227**

**SYSTEM SOFTWARE LAB**

**L T P C**  
**0 0 3 2**

1. Assemblers.
2. Linkers.
3. Loaders.
4. Features of text editors.
5. Basic UNIX commands.
6. Shell Programming.
7. Grep, sed, awk.
8. File system related system calls.
9. Process management – Fork, Exec.
10. Message queues.
11. Pipe, FIFO's.
12. Signals.
13. Shared memory.

**TOTAL : 45 PERIODS**



**MC9228**

**ALGORITHMS LAB**

**LT P C  
0 0 3 2**

1. Quick Sort
2. Binary Search
3. Binary Tree Traversal
4. Warshall's Algorithm
5. Dijkstra's Algorithm
6. Prim's Algorithm
7. Knapsack Problem – Dynamic Programming
8. Subset Sum Problem – Backtracking
9. Travelling salesperson problem – Branch and Bound
10. Strassen's matrix multiplication

**TOTAL : 45 PERIODS**

**MC9231**

**COMPUTER NETWORKS**

**LT P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**

Communication model – Data communications networking – Data transmission concepts and terminology – Transmission media – Data encoding – Data link control.

**UNIT II NETWORK FUNDAMENTALS 9**

Protocol architecture – Protocols – OSI – TCP/IP – LAN architecture – Topologies – MAC – Ethernet, Fast ethernet, Token ring, FDDI, Wireless LANS – Bridges.

**UNIT III NETWORK LAYER 9**

Network layer – Switching concepts – Circuit switching networks – Packet switching – Routing – Congestion control – X.25 – Internetworking concepts and X.25 architectural models – IP – Unreliable connectionless delivery – Datagrams – Routing IP datagrams – ICMP.

**UNIT IV TRANSPORT LAYER 9**

Transport layer – Reliable delivery service – Congestion control – Connection establishment – Flow control – Transmission control protocol – User datagram protocol.

**UNIT V APPLICATIONS 9**

Applications – Sessions and presentation aspects – DNS, Telnet – rlogin, – FTP – SMTP – WWW – Security – SNMP.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Larry L. Peterson & Bruce S. Davie, "Computer Networks – A systems Approach", Second Edition, Harcourt Asia / Morgan Kaufmann, 2000.
2. William Stallings, "Data and Computer Communications", Fifth Edition, PHI, 1997.

<b>UNIT I</b>	<b>THE 8086 PROCESSOR - SOFTWARE ASPECTS</b>	<b>11</b>
Evolution of Microprocessors - 8086 architecture – Addressing modes- Instruction set and assembler directives – Assembly language programming – Interrupts and interrupt service routines.		
<b>UNIT II</b>	<b>8086 SYSTEM DESIGN</b>	<b>10</b>
8086 signals description – Basic configurations - System bus timing –System design using 8086 – Minimum mode /Maximum modes 8086 system and timings.		
<b>UNIT III</b>	<b>INTERFACING CONCEPTS</b>	<b>10</b>
Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications.		
<b>UNIT IV</b>	<b>ADVANCED PROCESSORS</b>	<b>7</b>
Intel 80286 – Internal Architectural – Register Organization – Internal Block Diagram – Modes of operation – Real Address Mode – Protected Virtual Address mode – Privilege – Protection - Architectural features and Register Organization of i386, i486 and Pentium processors.		
<b>UNIT V</b>	<b>BUILDING SYSTEMS</b>	<b>7</b>
Bus Concepts – Bus Standards –The Peripheral Component Interconnect (PCI) Bus – Universal Serial Bus (USB) – Platform Architectures.		

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. A. K. Ray & K. M. Bhurchandi, “Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing”, TMH, 2002 reprint.
2. Barry B. Brey, “The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, PentiumIV, Architecture, Programming & Interfacing”, 6<sup>th</sup> Edition, Pearson Education/PHI, 2002.
3. Yu-cheng Liu, Glenn A. Gibson, “Microcomputer systems: The 8086/8088 Family architecture, Programming and Design”, PHI 2003.
4. Peter Abel, “IBM PC Assembly language and programming”, Prentice Hall of India Pvt. Ltd.
5. Websites of latest processors.

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Software Engineering paradigms – Waterfall Life cycle model – Spiral Model – Prototype Model – fourth Generation Techniques – Planning – Cost Estimation – Organization Structure – Software Project Scheduling, – Risk analysis and management – Requirements and Specification – Rapid Prototyping.		
<b>UNIT II</b>	<b>SOFTWARE DESIGN</b>	<b>9</b>
Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Various Design Concepts and notations – Real time and Distributed System Design – Documentation – Dataflow Oriented design – Jackson System development – Designing for reuse – Programming standards.		
<b>UNIT III</b>	<b>SOFTWARE METRICS</b>	<b>9</b>
Scope – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Reliability – Software Quality Assurance – Standards.		
<b>UNIT IV</b>	<b>SOFTWARE TESTING AND MAINTENANCE</b>	<b>9</b>
Software Testing Fundamentals – Software testing strategies – Black Box Testing – White Box Testing – System Testing – Testing Tools – Test Case Management – Software Maintenance Organization – Maintenance Report – Types of Maintenance.		
<b>UNIT V</b>	<b>SOFTWARE CONFIGURATION MANAGEMENT (SCM) &amp; CASE TOOLS</b>	<b>9</b>
Need for SCM – Version Control – SCM process – Software Configuration Items – Taxonomy – Case Repository – Features.		
		<b>TOTAL : 45 PERIODS</b>

**REFERENCES:**

1. Roger S. Pressman, "Software Engineering: A Practitioner Approach", Sixth edition, McGrawHill, 2005.
2. Sommerville, "Software Engineering", Sixth Edition, Addison Wesley-Longman, 2004.
3. Pankaj Jalote, "An Integrated approach to Software Engineering", Second Edition, Springer Verlag, 1997.

<b>UNIT I</b>	<b>BASIC CONCEPTS</b>	<b>9</b>
2D Transformations – Clipping – Window – View Prot Mapping – Graphical User Interfaces and Interactive Input Methods – Picture Construction Techniques – Virtual Reality Environment.		
<b>UNIT II</b>	<b>3D GRAPHICS</b>	<b>9</b>
3D Transformation – 3D Viewing – Visible Surface Detection – Back Face Detection – Depth Buffer Method – Scan Line Method.		

**UNIT III VISUAL COMMUNICATION 9**  
Creative Process – Digital Imaging Technology – Still Image – Digital Imaging – Using Images in Multimedia – Images on Web – Color Models.

**UNIT IV PRESENTATION 9**  
General Design Issues – Architectural Issues – Information Characteristics for Presentation – Presentation function – Presentation Design Knowledge – Effective Human Computer Interaction.

**UNIT V INTERACTIVE 3D ILLUSTRATED WITH IMAGES AND TEXT 9**  
Generating Illustrated Documents – Consistency of Rendered Images and their Textual Labels – Architecture – Zoom Techniques for Illustration Purpose – Interactive handling of Images and Text – Figure Captions for Anatomical Illustrations.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Donald Hearn and M. Pauline Baker, “Computer Graphics in C Version”, Second Edition, Pearson Education.
2. Raf Steinmetz and Klara Nahrstedt, “Multimedia: Computing, Communication and applications”, Pearson Education.
3. John Villamil Casanova and Leony Fernandez-Elias, “ Multimedia Graphics”, Prentice Hall India.
4. Thomas Strothotte, “Computer Visualization-Graphics Abstraction and Interactivity”, Springer Verlag, Berlin Heiderberg, 1998.

**MC9235 WEB PROGRAMMING L T P C  
3 0 0 3**

**UNIT I BASIC INTERNET CONCEPTS 8**  
Connecting to the Internet – Domain Name System - Exchanging E-mail – Sending and Receiving Files - Fighting Spam, Sorting Mail and avoiding e-mail viruses – Chatting and Conferencing on the Internet – Online Chatting - Messaging – Usenet Newsgroup – Internet Relay chat (IRC) – Instant Messaging - Voice and Video Conferencing.

