KARNATAK UNIVERSITY, DHARWAD

No. KU/Aca(S&T) /NSR-07//M.Sc.(Comp.Sci/2013-14/ 859 | 249 Date: 11-06-2014

12 JUN 2014

NOTIFICATION

Sub: Regarding, restructuring of syllabus for M.Sc.(Computer Science) I & IV semester with effect from the academic year 2014-15 and onwards.

Ref: 1) BOS in M.Sc. Computer Science (UG/PG) Res.No.(f) dated: 08-10-2013
2) Science Faculty Res No. 7 Dated: 14-03-2014
3) Academic Council Res. No. 11 dated 29-3-2014
4) Vice-Chancellor's order dated: 7-6-2014

Adverting to the above, it is hereby notified to the Chairman, PG Department of Studies (Computer Science) K.U. Dharwad, and Principals of all the constituent and affiliated degree colleges, coming under the jurisdiction of K.U. Dharwad running M.Sc. Computer Science Course that the syllabus for I & IV semester M.Sc course in Computer Science is restructured with effect from the academic year 2014-15 and onwards.

Hence, the content of this notification may please be brought to the notice of the students and all concerned.

The concerned syllabus may also be obtained through the K.U. **Website: www.kud.ac.in.**

Encl: As above

REGISTRAR

To,

1. The Chairman PG Dept. of Studies in (Computer Science), K.U.Dharwad.
2. Principals of all constituent & affiliated degree colleges running M.Sc. Computer Science course. (List enclosed)
3. The Registrar,(Evaluation), K.U. Dharwad.
4. Dr.R.M Vatnal, In charge Director, Information Technology, Exam Section, room No. 104, K.U.Dharwad, with a request to place the Notification in the University website: www.kud.ac.in

Copy f.w.cs. to

Dr. S.A. Patil, Dean Faculty of Science & Tech,, PG Dept. of Studies in Chemistry, K.U.Dharwad,

Copy to:

1. P.S. to Vice-Chancellor, K.U. Dharwad.
2. S.A. to Registrar, K.U. Dharwad.
3. S.A. to Registrar (Evaluation), K.U. Dharwad.
4. O.S., Exam. (Confdl.) Section, K.U. Dharwad.
5. O.S., Exam (PG) Section, K.U.Dharwad
6. O.S. Exam (OP) Section, KU, Dharwad

KARNATAKUNIVERSITY, DHARWAD

Regulations and Syllabus
for
P.G. Studies in

COMPUTER SCIENCE

(M.Sc)

(I-IV Semester)

Revised Syllabus

Under
Choice Based Credit System

From
2014-15 & onwards

Regulations Governing Post-Graduate Programmes in the Faculty of Science & Technology under Choice Based Credit System

(Framed under Section 44(1)(c) of the K. S.U. Act, 2000)

1.0 Title

These Regulations shall be called "Regulations Governing the Post-Graduate Programmes in the Faculty of Science & Technology under the Choice Based Credit System" in Karnatak University, Dharwad

2.0. Commencement

These Regulations shall come into force with effect from the academic year 2008-09.

3.0. Definitions

a In these Regulations, unless otherwise provided:
"Academic Council" means Academic Council of the University constituted according to the *Karnataka State Universities Act, 2000.*

b "Board of Studies" means P.G. Board of Studies of the University, Adhoc/ Combined and Steering Committees of International Diploma Programmes in the discipline/subjects concerned.

c "Compulsory Course" means fundamental paper, which the student admitted to a particular Post-Graduate Programme, should successfully complete to receive the Post Graduate Degree in the concerned subject.

d Course Weightage" means number of credits assigned to a particular course.

e "Credit" means the unit by which the course work is measured. One Credit means one hour of teaching work or two hours of practical work per week. As regards the marks for the courses, 1 Credit is equal to 25 marks, 2 credits are equal to 50 marks, 3 credits are equal to 75 marks and 4 credits are equal to 100 marks.

f "Cumulative Grade Point Average (CGPA)" refers to the cumulative Grade Point Averages weighted across all the semesters and is carried forward from first semester to subsequent semesters.

g "Degree" means Post-Graduate Degree.

h "Grade" is an index to indicate the performance of a student in the selected course. These Grades are arrived at by converting marks scored in each course by the candidate in both Internal Assessment and Semester-end Examinations.

i "Grade Point Average (GPA)" refers to an indication of the performance of the student in a given semester. GPA is the weighted average of all Grades a student gets in a given semester.

j "Open Elective Course" means a paper offered by a Department to the students of other Departments.

k "Post Graduate Programme" means semesterised Master's Degree Programmes excluding P.G. Diploma.

l "Specialization course" means advanced paper offered by a Department that a student of that Department can opt as a special course.

m "Student" means the student admitted to programmes under (k).

n "University" means Karnatak University, Dharwad.

4.0. Minimum Eligibility for Admission

A candidate, who has successfully completed Bachelor's Degree programme in Science or any other Degree programme of this University or of any other University recognized as equivalent thereto by this University, shall be eligible for admission to the Post Graduate Programmes in science provided the candidate also satisfies the conditions like the minimum percentage of marks and other eligibility conditions as prescribed by the University from time to time.

Admissions shall be as per Government of Karnataka reservation policy and the directions issued in this regard from time to time.

5.0. Duration of the Programme

The duration of the study for the Post-Graduate Degree programme shall extend over a period of two (three in case of MCA) consecutive academic years, each academic year comprising two semesters, and each semester comprising sixteen weeks with a minimum of ninety working days.

However, the students, who discontinue the programme after one or more semesters due to extraordinary circumstances, are allowed to continue and complete the programme with due approval from the Registrar. Candidates shall not register for any other regular course other than Diploma and Certificate courses being offered on the campus during the duration of P.G. Programme.

6.0. Medium of Instruction and Evaluation

The medium of instruction shall be English. However, the students may write the examinations in Kannada if so provided by the concerned Board of Studies.

7.0 Programme Structure

7.1 The students of Post-Graduate Programme shall study the courses as may be approved by the concerned Board of Studies, Faculty and the Academic Council of the University from time to time subject to minimum and maximum credits as outlined in these regulations.

7.2 There shall be three categories of courses namely, Compulsory Courses, Specialization Courses and Open Elective Courses.

7.3 Each programme shall have a set of Compulsory Courses, as stipulated in the regulations governing the concerned programme, that a student must complete to get the concerned degree.

7.4 In those programmes that offer specialization courses, the students shall choose the prescribed number of Specialization Courses offered within the Department.

7.5 Each Department shall offer Open Elective courses for students of other Departments. The students of a Department shall choose Open Elective courses from among those prescribed by the University and selected by the Department from time to time. P.G. Centers and affiliated colleges, can offer those Open Elective Courses which are approved or prescribed by their Parent Department of the University. Such Open Elective courses shall be taught by qualified teachers approved by the University.

7.6 The credits for each of the Compulsory Courses may vary from 2 to 4; for Specialization Course, from 2 to 4; and for Open Elective Course, from 2 to 4. Wherever project work/ field work/practical are involved in the course, the credits may extend to 6 or as otherwise provided by concerned programme.

7.7 The minimum credits for P.G. Programme shall be 96. In the case of MCA, the minimum number of credits shall be 158 and in case of M.Sc. Computer Science the minimum credits are 116.

7.8 The students shall undertake project/field work during the programme as a compulsory course or in lieu of Specialization Course or Open Elective Course if so specified by the concerned Board of Studies.

7.9 The ratio between Compulsory, Specialization and Open Elective may differ from department to department.

7.10 The detailed programme structure for Faculty of Science & Technology shall be as prescribed and shown in Annexure-I, Annexure –Ia & Annexure-Ib.

7.11 The Open Elective Courses generally will have practical component, unless otherwise specified by the respective Board of Studies. The number of students admitted to the course shall commensurate with the availability of infrastructure.

8.0. Attendance

8.1 Each course shall be taken as a unit for the purpose of calculating the attendance.

8.2 Each student shall sign the attendance register maintained by the Department for each course for every hour/unit of teaching/practical. The course teachers shall submit the monthly attendance report to the Chairperson of the Department who shall notify the same on the notice board of the Department during the second week of the subsequent month.

8.3 Marks shall be awarded to the student for attendance as specified in the regulations concerning evaluation.

8.4 A student shall be considered to have satisfied the required attendance for each course if he/she has attended not less than 75 % of the total number of instructional hours during the semester.

8.5 There is no provision for condoning shortage of attendance.

8.6 The students who do not satisfy the prescribed requirement of attendance shall not be eligible for the ensuing examination. Such candidates may seek admission afresh to the given semester.

8.7 Such of the candidates who have participated in State/National level Sports, NSS, NCC, Cultural activities and other related activities as stipulated under the existing regulations shall be considered for giving attendance for actual number of days utilized in such activities (including travel days) subject to the production of certificates from the relevant authorities within two weeks after the event.

9.0 Examination

9.1 There shall be an examination at the end of each semester. The odd semester examinations shall be conducted by the respective Departments/ P.G.Centres/ Colleges. The even semester examinations shall be conducted by the University.

9.1.1 Unless otherwise provided, there shall be semester-end examination of 3 hours duration for 75/100 marks; 1.5 hours for 50 marks and 2/4 hours for 35/75 marks practical examination.

9.1.2 Every student shall register for each semester-end examination as per the University Notification by submitting duly completed application form through the proper channel and shall also pay the fees prescribed.

9.1.3 The Office of the Registrar (Evaluation) shall allot the Register Number to the candidate at the 1st semester-end examination. That will be the Register Number of the candidate for all subsequent appearances at semester-end examinations.

9.1.4 The Answer scripts shall be in the safe custody of the University for a maximum period of six months from the date of announcement of results. These shall be disposed off after six months.

9.1.5 The programme under CBCS is a fully carry-over system. A candidate reappearing for either the odd or even semester examinations shall be permitted to take examinations as and when they are conducted (even semester examination in even semester and odd semester examination in odd semester).

9.1.6 Candidates who have failed, remained absent or opted for improvement in any course/ courses shall appear for such course/ courses in the two immediate successive examinations that are conducted. However, in the case of the candidates appearing for improvement of their marks, the marks secured in the previous examination shall be retained, if the same is higher.

9.1.7 Candidates who desire to challenge the marks awarded to them, in the even semester-end examinations, may do so by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 15 days from the announcement of results.

9.2. Odd Semester Examination

9.2.1 There shall be a Board of Examiners to set, scrutinise and approve question papers.

9.2.2 The BOE shall scrutinise the question papers submitted in two sets by the paper setters and submit the same to the office of the Registrar (Evaluation).

9.2.3 The office of the Registrar Evaluation shall dispatch the question papers to the Departments/ P.G.Centres/ Colleges who shall conduct the Examinations according to the Schedule announced by the University.

9.2.4 The Chairperson of the Department/ Administrator of the P.G.Centre/ Principal of the College shall appoint one of their full time course teachers as Post Graduate Programme (PGP) Coordinator who shall conduct the examinations and arrange for evaluation of answer scripts.

9.2.5 Answer scripts shall be valued by the examiners appointed by the University. However, in those centres where an examiner for a particular course is not available, then the answer scripts of that course shall be dispatched to the office of the Registrar (Evaluation) who shall arrange for valuation of the same.

9.2.6 There shall be single valuation. The examiners (Internal or External) shall value the answer scripts and shall indicate the marks awarded to each question on the answer script.

9.2.7 The Marks List, a copy of the Examination Attendance Sheet and the sealed bundles of the answer scripts shall be dispatched by the PGP Coordinator to the Registrar (Evaluation)'s Office at the conclusion of the valuation at the respective centres.

9.2.8 The Office of the Registrar Evaluation shall process and announce the results.

9.3. Even Semester

9.3.1 There shall be a Board of Examiners to set, scrutinise and approve question papers.

9.3.2 As far as practicable, it will be ensured that 50% of the paper setters and examiners are from other Universities/ Research Institutes.

9.3.3 Each answer script of the semester-end examination (theory and project report) shall be assessed by two examiners (one internal and another external). The marks awarded to that answer script shall be the average of these two evaluations. If the difference in marks between two evaluations exceeds 20% of the maximum marks, such a script shall be assessed by a third examiner. The marks allotted by the third examiner shall be averaged with nearer award of the two evaluations.

Provided that in case the number of answer scripts to be referred to the third examiner in a course exceeds minimum of 5 or 20% of the total number of scripts, at the even semester-end examinations, such answer scripts shall be valued by the Board of Examiners on the date to be notified by the Chairperson of the Board of Examiners and the marks awarded by the Board shall be final.

9.3.4 Wherever dissertation/ project work is prescribed in the even semesters of a programme, the same shall be evaluated by both internal and external examiners. The evaluation shall be as prescribed by the concerned Board of Studies.

