SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
MCA   DEPARTMENT

ACADEMIC REGULATIONS-2020
COURSE STRUCTURE
AND
SYLLABI
OF

MASTER OF COMPUTER APPLICATIONS

INSTITUTE VISION

To emerge as a Centre of Excellence for Learning and Research in the

domains of engineering, computing and management.

INSTITUTE MISSION

- Provide congenial academic ambience with state-art of resources for learning and research.

- Ignite the students to acquire self-reliance in the latest technologies.

- Unleash and encourage the innate potential and creativity of students.

- Inculcate confidence to face and experience new challenges.

- Foster enterprising spirit among students.

- Work collaboratively with technical Institutes / Universities / Industries of National and International repute

DEPARTMENT VISION

To become the Centre of excellence for skilled software professionals in Computer Applications.

DEPARTMENT MISSION

- Provide congenial academic ambiance with necessary infrastructure and learning resources.
- Inculcate confidence to face and experience new challenge from industry and society
- Ignite the students to acquire self reliance in the State-of-the Art Technologies.
- Foster Enterprise spirit among students

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates of Computer Applications shall

	Programme Education Objectives of the department
PEO1	Have Professional competency through the application of knowledge gained from fundamental and advanced concepts of structural and functional components in software. (**Professional Competency**)
PEO2	Excel in one's career by critical thinking toward successful services and growth of the organization or as an entrepreneur or through higher studies. (**Successful Career Goals**)
PEO3	Enhance Knowledge by updating advanced technological concepts for facing the rapidly changing world and contribute to society through innovation and creativity. (**Continuing Education to Society**)

PROGRAMME OUTCOMES (PO's)

Computer Applications Graduates will be able to

	PROGRAMME OUTCOMES (PO's)
PO1	**Computational knowledge:** Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
PO2	**Problem analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.
PO3	**Design/development of solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex computing problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5	**Modern tool usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.
PO6	**Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.
PO7	**Innovation and Entrepreneurship:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large
PO8	**Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.
PO9	**Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.
PO10	**Communication Efficacy**: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long Learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

ACADEMIC REGULATIONS FOR MCA

(EFFECTIVE FOR THE STUDENTS ADMITTED INTO THE ACADEMIC YEAR 2020-21)

1. ELIGIBILITY FOR ADMISSION

- Admission to the above programme shall be made subject to the eligibility qualifications as prescribed by the university from time to time.

- Admission shall be made strictly on the basis of merit rank obtained by the qualifying candidates at an entrance test (ICET) to be conducted by the university or on the basis of any other order of merit approved by the university, subject to reservations prescribed by the Government of Andhra Pradesh.

2. AWARD OF DEGREE

A candidate shall be eligible for the award of respective degree if he/ she satisfies the minimum academic requirements

i. In every subject including the Comprehensive viva-voce and Project Work successfully completed in not less than prescribed course work duration and not more than double the prescribed course work duration with he/she has not involved in any sort of indisciplinary activities certified by the principal.

ii. Register for 88 credits and secure all 88 credits.

iii. Students, who fail to fulfill all the above academic requirements, shall forfeit their seat in MCA course and their admission will stand cancelled.

3. CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Science And Humanities (SAH), Professional Core (PC), Core Elective (CE), Comprehensive Viva Voice (CVV), Project Work (PW).

3.1. SUBJECT COURSE CLASSIFICATION

All subjects/ courses offered for the post graduate programme in MCA degree programmes are broadly classified as follows. The Institution has followed almost all the guidelines issued by AICTE/UGC.

S.No	Broad Course Classification	Course Group Category	Course Description
1	Core Courses	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Computer Applications
		MOOC	Online courses which include the courses concerned to the Computer science domain. (with 2 credits)
2	Elective Courses	CE - Core Electives	Includes electives subjects related to the parent discipline department of Computer Applications
3	Employability Enhancement Courses	PW - Project Work	Major project work
		Comprehensive Viva Voce	Comprehensive Viva-Voce (with 2 credits)
		Industrial training	Industrial Internship or Industrial visit (non Credit)
		Reasoning and Aptitude	Placement training which includes mathematical Reasoning skills and Technical skills to understand and solve the real life problems. (non Credit)

3.2 COURSE PATTERN

The entire course work for MCA is of four semesters. In I-I, I-II, II-I, II-II semesters, the student has to study the course work and during II-I semester in addition to couse work the student should carry out Comprehensive Viva-Voce and II-II semester in addition to couse work the student should carry out Project Work.

