

Academic Regulations, Course Structure

MCA Master of Computer Applications (2 Year Program)



NARASARAOPETA ENGINEERING COLLEGE

(AUTONOMOUS)

Kotappakonda Road, Yellamanda (Post), Narasaraopet – 522601, Guntur District, AP
Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada,
Code: 47, Accredited by NBA & NAAC, RTA Approved Pollution test Centre,
ISO 9001 : 2008 Certified Institution

Phone: 08647-239905

[Website:www.nrtec.ac.in](http://www.nrtec.ac.in)

ACADEMIC REGULATIONS - 2020 FOR MCA (REGULAR)
(Effective for the students admitted into I year from the Academic Year 2020-21 and onwards)

1. ELIGIBILITY FOR ADMISSION

Admission to the above program shall be made subject to Eligibility, Qualification and Specialization as prescribed by the University from time to time. Admissions shall be made on the basis of merit / rank obtained by the candidates at the qualifying entrance test ICET or on the basis of any other order of merit as approved by the Government from time to time.

2. AWARD OF MCA DEGREE

A student will be declared eligible for the award of the MCA Degree, if he fulfills the following academic requirements.

- (a) Pursue a course of study for not less than two academic years and not more than four academic years.
- (b) The candidate registers for 80 credits and secure all 80 credits.

3. STRUCTURE OF THE PROGRAM

Semester	Credits
I MCA I SEM	22
I MCA II SEM	20
II MCA III SEM	22
II MCA IV SEM	16
TOTAL	80

- Each course is normally assigned a certain number of credits as follows:
- 3 credits for 3 lecture periods per week
 - 4 credits for 3 lecture periods + 1 tutorial
 - 2 credits for 4 laboratory periods per week.
 - 10 credits for project work.
 - 1 credit for Internship/Industry oriented Mini project.

4. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of the candidate in each semester shall be evaluated subject wise, with a maximum of 100 marks for Theory/Practical//Internship/Mini Project on the basis of either internal evaluation or end semester examinations/external evaluation or both internal and external evaluation. Project Work will be evaluated for 200 marks.

4.1 THEORY

For all theory courses consisting 6 units of syllabus in each subject, the assessment shall be for 40 marks through internal evaluation of 2 hours duration and 60 marks through external end semester examination of 3 hours duration.

4. 1. a. INTERNAL EVALUATION

The internal evaluation will be based on two cycle tests conducted in each semester. The 40 internal marks will be awarded as 80% of the best cycle and 20% of the least cycle examinations, where each cycle of examination contain

Descriptive test	- 30 Marks
Assignment	- 10 Marks

Each descriptive test question paper contains 3 questions one from each unit covering syllabus from 3 units (first 3 units for first cycle and remaining 3 units for second cycle). The student has to answer all the 3 questions (3X10M=30M). The descriptive examination will be conducted for 1½ hour duration.

In Assignment tests 5 or 6 questions from each unit will be declared in the class room at least one week in advance. In the Assignment test, each student will be given one question at random.

The Assignment Test – 1 will be conducted for 10 marks covering the syllabus from 1st & 2nd units. The Assignment Test - 2 will be conducted for 10 marks from 4th & 5th units.

4.1. b. EXTERNAL EVALUATION

The question paper comprises of two parts i.e. Part-A and Part-B. Part-A is compulsory and consists 6 questions covering all the units with equal marks. Each question in Part-A carries 2 marks (6X2M=12M). Part-B consists of 6 questions, one from each unit and the student has to answer 4 questions out of six (4x12M= 48M). The duration of end theory examination is 3 hours.

4.2 PRACTICALS

For practical subjects evaluation is as follows during the semester

4.2. a. INTERNAL EVALUATION

There shall be continuous evaluation during the semester for 40 internal marks. The internal marks shall be awarded as follows:

Record	- 10 Marks
Day-to-day work	- 15 Marks
Internal Lab Test	- 15 Marks

4.2. b. EXTERNAL EVALUATION

For practical subjects there shall be an external examination at the end of the semester for 60 marks in the presence of external examiner.

4.3 MOOCs

In order to inculcate continuous learning habit in students, Self-learning courses (Massive open online course) have been introduced.

Every student can register for MOOCs course offered by any reputed organization like NPTEL, COURSERA, SWAYAM, edX, Udacity etc., approved by the departmental Committee constituted by HOD. Student has to submit the progress of the MOOC's course (such as assignment submission etc.) to the departmental committee.

A Student is allowed to register and complete the MOOCs course even in the earlier semesters.

The Student has to submit certificate issued by the organization after successful completion of the online course to the department before the commencement of end examinations of that semester in which the MOOCs course is offered.

Departmental Committee will allot appropriate Grade/Grade Points after evaluation

A student will be awarded Pass Grade when he/she submits a pass MOOCs certificate with <60 percentage of marks. For remaining cases, grades will be awarded as per the regulations.

- 4.4** A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the end semester examination and a minimum of 50% of the total marks in the end semester examination and internal evaluation taken together.
- 4.5** In case the candidate does not secure the minimum academic requirement in any subject (as specified in 4.4) he/she has to re-appear for the end semester examination in that subject in the same Semester of the subsequent year. A candidate shall be given one more chance to re-register for internal evaluation in each subject provided the internal marks secured by a candidate is less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-register subject(s) shall be calculated separately to decide upon his/her eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks in the previous attempt stand cancelled. For re-registration the candidates have to apply to the college by paying the requisite fee and get approval from the authorities before beginning of the semester in which re-registration is required. Only two subjects are allotted for Re-registration.
- 4.6** In case the candidate secures less than the required attendance in any re-registered subject(s), He/She shall not be permitted to write the End examination in that subject. He/She shall again re-register the subject when next offered.
- 4.7** Laboratory examinations for MCA courses must be conducted with two examiners, one of them being the laboratory class teacher and the second examiner shall be appointed by the authorities from the panel of examiners submitted by the respective department.
- 4.8** There shall be an audit pass (Mandatory learning Course) course with no credits. There shall be no external examination. However, attendance in the audit course shall be considered while calculating aggregate attendance. Based on the day to day evaluation of each student, a Satisfactory/Not Satisfactory grade will be awarded. If any student gets Not Satisfactory grade, he/she has to reappear for the same course in the subsequent semester. Degree will be awarded only if student gets satisfactory grade.

5. INTERNSHIP/ MINI PROJECT

A Student should register for either Internship or Mini Project, not both.

Students are advised to take up Industrial Internship. Industrial Internship shall be evaluated for a total of 100 marks. Out of 100, 40 marks will be awarded by the departmental committee after evaluation. 60 marks will be awarded in the external examination in presence of external examiner. The time duration for internship shall be of 2 to 4 weeks during the inter semester break. After the completion of internship the student shall submit a certificate and a report to the concerned departmental committee constituted by the HOD for Evaluation.

In case, the student is unable to do Internship, he/she shall opt a Mini project. Mini Project shall be evaluated for a total of 100 marks. Out of 100, 40 marks will be awarded by the departmental committee after evaluation consisting of day-to-day work, reviews and the assessment of the project report. 60 marks will be awarded by an external examiner. Student has to submit the project report to the concerned departmental committee constituted by the Head of the Department. The evaluation of mini project work shall be conducted as and when offered.

6. PROJECT WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

- 6.1 A Project Review Committee (PRC) shall be constituted with Principal, HOD and two other senior faculty members of the department.
- 6.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical up to IV semester.
- 6.3 Every candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).
- 6.4 In the IV Semester, student has to do a project for 21 weeks (one full semester). The student should prepare a Project Report under the supervision of a guide from the faculty.
- 6.5 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee (PRC) shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of supervisor or topic as the case may be.
- 6.6 Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.
- 6.7 The thesis shall be adjudicated by one examiner selected by the Authorities. For this, the Head of the department shall submit a panel of 3 examiners, eminent in that field, with the help of the guide concerned.
- 6.8 Out of a total of 200 marks for the project work, 80 marks shall be for Internal Evaluation consisting of day-to-day work, reviews, the assessment of the project report and 120 marks for the external evaluation. The external evaluation shall be conducted by the committee. The committee consists of an External Examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the II year IV semester.

6.9 If the candidate gets Grade F (FAIL) in project viva voce, the candidate will retake the viva voce examination after 3 Months. If he fails to get one of the above grades other than grade F, he/she will not be eligible for the award of degree. If the candidate fails to secure one of the above Grades other than Grade F again, the Project shall be summarily rejected.

7. PASS MARK CRITERIA

A student shall be deemed to have satisfied the pass mark, if he secures not less than 40% of marks in the end examinations and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together as detailed below.

On passing a course of a program, the student shall earn the credits as assigned to that course.

S. No.	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Over all pass %	Over all pass mark
1	Theory	100	40	60	40	24	50	50
2	Practical	100	40	60	40	24	50	50
3	Mini Project/ Internship	100	40	60	40	24	50	50
4	Project work	200	80	120	40	48	50	100

8. ATTENDANCE REQUIREMENTS

- i. A student shall be eligible to appear for the end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects.
- ii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester for genuine medical reasons shall be approved by a committee duly appointed by the college. A fee stipulated by the college shall be payable towards condonation of shortage of attendance. However the number of condonations is restricted to two for the entire course.
- iii. A student who is short of attendance in a semester may seek re-admission into that semester when offered next time within 4 weeks from the date of commencement of class work.
- iv. If any candidate fulfills the attendance requirement in the present semester, he/she shall not be eligible for re-admission into the same semester.

9. COURSE PATTERN

- (i) The entire course of study is of two academic years and every year will have TWO Semesters.
- (ii) A student is eligible to appear for the end examination in a subject, but absent for it or has failed in the end examinations may appear for that subject in supplementary examinations, when conducted next.
- (iii) When a student is detained due to shortage of attendance, he may be re-admitted in to the same year/semester when offered next in which he/she has been detained.

10. METHOD FOR AWARDING OF GRADE POINTS FOR A SUBJECT

Marks Range	Level	Letter Grade	Grade Points
≥ 90	Outstanding	A+	10
80-89	Excellent	A	9
70-79	Very Good	B	8
60-69	Good	C	7
50-59	Satisfactory	D	6
<50	Fail	F	0
-	Absent	AB	0

11. Criteria for Award of Grades/Division

a. Calculation of Semester Grade Point Average (SGPA)* for Semester

The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is calculated as given below:

$$SGPA = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR= Credits of a course

GP = Grade Points awarded for a course

*SGPA is calculated for a candidate who passed all the courses in that semester.

b. Calculation of Cumulative Grade Point Average (CGPA) for Entire Program

The CGPA is calculated as given below:

$$CGPA = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR=Credits of a course

GP=Grade Points awarded for a course

*CGPA is calculated for a student who passed all the subjects in previous semesters along with current semester.

*The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

*Equivalent percentage = (CGPA – 0.75) x 10

c. Award of Division

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of MCA Degree and shall be placed in one of the following classes:

CGPA	Class
≥7.75	First Class with Distinction (with no subject failures)
≥ 6.75	First Class (with subject failures)
≥ 5.75 & < 6.75	Second Class
< 5.75	Fail

12. REVALUATION

1. Student can submit the application for revaluation, along with the prescribed fee for Revaluation of his/her answer script(s) of theory course(s) as per the notification issued by the Controller of Examinations.
2. The Controller of Examinations shall arrange for revaluation of such answer script(s). An External examiner, other than the first examiner shall reevaluate the answer script(s).

13. MINIMUM INSTRUCTION DAYS

The minimum instruction days for each semester shall be 90 working days.

14. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the college or if any case of indiscipline is pending against him, the result of such student will be kept withheld. His degree will be withheld in such cases.

15. TRANSITORY REGULATIONS

Discontinued or detained candidates are eligible for readmission as and when next offered. A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

- 15.1 A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of first year shall join the autonomous batch of first year first semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.
- 15.2 A student who is following JNTUK curriculum, detained due to shortage of attendance at the end of the second semester of first year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects will be offered in place of them as decided by the Board of Studies. The student has to clear his entire backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

- 15.2.1 The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.
- 15.2.2 Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder:

	Nature of Malpractices/ Improper conduct	Punishment
	<i>If the candidate:</i>	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the college.

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3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.

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6.	Refuses to obey the orders of the Chief Superintendent/ Assistant – Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

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9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the college for further action to award suitable punishment.	

OTHER MATTERS

- Physically challenged candidates who have availed additional examination time and a scribe during their UG / PG CET examinations will be given similar concessions on production of relevant proof / documents.
- The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the departments shall be reported to the Academic Council for ratification.