9.3.5 In case of programmes with practical examination details of maximum marks, credits or duration may vary from Department to Department as specified by the concerned Board of Studies.

9.4. Evaluation

9.4.1 Each Course shall have two evaluation components - Internal Assessment (IA) and the Semester End Exams.

9.4.2 The IA component in a course shall carry 25% / 30% / 50% and the Semester End Examination shall carry 75% / 70% / 50% respectively, as the case may be. Courses having 25% & 30% / 50% marks as internal assessment shall have 3 / 5 marks allotted to attendance. However, in case of project work, the distribution of marks for Internal Assessment and Examination shall be left to the discretion of the concerned BOS.

9.4.3 Marks for attendance shall be awarded to the students according to the following table.

For courses carrying 25 % of marks for IA, the attendance marks shall be

Attendance (in percentage)	Marks
Above 90	3
Above 80 and up to 90	2
Above 75 and up to 80	1

9.4.4 Internal Assessment (IA) shall be based on written tests, practical and seminars. However, the number of IA components per course per semester shall not be less than two.

9.4.5 The IA marks list shall be notified on the Department Notice Board as and when the individual IA components are completed and the consolidated list shall be submitted to the Office of the Registrar Evaluation before the commencement of semester-end examination, or as directed by the University.

9.4.6 The tests shall be written in a separately designated book supplied by the University which shall be open for inspection by the students after evaluation.

9.4.7 There is no provision for seeking improvement of Internal Assessment marks.

9.4.8 The IA records, pertaining to Semester Examination, shall be preserved by the department/Centres/Colleges for a period of one year from the date of semester examination. These records may be called by the University or a body constituted by the University as and when deemed necessary.

9.4.9 The dissertation/project work viva-voce shall be conducted by an internal and external examiner.

10.0. Maximum duration for completion of the Programme

10.1 A candidate admitted to a post graduate programme shall complete it within a period, which is double the duration of the programme from the date of admission.

10.2 Whenever the syllabus is revised, the candidate reappearing shall be allowed for the examinations only according to the new syllabus.

11.0. Declaration of Results

11.1 The minimum for a pass in each course shall be 40% of the total marks including both the IA and the semester-end examinations. Further, the candidate shall obtain at least 40% of the marks in the semester-end examination. There is no minimum for the IA marks.

11.2 Candidates shall secure a minimum of 50% in aggregate in all courses of a programme in each semester to successfully complete the programme.

11.3 Candidates shall earn the prescribed number of credits for the programme to qualify for the PG Degree.

11.4 For the purpose of announcing the results, the aggregate of the marks secured by a candidate in all the semester examinations shall be taken into account. However, Ranks shall not be awarded in case the candidate has not successfully completed each of the semesters in first attempt or has not completed the programme in the stipulated time (vide Regulation 5) or had applied for improvement of results.

12.0 Marks, Credit Points, Grade Points, Grades and Grade Point Average

12.1 The grade points and the grade letters to candidates in each course shall be awarded as follows:

Percentage of marks	Grade Points	Grade Letter
75 and above, up to 100.00 %	7.50 to 10.00	A
60 and above but less than 75 %	6.00 and above but less than 07.5	B
50 and above but less than 60 %	5.00 and above but less than 6.0	C
40 and above but less than 50 %	4.00 and above but less than 05.00	D
less than 40.00 %	Less than 4.00	F

12.2 Credit Point (CP): The Credit Point for each course shall be calculated by multiplying the grade point obtained by the credit of the course.

12.3 The award of Grade Point Average (GPA) for any student is based on the performance in the whole semester. The student is awarded Grade Point Average for each semester based on the Total Credit Points obtained and the total number of credits opted for. The GPA is calculated by dividing the total credit points earned by the student in all the courses by the total number of credits of those courses of the semester.

12.4 The Cumulative Grade Point Average (CGPA) shall be calculated by dividing the total number of credit points in all the semesters by the total number of credits in all

the semesters. The CGPA to date shall be calculated by dividing the total number of credit points in all the semesters to date by the total number of credits in all the semesters to date.

CGPA for the I Semester =
Sum of the CP of the I Semester ÷ Sum of the credits of the I Semester

CGPA for the II Semester =
Sum of the CP of the I Sem + Sum of the CP of II Sem. ÷ Sum of the credits of the I Semester + II Semester

CGPA for the III and IV Semesters shall be computed accordingly.

12.5 The Grade Card at each semester examination shall indicate the courses opted by the student, the credit for the course chosen by the student, the credit points obtained in each course, the grade letter and the grade point average. No class shall be awarded for each semester and the same would only be awarded at the end of all the semesters based on Cumulative Grade Point Average.

12.6 Class shall be awarded to the successful candidates based on the Cumulative Grade Point Average (CGPA) as specified below:

Cumulative Grade Point Average (CGPA)	Class to be awarded
7.5 to 10.0	First class with Distinction
6.0 and above but below 7.5	First Class
5.0 and above but below 6.0	Second Class

13. Miscellaneous:

a Notwithstanding anything contained in these regulations, the semester system at Post-Graduate level is hereby repealed.

b The provisions of any order, Rules or Regulations in force shall be inapplicable to the extent of its inconsistency with these Regulations.

c The University shall issue such orders, instructions, procedures and prescribe such format as it may deem fit to implement the provisions of this Regulations.

d The procedural details may be given by the University from time to time.

e Any unforeseen problems/ difficulties may be resolved by the Vice Chancellor, whose decision in the matter shall be final.

Annexure-I

The Programme structure of the Master of Science Degree shall be as follows:

Semester	No. of compulsory & Specialization courses (credits/course)	Total credits for compulsory & Specialization courses	No. of open elective course (credits/course)	Total credits of open elective course	Total credits for the semester
Sem. I	Th :03 (04) =12 Pra/Th*:03 (02)=06	18	Th :01 (04) =04 Pra/Th*:01(02)=02	06	24
Sem. II	Th :03 (04) =12 Pra/Th*:03 (02)=06	18	Th :01 (04) =04 Pra/Th*:01(02)=02	06	24
Sem. III	Th :03 (04) =12 Pra/Th*:03 (02)=06	18	Th :01 (04) =04 Pra/Th*:01(02)=02	06	24
Sem. IV	Th :03/04** (04) =12/16 Pra/Th:03/04** (02)=06/08 Pj# 01 (06) =06	24		-	24
Total	Th 12/13 (4) =48/52 Pra/Th 12/13(02)= 24/26 Pj:1 (06)=06	78	03 (04)=12 Pra/Th*:03(02)=06	18	96

Note: Except for IV semester, the concerned Department shall offer one each of open elective theory and practical course **or** two * open elective Theory courses for students of other science departments.

* Only for Mathematics; ** for Mathematics and Statistics; # except Mathematics & Statistics
Abbreviations: Th = Theory; Pra = Practical; Pj = Project;

GRADE CARD

Programme : M.Sc. (…….)

Name of the candidate :…… **Semester : IV**

Seat No.: Month & Year:

Course	**Course Code**	**Credit**	**IA Marks**		**Theory/ Practical**		**Max**	**Marks Obtained**	**Semester Grade Point**	**Credit Points**
			Max	Obt	Max	Obt				
Compulsory Courses										
Course – I	XX CT 4.1	04	25	15	75	45	100	60	6.00	24.00
Course – II	XX CT 4.2	04	25	15	75	59	100	74	7.40	29.60
Course – III	XX CT 4.3	04	25	15	75	28	100	43	4.30	17.20
Course – IV	XX CP 4.4	02	15	06	35	34	50	40	8.00	16.00
Course – V	XX CP 4.5	02	15	06	35	34	50	40	8.00	16.00
Course – VI	XX CP 4.6	02	15	06	35	34	50	40	8.00	16.00
Course – VII	XX CPJ$^{\#}$ 4.7	06	25	20	125	100	150	120	8.00	48.00
	Or									*or*
Course – VII	XX CT* 4.7	04	25	15	75	28	100	43	4.30	17.20
Course VIII*	XXCP^{+}/CT$^{\Psi}$ 4.8	02	15	05	35	35	50	40	8.00	16.00
Total		24					600			200.00/ 185.00

XX refers to course abbreviations, 4.1 refers to IV semester course 1; e.g. CHI CT 1.1= Chemistry Inorganic compulsory theory 1.1

except for Mathematics and Statistics ;* For Statistics and mathematics; +Only for Statistics;

$^{\Psi}$ only for Mathematics

GPA for IV Semester = CP (IV Sem) / Credits (IV Sem) = 200/24.00 = 8.33

GPA for I Semester = CP (I Sem) / Credits (I Sem)

CGPA for I Semester = GPA for I Semester

$$\text{CGPA for II Sem} = \frac{\text{CP (ISem)} + \text{CP (II Sem)}}{\text{Credits (I Sem)} + \text{Credits (II Sem)}}$$

$$\text{CGPA for III Sem} = \frac{\text{CP (I Sem)} + \text{CP (II Sem)} + \text{CP (III Sem)}}{\text{Credits (I Sem)} + \text{Credits (II Sem)} + \text{Credits (III Sem)}}$$

$$\text{CGPA for the Programme} = \frac{\text{CP (I Sem)} + \text{CP (II Sem)} + \text{CP (III Sem)} + \text{CP (IV Sem)}}{\text{Credits (I Sem)} + \text{Credits (II Sem)} + \text{Credits(IIISem)} + \text{Credits(IVSem)}}$$

(*CP: Credit Points)

Annexure – Ia

The Programme structure of the **M.Sc. (Computer Science)** shall be as follows:

Semester	No. of Compulsory & specialization courses (credits/course)	Total credits For compulsory & Specialization Courses	No. of open Elective course (credits/courses)	Total credits Of open Elective Course	Total credits For the semester
Sem – I	Th: 05 (04) = 20 Pra: 01 (04) = 04	24	Th: 01 (04) = 04 Pra: 01 (02) = 02	06	30
Sem – II	Th: 05 (04) = 20 Pra: 01 (04) = 04	24	Th: 01 (04) = 04 Pra: 01 (02) = 02	06	30
Sem – III	Th: 05 (04) = 20 Pra: 01 (04) = 04	24	Th: 01 (04) = 04 Pra: 01 (02) = 02	06	30
Sem – IV	Th: 05 (04) = 20 Pj: 01 (06) = 06	26	-----	-----	26
Total	Th: 20 (04) = 80 Pra: 03 (04) = 12 Pj: 01 (06) = 06	98	Th: 03 (04) = 12 Pra : 03 (02) = 06	18	116

Note: Except for IV semester, the concerned Department shall offer one each of open elective theory

and practical course for students of other departments.

Abbreviations: Th = Theory; Pra = Practical; Pj = Project;

GRADE CARD
Programme : M.Sc. (Computer Science)

Name of the candidate: **Semester: I / II / III**
Seat No.: **Month & Year:**

Courses	Course code	Credit	IA Marks		Theory/ Practical		Max. Marks	Marks Obtained	Semester Grade Point	Credit Point
			Max.	Obt	Max.	Obt.				
Compulsory Courses										
Course – I	CT X.1	4	25	15	75	45	100	60	6.00	24.00
Course – II	CT X.2	4	25	15	75	59	100	74	7.40	29.60
Course – III	CT X.3	4	25	15	75	50	100	65	6.50	26.00
Course – IV	CT X.4	4	25	15	75	45	100	60	6.00	24.00
Course – V	CT X.5	4	25	15	75	50	100	65	6.50	26.00
Course – VI	CP X.6	4	25	15	75	45	100	60	6.00	24.00
Open Elective courses:										
Course – VII	ET X.7	4	25	15	75	50	100	65	6.50	26.00
Course – VIII	ET X.8	2	10	05	40	35	50	40	8.00	16.00
TOTAL		**30**					**750**			**195.60**

CT **:** Core Theory

CP **:** Core Practical

X **:** Semester

GRADE CARD
Programme : M.Sc. (Computer Science)

Name of the candidate: **Semester: IV**

Seat No.: **Month & Year:**

Courses	Course code	Credit	IA Marks		Viva - voce		Theory/ Practical		Max. Marks	Marks Obtained	Semester Grade Point	Credit Point
			Max.	Obt	Max	Obt.	Max.	Obt				
Compulsory Courses												
Course – I	CT 4.1	4	25	15			75	45	100	60	6.00	24.00
Course – II	CT 4.2	4	25	15			75	59	100	74	7.40	29.60
Course – III	CT 4.3	4	25	15			75	50	100	65	6.50	26.00
Course – IV	**CPR 4.4**	**6**	**25**	**15**	**50**	**40**	**75**	**45**	**150**	**120**	**08.00**	**48.00**
Course – V	CT 4.5	4	25	15			75	50	100	65	6.50	26.00
Course – VI	CT 4.6	4	25	15			75	45	100	60	6.00	24.00
Total		**26**							**650**			**177.60**