**UNIT II WORLD WIDE WEB 8**  
Overview – Web Security, Privacy, and site-blocking – Audio and Video on the web – Creating and Maintaining the Web – Web site creation concepts – Web Page Editors – Optimizing Web Graphics – Web Audio Files – Forms, Interactivity, and Database-Driven Web sites – File Transfer and downloading – FTP – Peer to Peer – Downloading and Installing software.

**UNIT III JAVA FUNDAMENTALS 8**  
Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Packages and Interfaces – Exception Handling.

**UNIT IV PACKAGES 12**  
AWT package – Layouts – Containers – Event Package – Event Model – Painting – Garbage Collection - Multithreading – Language Packages.

**UNIT V          ADVANCED JAVA PROGRAMMING****9**

Utility Packages – Input Output Packages – Inner Classes – Java Database Connectivity  
- Servlets - RMI – Java Beans.

**TOTAL : 45 PERIODS****TEXT BOOKS:**

1. Margaret Levine Young, "Internet and WWW", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2002. (Unit 1 & 2)
2. Herbert Schildt, The Complete Reference – Java 2 , 4<sup>th</sup> Edition, Tata McGraw Hill, 2001. (Unit 3, 4 & 5)

**REFERENCES:**

1. Keyur shah, "Gateway to Java Programmer Sun Certification", Tata Mc Graw Hill 2002.
2. Deitel & Deitel, Java How to Program, Prentice Hall 1999.

**MC9236****GRAPHICS LAB****LT P C  
0 0 3 2****1. TWO DIMENSIONAL TRANSFORMATIONS:**

Creation of two dimensional objects and applying simple transformations like Translation, Scaling, Rotation and applying Composite transformations.

**2. THREE DIMENSIONAL TRANSFORMATIONS:**

Creation of simple three dimensional objects like cube, cone and cylinder and applying simple transformations like Translation, Scaling, Rotation and applying Composite transformations.

**3. VISIBLE SURFACE DETECTION:**

Finding out visible surfaces and removal of hidden surfaces in simple objects using object space and image space algorithms.

**4. IMAGE EDITING:**

Image enhancement, Image transformation from color to gray scale and vice versa, Image manipulation and Image optimization for web - Usage of editing tools, layers, filters, special effects and color modes. Creation of simple Gif animated images with textual illustrations.

**TOTAL : 45 PERIODS****MC9237****MICROPROCESSOR LAB****LT P C  
0 0 3 2**

1. Study of BIOS and DOS function calls for keyboard & Display interfacing
2. Assembly Language Programming with 8086 to perform the following operation
  - a. Arithmetic & Logical Operation
  - b. String Manipulation Operation
  - c. File Manipulation Operation

- d. Terminate and Stay Resident (TSR) Program
3. Using Assembly Language with C/C++
  4. Perform the following interfacing concepts with a microprocessor chip
    - a. Traffic signal controller using 8255 PPI
    - b. Stepper Motor controller using 8255 PPI
    - c. ADC/DAC interface
    - d. Waveform generation using 8253/8254 Timers
    - e. DC Motor Speed Controller
    - f. Keyboard/Display Controller using 8279

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. IBM PC Assembly Language and Programming by peter Abel, fifth edition
2. Advanced Microprocessors & peripherals A K Ray & K M Bhurchandi, Second Edition, Tata McGraw-Hill

**MC9238**

**WEB PROGRAMMING LAB**

**L T P C  
0 0 3 2**

1. Studying internet connection procedures
2. Sending and receiving mails from one or more email clients
3. Video Conferencing demonstration
4. Downloading and installing softwares (Example: Java) and setting up path and class path
5. Using FTP
6. Creation of web site with forms, frames, links, tables etc with any web page editors and using images and audio files as part of web pages
7. Writing Java programs by making use of class, interface, package, etc for the following
  - (a) Different types of inheritance study
  - (b) Uses of 'this' keyword
  - (c) Polymorphism
  - (d) Creation of user specific packages
  - (e) Creation of jar files and using them
  - (f) User specific exception handling
8. Writing window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion etc
9. Application of threads examples
10. Reading and writing text files
11. Reading image files and manipulating them with image related classes and methods
12. writing an RMI application to access a remote method
13. Writing a Servlet program with database connectivity for a web based application such as students result status checking, PNR number enquiry etc
14. Creation and usage of Java bean

**TOTAL : 45 PERIODS**

**MC9241**

**NETWORK PROGRAMMING**

**L T P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**

Introduction – Overview of UNIX OS – Environment of a UNIX process – Process control – Process relationships Signals – Interprocess Communication – overview of tcp/ip protocols

**UNIT II ELEMENTARY TCP SOCKETS 9**

Introduction to Socket Programming –Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server.

**UNIT III APPLICATION DEVELOPMENT 9**

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

**UNIT IV SOCKET OPTIONS, ELEMENTARY UDP SOCKETS 9**

Socket options – getsockopt and setsockopt functions – generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions.

**UNIT V ADVANCED SOCKETS 9**

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination – TCP echo server using threads – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input – ping program – trace route program.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. W. Richard Stevens, “Advanced Programming in The UNIX Environment”, Addison Wesley, 1999.
2. W. Richard Stevens, “UNIX Network Programming - Volume 1”, Prentice Hall International, 1998.

**MC9242**

**RESOURCE MANAGEMENT TECHNIQUES**

**L T P C  
3 0 0 3**

**UNIT I LINEAR PROGRAMMING MODELS 9**

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques- Variants of Simplex method

<b>UNIT II</b>	<b>TRANSPORTATION AND ASSIGNMENT MODELS</b>	<b>9</b>
Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem		
<b>UNIT III</b>	<b>INTEGER PROGRAMMING MODELS</b>	<b>9</b>
Formulation – Gomory’s IPP method – Gomory’s mixed integer method – Branch and bound technique.		
<b>UNIT IV</b>	<b>SCHEDULING BY PERT AND CPM</b>	<b>9</b>
Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling		
<b>UNIT V</b>	<b>QUEUEING MODELS</b>	<b>9</b>
Characteristics of Queuing Models – Poisson Queues - (M / M / 1) : (FIFO / ∞ / ∞), (M / M / 1) : (FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞) models.		
		<b>TOTAL : 45 PERIODS</b>

**TEXT BOOK:**

1. Taha H.A., “Operations Research : An Introduction “ 7<sup>th</sup> Edition, Pearson Education, 2004.

**REFERENCES:**

1. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, “Operations Research”, Pearson Education, Asia, 2005.
2. Prem Kumar Gupta, D.S. Hira, “Operations Research”, S.Chand & Company Ltd, New Delhi, 3<sup>rd</sup> Edition , 2003.

<b>MC9243</b>	<b>VISUAL PROGRAMMING</b>	<b>LT P C</b>
		<b>3 0 0 3</b>

<b>UNIT I</b>	<b>WINDOWS PROGRAMMING</b>	<b>8</b>
The windows programming Model – Event driven programming – GUI concepts – Overview of Windows programming – Creating and displaying the window – Message Loop – windows procedure – WM_PAINT message – WM_DESTROY message – Data types – Resources – An Introduction to GDI – Device context – Text output – Scroll Bars – Keyboard – Mouse – Menus.		
<b>UNIT II</b>	<b>VISUAL BASIC PROGRAMMING</b>	<b>10</b>
Visual Basic Applications – Form and properties – Variables and Constants – Variant type – Procedure scope – Main – Control statements – control arrays – Creating and using Controls – Menus and Dialogs – Programming fundamentals – Objects and instances – Debugging – Responding to mouse events – Drag and Drag drop events Responding to keyboard events – keypress, keyup, keydown events – Using grid control – Graphics controls – shape and line control – File system controls – Common dialog controls – Processing files – Accessing databases with the data controls.		
<b>UNIT III</b>	<b>VISUAL C++ PROGRAMMING</b>	<b>9</b>
Visual C++ components – Introduction to Microsoft Foundation Classes Library – Getting started with AppWizard – Class Wizard – Event handling – Keyboard and Mouse events - WM_SIZE, WM_CHAR messages - Graphics Device Interface - Pen, Brush, Colors, Fonts - Single and Multiple document interface - Reading and Writing documents - Resources – Bitmaps creation, usage of BMP and displaying a file existing as a BMP.		