4. CONTACT HOURS

Depending on the complexity and volume of the course, the number of contact hours per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours / week as follows.

- Contact Classes (Theory): 1 credit per lecture hour per week.
- Laboratory Hours (Practical): 1 credit for 2 Practical hours, per week.
- Project Work : 1 Credit for 2 hours of Project work per week.

DEFINITION OF CREDIT

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical (Lab)/week	1 credit

Table 1: Contact periods/ credits and marks

	Semester				
	Periods/week	Credits	Internal marks	External marks	Total Marks
Theory	03	03	40	60	100
Practical	03	1.5	40	60	100
MOOCs course	--	02	-	-	-
Comprehensive viva- voce	--	02	100	-	100
Project Work	--	12	40	60	100

Table 2: Course pattern and total credits

Semester	No.of Subjects	Number of labs	Total credits	
I-I	06	02	6x3+2x1.5=21	21
I-II	06+MOOCS	02	6x3+2+2x1.5=23	23
II-I	06	02	6x3+2x1.5=21	21
II-II	03	0	3x3 =9	09
II-I	Comprehensive viva-voce		2	02
II-II	Project Work		12	12
Total Credits				88

5. SUPPLEMENRTY EXAMINATIONS

The student eligible to appear the supplementary external examinations, if he/she was absent for it or failed in it or not registered in regular examination. However, II-II semester students there will be an advanced Supplementary Examinations.

6. DISTRIBUTION AND CREDENCE OF MARKS

6.1 EVALUATION OF STUDENT'S PERFORMANCE

- The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for each Theory and Practical subject (Lab course). In addition, a Comprehensive viva-voce for 100 marks and Project Work for 100 marks shall be evaluated.

- For theory subjects the distribution of marks shall be 40 marks for Internal Evaluation and 60 marks for the Eexternal End-Examination. There shall be five units in each of the theory subjects.

- For practical subjects (Lab courses) the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination.

6.2 INTERNAL EXAMINATIONS

- For theory subjects, during the semester, there shall be t**wo** Internal (mid-term) examinations

- Each internal (Mid-term) examination consists of 5 short answer questions for 10 marks and descriptive paper consists of 5 questions, out of which student has to answer 3 questions for 30 marks within 2 hours duration. Each internal examination will be conducted for 40 marks.

- I – Internal (Mid-term) examination shall be conducted in units-I,II and half of III unit and II- Internal (Mid- term) examination shall be conducted in the remaining syllabus.

- If there is any fraction in the marks secured by the student in any subject in the Internal examination, then it will be rounded off to the next highest digit.

- Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other.

- If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 80% Weightage to the marks secured by the student in the appeared examination and zero to the other.

6.3 EXTERNAL EXAMINATION

6.3.1 External Examinations(Theory Subjects)

The External Examination Question paper of theory subject shall have the following pattern

   i.   There shall be two parts, Part-A and Part-B

  ii.   Part-A shall contain 5 short answer questions (without choice) for a total of 10 marks such that each question carries 2 marks.

iii.   Part-B shall contain 5 descriptive answer questions of equal credence with internal choice for a total of 50 marks such that each question carries 10 marks. All questions have to be answered compulsory. Each question may consists one, two or more sub questions.

iv.   The total time duration to answer Part-A and Part-B is 3 hours.

v.   A student eligible to appear for the end examination in a subject, but absent for it or has failed in the external examination may appear for that subject at the next supplementary examination offered.

6.3.2. End Examinations (Practical subjects)

For Practical subjects there shall be a 40 sessional marks for Day -to-Day work in the laboratory shall be evaluated by the concerned laboratory teacher based on the regularity/record/ viva-voce/ execution of the progrmmes and End examination shall be for 60 marks.

The End examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department.

6.3.3 COMPREHENSIVE VIVA-VOCE

- The comprehensive viva-voce shall be evaluated by a three member committee consisting of HOD/HOD's nominee, Co-ordinator and one senior faculty member.

- Comprehensive viva-voce pertaining to the student's specialization will be conducted for 100 marks (internal evaluation) at the end of II-I semester by the above three member committee. He/ she should to secure 50% marks to acquire the required credits.

6.3.4. PROJECT WORK EVALUATION

- Out of a total of 100 marks for the project work,40 marks shall be for internal evaluation and 60 marks for the external examination (viva-voce).

- The internal evaluation shall be done by the committee, consisting of HOD/HOD's nominee, Project coordinator and Project supervisor on the basis of two seminars to be given by each student on the topic of his /her project.