CT : Core Theory

CPR : Core Project

GPA for I Semester = **195.60/30 = 6.52**

CGPA for I Semester = GPA = 6.52

CGPA for II Semester = $\frac{\text{CP (I Sem) + CP (II Sem)}}{\text{Credits (I Sem) + Credit (II Sem)}}$

CGPA for III Sem = $\frac{\text{CP (I Sem) + CP (II Sem) + CP (III Sem)}}{\text{Credits (I Sem) + Credit (II Sem) + Credit (III Sem)}}$

CGPA for the Programme = $\frac{\text{CP (I Sem) + CP (II Sem) + CP (III Sem) + CP (IV Sem)}}{\text{Credits (I Sem) + Credit (II Sem) + Credit (III Sem) + Credit (IV Sem)}}$

Annexure – Ib

The Programme structure of the **Master of Computer Applications (MCA)** shall be as follows:

Semester	No. of Compulsory & specialization courses (credits/course)	Total credits For compulsory & Specialization Courses	No. of open Elective course (credits/courses)	Total credits Of open Elective Course	Total credits For the semester
Sem – I	Th: 05 (04) = 20 Pra: 01 (04) = 04	24	Th: 01 (04) = 04 Pra: 01 (02) = 02	06	30
Sem – II	Th: 05 (04) = 20 Pra: 01 (04) = 04	24	Th: 01 (04) = 04 Pra: 01 (02) = 02	06	30
Sem – III	Th: 05 (04) = 20 Pra: 01 (04) = 04	24	Th: 01 (04) = 04 Pra: 01 (02) = 02	06	30
Sem – IV	Th: 05 (04) = 20 Pra: 01 (04) = 04 SR: 01 (02) = 02	26	-----	-----	26
Sem – V	Th: 05 (04) = 20 Pra: 01 (04) = 04 SR: 01 (02) = 02	26	-----	-----	26
Sem – VI	Pj: 01 (16) = 16	16	-----	-----	16
Total	Th: 25 (04) = 100 Pra: 05 (04) = 020 SR: 02 (02) = 004 Pj: 01 (16) = 016	140	03 (04) = 12 03 (02) = 06	18	158

Note: Except for IV, V and VI semester, the concerned Department shall offer one each of open elective

theory and practical course or two * open elective theory courses for students of other departments.

Abbreviations: Th = Theory; Pra = Practical; Pj = Project; SR = Seminar

GRADE CARD
Programme : MCA

Name of the candidate: **Semester: I / II / III**

Seat No. **Month & Year**

Courses	Course code	Credit	IA Marks		Theory/ Practical		Max. Marks	Marks Obtained	Semester Grade Point	Credit Point
			Max.	Obt	Max.	Obt.				
Compulsory Courses										
Course – I	CT X.1	4	25	15	75	45	100	60	6.00	24.00
Course – II	CT X.2	4	25	15	75	59	100	74	7.40	29.60
Course – III	CT X.3	4	25	15	75	50	100	65	6.50	26.00
Course – IV	CT X.4	4	25	15	75	45	100	60	6.00	24.00
Course – V	CT X.5	4	25	15	75	50	100	65	6.50	26.00
Course – VI	CP X.6	4	25	15	75	45	100	60	6.00	24.00
Open Elective Courses :										
Course – VII	ET X.7	4	25	15	75	50	100	65	6.50	26.00
Course – VIII	ET X.8	2	10	05	40	35	50	40	8.00	16.00
TOTAL		30					750			195.60

CT : Core Theory

CP : Core Practical

CSR : Core Seminar

X : Semester

GRADE CARD
Programme : MCA

Name of the candidate: **Semester : IV / V**
Seat No.: **Month & Year**

Courses	Course code	Credit	IA Marks		Theory/ Practical		Max. Marks	Marks Obtained	Semester Grade Point	Credit Point
			Max.	Obt	Max.	Obt.				
Compulsory Courses										
Course – I	CT X.1	4	25	15	75	45	100	60	6.00	24.00
Course – II	CT X.2	4	25	15	75	59	100	74	7.40	29.60
Course – III	CT X.3	4	25	15	75	50	100	65	6.50	26.00
Course – IV	CT X.4	4	25	15	75	45	100	60	6.00	24.00
Course – V	CT X.5	4	25	15	75	50	100	65	6.50	26.00
Course – VI	CP X.6	4	25	15	75	45	100	60	6.00	24.00
Course - VII	CSR X.7	2	--	--	--	--	50	40	8.00	16.00
TOTAL		26					650			169.60

CT : Core Theory

CP : Core Practical

CSR : Core Seminar

X : Semester

GRADE CARD
Programme : MCA

Name of the candidate: **Semester : VI**
Seat No.: **Month & Year**

Courses	Course code	Credit	IA Marks		Desertion Work		Viva-voce Marks		Max. Marks	Marks Obtai--ned	Sem--ester Grade Point	Credit Points
			Max.	Obt	Max.	Obt.	Max..	Obt.				
Compulsory Courses												
Core Project	CPR 6.1	16	100	60	200	120	100	60	400	240	06.00	96.00
Total		16							400			96.00

GPA for I Semester = **195.60/30 = 6.52**

CGPA for I Semester = GPA = 6.52

CGPA for II Semester = **CP (I Sem) + CP (II Sem)**

Credits (I Sem) + Credit (II Sem)

CGPA for III Sem = **CP (I Sem) + CP (II Sem) + CP (III Sem)**

Credits (I Sem) + Credit (II Sem) + Credit (III Sem)

CGPA for IV Sem = **CP (I Sem) + CP (II Sem) + CP (III Sem) + CP (IV Sem)**

Credits (I Sem) + Credit (II Sem) + Credit (III Sem) + Credit (IV Sem)

CGPA for the Programme = **CP (I Sem)+ CP (II Sem) + CP (III Sem) + CP (IV Sem) + CP (V Sem) + CP (VI Sem)**

Credits (I Sem) + Credit (II Sem) +Credit (III Sem) + Credit (IV Sem) + Credit (V Sem) + Credit (VI Sem)

COURSE OUTLINE FOR THE SCIENCE DEPARTMENTS

Semester	Course subject+Core Practical	Credits/ T + P	Elective paper + Elective Practical	Credits T + P
I	CT 1.1 + CP 1.4 CT 1.2 + CP 1.5 CT 1.3 + CP 1.6	4 + 2 = 6 4 + 2 = 6 4 + 2 = 6	Et 1.1 + EP 1.2	4 + 2 = 6
II	CT 2.1 + CP 1.4 CT 2.2 + CP 2.5 CT 2.3 + CP 2.6	4 + 2 = 6 4 + 2 = 6 4 + 2 = 6	Et 2.1 + EP 2.2	4 + 2 = 6
III	CT 3.1 + CP 3.4 CT 3.2 + CP 3.5 CT 3.3 + CP 3.6	4 + 2 = 6 4 + 2 = 6 4 + 2 = 6	Et 3.1 + EP 3.2	4 + 2 = 6
IV	CT 4.1 + CP 4.5 CT 4.2 + CP 4.6 CT 4.3 + CP 4.7 C Project Work 4.4	4 + 2 = 6 4 + 2 = 6 4 + 2 = 6 6		
	TOTAL	**78**	**+**	**18 = 96**

Course Structure and Scheme of Examination for M.Sc. (Computer Science)
(under CBCS Scheme)
(with effect from 2008 onwards)

SEMESTER – I

Sem. No.	Paper code	Paper Title	Credits	No. of Hrs/ Week Theory/ Practical	Duration of exam In Hrs Theory/ practical	Internal Assessment Marks Theory/ Practical	Marks at the Exams	Total Marks
Compulsory Courses								
I	MSc 1.1	Computer Organization & Architecture	4	4	3	25	75	100
	MSc 1.2	Discrete Mathematical Structures	4	4	3	25	75	100
	MSc 1.3	Data Structures Using C	4	4	3	25	75	100
	MSc 1.4	Introduction to Algorithms	4	4	3	25	75	100
	MSc 1.5	Object Oriented Program with C++	4	4	3	25	75	100
	MSc 1.6	System Software	4	4	3	25	75	100
	MSc 1.7	Data Structure Lab	4	5	3	25	75	100
	MSc 1.8	OOP Lab	4	5	3	25	75	100
		TOTAL	**32**	**34**	**24**	**200**	**600**	**800**

SEMESTER - II

Sem. No.	Paper code	Paper Title	Credits	No. of Hrs/ Week Theory/ Practical	Duration of exam In Hrs Theory/ practical	Internal Assessment Marks Theory/ Practical	Marks at the Exams	Total Marks
Compulsory Courses								
II	MSc 2.1	Operating System	4	4	3	25	75	100
	MSc 2.2	Theory of Computation	4	4	3	25	75	100
	MSc 2.3	Database Management System	4	4	3	25	75	100
	MSc 2.4	JAVA Programming	4	4	3	25	75	100
	MSc 2.5	Data Communication and Computer Networks	4	4	3	25	75	100
	MSc 2.6	DBMS Lab	4	5	3	25	75	100
	MSc 2.7	Java Programming Lab	4	5	3	25	75	100
	Open Elective							
	ET 2.8	Computer Concepts and Office Automation	4	4	3	25	75	100
		TOTAL	**32**	**34**	**24**	**200**	**600**	**800**

SEMESTER - III

Sem. No.	Paper code	Paper Title	Credits	No. of Hrs/ Week Theory/ Practical	Duration of exam In Hrs Theory/ practical	Internal Assessment Marks Theory/ Practical	Marks at the Exams	Total Marks
Compulsory Courses								
III	MSc 3.1	Advanced Java	4	4	3	25	75	100
	MSc 3.2	Computer Graphics	4	4	3	25	75	100
	MSc 3.3	Design & Analysis of Algorithms	4	4	3	25	75	100
	MSc 3.4	Operation Research	4	4	3	25	75	100
	MSc 3.5	Core Theory (Elective – I)	4	4	3	25	75	100
	MSc 3.6	Advance Java Lab	4	5	3	25	75	100
	MSc 3.7	Computer Graphics Lab	4	5	3	25	75	100
	Open Elective							
	ET 3.8	SPSS Software	4	4	3	25	75	100
		TOTAL	**32**	**34**	**24**	**200**	**600**	**800**

SEMESTER – IV

Sem. No.	Paper code	Paper Title	Credits	No. of Hrs/ Week Theory/ Practical	Duration of exam In Hrs Theory/ practical	Internal Assessment Marks Theory/ Practical	Marks at the Exams	Total Marks
IV	MSc 4.1	Software Engineering	4	4	3	25	75	100
	MSc 4.2	Web Technology	4	4	3	25	75	100
	MSc 4.3	.NET Frame work	4	4	3	25	75	100
	MSc 4.4	PROJECT	4	4	Dissertation Evaluation 50 Marks	25	Viva Voice 25 Marks	100
	MSc 4.5	Core Theory (Elective – II)	4	4	3	25	75	100
		TOTAL	**20**	**20**	**12**	**125**	**325**	**500**

List of Core Theory Electives:

Sl.No	**Elective Subject Code**	**Core Theory Electives** (One of the following elective to be chosen)
1	**2**	**3**
1	MSc 3.5A	Modeling and Simulation
2	MSc 3.5B	Mobile Computing
3	MSc 3.5C	Artificial intelligence
4	MSc 3.5D	Digital Image Processing
5	MSc 3.5E	Software Architecture

List of Core Theory Electives:

Sl.No	**Elective Subject Code**	**Core Theory Electives** (One of the following elective to be chosen)
1	**2**	**3**
1	MSc 4.5A	Compiler Design
2.	MSc 4.5B	Data warehouse and Data Mining.
3	MSc 4.5C	Pattern recognition
4	MSc 4.5D	Information Security
5	MSc 4.5E	UNIX System Programming

M. Sc 1.1 Computer Organizations and Architecture

Total Hours: 48

Unit-I **10 Hrs**

Number Systems: binary, octal hexadecimal, number base conversion, addition, subtraction of binary numbers, one's and two's complements, positive and negative numbers, character codes ASCH, EBCDIC.

Boolean algebra and Logic gates: Axiomatic definition of Boolean algebra, Basic theorems and properties, Boolean functions, canonical and standard forms, logic functions using gates and design of combinational circuits.

Unit-II **10 Hrs**

Simplification of Boolean functions: Karnaugh maps, product of sums, sum of products, simplification, NAND and NOR implementation, don't care condition.

Combinational and Sequential logic: Adders, subtractors, code, converters, decoder multiplexer, flip-flops, shift registers, counters.

Unit-III **10 Hrs**

Processor Logic Design: Processor organization, arithmetic logic unit, design of arithmetic and logic circuits, design of arithmetic logic unit, status registers, design of shifter, processor unit, design of accumulator.

Control Logic Design: Processor Organization, Hardware control micro program control, control of processor unit, PLA control, micro program sequencer, computer design.