**UNIT IV CONTROLS 9**  
Dialog Based Applications, controls – Animate control, image list, CRect tracker – Tree control – CtabControl – Dynamic controls – slider control – progress control – Inheriting CTreeView – CRicheditView – Modal Dialog, – Modeless Dialog – CColorDialog – CFileDialog.

**UNIT V ADVANCED CONCEPTS 9**  
Domain Name System – Email – World Wide Web (HTTP) – Simple Status bars – Splitter windows and multiple views – Dynamic Link Library – Data base Management with ODBC – TCP/IP – Winsock and WinInet, – ActiveX control – creation and usage – Container class.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Charles Petzold, “Windows Programming”, Microsoft press, 1996.
2. J. David Kruglirski, “Programming Microsoft Visual C++”, Fifth Edition, Microsoft press, 1998.
3. Marion Cottingham “Visual Basic”, Peachpit Press, 1999.

**REFERENCES:**

1. Steve Holzner, “Visual C++ 6 programming”, Wiley Dreamtech India Private Ltd., 2003.
2. Kate Gregory “Using Visual C++”, Prentice Hall of India Pvt., Ltd., 1999.
3. Herbert Sheildt, “MFC from the Ground Up”. Deitel , “ Visual Basic 6.0 How To Program”, Pearson Education, 1999.

**MC9244 OBJECT ORIENTED ANALYSIS AND DESIGN L T P C  
3 1 0 4**

**UNIT I INTRODUCTION 12**  
An overview – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Metaclasses – Object oriented system development life cycle.

**UNIT II METHODOLOGY AND UML 12**  
Introduction – Survey – Rumbugh, Booch, Jacobson methods – Patterns – Frameworks – Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Usecase diagrams – Dynamic modeling – Model organization – Extensibility.

**UNIT III OBJECT ORIENTED ANALYSIS 12**  
Identifying Usecase – Business object analysis – Usecase driven object oriented analysis – Usecase model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility

**UNIT IV OBJECT ORIENTED DESIGN 12**

Design process – Axioms – Colollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface

**UNIT V SOFTWARE QUALITY 12**

Quality assurance – Testing strategies – Object orientation testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction testing

**L : 45 T : 15 TOTAL : 60 PERIODS**

**TEXT BOOK:**

1. Ali Bahrami, "Object Oriented System Development", McGraw Hill International Edition, 1999.

**REFERENCES:**

1. Craig Larman, Applying UML and Patterns, 2<sup>nd</sup> Edition, Pearson, 2002.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley Long man, 1999.
3. Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Patterns and Java, Pearson 2004

**MC9245**

**VISUAL PROGRAMMING LAB**

**L T P C  
0 0 3 2**

**VB**

1. Form Design – Keyboard & Mouse events
2. Programs on usage of data types - variant, Control arrays
3. Simple applications using file system controls
4. Database applications using data control.

**VC++**

1. SDK type programs for creating simple windows with different window styles
2. SDK type programs code for keyboard and mouse events, GDI objects.
3. Simple Dialog Based application – eg. Calculator, interest computation, money conversions, etc.
4. Creating SDI & MDI applications, Modal and Modeless dialog.
5. Programming for reading and writing into documents.
6. Coding Dynamic controls – slider control, progress control, inheriting CtreeView and CrichteditView.
7. Creating static and dynamic splitter windows
8. Creating DLLs and using them.
9. Winsock and Winlnet & Internet Explorer common controls.
10. Data access through ODBC – Cdatabase, Crecordset.
11. Creating ActiveX control and using it.

**TOTAL : 45 PERIODS**

**MC9246**

**NETWORK PROGRAMMING LAB**

**L T P C**

**0 0 3 2**

1. Socket Programming
  - a. TCP Sockets
  - b. UDP Sockets
  - c. Applications using Sockets
2. Simulation of Sliding Window Protocol
3. Simulation of Routing Protocols
4. RPC
5. Development of applications such as DNS/ HTTP/ E – mail/ Multi - user Chat

**TOTAL : 45 PERIODS**

**MC9247**

**CASE TOOLS LAB**

**L T P C**

**0 0 3 2**

1. Practicing the different types of case tools such as (Rational Rose & other Open Source) used for all the phases of Software development life cycle.
2. Data modeling
3. Semantic data modeling
4. Source code generators
5. Re-engineering
6. Experimenting CASE Environments
  - a. Toolkits
  - b. Language-centered
  - c. Integrated
  - d. Fourth generation
  - e. Process-centered
7. Implementation of the following using CASE Workbenches:
  - a. Business planning and modeling
  - b. Analysis and design
  - c. User-interface development
  - d. Programming
  - e. Verification and validation
  - f. Maintenance and reverse engineering
  - g. Configuration management
  - h. Project management

**TOTAL : 45 PERIODS**

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>7</b>
Emergence of Middleware – Objects, Web Services – Middleware Elements – Vendor Architecture – Interoperability – Middleware in Distributed Applications – Types of Middleware – Transaction-Oriented Middleware – MOM – RPC.		
<b>UNIT II</b>	<b>OBJECT ORIENTED MIDDLEWARE</b>	<b>12</b>
OOM – Developing with OOM – Heterogeneity – Dynamic Object Request – Java RMI – COM+.		
<b>UNIT III</b>	<b>COMPONENT OBJECT RESOURCE BROKER ARCHITECTURE (CORBA)</b>	<b>12</b>
Naming – Trading – Life Cycle – Persistence – Security – CORBA.		
<b>UNIT IV</b>	<b>WEB SERVICES</b>	<b>7</b>
Introduction – XML Web Services standards – Creating Web Services – Extending Web Services – Messaging Protocol – Describing – Discovering – Securing.		
<b>UNIT V</b>	<b>OTHER TYPES OF MIDDLEWARE</b>	<b>7</b>
Real-time Middleware – RT CORBA – Multimedia Middleware – Reflective Middleware – Agent-Based Middleware – RFID Middleware.		
		<b>TOTAL : 45 PERIODS</b>

**TEXT BOOKS**

1. Chris Britton and Peter Eye, "IT Architecture and Middleware", Pearson Education, 2<sup>nd</sup> Edition, 2004.
2. Wolfgang Emmerich, "Engineering Distributed Objects", John Wiley, 2000.
3. Keith Ballinger, ".NET Web Services – Architecture and Implementation", Pearson Education, 2003. (Unit IV).

**REFERENCES**

1. Qusay H. Mahmoud, "Middleware for Communications", John Wiley and Sons, 2004.
2. Gerald Brose, Andreas Vogel, Keith Duddy, "JavaTM Programming with CORBATM: Advanced Techniques for Building Distributed Applications", Wiley, 3rd edition, January, 2004.
3. Michah Lerner, "Middleware Networks: Concept, Design and Deployment of Internet Infrastructure", Kluwer Academic Publishers, 2000.

**UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9**  
Project Definition – Contract Management – Activities Covered By Software Project Management – Overview Of Project Planning – Stepwise Project Planning.

**UNIT II PROJECT EVALUATION 9**  
Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

**UNIT III ACTIVITY PLANNING 9**  
Objectives – Project Schedule – Sequencing And Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity On Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

**UNIT IV MONITORING AND CONTROL 9**  
Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

**UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS 9**  
Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman–Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety – Case Studies.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Bob Hughes and MikeCotterell "Software Project Management", Third Edition, TATA McGraw Hill Edition 2004.
2. Ramesh, Gopaldaswamy: "Managing Global Projects ", Tata McGraw Hill, 2001.
3. Royce." Software Project Theory", Pearson Education, 1999.
4. P.Jalote "Software Project Management In Practice", Pearson Education, 2000.