GENERAL

1. The academic council may, from time to time, revise, amend or change the regulations, schemes of examinations and / or syllabi.
2. Where ever the words 'he', 'him', 'his' occur in the regulations, they include 'she', 'her', 'hers'.
3. The academic regulation should be read as a whole for the purpose of any interpretation.
4. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

COURSE STRUCTURE

Semester	No. of Courses per Semester (Theory + Lab)	Credits
I	5Theory+3Labs	22
II	5Theory+3Labs	20
III	5Theory+3Labs+Internship\Industry Oriented Mini Project	22
IV	2Theory+Project Work(10)	16
	TOTAL	80

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I SEMESTER

S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA1101	C Programming and Data Structures	PC	3	1	0	4
2	R20MCA1102	Computer Organization	PC	3	0	0	3
3	R20MCA1103	Database Management Systems	PC	3	0	0	3
4	R20MCA1104	Operating Systems	PC	3	0	0	3
5	R20MCA1105	Mathematical and Statistical Foundations	BS&H	3	0	0	3
6	R20MCA1106	Data Base Management Systems Lab	PC	0	0	4	2
7	R20MCA1107	C Programming and Data Structures Lab	PC	0	0	4	2
8	R20MCA1108	Operating Systems and Linux Lab	PC	0	0	4	2
Total				15	1	12	22

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II SEMESTER

S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA1201	Computer Networks	PC	3	0	0	3
2	R20MCA1202	Object oriented Programming using JAVA	PC	3	0	0	3
3	R20MCA1203	Software Engineering	PC	3	0	0	3
4	R20MCA1204	Design and Analysis of Algorithm	PC	3	0	0	3
5	R20MCA1205	Program Elective-1 1. Artificial Intelligence 2. Advanced Unix Programming 3. Data Warehousing and Data mining 4. MOOCs-1 (NPTEL/SWAYAM/ COURSERA) Any recommended course	PC/PE	3	0	0	3
6	R20MCA1206	Object Oriented Programming using JAVA Lab	PC	0	0	4	2
7	R20MCA1207	Statistical Programming with R Lab	PC	0	0	4	2
8	R20MCA1208	Employability Skills Lab	BS&H	0	0	2	1
Total				15	0	10	20

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S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA2101	Machine Learning with Python	PC	3	0	0	3
2	R20MCA2102	Web Technologies	PC	3	0	0	3
3	R20MCA2103	Network Security and Cryptography	PC	3	0	0	3
4	R20MCA2104	Program Elective-2 1. Cloud Computing 2. Digital Image Processing 3. Internet of Things 4. Unified Modeling Languages 5. MOOCs-2 (NPTEL/SWAYAM/ COURSERA etc.,) Any recommended course	PE	3	0	0	3
5	R20MCA2105	Human Resource Management	MS	3	0	0	3
6	R20MCA2106	Web Technologies Lab	PC	0	0	4	2
7	R20MCA2107	Machine Learning with Python Lab	PC	0	0	4	2
8	R20MCA2108	Network Security, Cryptography & UML Lab	PC	0	0	4	2
9	R20MCA2109	Employability Skills-2	AC	1	0	0	0
10	R20MCA2110	Internship / Industry Oriented Mini Project	PW				1
Total				16	0	12	22

DEPARTMENT OF MCA**IV SEMESTER**

S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA2201	Program Elective-3 1. Block Chain technologies 2. Design Patterns 3. E-Commerce 4. MOOCs-3 (NPTEL/SWAYAM/COURSERA etc.,) 1. Full Stack Technologies 2. Deep Learning 3. Any recommended course	PE	3	0	0	3
2	R20MCA2202	Program Elective-4 1. Big Data Analytics 2. Cyber Security 3. Human Computer Interaction 4. MOOCs-4 (NPTEL/SWAYAM/COURSERA etc.,) 1. Data Science 2. Any recommended course	PE	3	0	0	3
3	R20MCA2203	Project Work/ Dissertation	PW	0	0	0	10
Total				6	0	0	16

***Students going for Industrial Project/Thesis will complete these courses through MOOCs (even in earlier semester)**

I MCA I SEMESTER SYLLABUS

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I SEMESTER

S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA1101	C Programming and Data Structures	PC	3	1	0	4
2	R20MCA1102	Computer Organization	PC	3	0	0	3
3	R20MCA1103	Database Management Systems	PC	3	0	0	3
4	R20MCA1104	Operating Systems	PC	3	0	0	3
5	R20MCA1105	Mathematical and Statistical Foundations	BS&H	3	0	0	3
6	R20MCA1106	Data Base Management Systems Lab	PC	0	0	4	2
7	R20MCA1107	C Programming and Data Structures Lab	PC	0	0	4	2
8	R20MCA1108	Operating Systems and Linux Lab	PC	0	0	4	2
Total				15	1	12	22

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1101	3	1	-	40	60	100	4
C Programming and Data Structures							

COURSE OBJECTIVES:

1. Formulating algorithmic solutions to problems and implementing algorithms.
2. To understand the various steps in Program development.
3. To understand the basic concepts in Program.
4. Comprehensive knowledge of data structures and ability to implement the same in software applications.

COURSE OUTCOMES:

- CO 1:** Demonstrate the basic knowledge of computer hardware and software.
CO 2: Ability to problem solving and logical skills in programming.
CO 3: Implement modular programming using functions.
CO 4: Interpret dynamic memory allocation using pointers and Organize data into files.

UNIT I

Introduction to Computers, HW and SW concepts, Algorithm, pseudo code, flowchart, program development steps, Introduction to various IDE's and their use in C program development, structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation. Control structures such as if, goto, labels, and switch statements.

UNIT II

Loops- while, do-while and for statements, break, continue, Arrays – concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1- D arrays other than strings, 2-D character arrays – 2-D arrays other than character arrays – Multidimensional arrays.

UNIT III

Functions: basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C pre-processor. Passing 1-D arrays, 2-D arrays , and functions.

Pointers: concepts, initialization of pointer variables, pointers and function arguments, passing by address –dangling memory, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

UNIT IV

Derived types: structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations

UNIT V

Data Structures: Introduction to Data Structures – Time Complexity – Space Complexity – Pattern matching – naive method – Robin Karp Algorithm - Searching – Linear and binary search methods, sorting – Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.

UNIT VI

Single linked lists, doubly linked lists, circular list, representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation. Trees- Binary trees, terminology, representation, traversals, Graphs - terminology, representation, graph traversals (dfs & bfs) – Warshalls – Dijkstra – Kruskal – Prims Algorithms.

TEXT BOOKS

1. Computer science, A structured programming approach using C, B.A.Forouzan and R.F. Gilberg, Third edition, Thomson.

REFERENCE BOOKS

1. Fundamentals of Data Structures in C , Horowitz, Sahni, Anderson-Freed, 2nd ed, Universities Press, 2008.
2. Classic Data Structures, Samanta, 2nd ed, PHI, 2009.
3. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/ Pearson.
4. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
5. DataStructures Using C , A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson.
6. Programming in C , Stephen G. Kochan, III Edition, Pearson .
7. Data Structures and Program Design in C, R.Kruse, Tondo, Leung, Shashi M, 2nd Edition, Pearson.
8. Data Structures and Algorithms, Aho, Hopcroft, Ullman, Pearson ,2006
9. C and Data Structures, Ashok N. Kamthane, Pearson.
10. C Programming and Data Structures, E Balaguruswamy, TMH, 2008.

DEPARTMENT OF MCA

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1102	3	-	-	40	60	100	3
Computer Organization							

COURSE OBJECTIVE:

Comprehensive knowledge of computer system including the analysis and design of components of the system.

COURSE OUTCOMES:

After completion of this course student will be able to

- CO 1:** The basic components of a computer, including CPU, memories, and input/output, and their organization representation of data, addressing modes, instructions sets.
- CO 2:** Discriminate different register transfer micro operations, Principles of hardwired and micro programmed control.
- CO 3:** Demonstrate various fixed and floating point arithmetic operations, performing the Arithmetic operations of binary number systems and formulating the arithmetic functions and solve scientific problems by means of a numerical analysis method.
- CO 4:** Extrapolate memory organization and input, output organizations.
- CO 5:** Generalize pipe line and vector processing, multi processors and its applications.

UNIT I

BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional Units, Basic Operational concepts, Bus Structures.

NUMBER SYSTEM AND COMPUTER ARITHMETIC:

Signed, Unsigned numbers, Addition and Subtraction, Multiplication, Division, Floating point representation, Logic operations, Gray Code, BCD Codes, Error Detecting Codes, Boolean Algebra, Simplification of Boolean Expressions, K-Maps.

UNIT II

COMBINATION AND SEQUENTIAL CIRCUITS:

Decoders, Encoders, Multiplexers, Half and Full Adders, Sequential Circuits, Flip flops, Registers.

UNIT III

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer registers, Computer instructions, Timing and control, Instruction cycle, Memory – Reference Instruction, Input – Output and Interrupt.

CENTRAL PROCESSING UNIT: General Register Organization, Stack organization, Instruction formats, Addressing modes, Data Transfer and manipulation, Program control.

UNIT IV

REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Micro operations, Logical Micro operations, Shift Micro operations, Arithmetic logic shift unit.

UNIT V

MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, Micro program example, design of control unit.

UNIT VI

THE MEMORY SYSTEM: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

INPUT-OUTPUT ORGANIZATION: Peripheral devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

TEXT BOOKS

1. Computer System Architecture, M.Moris Mano, 3rd Edition, Pearson/PHI
2. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006
3. Digital Logic Design, Moriss Mano, PHI

REFERENCES

1. Computer Organization, 5th ed., Hamacher, Vranesic and Zaky, TMH, 2002.
2. Computer System Organization & Architecture, John D. Carpinelli, Pearson, 2008.
3. Computer System Organization, Naresh Jotwani, TMH, 2009.
4. Computer Organization & Architecture: Designing for Performance, 7th edition.

DEPARTMENT OF MCA

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1103	3	-	-	40	60	100	3
Database Management Systems							

COURSE OBJECTIVE:

The objective of the course is to enable students to understand and use a relational database system. Introduction to Databases, Conceptual design using ERD, Functional dependencies and Normalization, Relational Algebra are covered in detail. Students learn how to design and create a good database and use various SQL operations. The course concludes with an overview of transaction management and introduction to advanced and non-relational databases.

COURSE OUTCOMES:

CO 1: Able to master the basic concepts and understand the applications of database systems.

CO 2: Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.

CO 3: Able to construct unary/binary/set/aggregate queries in Relational Algebra.

CO 4: Understand and apply database normalization principles.

UNIT I

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL, DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, History of Data base Systems. Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views – Destroying /altering Tables and Views.

UNIT II

Relational Algebra and Calculus: Relational Algebra – Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set – Comparison Operators, Aggregate Operators, NULL values – Comparison using Null values – Logical connectives – AND, OR and NOT – Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT III

Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND,THIRD Normal forms – BCNF –Properties of Decompositions-Loss less-join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT IV

Overview of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL.

Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking.

Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

UNIT V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.

UNIT VI

Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3 rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz,H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.
3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant B.Navathe,Pearson Education,2008.

REFERENCE BOOKS

1. Database Management System Oracle SQL and PL/SQL,P.K.DasGupta,PHI.
2. Database System Concepts,Peter Rob & Carlos Coronel,Cengage Learning,2008.
3. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg,Pearson education.
4. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2 nd ed.,ELSEVIER
5. Fundamentals of Relational Database Management Systems,S.Sumathi,S.Esakkirajan, Springer.
6. Introduction to Database Management,M.L.Gillenson and others,Wiley Student Edition.
7. Database Development and Management, Lee Chao,Auerbach publications,Taylor & Francis Group.
8. Introduction to Database Systems,C.J.Date,Pearson Education.

WEB REFERENCES:

1. nptel.ac.in/courses/106106093
2. nptel.ac.in/courses/106104135

DEPARTMENT OF MCA

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1104	3	-	-	40	60	100	3
Operating Systems							

COURSE OBJECTIVE:

Operating systems are an essential part of any computer system. It provides a clear description of the concepts that underlie operating systems.

COURSE OUTCOMES:

At the end of the course the student will be able to

- CO 1:** Classify different types of systems like distributed system, special purpose system and the working principle of system calls.
- CO 2:** Compute the waiting time and turnaround time of different CPU scheduling algorithms and comparison among all the CPU scheduling algorithms.
- CO 3:** Examine the page faults for different Page Replacement algorithms and comparison among all the Page Replacement algorithms, and methods to handle deadlocks.
- CO 4:** Differentiate among different File System implementation and directory implementation.
- CO 5:** Assess different types of disk scheduling algorithms, distinguish different protection and security mechanisms.

UNIT I

INTRODUCTION: Operating system structures – simple batch, Multi programmed, Time shared, Personal computer, Parallel, Distributed systems, Real time systems, system components, Operating System services, System calls, Virtual machines, System Design and Implementation.

UNIT II

PROCESS SCHEDULING:

Process Concept: Overview – Process Scheduling – Operations on Processes – co-operating processes, Inter process Communication – Examples of IPC Systems – Communication in Client and Server Systems. Threads: Overview, Multi-threading models, Threaded Libraries, Java Threads, Threading issues, case studies of UNIX, LINUX, Windows.

UNIT III

CPU SCHEDULING: Basic concepts, Scheduling criteria, Scheduling algorithms: FCFS scheduling, SJF, SRTF, Priority Scheduling, Round Robin scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling, Multiprocessor scheduling.

DEADLOCKS: System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT IV

PROCESS MANAGEMENT AND SYNCHRONIZATION: The critical - section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of Synchronization, Monitors, Synchronization examples.

UNIT V

MEMORY MANAGEMENT AND VIRTUAL MEMORY: Logical versus Physical Address space, Swapping, Contiguous Allocation, paging, Segmentation, Segmentation with Paging, Demand Paging, Copy-on-Write, Page replacement algorithms, Allocation of Frames, Thrashing.

FILE SYSTEM INTERFACE AND IMPLEMENTATION: File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Directory Implementation, Efficiency and Performance, Recovery, Log structured File System.

UNIT VI

MASS STORAGE STRUCTURE: Disk structure, Disk Scheduling, Disk and Swap Space Management, RAID Structure, Stable Storage structure.

PROTECTION : Goals of protection, Principles of protection, Domain of protection, Implementation of Access Matrix, Revocation of Access Rights, Capability Based Systems.

SECURITY: Introduction part of Security problem, Program Threats, System and Network Threats, Cryptography.

TEXT BOOKS

1. Operating System Concepts, 7/e, Abraham Silberschatz, Peter Galvin, Greg Gagne.

REFERENCE BOOKS

1. Operating Systems, 6/e , William Stallings, PHI/ pearson.
2. Operating Systems Design and Implementation, 3/e, Tanenbaum, WoodHull.

WEB REFERENCES:

1. nptel.ac.in/courses/106108101
2. nptel.ac.in/courses/106106144

DEPARTMENT OF MCA

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1105	3	-	-	40	60	100	3
Mathematical and Statistical Foundations							

COURSE OBJECTIVE:

1. This course will discuss fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science.
2. To know the fundamental concepts in Probability which is regarding to sample points in a Sample space, Large Samples, Small Samples and a queuing model.

COURSE OUTCOMES:

Upon completion of the course student will be able to

CO1: Demonstrate skills in solving mathematical problems.

CO2: Comprehend mathematical principles and logic.

CO3: Formulate null, alternative hypothesis and test its validity based on random sample.

CO4: Apply queuing models to find the optimum service rate.

UNIT I

Mathematical Logic:

Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Theory of inference for the statement calculus, Rules of inference, Consistency of premises and indirect method of proof, Automatic Theorem Proving.

Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus

UNIT II

Recurrence Relations:

Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, The method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

UNIT III

Graph Theory and its applications:

Representation of Graph, Spanning Trees, BFS, DFS, Prim's, Kruskals Algorithm, Binary trees, Planar Graphs.

Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

UNIT-IV

SAMPLING THEORY: Introduction - Population and samples- Sampling distribution of means (σ known)-Central limit theorem- Sampling distribution of means (σ unknown) - Sampling distribution of variances. Point estimation- Maximum error of estimate - Interval estimation.

UNIT-V

TEST OF HYPOTHESIS FOR LARGE SAMPLES:

Formulation of null hypothesis, critical regions, level of significance.

Large sample tests: test for single mean, test for two means, test for single proportion and test for two proportions.

UNIT-VI: TEST OF HYPOTHESIS FOR LARGE SAMPLES:

Small Sample tests: Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), χ^2 - test for goodness of fit, χ^2 - test for independence of attributes. ANOVA for one-way and two-way classified data.

TEXT BOOKS

1. Discrete Mathematical Structures with Applications to computer science J.P Tremblery, R. Manohar, TMH.
2. T. K. V. Iyenger, Krishna Gandhi, Ranganadhan and M.V.S.S. Prasad Probability and Statistics, S. Chand & Company Ltd, 2015.

REFERENCE BOOKS

1. Discrete Mathematics, J K Sharma, 2nd ed., Macmillan, 2005.
2. Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
3. Discrete Mathematics for computer science, Bogart, Stein and Drysdale, Springer, 2005.
4. Discrete Mathematics and its Applications, Rosen, 5th ed, T M Graw-Hill ed, 2006.
5. Discrete Mathematics for Computer Science, Gary Haggard, John Schlipf, Sue Whitesides, Cengage., 2006.

DEPARTMENT OF MCA

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1106	-	-	4	40	60	100	2
Database Management Systems Lab							

COURSE OUTCOMES:

After Completion of this course student must be able to

CO1: Understand, analyse and apply SQL commands like DDL, DML, DCL to perform different Database operations.

CO2: Understand and practice PL/SQL block, control statements and cursors.

CO3: Develop PL/SQL programs using functions & procedures.

CO4: Develop PL/SQL programs using packages and Triggers

1. Execute a single line and group functions for a table.
2. Execute DCL and TCL Commands.
3. Create and manipulate various DB objects for a table.
4. Create views, partitions and locks for a particular DB.
5. Write PL/SQL procedure for an application using exception handling.
6. Write PL/SQL procedure for an application using cursors.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write a PL/SQL block for transaction operations of a typical application using triggers.
9. Write a PL/SQL block for transaction operations of a typical application using package.
10. Design and develop an application using any front end and back end tool (make use of ER diagram and DFD).
11. Create table for various relation Implement the query in sql for
 - a) insertion b) retrieval c) updation d) deletion
12. Creating Views
13. Writing Assertion
14. Writing Triggers
15. Implementing operation on relation using PL/SQL
16. Creating Forms
17. Generating Reports
18. Typical Applications – Banking, Electricity Billing, Library Operation, Pay roll, Insurance, Inventory etc.

DEPARTMENT OF MCA

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1107	-	-	4	40	60	100	2
C Programming and Data Structures Lab							

COURSE OBJECTIVE:

1. To learn/strengthen a programming language like C, To learn problem solving techniques
2. To introduce the student to simple linear and nonlinear data structures such as lists, stacks, queues etc.,

COURSE OUTCOMES:

CO1: Study, analyse and understand logical structure of computer programming and different constructs to develop programs in C Language.

CO2: Know how to write, compile and debug programs in C Language.

CO3: Understand and analyse data types, typecasting and operator precedence.

CO4: Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions.

Exercise 1

- a) Write a C program to find the sum of individual digits of a positive integer.
- b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
Write a C program to generate the first n terms of the sequence.
- c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- d) Write a program which checks a given integer is Fibonacci number or not.

Exercise 2

- a) Write a C program to calculate the following Sum: $Sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$
- b) Write a C program to find the roots of a quadratic equation.
- c) Write a C program to implement Newton Raphson method for a quadratic equation
- d) Write a C program to implement Newton Raphson method for a general purpose algebraic equation

Exercise 3

Write C programs that use both recursive and non-recursive functions

- i) To find the factorial of a given integer.
- ii) To find the GCD (greatest common divisor) of two given integers.
- iii) To solve Towers of Hanoi problem.
- iv) Write program to calculate probability of head/tail by generating random numbers using random() function.

Exercise 4

- a) The total distance travelled by vehicle in t seconds is given by $distance = ut + \frac{1}{2}at^2$ where u and a are the initial velocity (m/sec.) and acceleration (m/sec²). Write C program to find the distance travelled at regular intervals of time given the values of u and a . The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of u and a .
- b) Write a C program, which takes two integer operands and one operator from the user,

performs the operation and then prints the result. (Consider the operators +,-,*,/, % and use Switch Statement)

Exercise 5

- a) Write a C program to find both the largest and smallest number in a list of integers.
- b) Write a C program that uses functions to perform the following:
 - i) Addition of Two Matrices
 - ii) Multiplication of Two Matrices
 - iii) Checking symmetricity of a square matrix.
 - iv) Calculating transpose of a matrix in-place manner.

Exercise 6

- a) Write a C program that uses functions to perform the following operations:
 - i) To insert a sub-string in to given main string from a given position.
 - ii) To delete n Characters from a given position in a given string.
- b) Write a C program to determine if the given string is a palindrome or not

Exercise 7

- a) Write a C program that displays the position/ index in the string S where the string T begins, or -1 if S doesn't contain T.
- b) Write a C program to count the lines, words and characters in a given text.

Exercise 8

- a) Write a C program to generate Pascal's triangle.
- b) Write a C program to construct a pyramid of numbers.

Exercise 9

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\dots+x^n$
For example: if n is 3 and x is 5, then the program computes $1+5+25+125$. Print x, n, the sum
Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if $n < 0$, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

Exercise 10

- a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
- b) Write a C program to convert a Roman numeral to its decimal equivalent.

Exercise 11

Write a C program that uses functions to perform the following operations using Structure:

- i) Reading a complex number
- ii) Writing a complex number
- iii) Addition of two complex numbers
- iv) Multiplication of two complex numbers

Exercise 12

- a) Write a C program which copies one file to another.
- b) Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)

Exercise 13

- a) Write a C program that uses functions to perform the following operations on singly linked list:
 - i) Creation
 - ii) Insertion
 - iii) Deletion
 - iv) Traversal
- b) Adding two large integers which are represented in linked list fashion.

Exercise 14

Write a C program that uses functions to perform the following operations on doubly linked list.

- i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways

Exercise 15

a.) Write C programs that implement stack (its operations) using

- i) Arrays ii) Pointers iii) linked list.

Exercise 16

a. Write C programs that implement Queue (its operations) using

- i) Arrays ii) Pointers iii) linked lists.

Exercise 17

Write a C program that uses Stack operations to perform the following:

- i) Converting infix expression into postfix expression ii) Evaluating the postfix expression

Exercise 18

a. Write a C program that uses functions to perform the following:

- i) Creating a Binary Tree of integers
ii) Traversing the above binary tree in preorder, inorder and postorder.
b. Program to check balance property of a tree.
c. Program to check for its strictness.

Exercise 19

Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: i) Linear search ii) Binary search

Exercise 20

Write C programs that implement the following sorting methods to sort a given list of integers in ascending order: i) Bubble sort ii) Quick sort

Exercise 21

- a. Write C programs that implement the following sorting methods to sort a given list of Integers in ascending order: i) Insertion sort ii) Bubble sort
b. Recursive implementation of sorting algorithms.

Exercise 22

Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

Exercise 23

- a. Program to calculate mean and standard deviation of a population.
b. Write C programs to implement the linear regression and polynomial regression algorithms.

Exercise 24

- a. Write C programs to implement Trapezoidal and Simpson methods.
b. Program for Calculating pi value.

REFERENCE BOOKS

1. Digital Fundamentals, Floyd, Jain, 8th ed , Pearson
2. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006

I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1108	-	-	4	40	60	100	2
Operating Systems and Linux Lab							

COURSE OBJECTIVE:

- To implement CPU scheduling algorithms
- To implement Disk scheduling algorithms
- To execute different types of Linux commands
- To write shell scripts

COURSE OUTCOMES (COS):

At the end of the course, student will be able to

- Implement various CPU scheduling algorithms and compare results
- Implement various disk scheduling algorithms and compare results
- Implement page replace algorithms
- Implement various memory management techniques.
- Execute basic Linux commands List of Experiments:

Operating Systems

1. Simulate the Following CPU Scheduling Algorithms A) FCFS B) SJF C) Priority D) Round Robin.
2. Multiprogramming-Memory Management- Implementation of fork (), wait (), exec () and exit () 3.
3. Simulate The Following a. Multiprogramming with A Fixed Number Of Tasks (MFT)
b. Multiprogramming with A Variable Number Of Tasks (MVT)
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention
6. Simulate The Following Page Replacement Algorithms. A) FIFO B) LRU C) LFU
7. Simulate the Following File Allocation Strategies A) Sequenced B) Indexed C) Linked

Linux Lab

1. Write a Shell program to check whether given number is prime or not.
2. Write a shell script which will display Fibonacci series up to the given range.
3. Write a shell script to check whether the given number is Armstrong or not.
4. Write a shell script to the calculate the value of $nc r$
5. Write a shell script to accept student number, name, marks in 5 subjects. Find total, average and grade using the following rules: Avg \geq 80 then grade A Avg $<$ 80&&Avg \geq 70 then grade B Avg $<$ 70&&Avg \geq 60 then grade C Avg $<$ 60&&Avg \geq 50 then grade D Avg $<$ 50&&Avg \geq 40 then grade E
6. Write a shell script to find minimum and maximum elements in the given list of elements.
7. Write a shell program to check whether the given string is palindrome or not.
8. Write an awk program to print sum, avg of student's marks list

Note: Student is expected to do any 5 of each section.

I MCA II SEMESTER SYLLABUS

DEPARTMENT OF MCA

II SEMESTER

S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA1201	Computer Networks	PC	3	0	0	3
2	R20MCA1202	Object oriented Programming using JAVA	PC	3	0	0	3
3	R20MCA1203	Software Engineering	PC	3	0	0	3
4	R20MCA1204	Design and Analysis of Algorithm	PC	3	0	0	3
5	R20MCA1205	Program Elective-1 1. Artificial Intelligence 2. Advanced Unix Programming 3. Data Warehousing and Data mining 4. MOOCs-1 (NPTEL/SWAYAM/ COURSERA) Any recommended course	PC/PE	3	0	0	3
6	R20MCA1206	Object Oriented Programming using JAVA Lab	PC	0	0	4	2
7	R20MCA1207	Statistical Programming with R Lab	PC	0	0	4	2
8	R20MCA1208	Employability Skills Lab	BS&H	0	0	2	1
Total				15	0	10	20

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1201	3	-	-	40	60	100	3
Computer Networks							

COURSE OBJECTIVES:

The course provides knowledge on the fundamental concepts of the Computer Networks and problem solving techniques on Networks.

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO 1: Interpret the basic computer network technology.

CO 2: Identify the different types of network topologies and protocols.

CO 3: Explain the layers of the OSI and TCP/IP model and the functions of each layer.

CO 4: Design and implement data link or network layer protocols within a simulated networking environment

UNIT I

Network Hardware Reference Model: Transmission Media, Narrowband ISDN, Broad-band ISDN, ATM.

The Data Link Layer: Error detection and correction, Elementary Data Link Protocols, Sliding window protocols.

UNIT II

Channel Allocation Methods: TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols, IEEE standard 802 for LANs, Ethernet, Token Bus, Token ring, Bridges.

UNIT III

Network Layer Routing Algorithms: Shortest path, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms, General principles of congestion control, Congestion prevention policies.

UNIT IV

Internet Working: Tunneling, internetworking, Fragmentation, Network Layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP.

Network Layer in the ATM Networks-cell formats, connection setup, routing and switching, service categories and quality of service, ATM LANs.

UNIT V

The Transport Layer: Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, End to End protocols: UDP, TCP Protocol and Remote Procedure Call.

UNIT VI

Application Layer: Network Security, Cryptographic Algorithms: DES, RSA. Security Mechanisms: Authentication Protocols, Firewalls, DNS, Protocols-SMTP, MIME, HTTP, SNMP.

TEXT BOOKS

1. Computer Networks Andrew, Tanenbaum, 4/e, Pearson.
2. Data and computer communications, Stallings, 8/e, PHI.

REFERENCE BOOKS

1. Data communications and networking, Forouzan, 4/e, TMH.
2. An Engineering approach to compute networking, Kesha, Pearson.
3. Communication networks, 2/e, Leon-Garcia, TMH.
4. Computer networks, C R Sarma, Jaico, Held, 7/e, Pearson.

WEB REFERENCES

1. https://onlinecourses.nptel.ac.in/noc18_cs38
2. <https://in.udacity.com/course/computer-networking--ud436>
3. <https://www.class-central.com/subject/computer-networking>
4. <https://www.youtube.com/watch?v=3DZLIItfbqtQ&list=PL32DBC269EF768F74>

DEPARTMENT OF MCA

I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1202	3	-	-	40	60	100	3
OBJECT ORIENTED PROGRAMMING							

COURSE OBJECTIVE:

1. To understand the difference between Procedure Oriented Programming and Object-oriented Programming.
2. Understand the importance of Exception Handling and create robust programs in Java which can withstand runtime errors.
3. To learn how to create Graphical User Interface applications in Java.
4. To learn how to create lightweight multithreaded applications with synchronization.
5. To learn how to develop web applications using java Applets.

COURSE OUTCOMES:

CO 1: To be able to analyse the real world problems in an Object Oriented way.

CO 2: Apply Encapsulation, Inheritance and Polymorphism features of Java appropriately to solve problems.

CO 3: To be able to create Java console, GUI and Web applications in Java.

CO 4: To be able to create lightweight multithreaded applications with synchronization.

UNIT I

Basics of Object Oriented Programming (OOP): Problems with Procedure Oriented Programming and Need for OO paradigm. A way of viewing world-Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of oops concepts, coping with complexity, abstraction mechanisms.

UNIT II

Java Basics: Data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, classes and objects - concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

UNIT III

Packages, Interfaces and Inheritance: Defining, creating and accessing a package, understanding CLASSPATH, importing packages. Differences between classes and interface. Defining an interface, applying interfaces, variables in interface and extending interfaces. Hierarchical abstraction, base class objects, Subclass, sub type, substitutability, forms of inheritance, Specialization, specification, construction extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, Super uses, using final with inheritance, polymorphism, abstract classes.