- The viva-voce shall be conducted by a committee consisting of HOD/HOD's nominee, Project coordinator and Project supervisor and an External Examiner.

- The evaluation of project work shall be conducted at the end of the II- II semester.

6.3.5 MASSIVE ONLINE OPEN COURSE'S(MOOC'S)

The college in line with the developments in Learning Management Systems(LMS) intends to encourage the students to do online courses in MOOCs, offered nationally/ internationally. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discussion with professors from various universities

and finally to obtain certificate of completion of the course from the MOOCs providers. Our department intends the students to do one MOOC course in I Year II Semester of the MCA Programme. Our department give a list of standard MOOCs providers among NPTEL, Coursera,Udacity, edxor any other Standard providers, whose credentials are endorsed by the HOD. The department shall appoint a Coordinators/ Mentors and allot the students to them who shall be responsible to guide the students in selecting online courses and provide guidance for the registration, progress and completion of the same. A student shall choose an online course (relevant to his / her programme of study) from the given list of MOOCs providers as endorsed by the teacher concerned, with the approval of the HOD.

Students may be permitted to register one online (which is provided with certificate) in I year II semester and they should produce the course completion certificate of that course on or before IIyear IIsemester to the controller of examinations to become eligible for fulfillment of the degree. However if a student is not able to complete the course then on the request of the candidate an examination will be conducted at the department level on a list of courses of the approval of HOD.

7. CORE ELECTIVES

Students have to choose core electives (CE-I and CE-II) in II year I semester and core electives(CE-III and CE-IV) in IIyear II semester, from the list of core electives courses given. However, the students may opt for core elective subjects offered in the related area.

8. INDUSTRIAL VISIT

Industrial Visit for every student is required to go for at least one Industrial Visit starting from the I year of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

9. INDUSTRIAL TRAINING / INDUSTRIAL INTERNSHIP

Industrial Training / Industrial Internship for every student is required to go for at least one Industrial Training / Industrial Internship at end of the I year-II Semester (i,e summer vacation) of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

10. PRESERVATION OF RECORDS

The laboratory records, internal test papers and end examination answer booklets shall be preserved for minimum of 2 years in the institution.

12. ATTENDANCE REQUIREMENTS

i.   A student shall be eligible to appear for end semester examinations, if he/ she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

ii. **Shortage of attendance below 65% in aggregate shall in <u>NO</u> case be condoned.**

iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on valid reasons only by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

v.   A student will not be promoted to the next semester unless he/ she satisfies the attendance requirements of the present semester, as applicable. They may seek re-admission for that semester when offered next.

vi. A stipulated condonation fee shall be payable towards Condonation of shortage of attendance to the college. (a) a student is eligible to write the University Examinations if he/she aquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects.

12. MINIMUM ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied besides the attendance requirements mentioned in section-12 **:**

i.   A student shall be deemed to have satisfied the minimum academic requirements and acquired the credits allotted to each theory, practical, comprehensive viva-voce and project, if he/ she secures a minimum of 40% of marks in the external examination and a total of 50% of marks in the internal and external examinations put together for that particular subject.

ii. For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day to day performance.

iii. For Comprehensive viva-voce there will be an internal evaluation of 100 marks. A candidate has to secure a minimum of 50% to be declared successful. The assessment will be made by a board consisting of HOD/HOD nominee and two senior internal experts at the end of the semester instruction.

13. EVALUATION OF PROJECT WORK / DISSERTATION

* Every candidate shall be required to submit thesis/ dissertation after taking up a topic approved by the Project Review Committee (PRC).

- A PRC shall be constituted with Principal as the Chairperson, HOD and two senior faculty members.

- A candidate is permitted to register for the Project Work after satisfying the attendance requirement of all the subjects (theory and practical).

- A candidate has to submit the title, objective and plan of action of his/ her Project Work to the PRC for its approval in consultation with the Project Supervisor and after approval only the Project Work can be started.

- If a candidate wishes to change his /her supervisor or topic of the project he/ she can do so with an approval of PRC. However, the PRC shall examine whether the change of topic/ supervisor leads to a major change of his/ her initial plans of project proposal. If so, his / her date of registration for the Project Work starts from the date of change of supervisor/ topic as the case may be.

- A candidate shall submit status report in two stages at least with a gap of 3 months.

- The work on the project shall be initiated at the beginning of II-II-semester and the duration of the project is for a semester. For the approval of PRC, the candidate shall submit the draft copy of thesis to the Principal (through HOD) and shall make an oral presentation before the PRC.