Apply the following to typical application problems:

1. Java rmi
2. CORBA
3. COM
4. C# and .NET

A possible set of applications may be the following:

1. Typical experiment to investigate client-server communication
2. Typical experiment to investigate the workings of RMI

3. Typical experiment to investigate the use of CORBA technology with Java.
4. Chat Room
5. Designing of e-business
6. Online games

**TOTAL : 45 PERIODS**

**MC9254**

**SOFTWARE DEVELOPMENT LAB**

**LT P C  
0 0 3 2**

Apply the following to typical application problems:

1. Project Planning
2. Software Requirement Analysis
3. Software Estimation
4. Software Design
5. Data Modelling & Implementation
6. Software Testing
7. Software Debugging

A possible set of applications may be the following:

- a. Library System
- b. Student Marks Analyzing System
- c. Text Editor.
- d. Create a dictionary.
- e. Telephone dictionary.
- f. Simulator Software for Parallel Processing Operation.
- g. Inventory System.

**TOTAL : 45 PERIODS**

**MA9227**

**NUMERICAL AND STATISTICAL METHODS**

**L T P C  
3 1 0 4**

**UNIT I            LINEAR SYSTEM OF EQUATIONS**

**12**

Solution of Systems of equations – Solution of Simultaneous linear equations – Gauss elimination methods – Gauss Jordan methods, Jacobi and Gauss Seidal iterative methods

**UNIT II            NUMERICAL DIFFERENTIATION AND INTEGRATION**

**12**

Interpolation, Differentiation and integration – difference table – Newton's forward and backward interpolation –Lagrangian interpolation –Differentiation formulae– Trapezoidal and Simpson rule Gaussian – Quadrature

**UNIT III            DIFFERENTIAL EQUATIONS**

**12**

Ordinary Differential equations–Taylor Series and Euler methods, Runge– Kutta methods – Predictor-corrector method – Milne and Adam – Bashforth methods – Error Analysis

**UNIT IV PROBABILITY DISTRIBUTIONS 12**

Probability axioms- Bayes Theorem- Discrete random variables and Continuous random variables – Density & Distribution functions - Joint and marginal distributions – Conditional distributions - Characteristic function- moment generating function- expectation.

**UNIT V SAMPLING DISTRIBUTIONS 12**

Small sample, t-test, F-test,  $\chi^2$  –test, ANOVA one way classification and two way classification

**TOTAL : 60 PERIODS**

**TEXT BOOKS:**

1. Grewal B.S, “ Numerical methods in Engineering and Science”, Khanna Publishers, 1994. (Unit 1,2 & 3)
2. John.E..Freund, Irwin Miller, Marylees Miller “Mathematical Statistics with Applications ”, Seventh Edition, Prentice Hall of India, 2004. (Unit 4 & 5)

**REFERENCES:**

1. A.M.Natarajan & A.Tamilarasi, “Probability Random Processes and Queuing theory”, New Age International Publishers, 2<sup>nd</sup> Edition, 2005.
2. S.K. Gupta, “ Numerical Methods for Engineers “, New age International Publishers,1995.

**MC9271**

**ELECTRONIC COMMERCE**

**LTPC  
3003**

**UNIT I INTRODUCTION 6**

Networks and Commercial Transactions - Internet and Other Novelties - Electronic Transactions Today - Commercial Transactions - Establishing Trust - Internet Environment - Internet Advantage - World Wide Web.

**UNIT II SECURITY TECHNOLOGIES 9**

Why Internet Is Unsecure - Internet Security Holes - Cryptography : Objective - Codes and Ciphers - Breaking Encryption Schemes - Data Encryption Standard - Trusted Key Distribution and Verification - Cryptographic Applications - Encryption - Digital Signature - Nonrepudiation and Message Integrity.

**UNIT III ELECTRONIC PAYMENT METHODS 9**

Traditional Transactions : Updating - Offline and Online Transactions - Secure Web Servers - Required Facilities - Digital Currencies and Payment Systems - Protocols for the Public Transport - Security Protocols - SET - Credit Card Business Basics.

**UNIT IV ELECTRONIC COMMERCE PROVIDERS 9**

Online Commerce Options - Functions and Features - Payment Systems : Electronic, Digital and Virtual Internet Payment System - Account Setup and Costs - Virtual Transaction Process - InfoHaus - Security Considerations – CyberCash: Model - Security - Customer Protection - Client Application - Selling through CyberCash.

**UNIT V ONLINE COMMERCE ENVIRONMENTS 12**

Servers and Commercial Environments - Payment Methods - Server Market Orientation - Netscape Commerce Server - Microsoft Internet Servers - Digital Currencies - DigiCash - Using Ecash - Ecash Client Software and Implementation - Smart Cards - The Chip - Electronic Data Interchange - Internet Strategies, Techniques and Tools.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Pete Loshin, "Electronic Commerce", 4<sup>th</sup> Edition, Firewall media, An imprint of laxmi publications Pvt. Ltd., New Delhi, 2004.

**REFERENCES:**

1. Jeffrey F.Rayport and Bernard J. Jaworski, "Introduction to E-Commerce", 2<sup>nd</sup> Edition, Tata Mc-Graw Hill Pvt., Ltd., 2003.
2. Greenstein, "Electronic Commerce", Tata Mc-Graw Hill Pvt., Ltd., 2000.

**MC9272**

**INFORMATION SYSTEMS**

**LT P C  
3 0 0 3**

**UNIT I INFORMATION SYSTEM AND ORGANIZATION 9**

Matching the Information System Plan to the Organizational Strategic Plan – Identifying Key Organizational Objective and Processes and Developing an Information System Development – User role in Systems Development Process – Maintainability and Recoverability in System Design.

**UNIT II REPRESENTATION AND ANALYSIS OF SYSTEM STRUCTURE 9**

Models for Representing Systems: Mathematical, Graphical and Hierarchical (Organization Chart, Tree Diagram) – Information Flow – Process Flow – Methods and Heuristics – Decomposition and Aggregation – Information Architecture - Application of System Representation to Case Studies

**UNIT III SYSTEMS, INFORMATION AND DECISION THEORY 9**

Information Theory – Information Content and Redundancy – Classification and Compression – Summarizing and Filtering – Inferences and Uncertainty – Identifying Information needed to Support Decision Making – Human Factors – Problem characteristics and Information System Capabilities in Decision Making.

**UNIT IV INFORMATION SYSTEM APPLICATION 9**

Transaction Processing Applications – Basic Accounting Application – Applications for Budgeting and Planning – Other use of Information Technology: Automation – Word Processing – Electronic Mail – Evaluation Remote Conferencing and Graphics – System and Selection – Cost Benefit – Centralized versus Decentralized Allocation Mechanism.

**UNIT V DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS 9**

Systems analysis and design – System development life cycle – Limitation – End User Development – Managing End Users – off-the Shelf Software Packages – Outsourcing – Comparison of Different Methodologies.

**TOTAL : 45 PERIODS**



**TEXT BOOKS:**

1. K. C. Laudon, J. P. Laudon, M. E. Brabston, "Management Information Systems: Managing the Digital Firm", Pearson Education 2002.
2. K. C. Laudon, J. P. Laudon, "Management Information Systems, Organization and Technology in the Networked Enterprise," Sixth Edition, Prentice Hall, 2000.

**REFERENCES:**

1. E.F. Turban, R.K., R.E. Potter. "Introduction to Information Technology", Wiley, 2004.
2. M. E. Brabston, "Management Information Systems: Managing the Digital Firm", Pearson Education, 2002.
3. Jeffrey A. Hoffer, Joey F. George, Joseph S. Valachich, "Modern Systems Analysis and Design", Third Edition, Prentice Hall, 2002.

**MC9273****WEB GRAPHICS****LT P C  
3 0 0 3****UNIT I INTRODUCTION 9**

HTML coding - Basic web graphics - Web page design and site building - Image maps - Adding multimedia to the web- Vector and Raster graphics.