Unit-IV **10 Hrs**

Micro – computer System Design: Microcomputer organization, microprocessor organization, instructions and addressing modes, subroutines and interrupts, memory organization, input-output interface, programmed input-output, input – output processor, input – output device characteristics, direct memory access (DMA).

Unit-V **8 Hrs**

Memory Organization: Serial access, random access memories (RAM), read only memories (ROM), virtual memory, cache memory.

REFERENCES:

1. Digital Logic and Computer Design, Morris Mano, PHI
2. Digital Computer Fundamentals, Bartee, T.C., MC Graw Hill
3. Computer Architecture and Organization, Tanenbaum A.S., Mc Graw Hill
4. Computer Architecture and Organization, hayes, J.P., Mc Graw Hill
5. Introduction to Microprocessors, Gaonkar, Tata Mc Graw Hill
6. Digital Computer Electronics Malvino & Brown Shird Education, TMH.

M. Sc 1.2 Discrete Mathematical Structures

Total Hours: 48

Unit-I **10Hrs**

The Foundations: Logic and Proofs Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy

Unit-II **10Hrs**

Basic Structures: Sets, Functions, Sequences, Sums, and Matrices.
Sets, Set Operations, Functions, Sequences and Summations, Cardinality of Sets, Matrices

Unit-III **10Hrs**

Induction and Recursion Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.
Advanced Counting Techniques Applications of Recurrence Relations, Solving Linear Recurrence, Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion–Exclusion.

Unit-IV **1 0 Hrs**

Relations : Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

Unit-V **08Hrs**

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

Reference Book:

1. Kenneth H. Rosen: Discrete Mathematics and Its Applications.
2. Discrete Mathematical Structures. Trembley and Manohar
3. Graph Theory with Applications to Engg & Comp. Sci.: Narsingh Deo-PHI 1986
4. Graph Theory: F Harary – AWL
5. Discrete Mathematical Structure Bernard Kolman, Robert C. Busby, Sharon Ross, 2003.
6. Discrete and Combinatorial Mathematics Ralph P. Grimaldi, B. V. Ramana,Pearson Education,5 Edition

M. Sc 1.3 Data Structure Using C

Total Hours: 48

Unit-I **10 Hrs**

Introduction: Introduction C, Arrays, Functions, Structures, Pointers, Primitive & Non primitive data types, Dynamic memory allocation, Storage information & representation of Integers, Real numbers & Strings, Strings and String Operations, Relations and Relational Operations, Logical Operations and Expressions.

Unit-II **10 Hrs**

Linear Data Structures: Concepts and Terminology, Storage Structures for arrays.

Stacks: Definition and Concepts, Operations on Stacks. Applications of Stacks – Evaluation of Postfix Expression, Conversion from infix to postfix, infix to prefix expressions, Recursion – Factorial of n, Fibonacci sequence, Binary Search, The tower of Honai Problem.

Unit-III **10 Hrs**

Queues: Definition and concepts, Operations on Queues. Types of Queues like Ordinary queues, Double Ended Queues, Circular Queue, Priority queues.

Unit-IV **10 Hrs**

Linked Lists: Definition and Concepts, Operations on Linked Lists, Singly Linked Linear Lists, Circular singly Lined linear Lists, Doubly Linear Lists.
Applications of Linked Linear Lists – Polynomial Manipulation, Linked Dictionary.

Unit-V **08 Hrs**

Non Linear Data Structures:

Trees: Definition and Concepts, Operations on Binary trees, Storage representation and Manipulation of Binary trees, Binary Search Tree – Operations. Applications of Trees – Manipulation of Arithmetic Expressions, Symbol – Table Construction. Sparse Matrices.

REFERENCES:

1. Data structure Using C, Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, II Edition PHI Publications 2005.
2. An Introduction to Data Structures with Applications, Jean – Paul Tembley and Paul G. Sorension., II Edition, Tata Mc Graw Hill.
3. Systematic Approach to Data Structures, A Padma Reddy
4. Yedigyah Langran Woshe. J. Augenstein & M. Tananbaum PHI 2001.
5. Data Structures & Program Design Using C Rober L Kruse PHI, 1997
6. Classic Data Structures Samantha D PHI 2001.
7. Fundamentals of Data Structures Horowithz E & Sahani S, Galgotia Publ.

M. Sc 1.4 Introduction to Algorithms

Total Hours: 48

Unit-I: 10 hrs

Introduction to Computer Problem Solving

Introduction, The Problem-solving Aspect, Top- down Design, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms.

Fundamental Algorithms

Introduction, Exchange of Values of Two Variables, Counting, Summation of a Set of Numbers, Factorial Computation, Sine Function Computation, Generation of the Fibonacci sequence, Reversing the Digits of an Integer, Base Conversion, Character to Number Conversion

Unit-II: 10hrs

Factoring Methods

Introduction, Finding the Square Root of a Number, The Smallest Division of an Integer, The Greatest Common Divisor of Two Integers, Generating Prime Numbers, Computing the Prime Factors of an Integer, Generation of Pseudo-random Numbers, Raising a Number to a large Power, Computing the *n*th Fibonacci number

Unit-III: 10hrs

Array Techniques

Introduction, Array Order Reversal, Array Counting or Histogram Ming, Finding the Maximum Number in a Set, Removal of Duplicates from an Ordered Array, Partitioning an Array, Finding the *k*th Smallest Element, Longest Monotone Subsequence

Unit-IV: 10hrs

Merging, Sorting and Searching

Introduction, the Two-way Merge, Sorting by Selection, Sorting by Exchange, Sorting by Insertion, Sorting by Diminishing Increment, Sorting by Partitioning, Binary Search, Hash Searching.

Unit-V: 08 hrs

Dynamic Data Structure Algorithms

Introduction, Stack Operations, Queue Addition and Deletion, Linked List Search, Linked List Insertion and Deletion, Binary Tree Search, Binary Tree Insertion and Deletion

Recursive Algorithms

Introduction, Binary Tree Traversal, Recursive Quicksort, Towers of Hanoi Problem, Sample Generation, Combination Generation, Permutation Generation.

Reference:

1. How To Solve It By Computer by R. G. Dromey Fifteenth Ed 2014
1. Algorithms and Data Structures: N. Wirth 1985 Oberon version: August 2004.
2. Algorithmic graph theory by Alan Gibbons, Cambridge University Press Graph theory Harary, Addison Wesley 1972.
3. Algorithmic Graph Theory and Perfect Graphs by Martin Golumbric, M. C. Golumbic Second Edition 2nd Edition, 2004
4. Graph Theory : Modeling, Applications and Algorithms by Geir Agnarsson,1st Edition,2008

M. Sc 1.5 Object Oriented Programming Using C++

Total Hours: 48

Unit I **1 0 Hrs**

Introductions: A Tour of C++, A Tour of the Standard Library

Unit II **10 Hrs**

Basic Facilities: Types and Declarations, Pointers, Arrays, and Structures, Expressions and Statements Functions Namespaces and Exceptions Source Files and Programs

Unit III **10 Hrs**

Abstraction Mechanisms: Classes, Operator Overloading, Derived Classes, Templates Exception Handling, Class Hierarchies

Unit IV **10 Hrs**

The Standard Library: Library Organization and Containers, Standard Containers, Algorithms and Function Objects, Iterators and Allocators, Strings, Streams, Numeric's

Unit V **08 Hrs**

Design Using C++: Development and Design, Design and Programming, Roles of Classes

Reference:

1. The C++ Programming Language, Third Edition by Bjarne Stroustrup
2. Object Oriented Programming with C++ ,E.Balaguruswamy
3. Let us C++ by Yashwanth Kanitkar
4. Object Oriented Programming in C++ ,Robert Lafore,Pearson Education Limited,4,2012,2013
5. Object Oriented Programming Using C++**,**Suresh Palarimath,Sri Diddalingeshwar Book Depot &,1,2012
6. Object Oriented Programming With C++,PB Kotur,8,2010

M. Sc 1.6 System Software

Total Hours: 48

Unit-I **10 Hrs**

Introduction:

Machine Structure, Evaluation of the components of a programming system, Assemblers, Loaders, Macros, Compliers, Formal systems, Evolution of Operating Systems, Operating System User View point, Functions, Operating System User, Viewpoint : Facilities.

Unit-II **10 Hrs**

Machine Structure, Machine Language and Assembly Language:

General machine structure – 360 and 370, Memory, Registers, Data Instructions, Special Features, Machine Language, Long Way, No Looping, Address Modification Using Instructions as Data, Assembly Language.

Unit-III **10 Hrs**

Assemblers:

General Design Procedure, Design of Assembler

Macro language and The Macro processor:

Macro instructions, Features of a Macro facility, Implementation, Implementation of a restricted facility: A two – Pass algorithm, A single – pass Agorithm, implementation of a Macro calls within Macros, Implementation within an assembler.

Unit-IV **10 Hrs**

Loaders:

Loaders schemes. "Compile – and – Go" Loaders, General Loader scheme, Absolute loaders, Subroutine Link ages, Relocation Loaders, Direct – linking loaders, Linking loaders, Other loader schemes – binders, Linking loaders, Overlays, Dynamic binders.

Unit-V **08 Hrs**

UNIX System Structures:

Introduction, Features, Architecture of UNIX Kernel, File system Boot block, Super block, Inode block, Allocation of disk blocks, Interprocessors communication.

File System:

Basics of UNIX system Users, Unix File System, UNIX system capabilities, Shell, line editor, screen editor, Security, Introduction to awk and shell programming.

REFERENCES:

1. System Programming, John J. Donovan, McGraw Hill (1997).
2. System Programming and Operating Systems, Dhamdhere C. M., 2nd Edition, TMH (1999).
3. System Software – An Introduction to System Programming, Leland L. Beak: Addison, Wisley (1997).
4. Design of UNIX Operating System, Mauries. J. Bach, PHI (1994).
5. Exploring UNIX System, Stephen B. Kochan, CBS Publishers. (1987).
6. System Software Programming, David Clarke and Donald Merosi, Prentice Hall (1998).
7. UNIX concepts and Applications, Sumitabha Das, 2nd Edition TMH (1998).
8. The Complete Reference, Kenneth Rosenetal, Osborne / McGraw Hill (1999).

M. Sc 2.1 Operating Systems

Total Hours : 48

Unit-I **10 Hrs**

Introduction: Operating system concepts, types of operating system – Batch, interactive, time sharing, real time and distributed operating systems. Operating system services, system calls, system components, system programs.

Process Management: Processes-process scheduling, operation on processors, co-operating process threads, interprocess communication, concept of critical section problem and solution, semaphores and implementation.

Unit-II **10 Hrs**

CPU Scheduling: Scheduling criteria and scheduling algorithms, multiple processor scheduling.

Deadlock: Deadlock problem, characterization, prevention, avoidance, detection, recovery, combined approach to deadlock handling.

Unit-III **10 Hrs**

Memory Management: Logical and physical address, swapping overlays, contiguous allocation, paging segmentation, segmentation with paging, virtual memory-demand paging page replacement algorithms.

Unit-IV **10 Hrs**

Disk and Drum Scheduling: Physical characteristics FCFS, Shortest seek time first, SCAN scheduling, selection of disk scheduling algorithm, sector queuing.

Unit-V **08 Hrs**

File System: Files, access method, directory structure, protection and file system implementation, allocation methods.

Protection: Goals, mechanism and policies, doman of protection, access matrix and its implementation, dynamic protection structure, revocation, security.

REFERENCES :

1. Operating systems Concepts, Peterson, J. and Sliberschatz, McGraw Hill.2006
2. Operating system, Madnick, S.E. Donovan J.J., McGraw Hill.
3. Operating system Principles, Brinch Hansen P., PHI.
4. A logical Design of Operating systems, Shaw A.., PHI
5. Operating systems, Milan Milenkovic, McGraw Hill.
6. Fundamentals of Operating system, including case studies, Sridhar. R.,:MS-DOS, UNIX & OS/2, Dynaram Publications.
7. Windows 3.1 A Complete Tutorial, Galgotia Publication Pvt., Ltd., Subhash Mehta.
8. Systems Programming and Operating system, McGraw Hill.

M. Sc 2.2 Theory of Computation

Total Hours: 48

Unit-I **10Hrs**

Introduction To Finite Automata: Introduction to Finite Automata, the central concepts of Automata theory, deterministic finite automata, non-deterministic finite automata, an application. Finite automata with Epsilon-transitions.

Unit-II **10 Hrs**

Regular Expressions and Languages, Properties Of Regular Languages: Regular expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Proving languages not to be regular, Closure properties of Regular languages, Decision properties of Regular languages. Equivalence and minimization of automata.

Unit-III **10 Hrs**

Context-Free Grammars And Languages: Context-free grammars. Parse trees, Applications, Ambiguity in grammars and languages.