UNIT IV

Exception handling and Multithreading: Concept of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, Usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT V

Event Handling, AWT and Swings: Events, Event sources, Event classes, Event listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components – labels, button, canvas, scrollbars, text components, checkbox, checkbox groups, choice, lists, panels- scroll pane, dialogs, menu bar, graphics, layout manager - layout manager types - border, grid, flow, card and grid bag.

UNIT VI

Applets and Swings: Concepts of applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameter to applets. Limitation of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and Component, Icons and Labels, text fields, buttons - The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS

1. Java-The complete reference,7/e, Herbert schildt, TMH.

REFERENCE BOOKS

1. JAVA: How to program, 8/e, Dietal, Dietal,PHI.
2. Introduction of programming with JAVA,S.Dean,TMH.
3. Introduction to Java programming, 6/e, Y. Daniel Liang, Pearson.
4. Core Java 2, Vol 1(Vol 2) Fundamentals(Advanced), 7/e, Cay.S.Horstmann,Gary Cornell,Pearson.
5. Big Java2,3/e, Cay.S. Horstmann, Wiley.
6. Object Oriented Programming through Java, P. Radha Krishna, University Press.
7. JAVA&Object Orientation an Introduction, 2/e, John Hunt, Springer.
8. Introduction to JAVA Programming, 7/e, Y.Daniel Liang, Pearson.
9. AVA Programming and OO Application Development, Johnson, Cengage Learning.
10. First Encounter with JAVA, S.P.Bhuta, SPD
11. JAVA for Professionals, B.M.Harwani, SPD.
12. Program with JAVA, Mahesh Bhave, Palekan, Pearson.
13. Programming with JAVA, 3/e, E.Balaguruswamy, TMH.

WEB REFERENCES:

1. <http://www.w3schools.in/java/>
2. <https://docs.oracle.com/javase/tutorial/>
3. <https://docs.oracle.com/javase/tutorial/java/>

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1203	3	-	-	40	60	100	3
Software Engineering							

COURSE OBJECTIVES:

This course is intended to provide the students with an overall view over Software Engineering discipline and with insight into the processes of software development.

COURSE OUTCOMES:

After completion of this course the students should be able to

CO 1: Identify generic models of software development process.

CO 2: Understand fundamental concepts of Requirements Engineering and Analysis Modeling.

CO 3: Compare different design techniques and their implementation.

CO 4: List out various testing and maintenance measures.

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths.

A Generic View of Process: Software Engineering- A Layered Technology, A Process Framework, The Capability Maturity Model Integration (CMMI), Process Patterns, Process Assessment, Personal and Team Process Models.

UNIT II

Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, the Unified Process, Agile Models-Extreme Programming.

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

Requirements engineering processes: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

UNIT III

Design Engineering: Design Process and Design Quality, Design Concepts, the Design Model.

Creating an architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design.

UNIT IV

System models: Context Models, Behavioral models, Data models, Object models, structured methods.

Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution.

UNIT V

Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Product Metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

UNIT VI

Metrics for Process and Projects: Software Measurement, Metrics for Software Quality.

Risk management: Reactive vs Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: ISO 9000 quality standards, Six Sigma.

TEXT BOOKS

1. Software Engineering, A Practitioner's Approach- Roger S. Pressman, 7th edition. McGraw-Hill International Edition, 2005(Unit-1, 3, 5, 6)
2. Software Engineering- Somerville, 7th edition, Pearson education.(Unit-2,4)
3. Software Engineering, A Precise approach, Pankaj Jalote, Wiley.

REFERENCE BOOKS

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt, Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

WEB REFERENCES

1. nptel.ac.in/courses/106101061

I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1204	3	-	-	40	60	100	3
Design and Analysis of Algorithm							

COURSE OBJECTIVES:

Learn the student's good principles of algorithm design, elementary analysis of algorithms, and fundamental data structures. The emphasis is on choosing appropriate data structures and designing correct and efficient algorithms to operate on these data structures.

COURSE OUTCOMES:

After completion this course, the student should be able to:

- CO 1:** Analyze worst-case running times of algorithms using asymptotic analysis.
- CO 2:** Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.
- CO 3:** Describe the greedy, dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
- CO 4:** Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.

UNIT I

Introduction: Algorithm Specification, Performance Analysis -Space complexity, Time complexity, Asymptotic Notations (Big-oh notation, Omega notation, Theta notation, little-oh notation, little- Omega notation).

Disjoint Sets: Disjoint set operations, union and find algorithms.

UNIT II

Divide and Conquer: General method, Applications: Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.

UNIT III

Greedy method: General method, Applications: 0/1 Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest paths.

UNIT IV

Dynamic Programming: The General method, Applications: All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack, Reliability design, The Travelling sales person problem, Matrix-chain multiplication.

UNIT V

Backtracking: The General method, Applications: n-queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles.

UNIT VI

Branch and Bound: The method, Applications: 0/1 knapsack problem, Travelling sales person, LC Branch and Bound Solution. NP-Hard and NP-complete problems: Basic concepts, non-deterministic algorithms, cook's theorem.

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Satraj Sahni and Rajasekaram, Universities Press.

REFERENCE BOOKS

1. Design and Analysis of Algorithms, First Edition – S. Sridhar, Oxford.
2. Design and Analysis of Algorithms, Second Edition – Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education.
3. Design and Analysis of Computer Algorithms – Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education.
4. Introduction to the Design and Analysis of Algorithms, Third Edition – Anany Levitin, Pearson Education.

WEB REFERENCES

1. <http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html>
2. <https://www.coursera.org/learn/algorithms-divide-conquer>
3. <http://nptel.ac.in/courses/106101060/>
4. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.html>

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1205	3	-	-	40	60	100	3
Artificial Intelligence							

COURSE OBJECTIVE:

1. The main purpose of this course is to provide the most fundamental knowledge to the students so that they can understand what the AI is.
2. Due to limited time, we will try to eliminate theoretic proofs and formal notations as far as possible, so that the students can get the full picture of AI easily.
3. Students who become interested in AI may go on to the graduate school for further study.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Outline the fundamentals of artificial intelligence and characteristics of problems.

CO 2: Analyze different search techniques and predicate logic in artificial Intelligence.

CO 3: Interpret knowledge representation and symbolic reasoning using different rules.

CO 4: Interpret Statistical reasoning and filler structures.

CO 5: Apply various problem planning systems and different learning methodologies.

CO 6: Apply different language processing schemes while solving the real world problems.

UNIT - I

What is Artificial Intelligence? What is AI Technique?, Defining the problem as a State space search, production systems, Problem characteristics, Production System characteristics.

UNIT - II

Heuristic Search Techniques- Generate & Test, Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means Ends Analysis.

Predicate Logic– Representing Simple Facts in Logic, Representing Instances and Isa relationships, Computable functions and Predicates, Resolution, Natural deduction.

UNIT - III

Representing Knowledge Using Rules- Procedural vs Declarative knowledge, Logic Programming, Forward vs Backward Reasoning, Matching and Control Knowledge.

Symbolic reasoning under uncertainty– Introduction to non-monotonic Reasoning, Logics for non-monotonic reasoning, Implementation Issues, Implementation: Depth First Search, Breadth First Search.

UNIT - IV

Statistical Reasoning- Probability and Bayes' Theorem, Certainty Factors and Rule-based Systems, Bayesian Networks, Dempster-Shafer Theorem.

Weak and Strong Slot Filler Structures- Semantic nets, Frames, Conceptual dependency, Scripts.

UNIT - V

Planning- The Block world example, Components of a Planning System, Goal Stack Planning, Non Linear Planning using Constraint Posting, Hierarchical Planning.

Learning- Role of learning, Learning by taking advice, Learning in problem solving, Learning from examples: induction, Explanation-based learning, Discovery, Analogy.

UNIT - VI

Natural Language Processing- Syntactic processing, Semantic analysis, Discourse and pragmatic processing.

TEXT BOOKS:

1. Artificial Intelligence by Elaine Rich & Kevin Knight, Second edition, Tata Mcgraw hill.
2. Introduction to Artificial Intelligence and Expert Systems by Dan W. Paterson, PHI.

REFERENCE BOOKS:

1. Artificial Intelligence – A modern Approach by Stuart Russell and Peter Norvig, Second edition, Pearson.
2. Artificial Intelligence by Saroj Kaushik, Cengage Learning.

ONLINE REFERENCES:

1. <https://www.lynda.com/Data.../Artificial-Intelligence.../601798-2.htm>.
2. <https://freevidelectures.com/Course/2272/Artificial-Intelligence>
3. <https://www.technologyreview.com/.../you-could-become-an-ai-mast...>
4. <https://www.edx.org/course/artificial-intelligence-ai-columbiacx-csimm-101x-0>
5. <https://www.lynda.com/Data-Science-tutorials/Artificial-Intelligence-Foundations-Thinking-Machines/601798-2.html>
6. <https://www.journals.elsevier.com/artificial-intelligence/>
7. <https://www.technologyreview.com/s/600819/the-missing-link-of-artificial-intelligence/>

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1205	3	-	-	40	60	100	3
Advanced Unix Programming							

COURSE OBJECTIVES:

In this course student will learn about

1. Various utilities and filters in Unix operating system.
2. Programming in networking environment.
3. Various operating system functionalities including process management, file management, networking etc.
4. Inter Process Communication.
5. Network Programming through sockets.

COURSE OUTCOMES:

At the end of this course student will be able to

- CO 1:** Utilize various utilities in Unix operating system.
- CO 2:** Implement various OS functionalities using system calls.
- CO 3:** Implement Inter Process Communication.
- CO 4:** Implement network programming using sockets.
- CO 5:** Implement Remote Procedure Call

UNIT I

Review of Unix Utilities and Shell Programming: -File handling utilities, security by file permissions, process utilities, disk utilities, networking commands, backup utilities, text processing utilities,

UNIT II

Working with the Bourne shell-, What is a shell, shell responsibilities, pipes and input redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shells script examples.

UNIT III

Unix Files: Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, create, read, write, close, lseek, stat, fstat, octl, umask, dup, dup2. The standard I/O (fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar, fgets, gets), formatted I/O, stream errors, streams and file descriptors, file and directory maintenance (chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd), Directory handling system calls (opendir, readdir, closedir, rewinddir, seekdir, telldir)

UNIT IV

Unix Process: Threads and Signals: What is process, process structure, starting new process, waiting for a process, zombie process, process control, process identifiers, system call interface for process management: fork, vfork, exit, wait, waitpid, exec, system, Introduction to POSIX threads, Signals: Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

UNIT V

Data Management: Management Memory (simple memory allocation, freeing memory) file and record locking (creating lock files, locking regions, use of read/ write locking, competing locks, other commands, deadlocks).

UNIT- VI

Inter process Communication: Pipes and FIFOs.

System V IPC Mechanisms: Semaphores, Message Queues, Shared Memory.

Berkley sockets: Socket(), bind(), listen(), connect(), read(), write().

TCP client-server Example.

TEXTBOOKS:

1. Advanced Programming in the UNIX environment, 2nd edition, W. Richard Stevens and Stephen A. Rago.
2. UNIX network programming, 3rd edition, W. Richard Stevens, Bill Fenner, Andrew M. Rudoff.

REFERENCEBOOKS:

1. Unix and shell Programming, Sumitabha Das, TMH
2. A Beginner's Guide to Unix, N.P.Gopalan, B.Sivaselva, PHI
3. Unix Shell Programming, Stephen G.Kochan, Patrick Wood, 3/e, Pearson
4. Unix Programming, Kumar Saurabh, Wiley, India
5. Unix Shell Programming, Lowell Jay Arthus & Ted Burns, 3/e, GalGotia
6. Nix Concepts and Applications, Das, 4/e, TMH
7. Unix and shell Programming, N B Venkateswarlu, Reem
8. Unix Concepts and Applications, 3/e, Sumitabha Das, TMH

WEB REFERENCES

1. <https://www.learnshell.org>
2. <https://www.udemy.com/shellprogramming/>
3. <https://www.edureka.co/unix>

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1205	3	-	-	40	60	100	3
Data Warehousing and Data mining							

COURSE OBJECTIVES:

This course helps the students to understand the overall architecture of a data warehouse and techniques and methods for data gathering and data pre-processing by OLAP tool and outlier detection.

COURSE OUTCOMES:

After completion of this course, students should be able to

CO 1: Examine the types of data to be mined and extract knowledge using Data Mining Techniques.

CO 2: Analyze the different operations and techniques involved in Data Warehouse.

CO 3: Identify components in typical Data Warehouse architectures.

CO 4: Compare and contrast different dominant Data Mining Algorithms for classification, Association Analysis and Clustering.

UNIT I

Introduction to Data Mining: What Is Data Mining, Motivating Challenges, The Origins of Data Mining, Data Mining Tasks, Types of Data: Attributes and Measurement, Types of Data Sets, Data Quality: Measurement and Data Collection Issues, Issues Related to Applications.

UNIT II

Data: Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation, Measures of similarity and dissimilarity: Basics, Similarity and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, Similarities between Data Objects, Examples of Proximity Measures.

UNIT III

Data Warehouse and OLAP Technologies: What is a Data Warehouse, A Multidimensional Data Model: From tables to data cubes, Stars, snowflakes, and fact constellations(schemas for multidimensional databases), Examples for defining star, snowflake, and fact constellation schemas, Measures(their categorization and computation), Introducing concept hierarchies, OLAP operations in the multidimensional data model, A starlet query model for querying multidimensional databases, Data Warehouse Architecture: Steps for the design and construction of data warehouses, A three-tier data warehouse architecture, OLAP server architectures: ROLAP vs. MOLAP vs. HOLAP, SQL extensions to support OLAP operations, Data Warehouse implementation: Efficient computation of datacubes, Indexing OLAP data, Efficient processing of OLAP queries, Metadata repository, Data warehouse back-end tools and utilities.

UNIT IV

Classification: Basic Concepts, Decision Trees, and Model Evaluation: General Approach to Solving a Classification Problem, Decision Tree Induction: How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, Evaluating the

Performance of a Classifier: Holdout Method, Random Subsampling, Cross-Validation, Bootstrap Method.