**UNIT II RASTER IMAGE EDITING SOFTWARE 9**

Introduction - Image Basics - File Formats - GIF - JPEG - Color Palette – Color models- Layers - Creating new Images - Brushes – Grids and Guides- Gradients - Scaling Images - Moving and Merging Layers - Tool Palette - Dialogs - Masking – Filters – Adding text to images – Designing icons and background images.

**UNIT III VECTOR IMAGE HANDLING 9**

Introduction – Creating Simple Vector graphics – Creating banners -Images - Working with layers – Tweening - Motion guide – Masking – Frame by Frame animation – Onion Skin Effect – Creating special effects - Text effects and animation – Action scripts.

**UNIT IV MULTIMEDIA 9**

Creating clippings - Animations with sound effects - Adding audio or Video - Windows Media Player ActiveX Control - Agent control - Embedding VRML in a web page - Real Player ActiveX control.

**UNIT V APPLICATIONS 9**

Creating web site with a particular theme using all the utilities - Graphics - Animations and Interaction.

**TOTAL : 45 PERIODS****REFERENCES:**

1. Richard Schrand, Photoshop 6 Visual Jumpstrat, Adobe Press 2000.
- James L. Mohles, Flash 5.0 Graphics, Animation & Interaction, Macromedia 2000.
2. Carey Bunks, Grokking the Gimp, NEW Riders Publishing, 2000.
3. Adobe creative team, Adobe photoshop elements 7 and Adobe premiere elements 7 classroom in a book collection, Adobe Press, 2009.
4. Adobe creative team, Adobe Flash CS4 professional classroom in a book, Adobe Press, 2009.
5. Tavnjong Bah, Inkscape-Guide to Vector Drawing Program, 2<sup>nd</sup> Edition, 2006.

**UNIT I PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT 9**

Evolution of human resource management – the importance of the human factor – objectives of human resource management – role of human resource manager – human resource policies – computer applications in human resource management.

**UNIT II THE CONCEPT OF BEST FIT EMPLOYEE 9**

Importance of human resource planning – forecasting human resource requirement – internal and external sources. Selection process-screening – tests - validation – interview - medical examination – recruitment introduction – importance – practices – socialization benefits.

**UNIT III TRAINING AND EXECUTIVE DEVELOPMENT 9**

Types of training, methods, purpose, benefits and resistance. Executive development programmes – common practices - benefits – self development – knowledge management.

**UNIT IV SUSTAINING EMPLOYEE INTEREST 9**

Compensation plan – reward – motivation – theories of motivation – career management – development, mentor – protégé relationships.

**UNIT V PERFORMANCE EVALUATION AND CONTROL PROCESS 9**

Method of performance evaluation – feedback – industry practices. Promotion, demotion, transfer and separation – implication of job change. The control process – importance – methods – requirement of effective control systems grievances – causes – implications – redressal methods.

**TOTAL : 45 PERIODS****TEXT BOOKS:**

1. Decenzo and Robbins, Human Resource Management, Wilsey, 6<sup>th</sup> edition, 2001.
2. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India, 2001.

**REFERENCES:**

1. Human Resource Management, Eugence Mckenna and Nic Beach, Pearson Education Limited, 2002.
2. Dessler Human Resource Management, Pearson Education Limited, 2002.
3. Mamoria C.B. and Mamoria S. Personnel Management, Himalaya Publishing Company, 1997.
4. Wayne Cascio, Managing Human Resource, McGraw Hill, 1998.
5. Ivancevich, Human Resource Management, McGraw Hill 2002.

**UNIT I PARALLEL AND DISTRIBUTED DATABASES 9**

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies

**UNIT II OBJECT AND OBJECT RELATIONAL DATABASES 9**

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems : Object Relational feature sin SQL/Oracle – Case Studies.

**UNIT III XML DATABASES 9**

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

**UNIT IV MOBILE DATABASES 9**

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes

**UNIT V MULTIMEDIA DATABASES 9**

Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. V.S.Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt Ltd., 2001.
6. Vijay Kumar, “ Mobile Database Systems”, John Wiley & Sons, 2006.

**MC9277**

**SOFTWARE QUALITY MANAGEMENT**

**LT P C  
3 0 0 3**

**UNIT I FUNDAMENTALS OF SOFTWARE QUALITY ENGINEERING 9**

Concepts Of Quality – Hierarchical Modeling – Quality Models – Quality Criteria And Its Interrelation – Fundamentals Of Software Quality Improvement – Concepts Of Quality Improvement – Concepts Of Process Maturity – Improving Process Maturity.

**UNIT II DEVELOPMENTS IN MEASURING QUALITY 9**

Selecting Quality Goals And Measures – Principles Of Measurement – Measures And Metrics – Quality Function Deployment – Goal/Question/Measure Paradigm – Quality Characteristics Tree – The FURPS Model And FURPS+ – Gilb Approach – Quality Prompts.

**UNIT III QUALITY MANAGEMENT SYSTEM 9**  
 Elements Of A Quality Engineering Program – Quality Control, Assurance And Engineering – Reliability, Maintainability, Verifiability, Testability, Safety And Supportability – Historical Perspective Elements Of QMS – Human Factors – Time Management – QMS For Software–Quality Assurance – ISO9000 Series–A Generic Quality Management Standard – Tools For Quality.

**UNIT IV PRINCIPLES AND PRACTICES IN QMS 9**  
 Process–Product–Project–People In Software Development And Management Spectrum – Principle And Critical Practices In QMS – ISO 9001 And Capability Maturity Models – Six Sigma, Zero Defects And Statistical Quality Control.

**UNIT V MEASURES AND METRICS IN PROCESS AND PROJECT DOMAINS 9**  
 Key Measures For Software Engineers – Defects – Productivity And Quality – Measuring And Improving The Development Process – Assigning Measures To Process Elements And Events – Isikawa Diagrams – Metrics For Software Quality – Integrating Metrics Within Software Engineering Process – Metrics For Small Organizations.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Brian Hambling, “Managing Software Quality”, Tata McGraw Hill.
2. Juran. J.M.Frank, M.Gyrna, “Quality Planning and Analysis (from product developmement through use)”, Tata McGraw Hill.
3. Alcon Gillies, “Software Quality: Theory and Management”, International Thomson, Computer Press 1997.
4. Stephen H.Kan, “Metrics and Models in Software Quality Engineering”, Addison Wesley, 1955.
5. Roger S. Pressman, “Software Engineering - A Practitioner’s Approach”, Fifth Edition, McGraw Hill, 2001.
6. Humphrey Watts, “Managing the Software Process”, Addison Wesley, 1986.

**MC9278 TCP/IP DESIGN AND IMPLEMENTATION LT P C  
 3 0 0 3**

**UNIT I INTRODUCTION 9**  
 Internetworking concepts and architectural model– classful Internet address – CIDR– Subnetting and Supernetting –ARP– RARP– IP – IP Routing –ICMP – Ipv6.

**UNIT II TCP 9**  
 Services – header – connection establishment and termination– interactive data flow– bulk data flow– timeout and retransmission – persist timer – keep alive timer– futures and performance.

**UNIT III IP IMPLEMENTATION 9**  
 IP global software organization – routing table– routing algorithms–fragmentation and reassembly– error processing (ICMP) –Multicast Processing (IGMP).

**UNIT IV TCP IMPLEMENTATION I 9**  
 Data structure and input processing – transmission control blocks– segment format– comparison–finite state machine implementation–Output processing– mutual exclusion– computing the TCP data length.

**UNIT V TCP IMPLEMENTATION II 9**  
 Timers–events and messages– timer process– deleting and inserting timer event– flow control and adaptive retransmission–congestion avoidance and control – urgent data processing and push function.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Douglas E.Comer, “Internetworking with TCP/IP Principles, Protocols and Architecture”, Vol 1 & 2, fourth edition, Pearson Education Asia, 2003.
2. W.Richard Stevens “TCP/IP illustrated” Volume 1 Pearson Education, 2003.