- Three copies of the project thesis certified by the supervisor shall be submitted to the institute.

- The HOD/ HOD's nominee will submit a panel of 5 examiners to the Principal through the Controller of the Examinations, who are eminent and expertise in that field with the help of the guide and HOD concerned. The thesis shall be adjudicated by any one external examiner selected from the panel that is submitted by the Controller of Examinations in consultation with the Principal.

- If the report of the examiner is not favorable, the candidate shall have to revise and resubmit the thesis, in the time frame as stipulated by PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected.

- If the report of the examiner is favorable, viva-voce examination shall be conducted by a board consisting of the supervisor, HOD and the examiner who adjudicated the Project work. The Board shall jointly report the candidate's performance. The HOD shall coordinate and make arrangements for the conduct of viva-voce examination.

- If the candidate fails in viva-voce, then he/ she has to reappear for the viva-voce examination after 45 days. If he/ she fails again in the second viva-voce examination, he/ she will not be eligible for the award of the degree.

14. RE-ADMISSION

When a student is detained due to lack of credits/ shortage of attendance he/ she has to get re-admitted for that semester/ year after fulfillment of academic regulations, whereas he/ she continues to be in the academic regulations in which he/ she is admitted.

15. TRANSITORY REGULATIONS

Candidates who have been detained due to lack of attendance or have not fulfilled academic requirements or failed after having undergone the course in the earlier regulations or discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to section-**2** and they continue to be in the same academic regulations in which they are admitted.

16. WITHHOLD OF RESULTS

If the candidate has not paid the dues to the college or if any case of indiscipline/ malpractice is pending against him/her, the result of such candidate shall be withheld and he/she will not be allowed/ promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

17. AWARD OF LETTER GRADES

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

Letter grade	Grade points	Marks range
S	10	90 - 100
A	9	80 - 89
B	8	70 - 79
C	7	60 - 69
D	6	50 - 59
F (Fail)	0	< 50
AB (Absent)	0	----

17.2 GRADE SHEET

After results are declared, grade sheets will be issued to the student with the following details:

a.   The college in which the candidate has studied

b.   The list of courses enrolled during the semester and the grade scored

c.   The Grade Point Average (GPA) for the semester and

d.   The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester/ I-year onwards.

17.3 SEMESTER GRADE POINT AVERAGE (SGPA)

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \Sigma (C_i \times G_i)/ \Sigma C_i$$

Where, C_i is the number of credits of the ith subject and G_i is the grade point scored by the student in the ith course.

17.4 CUMULATIVE GRADE POINT AVERAGE (CGPA)

The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \Sigma (C_i \times S_i)/ \Sigma C_i$$

Where „S_i" is the SGPA of the ith semester and C_i is the total number of credits in that semester.

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

ii.   SGPA will be given to those who cleared all the subjects in that semester.

iii.   **GRADE POINT***:* It is a numerical weight allotted to each letter grade on a 10-point scale.

iv.   **LETTER GRADE***:* It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D and F.

17.5 AWARD OF GRADES TO MOOC

The award of grades for the MOOC course (20MCA127) with the following normalization to the marks of students, who have completed MOOC course through proctored and non-proctored examination.

(i)   PROCTORED EXAMINATION

If a student completed MOOC course under Proctored examination, then the marks awarded will be normalized as follows

NORMALIZATION FORMULA

$Y=X*1.25$

Where X is marks obtained in the Proctored examination

Y is Marks obtained after normalization

If the value of Y (normalized marks) exceeds 100 then it will be considered as 100 only

(ii)   NON-PROCTORED EXAMINATION

If the student completed MOOC course under non Proctored exam, then only pass grade will be awarded.

18. **CLASSIFICATION OF SUCCESSFUL CANDIDATES.**

- Classification of performance of the students at the end of the course (after completing all the course requirements) will be based on CGPA (Cumulative Grade Point Average) as indicated below**.**

Classification	CGPA
First class with distinction	>=7.5 and above
First Class	>=6.5 to <7.5
Second Class	>=5.0 to <6.5

- A minimum of 5.0 CGPA is required for the award of the degree.

19. **REVALUATION**

- A candidate can apply for revaluation of his/ her external examination answer paper in a theory course, within <u>two</u> days from the date of declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of the Institution. A candidate can apply for revaluation of answer scripts in not more than **5** subjects at a time**.** The Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Principal.
- No revaluation for Comprehensive viva-voce, Practical and Project Work.