Pushdown Automata: Definition of the Pushdown automata, The languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

Unit-IV **10Hrs**

Properties Of Context-Free Languages: Normal forms for CFGs, The pumping lemma for CFGs, Closure properties of CFLs.

Introduction To Turing Machines: Problems that computers cannot solve. The Turing Machine, Programming techniques for Turing Machines, Extensions to the basic Turing Machine, Restricted Turing Machines, Turing Machine and Computers.

Unit-V **08 Hrs**

Undecidability: A Language that is not recursively enumerable, An Undecidable problem that is RE, Post's Correspondence problem. Other undecidable problems.

References:

1. J.P. Hopcroft, Rajeev Motwani, J.D. Ullman, Introduction to automata Theory, Languages and Computation, II edition, Pearson Education, 2001.
2. Introduction to Formal Languages and Automata, Peter Linz, Narosa Publ.
3. Languages & Machine An Introduction to Computer Science, Thomds A Sud Kamp, Addison Wesley.
4. Elements of theory of Computation, H.R. Lewis, Shistor H, Papadimitroce, Prentice Hall, New Delhi 199
5. Introduction to Language and Theory of Computation, John Mastin TMH New Delhi, 1998.
6. Theory Of Computation, Rajesh K Shukla,Cengage \ Delmar Learning India Pvt, 1, 2009

M. Sc 2.3 Database Management System

Total Hours: 48

Unit-I: **10 Hrs**

Databases and Users
Introduction, File Oriented Approach, characteristics of Database Approach, advantages of DBMS over File Processing System. Implications of database approach, when not to use a DBMS.

Database system concepts and architecture: Data Models, Schemas and Instances, DBMS Architecture and Data Independence- the Three Schema Architecture, Data Independence, DBMS languages and interfaces, The Database System Environment, classification of DBMS.

Unit II: **10 Hrs**

ER MODEL
Entity Types ,entity sets, attributes and keys, Relationships, Relationship types, Roles and constraints, Weak entities, ER Diagrams Naming Conventions and Design Issues, ER Diagram for company Database, Case Studies: Insurance policy management system, Library Management system.

The Relational Data Model, Relational Constraints: Relational model concepts, Relational Constraints and Relational Database Schemas.

Relational Algebra Operation: Introduction, unary relational operation-select and project, Relation algebra operations from Set Theory-Union, intersection and minus operation, Cartesian product operation, Binary relational operations: Join and division, The Division operation.

Unit III **10 Hrs**

SQL Schema Definition, constraints, queries and views : SQL Data Definition and data types, specifying constraints in SQL, schema Change statement in SQL, basic queries in SQL, more complex SQL queries, INSERT, DELETE, AND UPDATE statements in SQL. Specifying constraints and assertions and triggers.

Functional Dependencies and Normalization of Relational Databases: Informal Design guidelines for Relation Schemas, functional dependencies, Normal Forms: 1NF, 2NF, 3NF AND BCNF, Multi valued Dependencies and fourth Normal Form, Join Dependencies and fifth Normal form.

Unit IV **10 Hrs**

Introduction to transaction processing concepts and theories
Introduction to transaction processing, transaction and system concepts, Desirable properties of transaction, characterizing schedules based on recoverability, characterizing schedules based on serializability.

Concurrency control techniques: Lock based concurrency control, Deadlocks, implementation of locking, Multiversion concurrency control techniques, and validation concurrency control Techniques.

Unit V **08 Hrs**

Database Recovery Techniques: Recovery concepts, recovery techniques based on Deferred update.

Database security: Introduction to database security, discretionary access control, mandatory access control, statistical database

References Books:

1. Fundamentals of "Database System" Elmasri and S.B.Navathe, Pearson education, 5TH edition
2. Database Management Systems, Prof .S.Nandagopalan.
3. Database Management Systems by PatriciaWard George Dufoulas publisher Jhon Yates, series editors, edition 2006.
4. Database Management Systems"P.S.Gill, I.K.International,, 2008 edition
5. Database Management Systems" Rajesh Narang,Prentice hall of India Pvt Ltd, 2004.

M. Sc 2.4 Java Programming

Total Hours: 48

Unit-I: **10Hrs**

The Genesis of Java:

The Java Buzzwords, Java's lineage (Needs of C and C++ and its Comparison with java), Basic Data Types Of Java and Simple programs, Command line Arguments, Why java is Important to the Internet, Java's Magic:-The Byte code.

Arrays, Strings and Vectors: Declaration, Creation and operations on One and Two-Dimensional Arrays. The String Classes and its commonly used methods, Vectors and Wrapper Classes.

Introducing Classes and Objects: Class Fundamentals, Declaring Object, Assigning object reference variables. Static variables and Static Methods. Constructors-Its Characteristics and Features, Overloaded Constructors and the 'this' keyword.

Inheritance:- Inheritance Basics, Concepts of Sub-class and Super-class. Constructing a Sub-class with the use of the keywords extends, super and final. Method Overriding and Access Modifiers.

Interfaces and Packages: Interfaces: Their Use in Multiple Inheritances. Defining and implementing interfaces with examples.

Packages: Java API Packages, Use of Import Statements and Package Creation.

Exception Handling: Fundamentals, Exception Types, Using try and catch blocks. Multiple catch clauses, Use of throw, throws and finally. Java Built in Exceptions and Creating Own-Exception subclasses.

Multithreaded Programming: Concept of Parallel and Multitasking, Creating Thread, Creating Multiple Threads, Thread Priorities and Synchronization.

Unit-II: **10Hrs**

APPLET CLASS: Fundamentals of Applets, Creations and Execution. Methods of applet. The HTML applet Tag, Passing parameters to applets.

Introducing the AWT:-AWT Classes Windows Fundamentals, Working with Graphics and Setting fonts and colors.

Unit-III: **10Hrs**

Using AWT Controls

Event Handling: The Delegation Event Model, Event Classes and Event Listener interfaces.

Form Elements: Labels, Text-Fields, Buttons, Checkboxes, Checkbox Group, Choice, List and Scrollbars. Their associated Methods and events.

Unit-IV: **10Hrs**

Layout Managers and Menus: Creating Frame Windows, Menus and Dialog boxes. Option Panes, Pop-Up Menus, Images and Image Handling.

A Tour of Swing: Swing features, Swing Packages and Classes.

User Interface Components: Label, JTextField, JButton, JCheckbox, JLIst, OptionButton, Tabbed Panes, Scroll Panes, Trees Tables.

Unit-V: **08Hrs**

I/P AND O/P: Managing Input and output files in java.

REFERENCE

1. "Programming with Java" Balaguruswamy, A primer, 4/e, Tata McGraw-Hill Publications.
2." Java Programming" Steven Holzner, BPB Publications, 2000.
3." Java for You", Kooparkar P, Tata McGraw-Hill, 1999.
4."Java Programmer Reference" Herbert Schildt, 1997
5." JavaTM2 the Complete Reference" Herbert Schildt, Tata McGraw-Hill, Fifth Edition2002

M. Sc 2.5 Data Communication and Computer Network

Total Hours : 48

Unit I: 10 hrs

Physical Layer & Media Analog and Digital, Periodic analog signals, Digital signals, Transmission of Digital Signals, Transmission impairment, Data rate limits, performance.

Digital Transmission Digital-to-digital conversion**,** analog-to-digital conversion, transmission modes Parallel Transmission Serial Transmission

Analog Transmission Digital-to-analog conversion, Analog-to-analog conversion

Bandwidth Utilization: Multiplexing & Spreading Multiplexing spread spectrum

Unit II 10 hrs

Transmission Media Guided media, unguided media

Circuit-switched networks Circuit-Switched Networks, Datagram networks, virtual-circuit networks

Data Link Layer Error Detection and Correction, Introduction, Block Coding, Linear block codes, cyclic codes, Checksum.

Unit III 1 0 hrs

Computer Networks and the Internet what is the Internet? What is a Protocol?

Application Layer Introduction, Network application architecture, process communication, HTTP, File Transfer: FTP, Electronic Mail in the Internet, SMPP, DNS.

Unit-IV: 10 hrs

Transport Layer

Introduction, Transport-Layer Services and Principles, Multiplexing and Demultiplexing Applications, Connectionless Transport: UDP, Principles of Reliable of Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control

Unit-V: 0 8 hrs

Network Layer and Routing

Introduction and Network Service Model, virtual circuits & datagrams, what is inside router? Internet protocol (IP), Forwarding & Addressing in internet, Routing Algorithms, Routing in the internet, Broad & Multicast Routing.

Wireless & Mobile Networks

Introduction: Wireless Links & Networks characteristics, Wi-Fi, Cellular Internet Access, Mobility Management, Mobile IP, Managing mobility in cellular networks, Wireless & mobility.

References:

1. "Data Communications & Networking "Fourth Edition, Behrouz A Forouzan
2. "Computer Networking" Third Edition, James F. Kurose, Keith W. Ross

M. Sc(ET) 2.8 Computer Concepts and Office Automation

Total Hours : 48

Unit-I **10 Hrs**

Basics: History and generations of Computer, Types of Computer, Organization of Computer System, Hardware and Software Components, Memory unit: Types of memory, ROM, RAM, types of RAM & ROM, Introduction to cache and virtual memory.

Unit-II **10 Hrs**

Number system: Binary Octal, Hexa-decimal, Number base conversion, Binary addition, Subtraction, One's and Two's compliment, Character codes – ASCII, EBCDIC.

Unit-III **10 Hrs**

Operating System: Types of operating system, Functions, Introduction to DOS and WINDOWS operating system.

Software: Types of languages, Types of software (System and Application software).

Unit-IV **1 0 Hrs**

Network and Internet: History and evolution of Computer Network, Types of network (LAN, MAN & WAN), Internet and its applications.

Unit-V **0 8 Hrs**

Office Automation: Working with MS-Word, MS-Excel and MS-POWER POINT

Reference:

1. Computer Concepts & C Programming,P.b.Kottur,Sapna Book House Bangalore 2009
2. Computer Fundaments, V. Rajaraman ,Prentice Hall of India , 2008
3. Computer Fundamental P.K. Sinha , Prentice Hall of India, 6th Edition,1992
4. Fundamentals of Information Technology second edition, Alexis Leon,2009
5. Microsoft Office-Complete reference ,Curt Simmons, Mc Graw Hill,2003

MSc 3.1 Advanced Java

Total Hours : 48

Unit -I **10Hrs**

Java and the J2EE Platform

The Enterprise Today - System Architecture, Is Java the Answer? The J2EE Platform,J2EE Architecture – Containers.J2EE Technologies -Component Technologies Service Technologies, Communication Technologies and XML.

Distributed Computing Using RMI-RMI Alternatives, The RMI Architecture, Locating Remote Objects, RMI Exceptions Developing Applications with RMI-Defining the Remote Interface, Implementing the Remote Interface, Writing the Client That Uses the Remote Objects, Generating Stubs and Skeletons, Registering the Object, Running the Client and Server.The RMISecurityManager, Parameter Passing In RMI and the Distributed Garbage Collector.

Database Programming with JDB-Java Bean Component, DatabaseDrivers and the JDBC 2.1 Core API Introduction to JNDI and Examples.

Unit-II **10 Hrs**

XML Beginnings

A Primer on XML,The Logical Structure of an XML Document, XML Documents with DTDs,DTD and Entities,Read Well-Known DTDs**,** DTDs, Parsers, and Validation, XML Namespaces ,Styling XML with CS.

Introduction to Web Containers:-The HTTP Protocol, Web Containers and Web Applications, Your First Web Application, the Making of Your Web Application, Summary.

Unit-III **10 Hrs**

Servlets Programming

Overview of the Java Servlet API, Servlet Implementation-The Servlet Interface ,The GenericServlet Class, The SingleThreadModel Interface, The HttpServlet Class.

Servlet Configuration -The ServletConfig Interface, Obtaining a Reference to ServletConfig **.**Servlet Exceptions, The Servlet Lifecycle, The Servlet Lifecycle – FreakServlet,Servelet Programming-Tech Support Application, Summary.

Servlet Sessions.:-Statelessness and Sessions, Approaches to Session Tracking .Session Tracking with theJava Servlet API: -Session Creation and Tracking, The HttpSession Interface, Binding and Unbinding Objects to and from Sessions and A Simple Shopping Cart Using Sessions.

Unit IV **10 Hrs**

JSP Basics and Architecture

Introducing JSP, The Nuts and Bolts: -JSP Directives, Scripting ElementsStandard Actions, Implicit Objects, Scope, XML Equivalent Tags. JSP Design Basics,the 'Dispatcher' Approach,JSP Technical Support, Summary.

Unit V **08 Hrs**

Ajax
Introduction to Ajax, Pre-Ajax JavaScript Communications Techniques.