Classification: Alternative Techniques: Bayesian classifier: Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier, SVM.

UNIT V

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Itemset Generation: The Apriori principle, Frequent Itemset Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support Counting, Rule Generation: Confidence-Based Pruning, Compact Representation of Frequent Itemsets: Maximal Frequent Itemsets, Closed Frequent Itemsets, FP-Growth algorithms: FP-Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm.

Association Analysis: Advanced Concepts: Handling Categorical Attributes, Handling Continuous Attributes: Discretization-Based Methods, Statistics-Based Methods, Non-discretization Methods.

UNIT VI

Cluster Analysis: Basic Concepts and Algorithms: Overview: What is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, K-means: The Basic K-means Algorithm, K-means and Different Types of Clusters, Strengths and Weaknesses, Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, DBSCAN: Traditional Density (center based approach), The DBSCAN algorithm, Strengths and Weaknesses.

TEXT BOOKS

1. Introduction to Data Mining: Pang-Ning tan, Michael Steinbach, Vipin kumar, Addison-Wesley. (UNIT – 1, 2, 4, 5, 6)
2. Data Mining, Concepts and Techniques, 2/e, Jiawei Han, Micheline Kamber, Elsevier, 2006. (UNIT – 3)

REFERENCE BOOKS

1. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson, 2008.
2. Introduction to Data Mining with Case Studies: GK Gupta; Prentice Hall.
3. Fundamentals of data warehouses, 2/e , Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
4. Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.

WEB REFERENCES

1. https://onlinecourses.nptel.ac.in/noc18_cs14
2. www.oracle.com/Data/Warehousing

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1206	-	-	4	40	60	100	2
Object Oriented Programming using JAVA Lab							

COURSE OBJECTIVE:

The course provides user interface and application development program implementation using core java principles.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Demonstrate his or her ability to write, compile & execute basic java program and also the use of OOP concept i.e. data abstraction & data hiding, encapsulation, inheritance, polymorphism.

CO2 : Create and use interfaces, threads.

CO3 : Handle exceptions and write applets.

CO4 : Knowledge of GUI for developing java components.

Note: 1) Use JDK 1.5 or above on any platform e.g. Windows or Unix.

2) Student is expected to complete any 16 programs.

1. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1,1.every subsequent value is the sum of the 2 values preceding it. Write A Java Program (WJJP) that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence.
2. WJJP to demonstrate wrapper classes and to fix the precision.
3. WJJP that prompts the user for an integer and then prints out all the prime numbers upto that Integer.
4. WJJP that checks whether a given string is a palindrome or not.
Ex. MALAYALAM is a palindrome.
5. WJJP for sorting a given list of names in ascending order.
6. WJJP to check the compatibility for multiplication , if compatible multiply two matrices and find its transpose.
7. WJJP that illustrates how runtime polymorphism is achieved.
8. WJJP to create and demonstrate packages.
9. WJJP, using String Tokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.
- 10.WJJP that reads on file name form the user then displays information about whether the file exists, whether the file is readable/writable, the type of file and the length of the file in bytes and display the content of the using FileInputStream class.
11. WJJP that displays the number of characters, lines and words in a text/text file.
12. Write an Applet that displays the content of a file.
- 13.WJJP that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +-*?% operations. Add a text field to display the result.

14. WAJP for handling mouse events.
15. WAJP demonstrating the life cycle of a thread.
16. WAJP that correctly implements Producer-Consumer problem using the concept of Inter Thread Communication.
17. WAJP that lets users create Pie charts. Design your own user interface(with Swings & AWT).
18. WAJP that allows user to draw lines, rectangles and ovals.
19. WAJP that implements a simple client/server application. The client sends data to a server.
The server receives the data, uses it to produce a result and then sends the result back to the client. The client displays the result on the console. For ex: The data send form the client is the radius of a circle and the result produced by the server is the area of the circle.
20. WAJP to generate a set of random numbers between two numbers x1 and x2, and $x1 > 0$.
21. WAJP to create an abstract class named shape, that contains an empty method named numberOfSides(). Provide three classes named Trapezoid, Triangle and Hexagon, such that each one of the classes contains only the method numberOfSides(), that contains the number of sides in the given geometrical figure.
22. WAJP to implement a Queue, using user defined Exception Handling (also make use of throw, throws).
23. WAJP that creates 3 threads by extending Thread class. First thread displays -Good Morning! Every 1 sec, the second thread displays -Hello! every 2 seconds and the third displays —Welcome! every 3 seconds. (Repeat the same by implementing Runnable).
24. Create an inheritance hierarchy of Rodent, Mouse, Gerbil, Hamster etc. In the base class Provide methods that are common to all Rodents and override these in the derived classes to perform different behaviors, depending on the specific type of Rodent. Create an array of Rodent, fill it with different specific types of Rodents and call your base class methods.

TEXT BOOKS:

1. The Complete Reference Java, 8/e, Herbert Schildt, TMH, 2011 (UNITS : I, IV, V & VI)
2. Programming in JAVA, 2/e, Sachin Malhotra, Saurabh Choudhary, Oxford, 2014, (UNITS: I, II & III)

REFERENCE BOOKS:

1. JAVA Programming, K. Rajkumar, 1/e, Pearson, 2013.
2. Core JAVA, Black Book, Nageswara Rao, Wiley, 1/e, Dream Tech, 2012.

WEB REFERENCES:

<https://www.tutorialspoint.com/java/index.html>

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1207	-	-	4	40	60	100	2
Statistical Programming with R Lab							

1. Write a program to illustrate basic Arithmetic in R
2. Write a program to illustrate Variable assignment in R
3. Write a program to illustrate data types in R
4. Write a program to illustrate creating and naming a vector in R
5. Write a program to illustrate create a matrix and naming matrix in R
6. Write a program to illustrate Add column and Add a Row in Matrix in R
7. Write a program to illustrate Selection of elements in Matrixes in R
8. Write a program to illustrate Performing Arithmetic of Matrices
9. Write a program to illustrate Factors in R
10. Case study of why you need use a Factor in R
11. Write a program to illustrate Ordered Factors in R
12. Write a program to illustrate Data Frame Selection of elements in a Data frame
13. Write a program to illustrate Sorting a Data frame
14. Write a program to illustrate List ? Why would you need a List
15. Write a program to illustrate Adding more elements into a List
16. Write a program to illustrate if-else-else if in R
17. Write a Program to illustrate While and For loops in R
18. Write a program to illustrate Compare and Matrices and Compare vectors
19. Write a program to illustrate Logical & and Logical | operators in R.
20. Write a program to illustrate Function inside function in R
21. Write a program to illustrate to create graphs and usage of plot() function in R
22. Write a program to illustrate Customising and Saving to Graphs in R.
23. Write a program to illustrate some built in Mathematical Functions.
24. Write a program to calculate mean, mode, SD, variance.
25. Write a program to implement linear regression.

DEPARTMENT OF MCA

I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA1208	-	-	2	40	60	100	1
Employability Skills Lab							

COURSE OBJECTIVES:

1. To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
2. To make the students understand the importance of body language.
3. To expose the students to SWOT Analysis.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Write effective Resume for employment..

CO 2: Make formal presentations using relevant technical style of communication and appropriate strategies for both academic and professional purpose.

CO 3: Participate in Group Discussions using analytical and problem solving skills.

CO 4: Face job interviews confidently and enhance employability.

UNIT I

Personal Introduction & JAM
SWOT Analysis

UNIT II

Resume and Video Portfolio
Non Verbal Communication
Professional Etiquette.

UNIT III

Presentation Skills

UNIT IV

Emotional Intelligence (How to face ambiguity, uncertainty and contingencies)

UNIT V

Group Discussion

UNIT VI

Interview skills- Mock Interviews

REFERENCE BOOKS:

1. Rajendra Pal, J S KorlahaHi, *Essentials of Business Communication*, Sultan Chand & Sons
2. Andrea J. Rutherford, *Basic Communication Skills for Technology*, Pearson Education Asia
3. V. Prasad, *Advanced Communication Skills*, Atma Ram Publications
4. Sanjay Kumar, Pushp Lata, *Communication Skills*, Oxford University Press
5. Meenakshi Raman, Sangeeta Sharma, *Fundamentals of Technical Communication*, Oxford University Press

II MCA III SEMESTER SYLLABUS

DEPARTMENT OF MCA**III SEMESTER**

S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA2101	Machine Learning with Python	PC	3	0	0	3
2	R20MCA2102	Web Technologies	PC	3	0	0	3
3	R20MCA2103	Network Security and Cryptography	PC	3	0	0	3
4	R20MCA2104	Program Elective-2 2. Cloud Computing 2. Digital Image Processing 3. Internet of Things 4. Unified Modeling Languages 5. MOOCs-2 (NPTEL/SWAYAM/ COURSERA etc.,) Any recommended course	PE	3	0	0	3
5	R20MCA2105	Human Resource Management	MS	3	0	0	3
6	R20MCA2106	Web Technologies Lab	PC	0	0	4	2
7	R20MCA2107	Machine Learning with Python Lab	PC	0	0	4	2
8	R20MCA2108	Network Security, Cryptography & UML Lab	PC	0	0	4	2
9	R20MCA2109	Employability Skills-2	AC	1	0	0	0
10	R20MCA2110	Internship / Industry Oriented Mini Project	PW				1
Total				16	0	12	22

II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2101	3	-	-	40	60	100	3
Machine Learning with Python							

COURSE OBJECTIVES:

The course is introduced for students to

- Gain knowledge about basic concepts of Machine Learning
- Study about different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about Dimensionality reduction

COURSE OUTCOMES:

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques
- Design application using machine learning techniques

UNIT I

Introduction

Learning Problems, Designing a learning system, Issues with machine learning Concept Learning, Version Spaces and Candidate Eliminations, Inductive bias.

UNIT II

Supervised and Unsupervised learning

Decision Tree Representation, Appropriate problems for Decision tree learning, Algorithm, Hypothesis space search in Decision tree learning, inductive bias in Decision tree learning, Issues in Decision tree learning K- Nearest Neighbor Learning, Locally Weighted Regression, Radial Bases, Functions, Case Based Reasoning

UNIT III

Artificial Neural networks

Neural Network Representation, Appropriate problems for Neural Network Learning, Perceptrons,

UNIT IV

Multilayer Networks and Back Propagation Algorithms: Remarks on Back Propagation Algorithms Case Study: face Recognition

UNIT V

Genetic algorithms

Hypothesis Space search, Genetic Programming, Models of Evaluation and learning, Parallelizing Genetic algorithms

UNIT VI:

Bayesian Learning

Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least squared Error Hypothesis, Maximim likelihood hypothesis for Predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm

Case Study: Learning to classify text,

TEXT BOOKS:

1. Tom M Mitchell, “Machine Learning”, McGraw Hill
2. Peter Harrington, “Machine Learning in Action”, DreamTech

REFERENCE BOOKS:

1. Henrik Brink, Joseph Richards, Mark Fetherolf, “Real-World Machine Learning”, DreamTech
2. Christopher Bishop, “Pattern Recognition and Machine Learning”
3. Hastie, Tibshirani, and Friedman, “Elements of Statistical Learning”. Springer
4. Jiawei Han and Michelline Kamber, “Data Mining: Tools and Techniques”, 3rd Edition.
5. I H Witten, Eibe Frank, Mark A Hall, “Data Mining: A practical Machine Learning Tools and techniques”, Elsevier

WEB REFERENCES

1. Coursera.org: Machine Learning by Andrew Ng, Stanford University

DEPARTMENT OF MCA

II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2102	3	-	-	40	60	100	3
Web Technologies							

COURSE OBJECTIVES:

The main objective of the course is to expose the students to different web technologies and prepare him to design, develop and maintain a web site.

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO 1: Acquaint with necessary fundamental skills for creating web applications.

CO 2: Install and manage web server software and study server side scripting languages like servlets and JSP.

CO 3: Acquire the concepts of java beans.

CO 4: Understand database access and use it in JSP and servlets.

UNIT I

Review of HTML 5: HTML Common Tags, List, Tables, images, forms, Frames, SVG, CSS3: Images, Rounded Corners, Shadows, Animations.

Client side Scripting: Introduction to JavaScript: JavaScript language, declaring variables, scope of variables, functions, Event handlers (onclick, onsubmit etc.), Document Object Model, Form validation, Simple AJAX application.

UNIT II

Introduction to Swing: Differences between AWT Controls & Swing Controls, Handling Swing Controls like Icons, Buttons, Text Boxes, Combo Boxes, Tabbed Panes, Scroll Panes, Layout Managers, Trees, Tables, Developing a Home page using Applets & Swing. Introduction to Applets, Life cycle of an Applet, Japplet.

UNIT III

Introduction to Servlets: Lifecycle of a Servlet, JSDK, the Servlet API, Types of Servlet (HTTP and Generic), The javax.servlet Package, Reading Servlet parameters, Reading Initialization Parameters, The javax.servlet.HTTP package, Handling, Http Request & Responses, Using Cookies, Session Tracking, Security Issues.

UNIT IV

Introduction to JSP: The Problem with Servlets, The Anatomy of a JSP Page, Differences between Servlets and JSP, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat.

UNIT V

JSP Application Development & Java Beans: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing – Displaying Values, Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data between JSP Pages, Requests and Users.

Java Beans: Introduction to Java Beans, Advantages of Java Beans, Introspection, Using Bound Properties, Bean Info Interface, Constrained Properties, Persistence, Customizers, Java Beans API, Deploying JAVA Beans in a JSP Page.

UNIT VI

Database Access: Database Programming using JDBC, JDBC Drivers, Studying javax.sql.*Package, Prepared statement, Result set, Accessing a Database from a JSP Page, Application Specific Database Actions.

TEXT BOOKS

1. Internet and World Wide Web: How to program, 6/e, Dietel, Dietel, Pearson(2008).
2. The Complete Reference Java2, 8/e, Patrick Naughton, Herbert Schildt, TMH.
3. Java Server Faces, Hans Bergstan, O'reilly.