**REFERENCES:**

1. Forouzan, “TCP/IP protocol suite” Second edition, Tata McGraw Hill, 2003.
2. W.Richard Stevens “TCP/IP illustrated” Volume 2, Pearson Education 2003.

**MC9279 DISTRIBUTED SYSTEMS L T P C**  
**3 0 0 3**

**UNIT I COMMUNICATION IN DISTRIBUTED ENVIRONMENT 8**  
 Introduction – Various Paradigms in Distributed Applications – Remote Procedure Call – Remote Object Invocation – Message-Oriented Communication – Unicasting, Multicasting and Broadcasting – Group Communication.

**UNIT II DISTRIBUTED OPERATING SYSTEMS 12**  
 Issues in Distributed Operating System – Threads in Distributed Systems – Clock Synchronization – Causal Ordering – Global States – Election Algorithms –Distributed Mutual Exclusion – Distributed Transactions – Distributed Deadlock – Agreement Protocols .

**UNIT III DISTRIBUTED RESOURCE MANAGEMENT 10**  
 Distributed Shared Memory – Data-Centric Consistency Models – Client-Centric Consistency Models – Ivy – Munin – Distributed Scheduling – Distributed File Systems – Sun NFS.

**UNIT IV FAULT TOLERANCE AND CONSENSUS 7**  
 Introduction to Fault Tolerance – Distributed Commit Protocols – Byzantine Fault Tolerance – Impossibilities in Fault Tolerance.

**UNIT V CASE STUDIES 8**  
 Distributed Object-Based System – CORBA – COM+ – Distributed Coordination-Based System – JINI.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design", Third Edition, Pearson Education Asia, 2002.
2. Hagit Attiya and Jennifer Welch, "Distributed Computing: Fundamentals, Simulations and Advanced Topics", Wiley, 2004.
3. Mukesh Singhal, "Advanced Concepts In Operating Systems", McGrawHill Series in Computer Science, 1994.
4. A.S.Tanenbaum, M.Van Steen, "Distributed Systems", Pearson Education, 2004.
5. M.L.Liu, "Distributed Computing Principles and Applications", Pearson Addison Wesley, 2004.

**MC9280****DATA MINING AND DATA WAREHOUSING****LT P C****3 0 0 3****UNIT I****9**

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

**UNIT II****9**

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.  
Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

**UNIT III****9**

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

**UNIT IV****9**

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

**UNIT V****9**

Mining Object, Spatial, Multimedia, Text and Web Data:  
Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition,
2. Elsevier, Reprinted 2008.
3. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
4. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
6. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

**MC9281**

**COMPONENT BASED TECHNOLOGY**

**LT P C**

**3 0 0 3**

### **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 – appdomains – contexts – reflection – remoting.

### **UNIT V COMPONENT FRAMEWORKS 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 PERIODS**

### **TEXT BOOKS:**

1. “Component Software: Beyond Object-Oriented Programming”, Pearson Education publishers, 2003.

### **REFERENCES:**

1. Ed Roman, “Enterprise Java Beans”, Third Edition , Wiley , 2004.

**UNIT I INTRODUCTION TO MANAGERIAL ECONOMICS 9**

Managerial Economics – meaning, nature and scope – Managerial Economics and business decision making – Role of Managerial Economist – Fundamental concepts of Managerial Economics. Demand Analysis – meaning, determinants and types of demand – Elasticity of demand – Demand function – Demand curve – Estimation of the Demand Function.

**UNIT II SUPPLY, PRODUCTION AND COST ANALYSIS 9**

Supply – meaning and determinants – Supply Function-Meaning of production – Production analysis: long run and short run – production functions – Isoquants - Expansion path – Cobb-Douglas function. Cost concepts – cost – output relationship: long run and short run – Economies and diseconomies of scale – cost functions – estimation of cost function.

**UNIT III MARKET STRUCTURE AND PRICE DETERMINATION 9**

Market structure – Perfect Competition – Monopoly – Monopolistic Competition – Oligopoly - characteristics – Pricing of Goods and Services- Pricing and output decisions – Price Discrimination – Price Determinants – Profit Maximization and free pricing-methods of pricing – differential pricing – Government intervention and pricing.

**UNIT IV PROFIT AND INVESTMENT ANALYSIS 9**

Profit - Meaning and nature – Profit policies – profit planning and forecasting –Cost volume profit analysis – Investment analysis – Meaning and Significance – Time Value of money – cash flow and measures of investment worth –payback period criterion – average rate of return criterion – net present value criterion – internal rate of return criterion – profitability – index criterion.

**UNIT V MACROECONOMIC ISSUE 9**

National Income –concepts –determination of national income - Business cycle – Inflation and Deflation –types of inflation – causes of inflation- Balance of payments – account- assessing the balance of payments figures – Monetary and Fiscal Policies – attitudes towards monetary policy – problems of monetary policies – nature of fiscal policy- effectiveness of fiscal policy.

**TOTAL : 45 PERIODS****TEXT BOOK:**

1. G.S. Gupta , “ Managerial Economics”, Tata McGrawhill, 1990.

**REFERENCES:**

1. Joel Dean, “ Managerial Economics”, Prentice Hall India. 1987
2. Evan J. Douglas, “Managerial Economics”, Prentice Hall International, 1987.



**MC9283**

**MOBILE COMPUTING**

**L T P C**

**3 0 0 3**

**UNIT I WIRELESS COMMUNICATION FUNDAMENTALS 9**

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

**UNIT II TELECOMMUNICATION SYSTEMS 11**

GSM – System Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Handover – Security - GPRS

**UNIT III WIRELESS NETWORKS 9**

Wireless LAN – IEEE 802.11 Standards – Architecture – services – HIPERLAN – AdHoc Network – Blue Tooth.

**UNIT IV NETWORK LAYER 9**

Mobile IP – Dynamic Host Configuration Protocol – Routing – DSDV – DSR – AODV – ZRP – ODMR.

**UNIT V TRANSPORT AND APPLICATION LAYERS 7**

TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing – Selective Retransmission – Transaction Oriented TCP – WAP – WAP Architecture – WDP – WTLS – WTP – WSP – WML – WML Script – WAE – WTA.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Jochen Schiller, “Mobile Communications”, Second Edition, Prentice Hall of India / Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks”, Second Edition, Prentice Hall of India / Pearson Education, 2004.

**REFERENCES:**

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, Pearson Education, 2003.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York, 2003.
3. C.K.Toth, “AdHoc Mobile Wireless Networks”, Prentice Hall Inc., 2002.

**MC9284**

**DIGITAL IMAGING**

**L T P C**

**3 0 0 3**

**UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9**

Introduction – Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats, Image operations – Arithmetic, Geometric and Morphological.

**UNIT II IMAGE ENHANCEMENT 9**  
Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain : Filtering in Frequency Domain – DFT, FFT, DCT – Smoothing and Sharpening filters – Homomorphic Filtering.

**UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS 9**  
Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphological WaterSheds – Motion Segmentation, Feature Analysis and Extraction.

**UNIT IV MULTI RESOLUTION ANALYSIS AND COMPRESSIONS 9**  
Multi Resolution Analysis : Image Pyramids – Multi resolution expansion – Wavelet Transforms.  
Image Compression : Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards.

**UNIT V APPLICATIONS OF IMAGE PROCESSING 9**  
Image Classification – Image Recognition – Image Understanding – Video Motion Analysis – Image Fusion – Steganography – Digital Compositing – Mosaics – Colour Image Processing.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing” Second Edition, Pearson Education, 2003.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Second Edition, Thomson Learning, 2001
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Person Educaiton, 2003.

**MC9285 ENTERPRISE RESOURCE PLANNING LT P C  
3 0 0 3**

**UNIT I INTRODUCTION TO ERP 9**  
Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On–line Analytical Processing – Supply Chain Management.

**UNIT II ERP IMPLEMENTATION 9**  
Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring.

**UNIT III BUSINESS MODULES 9**  
Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintanance – Materials Management – Quality Management – Sales and Distribution.