Reference:

1. Professional Java Server Programming J2EE by Subramanyam Allamaraju, Karl Avedal et al., J2EE Edition Volume I, Shroff Publishersand Distributors PVT.LTD, October 2000.
2. Professional Java Server Programming J2EE by Subramanyam Allamaraju, Karl Avedal et al., J2EE Edition Volume I, Shroff Publishers And Distributors PVT.LTD, October 2000.
3. The J2EETM 1.4 Tutorial, Eric Armstrong Jennifer Ball et al., the Complete Reference Tata Mc-Graw Hill, For Sun Java System Application Server Platform Edition8.2 ,December 2005.
4. Ajax, the Complete Reference Tata Mc-Graw Hill Publishing, 2008.
5. Sams Teach Yourself J2EE in 21 Days by Martin Bond ,Dan Haywood et al., Sams Publishing 2002.The Complete Reference, Book Edition 1, James Keogh Tata

M. Sc 3.2 Computer Graphics

Total Hours : 48

Unit-I **10 Hrs**

Introduction: Computer graphics and its applications in various fields. Hardware system for graphics working of different input devices, visual display devices and hard copy device. Introduction to different coordinate systems.

Raster Scan display: Concepts of resolution, aspect ratio refresh rate and frame buffer. Random scan displays: Concepts of display file and display file interpreted comparison between raster scan and random scan. Implementation of graphics in 'C' language and study of various graphics functions.

Unit-II **10 Hrs**

Line drawing methods: DDA algorithm and Bresenham's algorithm for different scope conditions, midpoint method for line generation.

Two-dimensional transformation: Mathematical treatment of basic transformation such as translation scaling and rotation. Development of composite transformation matrices using homogeneous coordinates. General fixed point scaling and pivot point rotation.

Clipping: Study of Cohen Sutherland line clipping procedure and Sutherland hodgmen polygon clipping procedure.

Windows and view ports: Derivation of generalized window to view port transformation matrix. Introduction to interrupt driven programming in 'C' and interacting with the mouse.

Unit-III **10 hrs**

Three-dimensional Computer Graphics: Introduction to left and right hand coordinate systems. Basic 3D transformation. Hidden line removal.

Projection**:** Study of orthographic and oblique parallel transformation equations for them.

Unit-IV **10 Hrs**

Graphic software standards: GKS and PHIGS. Study of various attributes of output primitives such as line attributes, area fill attributes and character attributes.

Graphics Software Study: DirectX and Open GL

Unit-V **08 Hrs**

Segments: Concepts and advantages. Segment table various operations on segments. Data structures for the display file arrays on segment, linked list and paging schemes M

Miscellaneous topics – Brief introduction to Bezier curves and their application, fractal morphing and animation.

REFERENCE:

1. Hearn Donald Pauling Baker .M: Computer Graphics EEE PHI, 1998
2. Newman and Sproull: Principles of Interactive Computer Graphics McGraw Hill, 1996.
2. S. Harrington: Computer graphics McGraw Hill, 1997.
3. YeshwantKanetkar: Graphics under "C" BPB, 1995.
4. YeshwantKanetkar: C Pearls BPB, 1996.

M. Sc 3.3 Analysis and Design of Algorithms

Total Hours: 48

Unit-I: **10 hrs**

Introduction, Fundamentals of the Analysis of Algorithm Efficiency, Brute Force Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem, Types,

Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. Selection Sort and Bubble Sort, Sequential Search and String Matching.

Unit-II: **1 0 hrs**

Divide-and-Conquer
Merge sort, Quick sort, Binary Search, Binary tree Traversals and related properties, Multiplication of large integers, Stress en's Matrix Multiplication

Decrease-and-Conquer
Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects.

Unit-III: **10 hrs**

Space and Time Tradeoffs
Sorting by Counting, Input Enhancement in String Matching, Hashing.

Unit-IV: **10 hrs**

Dynamic Programming
computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions

Unit-V: **08 hrs**

Greedy Technique Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Knapsack

Limitations of Algorithm Power
Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems

Reference Books:

1. Introduction to the Design and Analysis of Algorithms AnanyLevitin, Publisher**:** Pearson (2008), 2 Editions
2. Introduction to Algorithms, Coremen T.H., Leiserson C.E and Rivest R.L, PHI 1998.
3. Computer Algorithms, Horowitz E., Sahani S., Rajasekharan S., Galgotia Publication 2001.
4. Algorithm Design" Michael T Goodrich and Roberto Tamassia, Wiley India
5. Introduction to Design and Analysis of Algorithms "R C T Lee, S S Tseng, R C Chang, Y T Tsai, A Strategic Approach, Tata McGraw Hill

M. Sc 3.4 Operations Research

Total Hours : 48

Unit-I **1 0 Hrs**

Operation Research

Nature and meaning, models –characteristics, advantages and classification. General methods for solving O.R models. Main phases of O.R. study, scope and applications.

Unit-II **10 Hrs**

Linear Programming

Formulation (both minimization and maximization type), Solution: cal form of LPP and its characteristic features. Simplex algorithm and flowchart for maximization type problem. Big – M method, two – phase method and problem of degeneracy.

Concept of duality: Formulation of dual LPP, Duality theorem, advantages of duality, dual simplex Algorithm and sensitivity analysis.

Unit-III **10 Hrs**

Transport Problem: Introduction, Formulation, Necessary and sufficient condition fo9r the existence of feasible solution to a T.P. Initial basic feasible solution by NWCR, LCM and VAM. Optional solution using U –V method. Algorithm and flow chart for minimization T.P.

Assignment Problem: Formulation, Optimal solution using Hungarian algorithm. Travelling sales man problem. Variations of the assignment problem.

Unit-IV **10 hrs**

Game Theory: Basic definitions, minimax – maxmin principle and optimal strategy. Solution of games with saddle point, dominance rule for solving a two – person game.

Network Analysis: Network and basic components, Rules for network construction, basic steps in PERT/CPM techniques and applications. Time estimates and critical path in network analysis.

Unit-V **08 Hrs**

Queuing Analysis: Introduction to stochastic process, Markov chain, t.p.m, c-k Equations, Poisson process, birth and death process. Concept of queues, Kendall's notation, m/m/1,m/m/s queues and their variants.

REFERENCES:

1. "Operations Research", H.A. Taha, Collin McMillan, Publisher: Pearson (2012)
2. "Introduction to Operations Research", B.E. Gillet, Publisher: Tata McGraw - Hill Education (1979) , 1st Edition
3. "Operations Research: Theory and Applications", J K Sharma Publisher: Macmillan (2013) 5th Edition
4. "Operations Research" S.S. Rao, Optimisation
5. "Operations Research "R. Panneerselvam, PHI Learning (2011), 2 Edition

M. Sc(ET) 3.8 SPSS Software

Total Hours : 48

UNIT-I **10 Hrs**

Table of Contents

Overview of PASW Statistics, Introduction to PASW: Menus, Tool Bar, Dialogue Box, Designate Window, Basic Steps for performing any Statistical Procedure

Data Management

Creating a Data File, Defining Variables, Entering the Data, Saving Data, Opening an existing Data File, Inserting Variables, Inserting Cases, Identifying Duplicate Cases, Identifying Unusual Cases, Sorting Cases, Merging a File: Add Cases, For Adding Variables, Data Aggregation, Splitting File, Selecting Cases, Listing Cases

UNIT-II **10 Hrs**

Data Transformation

Computing a New Variable, Recoding Variables, Automatic Recode, Visual Binning, Rank Cases

Describing Data Numerically

Types of Measurement Scales, Summary Measures, Frequencies, Descriptive Statistics, Explore, Crosstabs

UNIT-III **10Hrs**

Describing Data Graphically

Line Chart, Pie Chart, Bar Chart, Histogram and the Standard Normal Curve, Box Plot, Scatter Diagram, P-P Plot, Q-Q Plot, Chart Builder, Formatting Charts

UNIT-IV **10Hrs**

One Sample t-Test

Hypothesis Testing, Steps in Hypothesis Testing, Assumptions of Hypothesis Testing, Testing for Population Mean, Statistical and Practical Significance

Independent Sample t-Test

Assumptions of Independent Sample t-Test, Procedure for Testing for Differences in Means between Groups, Interpretation of Null Results, Effect Size

UNIT-V **08 Hrs**

Nonparametric Statistics

Runs Test, Chi-Square Test, Mann-Whitney U Test, Wilcoxon Signed Rank Test, Kruskal-Wallis Test

References

1. SPSS In Simple Steps by Kiran Pandya Smruti Bulsari Sanjay Sinha, Dreamtech Press (2011)
2. Applied Statistics with SPSS by Eelko Huizingh, New ed Edition, Sage Publications (CA) (2007)
3. SPSS: A User-Friendly Approach by Jeffery E. Aspelmeier, Thomas W. Pierce , Worth Publishers (2009)
4. Statistical Methods For Practice And Research : A Guide To Data Analysis Using SPSS 0002 Edition, Response Books (2009)
5. A Visual Approach to SPSS for Windows: A Guide to SPSS 17.0,by Leonard D. Stern, Pearson (2009)

M. Sc 4.1 Software Engineering

Total Hours : 48

Unit-I **10 Hrs**

The Product and The Process: Evolving role of software, software characteristics and components, Crisis, Software Myths, Software Engineering-A Layered Technology, Software process, linear sequential model, Prototyping model, RAD model, Evolutionary software process model.

Project Management Concepts: The Management Spectrum, The People, The Product, The Process, and The Project .W5HH Principle.

Software Process and Project Metrics: Measures, Metric Indicators, Metric in process and the Project Domains ,Software Measurement, Metrics for software quality.

Unit-II **10 Hrs**

Software Project Planning: Project Planning Objectives, Software Project Estimation, decomposition Techniques, Empirical Estimation Models.

Risk Analysis and Management: Software Risks, Risk Identification, Risk Projection, Risk Refinement and Risk Mitigation, Monitoring, and Management.

Unit-III **10Hrs**

Analysis Concepts and Principles: Requirement analysis, communication techniques, analysis principles, software prototyping and specification.

Analysis Modeling: Elements of analysis model, data modeling, functional modeling, behavioral modeling, the mechanics of structured analysis, data dictionary, other classical analysis methods.

Unit-IV **10hrs**

Design Concepts and Principles: Software design and software engineering design process, design principles, design concepts, design methods, data design, architectural design and process, transform and transaction mappings, design post processing, architectural design optimization, interface design, procedural design.

Unit-V **08 hrs**

Software Testing Techniques and Strategies: Fundamentals, Test case design, White box testing, Basis path testing, Control structure testing, Black box testing, Software testing strategies.

Software Configuration Management: Configuration management, maintenance costs, maintenance side effects, maintenance tissues.

Software Quality Assurance: Quality Concepts, **Software** Quality Assurance, FTR, ISO 9001, ISO-9002, ISO-9003, Introduction to CASE, DOD standard 2167 A.

REFERENCES:

1. Software Engineering, Fifth Edition, Roger - Pressman, McGraw Hill.
2. Software Engineering , I Sommerville, International Computer Science, Series
3. Object Oriented Modeling and Design, Rumbaugh. J., Blaha M., Premerlani W., Eddy F and Lorensen**W.,** PHI.
4. Software Engineering, Schooma, McGraw Hill
5. Object Oriented Design and Analysis, Booch, Benjamin / Cummings,
6. Software Engineering: A Practitioner's Approach 6 Edition, Roger – Pressman, Tata McGraw - Hill Education (2010)

M. Sc 4.2 Web Technology

Total Hours : 48

UNIT-I **8Hr**

PHP Language Structure

The Building Blocks of PHP: Variables, Data Types, Operators and Expressions, Constants

Flow Control Functions in PHP: Switching Flow, Loops, Code Blocks and Browser Output.

Working with Functions: What Is a Function?, Calling Functions, Defining a Function, Returning Values from User-Defined Functions, Variable Scope, Saving State Between Function Calls with the static Statement, More About Arguments, Testing f or t he Existence of a Function.

Working with Arrays: What Are Arrays? Creating Arrays, Some Array-Related Constructs and Functions.

Working with Objects: Creating an object, Object Inheritance

UNIT-II **10Hr**

Getting Involved with the Code

Working with Strings, Dates, and Time: Formatting Strings with PHP, Investigating Strings in PHP , Manipulating Strings with PHP, Using Date and Time Functions in PHP, Other String, Date, and Time Functions.

Working with Forms: Creating a Simple Input Form, Accessing Form Input with User-Defined Arrays, Combining HTML and PHP Code on a Single Page, Using Hidden Fields to Save State, Redirecting the User, Sending Mail on Form Submission, Creating the Form, Creating the Script to Send the Mail, Working with File Uploads.

Working with Cookies and User Sessions: Introducing Cookies, Setting a Cookie with PHP , Deleting a Cookie with PHP, Session Function Overview, Starting a Session, Working with Session Variables, Destroying Sessions and Unsetting Variables, Using Sessions in an Environment with Registered Users.