REFERENCE BOOKS

1. Web Programming, building internet applications, 2/e, Chris Bates, Wiley Dreamtech
2. Programming world wide web, Sebesta, PEA
3. Web Tehnologies, 2/e, Godbole, kahate, TMH
4. An Introduction to Web Design , Programming ,Wang,Thomson

DEPARTMENT OF MCA

II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2104	3	-	-	40	60	100	3
NETWORK SECURITY AND CRYPTOGRAPHY							

COURSE OBJECTIVES

The objectives of this course are

1. To understand the fundamentals of Cryptography.
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across data networks.
5. To design security applications in the field of Information technology.

COURSE OUTCOMES

At the end of this course, the student should be able to

- CO1:** Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- CO2:** Identify the security issues in the network and resolve it.
- CO3:** Evaluate security mechanisms using rigorous approaches, including theoretical.
- CO4:** Compare and Contrast different IEEE standards and Electronic mail security.
- CO5:** Understand and use Security & Privacy mechanisms in EDI like E-mail.

UNIT I

Introduction

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs.

UNIT II

Conventional Encryption

Conventional Encryption Principles, Conventional encryption algorithms, Cipher block modes of operation, Location of encryption devices, key distribution, Approaches of Message Authentication, Secure Hash Functions and HMAC.

UNIT III

Public key Cryptography

Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management, Kerberos, X.509 Directory Authentication Service.

UNIT IV

IP Security

IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT V

Web Security

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Email Privacy

Pretty Good Privacy (PGP) and S/MIME.

UNIT VI

Intruder Types, Detection & Prevention Mechanisms

Intruders, Viruses and related threats.

Fire walls

Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

TEXT BOOKS

1. Network Security Essentials: Applications and Standards, William Stallings, PEA.

REFERENCE BOOKS

1. Network Security & Cryptography, Bernard Menezes, Cengage, 2010.
2. Fundamentals of Network Security, Eric Maiwald, Dream Tech.
3. Network Security: Private Communication in a Public World, Kaufman, Perlman, PEA/PHI.
4. Principles of Information Security, Whitman, Thomson.
5. Cryptography and Network Security, 3/e, Stallings, PHI/PEA.
6. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH.
7. Introduction to Cryptography, Buchmann, Springer.

DEPARTMENT OF MCA

II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2104	3	-	-	40	60	100	3
CLOUD COMPUTING							

COURSE OBJECTIVES:

This course will enable students

1. To gain knowledge about virtualization and Virtual Machines.
2. To familiarize Cloud Computing and its services.
3. Understand various basic concepts related to cloud computing technologies.
4. Understand different management applications.

COURSE OUTCOMES:

After Completion of this course the student should be able to

- CO 1:** Understand the Virtualization and applications for the state-of-the-art cloud computing.
- CO 2:** Carry out the Cloud Scale and value of Cloud Computing.
- CO 3:** Analyze the infrastructure of cloud computing including public, private and hybrid clouds and various services like PaaS, SaaS, IaaS etc.
- CO 4:** Monitor the Security in cloud.

UNIT I

Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the Integration as a Service ‘Paradigm for the Cloud Era. The Enterprise Cloudcomputing Paradigm.

UNIT II

Infrastructure as a Service (IAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service. Secure Distributed Data Storage in Cloud Computing.

UNIT III

Platform and Software as a Service (PAAS / SAAS):

Aneka, Comet Cloud, T-Systems, Workflow Engine for Clouds. Understanding Scientific Applications for Cloud Environments.

UNIT IV

Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing.

UNIT V

Performance Production for HPC on Clouds, Best Practices in Architecture Cloud Applications in the AWS cloud, Building Content Delivery networks Clouds, Resource Cloud Mashups.

UNIT VI

Governance and Case Studies: Organizational Readiness and Change management in the Cloud age. Data Security in the Cloud, Legal issues in Cloud computing. Achieving Production Readiness for Cloud Services.

TEXT BOOKS

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg.
2. Distributed and Cloud Computing. Kal Hwang. Geoffeiy C.Fox. Jack J.Dongarra. Esevier. 2012.

REFERENCE BOOKS

1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp2011.
2. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James Ransome. CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Redi SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Ktriaraswamy, Shahed Latif, O'Redç SPD, rp2011.

WEB REFERENCES:

1. <http://nptel.ac.in/courses/106106129/21>
2. <https://freevideolectures.com/course/3649/cloud-computing>
3. https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UIrhJ_JwyA5IIOCdEW1NArFke4jgtlg.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2104	3	-	-	40	60	100	3
DIGITAL IMAGE PROCESSING							

Course Outcomes:

By the end of the course the students will be able to

CO1: Process, quantize and to perform sampling on given images.

CO2: Transform and filter the digital image for improving the image quality.

CO3: Generate Color images by applying different image characteristics using different color models.

CO4: Compress the digital images by applying different lossless and lossy compression techniques.

CO5: Identify different representations and restoration of digital images.

UNIT I

Introduction to Digital Image Processing: Applications of digital image processing, Steps in digital image processing, Components of an Image Processing system, Image sampling and Quantization, Relationships between pixels.

Image Enhancement: Intensity transformations and spatial filtering, Point and Mask based techniques, Histogram processing, Fundamentals of spatial filtering, Smoothing and sharpening spatial filters.

UNIT II

Filtering in frequency domain: Fourier series and Transform, Discrete Fourier Transform, Frequency Domain Filtering Fundamentals, Homomorphic Filtering.

Color Image Processing: Color Fundamentals, Color characteristics, Color models, RGB, CYK, CMYK, HIS, YIQ models, Pseudo color image processing, full color image processing, color transformations, Smoothing and sharpening of images.

UNIT III

Image Restoration: Model of Image Degradation/Restoration process, Noise models, Linear, Inverse filtering, Mean Square Error Restoration, Least Square Restoration.

UNIT IV

Image Compression Fundamentals: Lossless and Lossy Compression, Basic Compression Methods: Huffman Coding, Run-Length Coding, LZW Coding, Arithmetic Coding, Bit-Plane Coding, Predictive Coding, Transform Coding, Wavelet Coding, Compression standards.

UNIT V

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation.

UNIT VI

Image Representation: Boundary Representation, Chain Codes, Polygonal Approximations, Signatures, Boundary Descriptors, Simple Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors, Texture.

TEXT BOOKS

1. Gonzalez R.C., Woods R.E., "Digital Image Processing", Pearson Education.
2. Vipula Singh, "Digital Image Processing with MATLAB and LABVIEW", Elsevier India.
3. Ganzalez R.C., "Digital Image Processing with MATLAB", Tata McGraw Hill.
4. Sonka Milan, "Image Processing Analysis and Machine vision", Cengage Learning.
5. William K. Pratt, "Digital Image Processing", Wiley India Pvt. Ltd.
6. Chanda B., Majumder D. Dutta, "Digital Image Processing and Analysis", PHI Learning.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2104	3	-	-	40	60	100	3
INTERNET OF THINGS							

COURSE OBJECTIVES:

1. To understand this fundamentals of Internet of Things.
2. To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
3. To apply the concept of Internet of Things in the real world scenario

COURSE OUTCOMES:

CO 1: Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things

CO 2: Conceptually identify vulnerabilities involving the Internet of Things

CO 3: Develop critical thinking skills

CO 4: Conceptually identify recent security attacks.

UNIT I

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices.

UNIT II

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV

Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet

UNIT V

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT VI

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Sensor Network Technology, Sensing the World.

TEXT BOOKS

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education.
2. Internet of Things, A. Bahgya and V. Madiseti, Univesity Press, 2015.

REFERNCE BOOKS

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.
2. Getting Started with the Internet of Things CunoPfister , Oreilly.

WEB REFERENCES

1. <https://www.youtube.com/watch?v=G4-CtKkrOmc>
2. http://www.cse.wustl.edu/~jain/cse570-13/m_18iot.htm
3. <https://www.youtube.com/watch?v=9ZUFYyXhQm8>
4. <https://www.udemy.com/introduction-to-iot-using-raspberry-pi-2/>

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2104	3	-	-	40	60	100	3
Unified Modeling Language							

COURSE OBJECTIVES:

The students become familiar with all phases of Object-Oriented Analysis and Design (OOAD). List out the Object Design Principles and understand how to apply them towards implementation.

COURSE OUTCOMES:

After completion this course, the student should be able to

CO1: Analyze software requirements and document those using Use Cases.

CO2: Utilize the notation of the UML diagrams such as Use Case, Class, Sequence, Activity, State chart, Deployment and Package Diagrams.

CO3: Acquire the knowledge of Library Files, Executable Files, Processors and Devices for a system.

CO4: Build the Forward and Reverse Engineering using UML notations.

UNIT I

Introduction to UML: The Meaning of Object-Oriented, Object Identity, Encapsulation, Information Hiding, Polymorphism, Genericity.

Why We Model: Importance of Modeling, Principles of Modeling, Object Oriented Modeling. **Introducing the UML:** An Overview of the UML, A Conceptual Model of the UML, Architecture and Software Development Life Cycle.

UNIT II

Basic Structural Modeling:

Classes: Terms and Concepts, Common Modeling Techniques-Modeling the Vocabulary of a System, Modeling the Distribution of Responsibilities in a System, Modeling Nonsoftware Things, Modeling Primitive Types.

Relationships: Terms and Concepts, Common Modeling Techniques-Modeling Simple Dependencies, Modeling Single Inheritance, Modeling Structural Relationships.

Common Mechanisms: Terms and Concepts, Common Modeling Techniques-Modeling New Building Blocks, Modeling Comments, Modeling New Semantics, Modeling New Properties.

Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Different Views of a System, Modeling Different Levels of Abstraction, Modeling Complex Views.

Advanced Structural Modeling:

Advanced Classes: Terms and Concepts, Common Modeling Techniques-Modeling the Semantics of a Class.

Advanced Relationships: Terms and Concepts, Common Modeling Techniques-Modeling Webs of Relationships.

Interfaces, Types and Roles: Terms and Concepts, Common Modeling Techniques-Modeling the Seams in a System, Modeling Static and Dynamic Types.

Packages: Terms and Concepts, Common Modeling Techniques-Modeling Groups of Elements, Modeling Architectural Views.

Instances: Terms and Concepts, Common Modeling Techniques-Modeling Concrete Instances, Modeling Prototypical Instances.

Class Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Simple Collaborations, Modeling a Logical Database Schema, Forward and Reverse Engineering.

Object Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Object

Structures, Forward and Reverse Engineering.

UNIT III

Basic Behavioral Modeling-I:

Interactions: Terms and Concepts, Common Modeling Techniques-Modeling a Flow of Control.

Interaction Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Flows of Control by Time Ordering, Modeling Flows of Control by Organization, Forward and Reverse Engineering.

Sequence Diagrams: Terms and Concepts, differences between Collaboration and Sequence Diagrams, Depicting Synchronous Messages with/without Priority Call Back Mechanism Broadcast Message.

Collaboration Diagrams: Terms and Concepts, Depicting a Message, Polymorphism in Collaboration Diagrams, Iterated Messages, use of self in messages.

UNIT IV

Basic Behavioral Modelling-II:

Use Cases: Terms and Concepts, Common Modeling Techniques-Modeling the Behaviour of an Element.

Use Case Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling the Context of a System, Modeling the Requirements of a System, Forward and Reverse Engineering.

Activity Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling a Workflow, Modeling an Operation, Forward and Reverse Engineering.

UNIT V

Advanced Behavioral Modeling:

Events and Signals: Terms and Concepts, Common Modeling Techniques-Modeling a Family of Signals, Modeling Exceptions.

State Machines: Terms and Concepts, Common Modeling Techniques-Modeling the Lifetime of an Object.

Processes and Threads: Terms and Concepts, Common Modeling Techniques-Modeling Multiple Flows of Control, Modeling Interprocess Communication.

Time and Space: Terms and Concepts, Common Modeling Techniques-Modeling Timing Constraints, Modeling the Distribution of Objects, Modeling Objects that Migrate.

State Chart Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Reactive Objects, Forward and Reverse Engineering.

UNIT VI

Architectural Modeling:

Components: Terms and Concepts, Common Modeling Techniques-Modeling Executables and Libraries, Modeling Tables, Files, and Documents, Modeling an API, Modeling Source Code.

Deployment: Terms and Concepts, Common Modeling Techniques-Modeling Processors and Devices, Modeling the Distribution of Components.

Component Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Source Code, Modeling an Executable Release, Modeling a Physical Database, Modeling Adaptable Systems, Forward and Reverse Engineering.

Deployment Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System,

Forward and Reverse Engineering.

Case Study: The Library Application, University Management System.

TEXT BOOKS

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education, 2004, 2007, 2009(UNIT-I, UNIT-II, Chapter 1 & 2 of UNIT-III, UNIT-IV, UNIT-V, UNIT -VI)
2. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education, 2005 (Chapter 3 & 4 of UNIT-III).

REFERENCE BOOKS

1. Applying UML and Patterns: An introduction to Object–Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
2. The Unified Modeling Language Reference Manual, 2/e, Rumbaugh, Grady Booch, etc., PEA
3. Object Oriented Analysis & Design, Satzinger, Jackson, Thomson
4. Object Oriented Analysis & Design, John Deacon, PEA
5. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

WEB REFERENCES

1. <https://www.uml-diagrams.org/uml-object-oriented-concepts.html>
2. <https://www.lucidchart.com/blog/uml-diagram-templates>
3. <https://www.smartdraw.com/uml-diagram/>
4. <https://www.ibm.com/developerworks/rational/library/769.html>

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2105	3	-	-	40	60	100	3
HUMAN RESOURCE MANAGEMENT							

COURSE OUTCOMES:

The student is able to

CO1: Outline the functions and challenges of HRM. [K4]

CO2: Apply different concepts of HR Planning, Recruitment, Selection, Training, Interviewing Techniques and Executive Development Programs. [K3]

CO3: Apply the uses of job analysis, job description, job specification, ergonomics in industry and the methods of job evaluation. [K3]

CO4: Utilize the various methods of performance appraisal. [K3]

CO5: Develop a sound compensation mechanism at global level, determinants of payment of wages and incentive plans. [K6]

CO6: Examine the role of trade unions, Grievance Handling Procedures, Industrial Disputes Resolution Mechanisms and stress management at work place. [K4]

UNIT I

INTRODUCTION TO HRM

Definition, Nature and scope of HRM – functions of HRM – Role and position of HRM- Differences between Personnel Management and HRM- Challenges of HRM.