**UNIT IV ERP MARKET 9**  
ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.



**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 organising 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 - Interlingua and Statistical Approaches - Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Daniel Jurafsky and James H. martin, “ Speech and Language Processing” , 2000.
2. Ron Cole, J.Mariani, et.al “Survey of the State of the Art in Human Language Technology”, Cambridge University Press, 1997.
3. Michael W. Berry “ Survey of Text Mining: Culstering, 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. Maybury, “Information Storage and Retrieval systems”, Kluwer academic Publishers, 2000.
3. Tomek Strzalkowski “ Natural Language Information Retrieval “, Kluwer academic Publishers, 1999.
4. Christopher D.Manning and Hinrich Schutze, “ Foundations of Statistical Natural Language Processing “, MIT Press, 1999.

<b>UNIT I</b>	<b>AGENTS – OVERVIEW</b>	<b>9</b>
Agent Definition – Agent Programming Paradigms – Agent Vs Object – Aglet – Mobile Agents – Agent Frameworks – Agent Reasoning.		
<b>UNIT II</b>	<b>JAVA AGENTS</b>	<b>9</b>
Processes – Threads – Daemons – Components – Java Beans – ActiveX – Sockets – RPCs – Distributed Computing – Aglets Programming – Jini Architecture – Actors and Agents – Typed and proactive messages.		
<b>UNIT III</b>	<b>MULTIAGENT SYSTEMS</b>	<b>9</b>
Interaction between agents – Reactive Agents – Cognitive Agents – Interaction protocols – Agent coordination – Agent negotiation – Agent Cooperation – Agent Organization – Self-Interested agents in Electronic Commerce Applications.		
<b>UNIT IV</b>	<b>INTELLIGENT SOFTWARE AGENTS</b>	<b>9</b>
Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications.		
<b>UNIT V</b>	<b>AGENTS AND SECURITY</b>	<b>9</b>
Agent Security Issues – Mobile Agents Security – Protecting Agents against Malicious Hosts – Untrusted Agent – Black Box Security – Authentication for agents – Security issues for Aglets.		

**TOTAL : 45 PERIODS****REFERENCES:**

1. Bigus & Bigus, " Constructing Intelligent agents with Java ", Wiley, 1997.
2. Bradshaw, " Software Agents ", MIT Press, 2000.
3. Russel, Norvig, "Artificial Intelligence: A Modern Approach", Second Edition, Pearson Education, 2003.
4. Richard Murch, Tony Johnson, "Intelligent Software Agents", Prentice Hall, 2000.
5. Gerhard Weiss, "Multi Agent Systems – A Modern Approach to Distributed Artificial Intelligence", MIT Press, 2000.

<b>UNIT I</b>	<b>BUILDING BLOCKS, PERFORMANCE MEASURES, DECISIONS</b>	<b>9</b>
Building Blocks of a Supply Chain Network – Performance Measures – Decisions in the Supply Chain World – Models for Supply Chain Decision – Making.		
<b>UNIT II</b>	<b>SUPPLY CHAIN INVENTORY MANAGEMENT</b>	<b>9</b>
Economic Order Quantity Models – Reorder Point Models – Multichelon Inventory Systems.		
<b>UNIT III</b>	<b>MATHEMATICAL FOUNDATIONS OF SUPPLY CHAIN SOLUTIONS</b>	<b>9</b>
Use of Stochastic Models and Combinatorial Optimization in Supply Chain Planning – Supply Chain Facilities Layout – Capacity Planning – Inventory Optimization – Dynamic Routing and Scheduling – Understanding the "internals" of industry best practice solutions.		

**UNIT IV INTERNET TECHNOLOGIES AND ELECTRONIC COMMERCE IN SCM 9**  
 Relation to ERP – Eprocurement – ELogistics – Internet Auctions – Emarkets –  
 Electronic business process optimization – Business objects in SCM.

**UNIT V CASE STUDIES 9**  
 Digital Equipment Case Study – IBM Case Study.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. R.B. Handfield, E.L. Nichols Jr., "Introduction to Supply Chain Management", Pearson Education, 1999.
2. Sunil Chopra, Peter Meindel, "Supply Chain Management: Strategy, P Planning, and Operation", Second Edition, Pearson Education, 2003.
3. Jeremy F. Shapiro, "Modeling the Supply Chain", Duxbury Thomson Learning, 2001.
4. David Simchi Levi, Philip kaminsky, Edith Simchi Levi, "Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies", Irwin McGraw Hill, 2000.
5. W.J. Hopp, M.L. Spearman, "Factory Physics: Foundations of Manufacturing Management", Irwin McGraw–Hill, 1996.
6. N. Viswanadham, "Analysis of Manufacturing Enterprises", Kluwer Academic Publishers, 2000.
7. Sridhar Tayur, Ram Ganeshan, Michael Magazine, "Quantitative Models for Supply Chain Management", Kluwer Academic Publishers, 1999.
8. N. Viswanadham, Y. Narahari, "Performance Modeling of Automated Manufacturing Systems", Prentice Hall of India, 1998.

**MC9290 HEALTHCARE SYSTEMS LT P C  
 3 0 0 3**

**UNIT I INTRODUCTION 9**  
 Introduction to health care information – Health care data quality – Health care information regulations, laws and standards.

**UNIT II HEALTH CARE INFORMATION SYSTEMS 9**  
 History and evolution of health care information systems – Current and emerging use of clinical information systems – system acquisition – System implementation and support.

**UNIT III INFORMATION TECHNOLOGY 9**  
 Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.

**UNIT IV MANAGEMENT OF IT CHALLENGES 9**  
 Organizing information technology services – IT alignment and strategic planning – IT governance and management.

**UNIT V IT INITIATIVES 9**  
 Management's role in major IT initiatives – Assessing and achieving value in health care information systems.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Karen A Wager, Frances Wickham Lee, John P Glaser, “ Managing Health Care Information Systems: A Practical Approach for Health Care Executives”, Jossey-Bass/Wiley, 2005.

**REFERENCE:**

1. Rudi Van De Velde and Patrice Degoulet, “Clinical Information Sytems: A Componenet based approach”, Springer 2005.

**MC9291****PORTFOLIO MANAGEMENT****LT P C****3 0 0 3****UNIT I MONEY AND CAPITAL MARKETS 8**

Trends of savings and financial flow, the Indian Money market , introduction, characteristics of money market , need for money market, major segments of money market, money market instruments and Capital market, introduction, primary market and secondary market, recent capital market reforms, new capital issue, instruments and market participant

**UNIT II STOCK EXCHANGES 10**

Nature and functions of stock exchange in India,organizational structure of the secondary marlet,stock exchanges and financial development in India, listing of securities in stock exchange-OTCEI market-New Issue Market- concepts and function, underwriting, role of new issue market ,mechanics of trading in stock exchanges.

**UNIT III FUNDAMENTAL ANALYSIS 8**

Economic Analysis - Economic forecasting and stock Investment Decisions - Forecasting techniques. Industry Analysis - Industry classifications. Economy and Indus try Analysis. Industry life cycle - Evaluating Industry relevant factors - External industry information sources. Company Analysis : Measuring Earnings - Forecasting Earnings - Applied valuation techniques - Graham and Dodds investor ratios.

**UNIT IV TECHNICAL ANALYSIS 10**

Technical Analysis: Fundamental Analysis Vs Technical Analysis - Charting methods - Market Indicators. Trend - Trend reversals - Patterns - Moving Average - Exponential moving Average - Oscillators - ROC - Momentum - MACD - RSI - Stoastics.Factors influencing share prices, forecasting stock prices - Efficient Market Theory - Risk and Returns.