UNIT-III **10Hr**

Working with Files and Directories: Including Files, Using include_once, Validating Files, Creating and Deleting Files, Opening a File for Writing, Reading, or Appending, viii Sams Teach Yourself PHP, MySQL and Apache All in One, Reading from Files, Writing or Appending to a File, Working with Directories, Opening Pipes to and from Processes Using popen(). Running Commands with exec(). Running Commands with system() or passthru().

Working with Images : Understanding the Image-Creation Process, Necessary Modifications to PHP, Drawing a New Image, Modifying Existing Images, Image Creation from User Input, Using Images Created by Scripts.

UNIT-IV **10Hr**

PHP and MySQL Integration

Understanding the Database Design Process: The Importance of Good Database Design, Types of Table Relationships, Understanding Normalization, Following the Design Process.

Learning Basic SQL Commands: Learning the MySQL Data Types, Learning the Table-Creation Syntax, Using the INSERT Command, Contents ix Using the SELECT Command. Using WHERE in Your Queries. Selecting from Multiple Tables. Using the UPDATE Command to Modify Records, Using the REPLACE Command. Using the DELETE

Command. Frequently Used String Functions in MySQL. Using Date and Time Functions in MySQL.

Using Transactions and Stored Procedures in MySQL: What Are Transactions? What Are Stored Procedures?

UNIT-V **10Hr**

Interacting with MySQL Using PHP: MySQL or MySQLi Functions?. Connecting to MySQL with PHP. Working with MySQL Data

Restricting Access to Your Applications: Authentication Overview, Apache Authentication Module Functionality, Using Apache for Access Control, Combining Apache Access Methods, Limiting Access Based on HTTP Methods, Restricting Access Based on Cookie Values

References

1. Sams Teach yourself php mysql and apache all in one by Julie C. Meloni, Seth Kerney Pearson P T R, 5th Ed 2012
2. PHP 5 Power Programming by AndiGutmans, StigSætherBakken, and Derick Rethans, 2005 Pearson Education. Learning PHP, MySQL, JavaScript, and CSS By Robin Nixon, 2nd edition 2012.
3. Programming PHP 2nd Edition, Rasmus Lerdorf,SHROFF PUB & DIST PVT LTD (RS) (2011)
4. PHP:The Complete Reference 1st Edition, Steven Holzer, Tata McGraw - Hill Education (2007)
5. Pro PHP Programming 1st Edition, Peter Maclntyre , Apress (2011)

MSc 4.3: . NET FRAMEWORK

Total Hours: 48

Unit-I **10 Hrs**

Introduction: What is DOTNET ? What are C#, VB.NET and MSIL? Introduction to Visual Studio DOTNET SDK and tools.

Langauage Fundamentals: Console IO, Comments and Documenting, Common language runtime, Base class library, Namespaces, Syntex comparison of C# and VB DOTNET

Unit-II **10 Hrs**

Type Hierarchy: Object and Basic types, References and values, Boxing.

Language Features: Object oriented programming, Inheritance, Polymorphism, Garbage collection, Iteration and flow of control, Arrays Exception handling, Interfaces.

Unit-III **10 Hrs**

Windows Application Development: WinForms, Event model, Controls and Menus, DONTNET Framework: File handling, Event Handling, Thread pool and synchronization.

ADO.NET: ADO.NET objects, Connections, DataAdapters, Commands, DataSets, DataViews, Binding to controls.

Unit-IV **10 Hrs**

Code Management: Interoperability with COM, Interoperability with other DONNET modules, Private and shared assemblies, Versioning.

Unit-V **08 Hrs**

ASP.NET: HTTP paradigm and ASP.NET, What are active server pages (ASP) DOTNET using ASP.NET, ASP,NET Advantages, State Management, Controls, Page Layout, Error Handling, Traching.

Web Services: Web service development, Creating a Web Service Client.

REFERENCE:

1. An Introduction to programming using Visual Basic .Net, 5/e, David I, Scheinder, PHI (2005).
2. Using ASP.NET, Richar Leinecker, Pearson Education (2005).
3. Active Server Pages, Keith Morneau and Jill Batistick , Thomson Learning (2003).
4. Microsoft® Asp.Net Programming with Microsoft Visual Basic ® .Net, G. Andrew Duthie, Version 2003 step by step, PHI (2005).
5. OOP with Microsoft Visual Basic .Net and Microsoft Visual basic C#, Reynolds – Haertle., .Net-step by step, PHI (2005).
6. Microsoft ® Visual C#. Net, John Sharp|Jon Jagger, step by step, PHI.
7. .NET Compact framework (Core Reference) by Microsoft Press (2003).
8. Visual Basic .NET, Shirish Chavan, Pearson Education, (2005).

MSc 3.5A Modeling and Simulation

Total Hours: 48

Unit-I **10 Hrs**

System Models: The concept of a system, system environment, stochastic activities, continuous and discrete systems, system modeling, types of models, static physical model, dynamic physical model, static mathematical models, dynamic mathematical model, and principles used in modeling.

Introduction to Simulation: Simulation of a pure-pursuit problem-an example, a system and its model, simulation of a inventory problem, the basic nature of simulation, when to simulate.

Unit-II **10 Hrs**

Simulation of Continuous Systems: A chemical reactor, simulation of a servo system, simulation of a water reservoir system, analog vs. digital simulation.

Unit-III **10 Hrs**

Discrete System Simulation: Fixed time-step vs. event-to-event model, on simulating randomness, generation of random nos., generation of non-uniformly distributed random nos., Monte-Carlo computation vs. stochastic simulation.

Unit-IV **10 Hrs**

Simulation of queuing Systems: Simulation of a single –server queue, simulation of a two server queue, simulation of more general queues.

Inventory Control and Forecasting: Elements of inventory theory, more complex inventory models, simulation example-1, simulation example-2, and forecasting and regression analysis.

Unit-V **08 Hrs**

Design and Evaluation of Simulation Experiments: Length of simulation runs, variance reduction techniques, validation.

Simulation Languages: Continuous and discrete simulation languages, continuous simulation languages, block-structured continuous simulation languages, expression-based languages, discrete-system simulation languages, SIMSCRIPT, GPSS, SIMULA, factors in selection of a discrete system simulation language.

REFERENCES:

1. System Simulation with Digital Computer, N. Deo, PHI.
2. System Simulation, G. Gordon, PHI.
3. Discrete Event system simulation, Bankds J Crson& Nelson, PHI, India 1996
4. Element of stochastic Press & Simulation, Gottfried PHI, London, 1984
5. System Simulation with Digital Computer NarsinghDeo, PHI

MSc 3.5B Mobile Computing

Total Hours : 48

Unit-I **10 Hrs**

Introduction to Mobile Computing, Novel Application of Mobile Computing, Limitations of Mobile Computing, Evolution of Mobile Communication Services.

Mobile Communication: Architectural models for Mobile Computing systems, Mobile Devices, Wireless Networks, Introduction to Mobile Ad-hoc Network and its Application , Data Dissemination, Mobile Management ,Security.

Unit-II **10 Hrs**

Cellular Network: Cellular Architecture, Call Set-up, Frequency Reuse and Co-channel Cell, Cell Design, Interference in Cellular system, Channel Assignment, Handoff, Grade of Service, Capacity Improving Methods, User Validation in Cellular Communication.

Cellular Network Standards: Multiple Access Techniques, GSM: System Architecture, OSI Layers in GSM, Services and Features, Handover, GSM Channels, Establishment and Channel Usage during GSM Call, User Validation in GSM. IS-95: System Architecture, Protocol Layers and Channel in IS-95.

Wireless Local Area Network: Application, Data Transfer, WLAN Categories, WLAN Architecture, Protocol Stack, Roaming in WLAN, WLAN Security.

Unit-III **10 Hrs**

Wireless Data Service: Initiative on Data Services: HSCSD, CDPD. General Packet Radio Service: GPRS Architecture, Protocol Stack, GPRS Services and Channels, Mobility Management and Data Routing, GPRS User Validation. Wireless Application Protocol: WAP Architecture, WAP Protocol Stack. Mobile IP: Architecture, Working of Mobile IP, Security.

Unit-IV **10 Hrs**

Mobile Transport Layer: Conventional TCP/IP Transport Layer Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP-layer.

Unit-V **08 Hrs**

Databases: Database Hoarding Techniques, Data Caching, Client-Server Computing and Adaptation, Transactional Models, Query Processing, Data Recovery, Issues relating to Quality of Service.

Information Management: Data-Delivery Mechanisms (Push based, Pull based and Hybrid based Mechanisms), Mobile File Systems, Bluetooth-Enabled Devices Network, Issues and Challenges in Mobile computing Environment.

Reference:

1. Mobile Computing, Rajkamal - Oxford University Press, 2007
2. Mobile Computing, Rajkamal - Oxford University Press, 2007.
3. Mobile Computing Sipra DasBit and Biplab K.Sikdar , Eastern Economy Edition, PHI Learning Private Ltd,2009 .
4. "Mobile Communications", Jochen Schiller, Addison-Wesley, 2000.
5. "Mobile Ad hoc Networking", Basagni, Conti, Giordano and Stojmenovic, Eds., IEEE/Wiley Press, 2004.
6. "Ad hoc Networking", Charles Perkins, Ed., Addison-Wesley, 2000.

MSc 3.5C Artificial Intelligence and Applications

Total Hours : 48

Unit- I Artificial Intelligence: History and applications **10 Hrs**

Knowledge representation : Reasoning, issues and acquisition –Introduction to predicate logic-Rule-based knowledge representation – the rules- representation of knowledge using rules-predicate calculus using rulesunification-forward chaining and backward chaining –resolution.

Symbolic reasoning under uncertainty – Non monotonic reasoning –truth maintance systems-sources of uncertainty probability and bayes theorem-approaching uncertainty using fuzzy set.

Unit-II **10 Hrs**

Heuristic search – Search as a problem solving techniques-heuristic search-hill climbing-best-first search evaluation of heuristic functions-admissibility, monotonicity and informed ness.

State space search: strategies for state space search-implementation of graph search: Depth first search, breadth first etc -production system-application of search techniques in Game playing-Game playing-minimax –alternative to minimax-iterative deepening.

Unit-III **10 Hrs**

Expert system- Stages in the development of expert system-probability-based expert system-expert system tools.

Fuzzy systems – Basics of fuzzy logic and fuzzy control system –justification, fuzzy inference and defuzzification

Unit –IV **10 Hrs**

Neural networks – Perceptrons –feed forward neural network with back propagation algorithm –self-organizing map

Unit- V **08 Hrs**

Genetic algorithms – Natural selection – rank method –rank space method- Genetic programming.

Other learning algorithms – Winston's learning – version space algorithm.

Reference:

1. Artificial Intelligence by Elain Rich and Knight
2. Artificial intelligence and intelligence system by N.P.Pathy-oxford publication
3. Artificial intelligence by Patric Henry Winston –Pearson
4. Artificial Intelligence by George Lugar –Pearson
5. Artificial Intelligence –A modern approach – Stuart Russell and Peter Norwig-Pearson

MSc 3.5D Digital Image Processing

Total Hours : 48

Unit I. **8 Hrs**

Introduction: Defination, Origin, and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing.

Digital Image Fundamentals : Basic concepts, Image digitization, Basic Relationships between Pixels, Digital image Properties.

Unit II. **10 Hrs**

Intensity Transformations and Spatial Filtering: Intensity transformations, contrast stretching,histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

Unit III. **10 Hrs**

Filtering in the Frequency Domain : Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Unit IV. **10 Hrs**

Image Restoration and Reconstruction : Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

Morphological Image Processing : Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

Unit V. **10 Hrs**

Image Segmentation: Boundary detection based techniques, Point,line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region based segmentation, Watershed algorithm, Use of motion in segmentation.

Representation and Description: Boundary following, Chain codes, Polygon Approximation Approaches, signatures, Boundary descriptors, Regional descriptors, Use of Principal Components for description.

Reference Books:

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearson Education,3rd Edition, 2008.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis and Machine Vision”, Cengage Learning; 4 edition (1 January 2014)
3. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall of India Pvt. Ltd., 1997.
4. Richard O. Duda, Peter E. Hart, David G. Stork, “ Pattern Classification”, John Wiley & sons, 2nd Edition, 2008.

5. Earl Gose, Richard Johnsonbaugh, Steve Jost "Pattern Recognition and Image analysis", Prentice Hall PTR, 1996

MSc 3.5E Software Architectures

Total Hours : 48

Unit –I **10 Hrs**

Introduction; What software architecture is and what it is not; Architectural Structures and views; Architectural patterns; What makes a "good" architecture? Why is software important?

Context of Software Architecture: Technical Context; Project life-cycle context; Business context; Professional context; Stake holders; How is Architecture influenced? What Do Architecture influence?