UNIT II

OPERATIVE FUNCTIONS OF HRM

Perspectives of HRM- HR Planning Process – Recruitment– Sources of Internal and External Recruitment- Selection Procedure – Selection tests – Interview Techniques – Training Methods –On–the-job Training Methods- off-the-job Training Methods.

UNIT III

JOB ANALYSIS & DESIGN

Job Analysis- Uses of Job analysis – Job Description and Job Specification – Flexible Job Enrichment – Job Sharing – Tele Community – Ergonomics – Job Design and Job Evaluation.

UNIT IV

PERFORMANCE APPRAISAL

Meaning and Definition of Performance, Appraisal Traditional and Modern methods of Performance Appraisal– Latest trends in Performance Appraisal – Compensation concepts – current trends – methods of payment.

UNIT V

WAGE AND SALARY ADMINISTRATION & WELFARE MANAGEMENT

Concept of Wage – Wage Structure – legal Frame work – Determinants of payment of wages – Incentive payment systems- Welfare Management: Nature and Concepts – Statutory and Non-statutory welfare measures.

UNIT VI

INDUSTRIAL RELATIONS & CONTEMPORARY ISSUES IN HRM

Trade Unions – Grievance Handling Procedure- Collective Bargaining Methods–Industrial Disputes Resolution Mechanisms – Statutory provisions of Industrial safety – Stress Management at Work place.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. K Aswathappa: “*Human Resource and Personnel Management*”, Tata McGraw Hill, New Delhi, 2013
2. SubbaRao P: “*Personnel and Human Resource Management-Text and Cases*”, Himalaya Publications, Mumbai, 2013.

REFERENCE BOOKS:

1. N.SambasivaRao and Dr.Nirmal Kumar: “*Human ResourceManagement and Industrial Relations*”, Himalaya PublishingHouse, Mumbai
2. Mathis, Jackson,Tripathy:”*Human Resource Management:Asouth-Asin Perspective*”, Cengage Learning, New Delhi, 2013
3. MadhurimaLall, SakinaQasimZasidi: “*Human ResourceManagement*”, Excel Books, New Delhi, 2010
4. Muller_Camen. Croucher and Leigh: “*Human ResourceManagement- A Case Study Approach*”, JAICO Publishing, Delhi.
5. S.Seetharaman, B.VenkateswaraPrased: “*Human ResourceManagement*”, SCITECH Publication (India) Limited, Hyderabad,2009.
6. Gary Dessler, BijuVrkkey: “*Human Resource Management*”, Pearson Education, New Delhi, 2011
7. Uday Kumar Haldar: “*Human Resource Development*”, Oxford University Press,New Delhi, 2012.
8. NarendarSingh:”*Human Resource Management*”, Universities Press (India) Private Limited, Hyderabad, 2011.
9. B.B.Mahapatro:”*Human Resource Management*”, New Age International Publishers, New Delhi, 2011
10. R.S.Dwivedi: “*Human Relations and OrganisationalBehaviour*”, MacMillan Business Books, New Delhi, 2013.

DEPARTMENT OF MCA

II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2106	-	-	4	40	60	100	2
Web Technologies Lab							

COURSE OBJECTIVES

The main objective of the lab course is to expose the students to different programming aspects related to web designing using different technologies.

1. Understand web page site planning, designing, and maintenance.
2. Develop web sites which are secure and dynamic in nature and writing scripts which get executed on server as well.
3. Study the actual advanced Web methodologies, specifications and techniques.
4. Acquire the skills necessary to design, implement and deploy complex Web sites and applications.
5. Understands the concepts of PHP and AJAX to develop web pages & website.

COURSE OUTCOMES

After Completion of this course, the student should be able to:

CO 1: Get practical exposure on HTML, XHTML, CSS, JavaScript, XML and other web technologies.

CO 2: Get practical exposure to develop XML Technologies such as XML Schemas, XSLT.

CO 3: Get practical exposure to develop Server-Side Programming using Servlets and JSP's.

CO 4: Develop a web page & web site using AJAX and PHP.

Week-1

Design the following static web pages required for an online book store web site.

HOME PAGE

The static home page must contain three frames.

Top frame:

Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame:

At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.

Right frame:

The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.

Week-2:

1) Login Page:

This page looks like below:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : <input style="width: 100px;" type="text"/> Password: <input style="width: 100px;" type="password"/> <input type="button" value="Submit"/> <input type="button" value="Reset"/>			

2) CATALOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table.

The details should contain the following:

- | | |
|-----------------------------|-----------------|
| 1. Snap shot of Cover Page. | 2. Author Name. |
| 3. Publisher. | 4. Price. |
| 5. Add to cart button. | |

Note: Week 2 contains the remaining pages and their description.

3) CART PAGE: The cart page contains the details about the books which are added to the cart. The cart page should look like this:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Book name	Price	Quantity	Amount
	Java 2	\$35.5	2	\$70
	XML bible	\$40.5	1	\$40.5
	Total amount -			\$130.5

4) REGISTRATION PAGE:

Create a “*registration form*” with the following fields

- | | |
|--|-----------------------------------|
| 1) Name (Text field) | 2) Password (password field) |
| 3) E-mail id (text field) | 4) Phone number (text field) |
| 5) Sex (radio button) | 6) Date of birth (3 select boxes) |
| 7) Languages known (check boxes – English, Telugu, Hindi, Tamil) | |
| 8) Address (text area) | |

WEEK 3:

VALIDATION:

Write *JavaScript* to validate the following fields of the above registration page.

1. Name (Name should contains alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters length).
3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Phone number (Phone number should contain 10 digits only).

Week-4:

Design a web page using CSS (Cascading Style Sheets) which includes the following:

Use different font, styles: In the style definition you define how each selector should work (font,color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.

For example:

```
BODY { background-image: url(myimage.gif); }
<HTML>
<HEAD>
<style type="text/css">
B.headline { color: red; font-size: 22px; font-family: arial; text-decoration: underline }
</style>
</HEAD>
<BODY>
<b>This is normal bold</b><br>
Selector { cursor: value }
```

For example:

```
<html>
<head>
<style type="text/css">
.xlink { cursor: crosshair }
.hlink { cursor: help }
</style>
</head>
<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>
<b class="headline">This is headline style bold</b>
</HTML>
```

2) Set a background image for both the page and single elements on the page.

You can define the background image for the page like this:

3) Control the repetition of the image with the background-repeat property.

As background-repeat: repeat Tiles the image until the entire page is filled, just like an ordinary background image in plain HTML.

4) Define styles for links as A:link

A:visited
A:active
A:hover

Example:

```
<style type="text/css"> A:link { text-decoration: none }
A:visited { text-decoration: none } A:active { text-decoration: none }
A:hover { text-decoration: underline; color: red; } </style>
```

5) Work with layers: For example:

LAYER 1 ON TOP:

```
<div style="position: relative; font-size: 50px; z-index: 2;">LAYER 1</div> <div
```

```
style="position:relative; top:-50; left:5; color:red; font-size:80px; zindex: 1">LAYER  
2</div>
```

LAYER 2 ON TOP:

```
<div style="position:relative; font-size:50px; z-index:3;">LAYER 1  
</div> <div style="position:relative; top:-50; left:5; color:red; font-  
size:80px; zindex: 4">LAYER 2</div>
```

6) Add a customized cursor:

Selector {cursor:value}

For Example:

```
<html>  
<head>  
<style type="text/css">  
.xlink{cursor:crosshair}  
.hlink{cursor:help}  
</style>  
<body>  
<b>  
<a href="mypage.htm" class="xlink">CROSS LINK</a>  
<br>  
<a href="mypage.htm" class="hlink">HELP LINK</a>  
</b>  
</body>  
</html>
```

Week 5:

Write an XML file which will display the Book information which includes the following:

- | | |
|----------------------|-------------------|
| 1) Title of the book | 2) Author Name |
| 3) ISBN number | 4) Publisher name |
| 5) Edition | 6) Price |

Write a Document Type Definition (DTD) to validate the above XML file. Display the XML file as follows.

The contents should be displayed in a table. The header of the table should be in color GREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the above purpose.

Note: Give at least for 4 books. It should be valid syntactically.

Week-6:

VISUAL BEANS:

Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click. The color should also be changed if we change the color in the "property window".

Week-7:

1)Install TOMCAT web server and APACHE.

While installation assign port number 4040 to TOMCAT and 8080 to APACHE. Make sure

that these ports are available i.e., no other process is using this port.

2) Access the above developed static web pages for books web site, using these servers by putting the web pages developed in week-1 and week-2 in the document root.

Access the pages by using the urls : <http://localhost:4040/rama/books.html> (for tomcat)

<http://localhost:8080/books.html> (for Apache)

Week-8:

User Authentication:

Assume four users user1, user2, user3 and user4 having the passwords pwd1,pwd2,pwd3 and pwd4 respectively. Write a servlet for doing the following.

1. Create a Cookie and add these four user id's and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user(i.e., user-name and password match) you should welcome him by name(user-name) else you should display “ You are not an authenticated user “.

Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters() method.

Week 9:

Install a database(Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form). Practice 'JDBC' connectivity.

Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).

Week-10:

Write a JSP which does the following job:

Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

Week-11:

Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount)) of each category. Modify your catalogue page (week 2)in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

Week-12:

HTTP is a stateless protocol. Session is required to maintain the state. The user may add some items to cart from the catalog page. He can check the cart page for the selected items. He may visit the catalogue again and select some more items. Here our interest is the selected items should be added to the old cart rather than a new cart. Multiple users can do the same thing at a time(i.e., from different systems in the LAN using the ip-address instead of localhost). This can be achieved through the use of sessions. Every user will have his own session which will be created after his successful login to the website. When the user logs out his session should

get invalidated (by using the method `session.invalidate()`). Modify your catalogue and cart JSP pages to achieve the above mentioned functionality using sessions.

TEXT BOOKS

1. Internet and World Wide Web: How to program,6/e, Dietel, Dietel, Pearson(2008).
2. The Complete Reference Java2, 8/e, Patrick Naughton, Herbert Schildt, TMH.
3. Java Server Faces, Hans Bergstan, O'reilly.

WEB REFERENCES

1. <https://www.coursera.org/learn/html-css-javascript-for-web-developers>.
2. <https://www.coursera.org/learn/web-applications-php>.
3. <https://www.udemy.com/javawebtut/>.
4. <https://www.coursera.org/learn/desenvolvimento-agil-com-java-avancado/lecture/LUXm0/criando-java-servlets>.

II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2107	-	-	4	40	60	100	2
MACHINE LEARNING WITH PYTHON LAB							

COURSE OBJECTIVES

This course will enable students to

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice.

SYLLABUS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using *k*-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement *k*-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2108	-	-	4	40	60	100	2
Network Security, Cryptography & Unified Modeling Language LAB							

COURSE OBJECTIVES:

The students acquire the knowledge of various phases of Object-Oriented Analysis and Design (OOAD) Principles and understand how to apply them towards implementation.

COURSE OUTCOMES:

After completion this course, the student should be able to

CO 1: Understand how to model requirements with Use Cases.

CO 2: Utilize the principles to design packages for large scale software projects.

CO 3: Design the Dynamic Behaviour and Structure of the design.

CO 4: Apply the pragmatic approach to Software Design and Development.

1. Write a C program that contains a string (char pointer) with a value 'Hello world'.
The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'.
The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a Java program to implement RSA algorithm.

S. No.	Name of the Experiment
1	Banking System
2	Automatic Teller Machine (ATM) Application
3	Online Auction System
4	Railway Reservation System
5	Sending Secure File using Cryptography
6	Library Information System
7	University Course Registration System
8	Hospital Management System

TEXT BOOK

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education(2004).

REFERENCE BOOKS

1. Visual Modeling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education.
2. UML2 Toolkit, Hans-Erik Eriksson, etc; Wiley.

WEB REFERENCES

1. <https://www.uml-diagrams.org/uml-object-oriented-concepts.html>
2. <https://www.lucidchart.com/blog/uml-diagram-templates>
3. <https://www.smartdraw.com/uml-diagram/>
4. <https://www.ibm.com/developerworks/rational/library/769.html>

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2109	1	-	-	40	60	100	0
Employability Skills-2							

Course Objective

Enable the students to Analyze, Design and Develop a Mobile application by applying software tools like UML, Selenium Testing, Android Studio.

Course Outcomes

After completion this course, the student should be able to

CO1: Effectively use UML for Analysis of a given problem.

CO2: Effectively use UML for Design of a given problem.

CO3: Effectively use Android Studio for the development of Android application.

CO4: Automate testing using Selenium or any other tool.

UNIT I

Unified Modeling Language

UNIT II

Agile Scrum Methodology.

UNIT III

Selenium Software Testing

UNIT IV

Android App Development

Note: Student is expected to submit a project report on above tools.

II MCA IV SEMESTER SYLLABUS

IV SEMESTER

S. No.	Course Code	Course Name	Cat	L	T	P	Credits
1	R20MCA2201	Program Elective-3 5. Block Chain technologies 6. Design Patterns 7. E-Commerce 8. MOOCs-3 (NPTEL/SWAYAM/COURSERA etc.,) 1. Full Stack Technologies 2. Deep Learning 3. Any recommended course	PE	3	0	0	3
2	R20MCA2202	Program Elective-4 1. Big Data Analytics 2. Cyber Security 3. Human Computer Interaction 4. MOOCs-4 (NPTEL/SWAYAM/COURSERA etc.,) 1. Data Science 2. Any recommended course	PE	3	0	0	3
3	R20MCA2203	Project Work/ Dissertation	PW	0	0	0	10
Total				6	0	0	16

***Students going for Industrial Project/Thesis will complete these courses through MOOCs (even in earlier semester)**

II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2201	3	-	-	40	60	100	3
BLOCKCHAIN TECHNOLOGY							

COURSE OBJECTIVE

To understand the concepts of Block Chain, Block Chain networks and Security of Bitcoins.

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

- CO 1:** Interpret the working procedure of Bitcoins
- CO 2:** Analyze the Transactions in Bitcoin Network
- CO 3:** Analyze the Block Chain and Bitcoin Network
- CO 4:** Analyze the Mining and Consensus in Block Chain

UNIT I

Introduction: What is Bitcoin?, History of Bitcoin, Bitcoin Uses, Users and Their Stories, Getting Started, Quick Start Getting your first bitcoins, Sending and receiving bitcoins.