**UNIT V PORTFOLIO ANALYSIS 9**

Portfolio theory- Markowitz theory, Sharpe index model,CAPM.Portfolio investment model- basic principles, planning, implementation, portfolio objective and types. Portfolio evaluation – measures of return, formula plans,types of formula plans.Risk adjusted measure of performance – Sharpe’s measure, Treynor’s measure and Jensen’s measure

**TOTAL : 45 PERIODS****TEXT BOOKS:**

1. V.K.Bhalla, “Investment Management”, S.Chand & Company Ltd, New Delhi 2003.

**REFERENCES:**

1. Punithavathy Pandian, Security Analysis & Portfolio Management – Vikas Publishing House Pvt. Ltd., 2001.
2. V.A.Avadhani – Securities Analysis & Portfolio Management – Himalaya Publishing House, 1997.

**MC9292****UNIX INTERNALS****LT P C  
3 0 0 3****UNIT I OVERVIEW 8**

General Overview of the System : History – System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel : Architecture of the UNIX operating system – Introduction to system concepts. The Buffer Cache: Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer – Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

**UNIT II FILE SUBSYSTEM 8**

Internal representation of files: Inodes – Structure of a regular file – Directories – Conversion of a path name to an Inode – Super block – Inode assignment to a new file – Allocation of disk blocks.

**UNIT III SYSTEM CALLS FOR THE FILE SYSTEM 10**

Open – Read – Write – File and record locking – Adjusting the position of file I/O – Lseek – Close – File creation – Creation of special files – Changing directory, root, owner, mode – stat and fstat – Pipes – Dup – Mounting and unmounting file systems – link – unlink.

**UNIT IV PROCESSES 10**

Process states and transitions – Layout of system memory – The context of a process – Saving the context of a process – Manipulation of the process address space - Sleep. Process Control : Process creation – Signals – Process termination – Awaiting process termination – Invoking other programs – user id of a process – Changing the size of a process - Shell – System boot and the INIT process– Process Scheduling.

**UNIT V MEMORY MANAGEMENT AND I/O 9**

Memory Management Policies : Swapping – Demand paging. The I/O Subsystem : Driver Interface – Disk Drivers – Terminal Drivers– Streams – Inter process communication.

**TOTAL : 45 PERIODS****TEXT BOOKS:**

1. Maurice J. Bach, “The Design of the Unix Operating System”, First Edition, Pearson Education, 1999.

**REFERENCES:**

1. B. Goodheart, J. Cox, “The Magic Garden Explained”, Prentice Hall of India, 1986.
2. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman., “The Design and Implementation of the 4.3 BSD Unix Operating System”, Addison Wesley, 1998.



<b>UNIT I</b>	<b>LEXICAL ANALYSIS</b>	<b>9</b>
Compilers – Analysis of Source Program - Phases of Compiler – Compiler Construction Tools – Role of a Lexical Analyzer – Specification and Recognition of Tokens – Finite Automata – Regular Expression to Finite Automation.		
<b>UNIT II</b>	<b>SYNTAX ANALYSIS</b>	<b>9</b>
Role of a Parser – Context Free Grammars – Top-Down Parsing – Bottom-Up Parsing – LEX and YACC.		
<b>UNIT III</b>	<b>INTERMEDIATE CODE GENERATION</b>	<b>9</b>
Intermediate Languages – Declaration – Assignment Statements – Boolean Expressions – Flow Control Statements – Back Patching.		
<b>UNIT IV</b>	<b>CODE OPTIMIZATION</b>	<b>9</b>
Introduction to Code Optimization – Principal Sources of Optimization – Basic Blocks and Flow Graphs – Optimization of Basic Blocks – Code Improving Transformations.		
<b>UNIT V</b>	<b>CODE GENERATION</b>	<b>9</b>
Issues in the Design of a Code Generator – Run-Time Storage Management – Next Use Information – A Simple Code Generator – DAG Representation of Basic Blocks – Peephole Optimization – Code Generation from DAG.		

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. A.V. Aho, Ravi Sethi, J. D. Ullman, "Compilers - Principles, Techniques and Tools", Addison-Wesley Publishing Company, 1988.

**REFERENCES:**

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 1993.
2. Fischer Leblanc, "Crafting Compiler", Benjamin Cummings, Menlo Park, 1988.

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>8</b>
Intelligent Agents – Agents and environments – Good behavior – The nature of environments – structure of agents – Problem Solving – problem solving agents – example problems – searching for solutions – uniformed search strategies – avoiding repeated states – searching with partial information.		
<b>UNIT II</b>	<b>SEARCHING TECHNIQUES</b>	<b>10</b>
Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments – Constraint satisfaction problems (CSP) – Backtracking search and Local search – Structure of problems – Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision – games that include an element of chance.		

**UNIT III KNOWLEDGE REPRESENTATION 10**

First order logic - syntax and semantics – Using first order logic – Knowledge engineering – Inference – propositional versus first order logic – unification and lifting – forward chaining – backward chaining – Resolution – Knowledge representation – Ontological Engineering – Categories and objects – Actions – Simulation and events – Mental events and mental objects.

**UNIT IV LEARNING 9**

Learning from observations – forms of learning – Inductive learning - Learning decision trees – Ensemble learning – Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods – Learning with complete data – Learning with hidden variable – EM algorithm – Instance based learning – Neural networks – Reinforcement learning – Passive reinforcement learning – Active reinforcement learning – Generalization in reinforcement learning.

**UNIT V APPLICATIONS 8**

Communication – Communication as action – Formal grammar for a fragment of English – Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity and disambiguation – Discourse understanding – Grammar induction – Probabilistic language processing – Probabilistic language models – Information retrieval – Information Extraction – Machine translation.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education / Prentice Hall of India, 2004.
2. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Second Edition, Tata McGraw Hill, 2003.
4. George F. Luger, “Artificial Intelligence-Structures And Strategies For Complex Problem Solving”, Pearson Education / PHI, 2002.

**MC9295 PARALLEL AND DISTRIBUTED COMPUTING L T P C  
3 0 0 3**

**UNIT I INTRODUCTION TO DISTRIBUTED ENVIRONMENT 8**

Introduction – Client–Server Paradigm – Threads in Distributed Systems – Remote Procedure Call – Remote Object Invocation – Message-Oriented Communication - Unicasting – Group Communication – Reliable and Unreliable Multicasting.

**UNIT II INTRODUCTION TO PARALLEL COMPUTERS AND COMPUTATION 8**

Introduction to Parallelism and computing; Parallel machine model; Parallel programming model; HPC/HTC models.

**UNIT III DESIGNING PARALLEL ALGORITHMS 10**

Methodical design; Partitioning; Communication; Agglomeration; Mapping. Design and development of parallel processing systems. Unix workstation clusters. Master slave programming. Multi-threaded programming. Scheduling. Concurrency

**UNIT IV      FAULT TOLERANCE AND DISTRIBUTED FILE SYSTEMS      10**  
Introduction to Fault Tolerance – Distributed Commit Protocol – Distributed File System Architecture – Issues in Distributed File Systems – Sun NFS.

**UNIT V      CASE STUDIES      9**  
Distributed Object-Based System – CORBA – COM – Distributed Coordination Based System – JINI – Matrix Vector Multiplication – Combinatorial Search.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design", Third Edition, Pearson Education Asia, 2002.
2. Mukesh Singhal, "Advanced Concepts In Operating Systems", McGraw Hill Series in Computer Science, 1994.
3. An Introduction to Parallel Computing, Design and Analysis of Algorithms, 2nd edition, A. Grama, V. Kumar, A. Gupta, Addison Wesley, 2003.
4. Parallel Computing: Theory and Practice, M J Quinn, McGraw Hill, 1996.

**MC9296**

**SOFT COMPUTING**

**LT P C  
3 0 0 3**

**UNIT I      INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS      9**  
Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

**UNIT II      GENETIC ALGORITHMS      9**  
Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

**UNIT III      NEURAL NETWORKS      9**  
Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

**UNIT IV      FUZZY LOGIC      9**  
Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

**UNIT V      NEURO-FUZZY MODELING      9**  
Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.

**REFERENCES:**

1. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997.
3. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer, 2007.
4. S.N.Sivanandam · S.N.Deepa, " Introduction to Genetic Algorithms", Springer, 2007.
5. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers, 1992.