Unit-II **10 Hrs**

Understanding Quality Attributes
Architecture & Requirements; Functionality; quality attribute considerations; Specifying and achieving Quality attribute requirements; Guiding quality design decisions; Availability; Interoperability; Modifiability; Performance; Security; Testability; Usability

Unit-III **10 Hrs**

Quality Attribute modeling and Analysis

Modeling Architecture to enable quality attribute analysis; Quality attribute check lists; Through experiments and Back-of-the envelope analysis; Experiments; Simulations and prototypes; Analysis at different stages of the life cycle

Unit-IV **10 Hrs**

Architecture and requirements Gathering ASRs from requirements documents; ASRs by interviewing stake holders; ASRs by understanding the business; capturing ASRs in a utility tree; Typing the methods together

Designing an Architecture: Design strategy; the attribute driven design methods; the steps of ADD

Unit- V **08 Hrs**

Documenting Software Architecture
Uses and Audiences for architecture documentation; Notations, View and Behavior; Documentation and quality attributes

Architecture, Implementation & Testing Architecture and implementation; Architecture and testing

Architectural Patterns: Introduction to patterns; From Mud to structure; Layers; Pipes and filters; Blackboard; Distributed systems; Brocker; Interactive systems; Model-view-control; Presentation-abstraction- control; Adaptable systems; Microkernel .

Reference Books:

1. Software Architecture in Practice, Len Bass, Paul Clements, Rick Kazman: Pearson Education, 2013 3d Edition, (Listed Topics only from Chapters (1,2,3,4,5,6,7,8,9,10,11,14,16,17,18,19)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern- Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2012 (chapter 2)
3. Software Architecture: Foundations, Theory, and Practice, Richard N. Taylor, Nenad Medvidovic and Eric M. Dashofy Wiley- India 2012
4. Software Architecture-Perspectives on an Emerging Discipline, Mary Shaw and David Garlan: Prentice Hall of India, 2007.
5. Software Architecture in Practice, Len Bass, Paul Clements, Rick Kazman: 3d Edition, Pearson Education, 2013 .
6. Software Architecture: Perspectives on an Emerging Discipline : Perspectives on an Emerging Discipline 1 Edition, Mary Shaw, David Gurlan, PHI Learning2009.
7. Pattern-Oriented Software Architecture : A System of Patterns (Volume - 1) 1st Edition Terrence Chan, PHI Learning 2009.

MSc 4.5A Compiler Design

Total Hours : 48

Unit- I

Introduction, Lexical analysis **10 Hrs**

Language processors; the structure of a Compilers; The evolution of programming languages; The science of building a compiler; Applications of Compiler technology; Programming language basics; Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

Unit-II **10 Hrs**

Syntax Analysis - 1

Introduction; Context-free Grammars; Writing a Grammar; Top-down Parsing

Syntax Analysis – 2

Bottom-up Parsing; Introduction to LR Parsing: Simple LR.

Syntax Analysis – 3

More powerful LR parsers; Using ambiguous grammars; Parser Generators.

Unit-III **10 Hrs**

Syntax-Directed Translation

Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax-directed translation schemes

Unit-IV **10 Hrs**

Intermediate Code Generation

Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Type checking; Control flow; Back patching; Switch statements; Intermediate code for procedures.

Unit- V **08 Hrs**

Run-Time Environments

Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection

Code Generation: Issues in the design of Code Generator; the Target language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator.

Reference Books:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers-Principles, Techniques and Tools, 2nd Edition, Addison-Wesley, 2007. (Chapters 1, 3.1 to 3.4, 4, 5.1 to 5.4, 6, 7.1 to 7.5, 8.1 to 8.6)
2. Charles N. Fischer, Richard J. LeBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 1991.
3. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997.
4. Kenneth C Louden: Compiler Construction Principles & Practice, Thomson Education, 1997.
5. Compilers: Principles, Techniques and Tools 2 Edition, Monica S.Lam, Pearson (2008)
6. Compiler Design 1st Edition , K.Muneeswaran, OUP India (2012)

M. Sc 4.5B Data Warehousing and Data Mining

Total Hours : 48

Unit -I **10 Hrs**

Introduction to data warehousing – The need for data warehousing (1.2), Operational and informational Data stores(1.5), Data warehouse definition and characteristics (1.6), Data warehouse architecture (1.7)
Data warehousing component - Data warehouse Database (6.2), Sourcing, Acquisition, Cleanup and transformation tools (6.3), Metadata (6.4), Access tools (6.5), Data marts(6.6), Data warehousing administration and management (6.7), Information delivery system.

Unit-II **10 Hrs**

Online analytical processing (OLAP) - Need for OLAP (13.1), Multidimensional data model (13.2), OLAP guidelines (13.3), Multidimensional vrs. Muiltirelational (OLAP (13.4), Categorization of OLAP tools (13.5), OLAP tools internet (13.6)
Statistics- Data counting and probability (15.1), Hypothesis testing (15.2), Contingency Tables, The chi square test, and non-causal relationship.

Unit-III **10 Hrs**

Introduction to data mining – The motivation (17.2), Learning from past mistake (17.3), Data mining (17.4), Measuring data mining effectiveness(17.5), Embedded data mining into business process (17.6), What is decision tree (18.1), Business score card (18.2), Where to use decision tree (18.3), The general idea (18.4), How the decision tree works (18.5).
Case study: Prediction wireless communication churn with CART.

Unit-IV **10 Hrs**

Nearest neighbor and clustering - Where to use clustering and nearest neighbor prediction (20.2), How clustering and nearest neighbor prediction works (20.4)
Case study: Image recognition for human handwriting

Unit-V **08 hrs**

Genetic Algorithm - What are Genetic Algorithms (21.1), Where to use Genetic Algorithm? (21.2), the general idea (21.3), How the Genetic algorithm works (21.4)
Case study: Optimizing predictive customer segment

Reference Books:

1. "*Principles and Implementation of Data Ware housing*" by Rajeev Parida Fire Wall Media, Lakshmi Publications. 2006.
2. "Building the Data Warehouse", W.H.Inmon, John Wiley & Sons.2002.
3. Data warehousing, Data mining and OLAP by Alex Berson& Stephon J. Smith, Tata McGraw Hill.2003
4. Data Warehousing in the Real World – A Practical Guide for Building Decision Support Systems, Sam Anahory& Dennis Murray, Pearson Education.2003.
5. Data warehousing, Data mining and OLAP by Alex Berson& Stephon J. Smith, Tata McGraw Hill.2003
6. Data Mining – Introductory and Advanced Topics, Margaret H. Dunham, Pearson Education., Prentice Hall 2003.
7. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, &Vipin Kumar, Pearson Addison Wesley, 2006.
8. Managing the Data Warehouse", W.H.Inmon, C.L.Gassey, John Wiley & Sons.2004.
9. "Advances in knowledge discovery & Data mining", Fayyad, Usama M. et. al.,MIT Press, 2003.

M.Sc. 4.5 C: Pattern Recognition

Total Hours : 48

Unit - I **10 Hrs**

INTRODUCTION: Applications of pattern recognition, statistical decision theory, image processing and analysis.

PROBABILITY: Introduction, probability of events, random variables, Joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

Unit – II **10 Hrs**

STATISTICAL DECISION MAKING: Introduction, Baye's Theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leavingone- out technique. Characteristic curves, estimating the composition of populations.

Unit - III **10 Hrs**

NONPARAMETRIC DECISION MAKING: Introduction, histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.

Unit – IV **10 Hrs**

CLUSTERING: Introduction, hierarchical clustering, partitional clustering.
ARTIFICIAL NEURAL NETWORKS: Introduction, nets without hidden layers. Nets with hidden layers, the back Propagation algorithms, Hopfield nets, an application.

Unit - V **08 Hrs**

PROCESSING OF WAVEFORMS AND IMAGES: Introduction, gray level sealing transfoniiations, equalization, geometric image and interpolation, Smoothing, transformations, edge detection, Laplacian and sharpening operators, line detection and template matching.

IMAGE ANALYSIS: Introduction, Scene segmentation and labeling, counting objects, perimeter measurement, Hough Tranforms, Morphological Operations, texture, Fourier transforms, The classification of White Blood Cells

REFERENCE BOOKS

1. "Pattern Recognition and Image Analysis", Eart Gose, Richard Johnsonburg and Steve Joust, Prentice-Hall of India-2003.
2. "Pattern Recognition and Image Analysis", Eart Gose, Richard Johnsonburg and Steve Joust, Prentice-Hall of India-2003.
3. "Pattern recognition: Statistical, Structural and neural approaches", Robert J Schalkoff, John Wiley2007.
4. Pattern Recognition, Pankaj Sharma,S K Kataria & Sons,2012.
5. Pattern Recognition: An Algorithmic Approach,M Narasimha Murthy, VSusheela Devi,Universities Press 2012.

M.Sc.4.5 D: Network and Information Security

Total Hours : 48

Unit-I **10 Hrs**

Network Security Fundamentals: Introduction, security Vulnerabilities and Threats, Classification of Security Services.

Cryptography: Encryption Principles, Conventional Encryption DES, IDEA, Algorithms, CBC, Location of Encryption Devices key Distribution.

Message Digests and Checksums, Message Authentication, Message Digests, Hash Functions and SHA, CRCs.

Unit-II **10 Hrs**

Public Key Systems: RSA, Diffie-Hellman, DSS, Key Management
Number Theory: Modular Arithmetic, Euclid Algorithm, Euler Theorem, Chinese Remainder Theorem.
Confidentiality, Integrity, Non-Repudiation, Mechanisms, Protocol Requirements, Options, Non-Repudiation - Process Non-Repudiation - Delivery.

Unit –III **10 Hrs**

Authentication, Password-Based Authentication, Address-Based Authentication, Certificates, Authentication Services.
Email Security, Threats, PGP, S/MIME.
Firewalls, Design Principles, Packet Filtering, Access Control, Trusted Systems, Monitoring and Management.

Unit-IV **10 Hrs**

IP Security: IP Overview, IP security Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Network Management.
Web Security, Web Security Threats, Web Security Requirements, Secure Socket Layer and Transport Layer Security, Secure Electronic Transactions.

Unit-V **08 Hrs**

Intruders: intrusion Techniques, Intrusion Detection.
Viruses, Access Control and Management, Access Control Policies, Access Control Mechanisms, Types of Viruses, Anti-virus Techniques

Reference:

1. Network security Essentials: Applications and Standards. William Stallings. Pearson Education. 1st Edition, 2000.
2. Network security Essentials: Applications and Standards. William Stallings. Pearson Education. 1st Edition, 2000.
3. Cryptography and Network Security. William stallings. Pearson Education.

2004.
4. Network Security : Kaufman Perlman and Speciner, PHI Publications.2002.
5. Network Security,A Decision and Game-Theoretic Approach, Tansu Alpcan, Universitof
6. Melbourne Tamer Başar, University of Illinois, Urbana-Champaign ,November 2010
7. Network Security Essentials : Applications and Standards (For JNTU) , Pearson
8. Publications, 2011

MSc 4.5E Unix System Programming

Total Hours: 48

Unit-I **12 Hrs**

Introduction:

UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX. 1 FIPS Standard, The X/Open Standards.

UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

Unit-II **12 Hrs**

UNIX Files: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory Files, FIFO File Class, Device File Class, Symbolic Link File Class, File Listing Program.

Unit-III **12Hrs**

UNK Processes

The Environment of a UNIX Process: Introduction, main function.Process Termination, Command-Line Arguments, Environment List,Memory Layout of a C Program, Shared Libraries, Memory Allocation,Environment Variables, setjmp and Iongjmp Functions, getrlimit,setrlimit Functions, UNIX Kernel Support for Processes.

Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3,wait4 Functions, Race Conditions, exec Functions, Changing User IDsand Group IDs, Interpreter Files, system Function, Process Accounting,User Identification, Process Times, I/O Redirection.

Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups,Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, JobControl, Shell Execution of Programs, Orphaned Process Groups.

Unit-IV **12 Hrs**

Signals and Daemon ProcessesSignals: The UNK Kernel Support for Signals, signal, Signal Mask, sigaction. The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers.

Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.

Interprocess Communication: Overview of JPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs. System V IPC, Message Queues, Semaphores, Shared Memory,

REFERENCE BOOKS:

1. Unix concepts and Applications, Sumitabha Das, Third Edition, TMH, 2003
2. Unix and Shell Programming, Behrouz A. Forouzan and Richard F. GilbergAText book, Thomson Edition 2003.
3. The complete reference UNIX, Kenneth Rosen, Douglas Host, James Farber & Richard Rosinski , MH, Edition 2000.
4. UNIX System Programming, K U Subhash, Pearson Higher Education,,2011
5. System Programming with C and Unix, Adam Hoover, Pearson Higher Education, 2009.