How Bitcoin Works: Transactions, Blocks, Mining, and the Block chain, Bitcoin Overview, Bitcoin Transactions, Common Transaction Forms, Constructing a Transaction, Getting the right inputs, Creating the outputs, Adding the transaction to the ledger, Bitcoin Mining, Mining transactions in blocks, Spending the transaction

UNIT II

Keys, Addresses, Wallets: Generating a public key, Bitcoin Addresses-Base58 and Base58Check Encoding, Key Formats .Wallets -Non-Deterministic (Random) Wallets Deterministic (Seeded) Wallets, Mnemonic Code Words, Hierarchical Deterministic Wallets (BIP0032/BIP0044) . Advanced Keys and Addresses - Encrypted Private Keys (BIP0038), Pay To Script Hash (P2SH) and Multi-Sig Addresses, Vanity Addresses, Paper Wallets.

UNIT III

Transactions: Introduction, Transaction Lifecycle - Creating Transactions, Broadcasting Transactions to the Bitcoin Network, Propagating Transactions on the Bitcoin Network, Transaction Structure, Transaction Outputs and Inputs - Transaction Outputs, Transaction Inputs, Transaction Fees, Adding Fees to Transactions. Transaction Chaining and Orphan Transactions, Transaction Scripts and Script Language - Script Construction (Lock + Unlock), Scripting Language, Turing Incompleteness, Stateless Verification. Standard Transactions - Pay to Public Key Hash (P2PKH), Pay-to-Public-Key, Multi-Signature, Data Output (OP_RETURN) ,Pay to Script Hash (P2SH).

UNIT IV

The Bitcoin Network: Peer-to-Peer Network Architecture , Nodes Types and Roles , The Extended Bitcoin Network , Network Discovery , Full Nodes , Exchanging -Inventory| ,Simplified Payment Verification (SPV) Nodes , Bloom Filters , Bloom Filters and Inventory Updates , Transaction Pools , Alert Messages.

UNIT V

Bitcoin Security: Security principles - Developing Bitcoin Systems Securely, The Root of Trust. User Security Best Practices - Physical Bitcoin Storage , Hardware Wallets , Balancing Risk (loss vs. theft) ,Diversifying Risk , Multi-sig and Governance , Survivability , Conclusion.

The Block chain: Introduction, Structure of a Block, Block Header, Block Identifiers - Block Header Hash and Block Height, The Genesis Block, Linking Blocks in the Block chain, Merkle Trees, Merkle Trees and Simplified Payment Verification (SPV).

UNIT VI

Mining and Consensus: Introduction - Bitcoin Economics and Currency Creation. Decentralized Consensus ,Independent Verification of Transactions, Mining Nodes , Aggregating Transactions into Blocks- Transaction Age, Fees, and Priority ,The Generation Transaction ,Coinbase Reward and Fees ,Structure of the Generation Transaction , Coinbase Data .Constructing the Block Header , Mining the Block - Proof-of-Work Algorithm , Difficulty Representation , Difficulty Target and Re-Targeting .Successfully Mining the Block , Validating a New Block ,Assembling and Selecting Chains of Blocks -Blockchain Forks .Mining and the Hashing Race - The Extra Nonce Solution ,Mining Pools . Consensus Attacks.

TEXT BOOKS

1. Mastering bitcoin: unlocking digital crypto-currencies, Andreas M. Antonopoulos, 2nd edition, O'Reilly publishers.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2201	3	-	-	40	60	100	3
DESIGN PATTERNS							

COURSE OBJECTIVES:

- Demonstrate the concept of Design patterns and its importance.
- Demonstrate the behavioural knowledge of the problem and solutions.
- Relate the Creational, Structural, behavioural Design patterns.
- Apply the suitable design patterns to refine the basic design for given context.

COURSE OUTCOMES:

CO1: Identify the appropriate design patterns to solve object oriented design problems.

CO2: Develop design solutions using creational patterns.

CO3: Apply structural patterns to solve design problems.

CO4: Construct design solutions by using behavioural patterns.

CO5: Demonstrate about Advanced Patterns like Pattern Catalogs

UNIT I

Introduction: History and Origin of Patterns, Design Patterns in MVC, Describing Design Patterns, How Design Patterns Solve Design Problems, Selecting a Design Pattern, Using a Design Pattern

UNIT II

Design Patterns-1: Creational, Abstract Factory-Builder, Factory Method, PrototypeSingleton

UNIT III

Design Patterns-2: Structural Patterns: Adapter, Bridge, Composite Decorator, Façade, Flyweight, Proxy

UNIT IV

Design Patterns-3: Behavioural Patterns, Chain of Responsibility, Command-Interpreter, Iterator- Mediator, Memento, Observer, State, Strategy, Template Method, Visitor

UNIT V

Advanced Patterns: Pattern Catalogs and Writing Patterns

UNIT VI

Patterns and Case Study: Designing a Document Editor Anti-Patterns - Case Studies in UML and CORBA, Pattern Community.

TEXT BOOKS

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design patterns: Elements of Reusable object-oriented software, Addison-Wesley, 1995.
2. James W Cooper, Java Design Patterns - A Tutorial, Addison-Wesley, 2000.

REFERENCE BOOKS

1. Craig Larman, Applying UML and Patterns: An Introduction to object- oriented Analysis and Design and iterative development ,3/e, Pearson, 2005.
2. Thomas J Mowbray and Raphael Malveau, CORBA and Design Patterns, John Wiley
3. William J Brown, Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis, John Wiley, 1998.

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III MCA V SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2201	3	-	-	40	60	100	3
E-COMMERCE							

COURSE OBJECTIVES:

This course will enable students

1. Explain to students why information systems are so important today for business and management.
2. Evaluate the role of the major types of information systems in a business environment and their relationship to each other.
3. Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges.

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO 1: Demonstrate an understanding of the foundations and importance of E-commerce.

CO 2: Demonstrate an understanding of retailing in E-commerce.

CO 3: Analyse the impact of E-commerce on business models and strategy.

CO 4: Describe Internet trading relationships including Business to Consumer, Business-to-Business & Intra-organizational.

UNIT I

Electronic Commerce, Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT II

Consumer Oriented Electronic commerce, Mercantile Process models.

UNIT III

Electronic payment systems , Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT IV

Intra Organizational Commerce: Work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT V

Corporate Digital Library: Document Library, Digital Document types, Corporate Data Warehouses. Advertising and Marketing, Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT VI

Consumer Search and Resource Discovery, Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing's, Desktop video conferencing.

TEXT BOOK

1. Frontiers of Electronic Commerce, Kolkata, Whinstone, PEA, 2006.

REFERENCE BOOKS

1. E-Commerce Fundamentals and Applications Hendry Chan, Raymond Lee, Dillon, Chang, John Wiley.
2. E-Commerce, A Managerial Perspective, Turban E, Lee J , King, Chung H.M.,PEA,2001.
3. E-Commerce An Indian Perspective , 3/e, P.T. Joseph, PHI,2009.
4. E-Commerce, S.Jaiswal. , Golgothia.
5. Electronic Commerce , Gary Schneider, Thomson.

WEB REFERENCES

1. <http://www.udemy.com/topic/e-commerce>.
2. <http://www.nptel.ac.in/topic/e-commerce>.

II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2202	3	-	-	40	60	100	3
BIG DATA ANALYTICS							

COURSE OBJECTIVES:

This course will enable students

1. Introducing Java concepts required for developing map reduce programs.
2. Optimize business decisions and create competitive advantage with Big Data analytics.
3. Derive business benefit from unstructured data.
4. Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
5. To introduce programming tools PIG & HIVE in Hadoop ecosystem.

COURSE OUTCOMES:

At the end of this course, the student should be able to

CO 1: Preparing for data summarization, query, and analysis.

CO 2: Applying data modelling techniques to large data sets.

CO 3: Creating applications for Big Data analytics.

CO 4: Building a complete business data analytic solution.

UNIT I

Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization.

UNIT II

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT III

Writing Map Reduce Programs: A Weather Dataset, Understanding Hadoop API for Map Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

UNIT IV

Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.

UNIT V:

Pig: Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

UNIT VI:

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

TEXT BOOKS:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne.

WEB REFERENCES:

1. Hadoop: <http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>

Piglatin: <http://pig.apache.org/docs/r0.7.0/tutorial.html>

DEPARTMENT OF MCA

II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
R20MCA2202	3	-	-	40	60	100	3
CYBER SECURITY							

COURSE OBJECTIVES:

This course will enable students

- 1.To gain a fundamental knowledge of what Cyber Security is and how it applies to your daily work.
- 2.To gain an understanding of terms commonly used in Cyber Security such as vulnerability.
- 3.To know how vulnerabilities occur and how to limit your exposure to them.
- 4.To gain a fundamental understanding of what an attack is and how to identify and prevent them from occurring.
- 5.To provide the fundamental skills and understanding needed to identify Cyber Security threats.

COURSE OUTCOMES:

At the end of this course, the student should be able to

CO 1: Possess a fundamental knowledge of Cyber Security.

CO 2: Understand what vulnerability is and how to address most common vulnerabilities.

CO 3: Know basic and fundamental Computer Forensics principles as it relates to Cyber Security.

CO 4: Have the knowledge needed to practice safer computing and safeguard your information.

CO 5: Understand basic technical controls in use today, such as firewalls and Intrusion Detection systems.

UNIT I

Understanding Computer Network Security: Securing the Computer Network Forms of Protection, Security Standards.

Security Threats to Computer Networks: Sources of Security Threats, Security Threat Motives, Security Threat Management, Security Threat Correlation, Security Threat Awareness.

Computer Network Vulnerabilities: Sources of Vulnerabilities, Vulnerability Assessment.

Cyber Crimes and Hackers: Cyber Crimes, Hackers, Dealing with the Rising Tide of Cyber Crimes.

UNIT II

Security Assessment, Analysis and Assurance: System Security Policy, Building a Security Policy, Security Requirements Specification, Threat Identification, Threat Analysis, Vulnerability Identification and Assessment, Security Certification, Security Monitoring and Auditing, Products and Services.

Access Control and Authorization: Access Rights, Access Control Systems, Authorization, Types of Authorization Systems, Authorization Principles, Authorization Granularity, Web Access and Authorization.

Authentication: Multiple Factors and Effectiveness of Authentication, Authentication Elements, Types of Authentication, Authentication Methods, Developing an Authentication Policy.

UNIT III

Firewalls: Types of Firewalls, Configuration and Implementation of a Firewall, The Demilitarized Zone (DMZ), Improving Security Through the Firewall, Firewall Forensics, Firewall Services and Limitations.

System Intrusion Detection and Prevention: Intrusion Detection, Intrusion Detection Systems (IDSs), Types of Intrusion Detection Systems, The Changing Nature of IDS Tools, Other Types of Intrusion Detection Systems, Response to System Intrusion, Challenges to Intrusion Detection Systems, Implementing an Intrusion Detection System, Intrusion Prevention Systems (IPSs), Intrusion Detection Tools.

The Art of Intrusion Detection: Basic Ideas of Intrusion Detection, Network-Based Detections and Host-Based Detections, Signature Detections, Statistical Analysis, Behavioral Data Forensics, Honeypots.

UNIT IV

The Art of Anti Malicious Software: Viruses, Worms, Virus Defense, Trojan Horses, Hoaxes, Peer-to-Peer Security, Web Security, Distributed Denial of Service Attacks.

Computer and Network Forensics: Computer Forensics, Network Forensics, Forensics Tools.

Virus and Content Filtering: Scanning, Filtering, and Blocking, Virus Filtering, Content Filtering, Spam.

UNIT V

Security in Wireless Networks and Devices: Cellular Wireless Communication Network Infrastructure, Wireless LAN (WLAN) or Wireless Fidelity (Wi-Fi), Standards for Wireless Networks, Security in Wireless Networks.

Security in Sensor Networks: The Growth of Sensor Networks, Design Factors in Sensor Networks, Security in Sensor Networks, Security Mechanisms and Best Practices for Sensor, Trends in Sensor Network Security Research.

UNIT VI

Security beyond Computer Networks: Information Assurance: Collective Security Initiatives and Best Practices.

Network Perimeter Security: General Framework, Packet Filters, circuit Gateways, Application Gateways, Trusted Systems and Bastion Hosts, Firewall Configurations, Network Address Translations, Setting up Firewalls.

TEXT BOOKS

1. Computer Network Security- Theory and Practice by Jie Wang, 2009 edition, Higher Education Press, Beijing and Springer-Verlag.
2. A Guide to Computer Network Security by Joseph Migga Kizza, 2009 Edition, Springer-Verlag London Limited.

REFERENCE BOOKS

1. Network Security Essentials- Applications and Standards by William Stallings, 4th edition.
2. Modern Cryptography: Theory and Practice by Wenbo Mao Hewlett-Packard Company, 1st edition, Prentice Hall PTR.
3. Network Security: Private Communication in a Public World by Charlie Kaufman, Radia Perlman, Mike Speciner, 2nd edition.
4. Cryptography and Network Security: Principles and Practice by William Stallings, 6th Edition.

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HUMAN COMPUTER INTERACTION							

UNIT I

Introduction: Importance of user Interface, definition, importance of good design. Benefits of good design. A brief history of Screen design The graphical user interface: Popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – interface popularity, characteristics- Principles of user interface.

UNIT II

Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, Understanding business junctions.

UNIT III

Screen Designing: Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

UNIT IV

Windows: Windows new and Navigation schemes selection of window, selection of devices based and screen based controls.

UNIT V

Components: Components text and messages, Icons and increases, Multimedia, colors, uses problems, choosing colors.

UNIT VI

Software tools: Specification methods, interface, Building Tools. Interaction Devices: Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers.

TEXTBOOKS

1. Human Computer Interaction. 3/e, Alan Dix, Janet Finlay, Goryd, Abowd, Russell Beal, PEA, 2004.
2. The Essential guide to user interface design, 2/e, Wilbert O Galitz, Wiley Dreaama Tech.

REFERENCEBOOKS

1. Designing the user interface. 4/e, Ben Shneidermann, PEA.
2. User Interface Design, Soren Lauesen , PEA.
3. Interaction Design PRECE, ROGERS, SHARPS, Wiley .
4. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.