20. **NUMBER OF INSTRUCTION DAYS**

The minimum no. of instruction days including examinations will be 90 per semester.

21. **CONDUCT AND DISCIPLINE**

(i) Students shall conduct themselves within and outside the precincts of the Institute in a manner befitting the students of an Institute of National importance

(ii) As per the order of the Hon'ble Supreme Court of India, ragging in any form is banned: acts of ragging will be considered as gross indiscipline and will be severely dealt with.

(iii) The following additional acts of omission and /or commission by the students within or outside the precincts of the college shall constitute gross violation of code of conduct and are liable to invoke disciplinary measures

(a) Ragging

(b) Lack of courtesy and decorum: indecent behaviour anywhere within or outside the campus.

(c) Wilful damages or stealthy removal of any property /belongings of the Institute / Hostel or of fellow students

(d) Possession, consumption of distribution of alcoholic drinks or any kind of hallucinogenic drugs

(e) Mutilation or unauthorized possession of library books

(f) Hacking in computer systems

(g) Furnishing false statements to the disciplinary committee, or willfully withholding information relevant to an enquiry

(h) Organizing or participation in any activity that has potential for driving fellow students along lines of religion caste batch of admission hostel or any other unhealthy criterion .

(i)   Resorting to noisy and unseemly behavior, disturbing studies of fellow students

(j)   Physical or mental harassment of fresher through physical contact or oral abuse

(k) Adoption of unfair means in the examination

(l) Organizing or participating in any group activity except purely academic and scientific Programmers in company with others in or outside campus without prior permission of the Principal

(m) Disturbing in drunken state or otherwise an incident in academic or students function or any other public event.

(n) Not obeying traffic rules in campus not following safety practices or causing potential danger to oneself or other persons in any way.

(o) Any other act or gross indiscipline

(iv). Commensurate   with the gravity of the offence the punishment may be reprimand fine and expulsion from the hostel debarment from an examination rustication for a specified period or even outright expulsion from the College

(v). The reprimanding Authority for an offence committed by students in the Hostel and in the Department or the classroom shall be respectively, the managers of the Hostels and the Head of the concerned Department

(vi). In all the cases of offence committed by students in jurisdictions outside the purview of clause (19.v) the Principal shall be the Authority to reprimand them.

(vii). All Major acts of indiscipline involving punishment other than mere reprimand shall be considered and decided by the Principal Students Disciplinary Committee appointed by the Principal

(viii) All other cases of Indiscipline of Students like adoption of unfair means in the examinations shall be reported to the Vice-Principal for taking appropriate action and deciding on the punishment to be levied.

(ix) In all the cases of punishment levied on the students for any offence committed the aggrieved party shall have the right to appeal to the Principal who shall constitute appropriate Committees to review the case.

- Any attempt by any student to influence the teachers, examiners, faculty and staff of controller of examination for undue favors in the exams, and bribing them for marks/ attendance will be treated as malpractice cases and the student will be debarred from the college.

- When the student absents himself/ herself, he/ she is treated as to have appeared and obtained ZERO marks in that subject(s) and grading is done accordingly.

- When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he/she will be awarded zero marks in that subject(s).

- When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the examiner is final.

22. TRANSFER DETAILS

- Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

23. GENERAL

i. The academic regulations should be read as a whole for purpose of any interpretation.

ii. Malpractices rules- nature and punishments is appended.

iii. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.

iv. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the academic council will be final. The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi.

24. **DISCIPLINARY   ACTION   FOR   MALPRACTICES/   IMPROPER   CONDUCT   IN EXAMINATIONS**

	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate	
1. (a)	Ppossesses or keeps access 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/ practical) in which he/she 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.
(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 inside 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/she will be handed over to the police and a case is registered against him/her.
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 will be cancelled and retained by the CE.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall 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 university 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/she will be handed over to the police and a case is registered against him/her.
4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper 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 university 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.
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 or causes any injury to his person or to any of his relatives whether by offensive words spoken or written or by signs or by visible representation or assaults the officer-in-charge, or any person on duty inside or outside the examination hall or any of his relatives, or indulges in any other act of misconduct or mischief which results 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 are also 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.

MCA COURSE STRUCTURE (Regular) (2020 – 21)

I MCA- I Semester

S. No.	Course Code	Subject	Subject Category	Scheme of Instruction Periods per week				Scheme of Examination Maximum Marks		
				L	T	P	C	Internal Exam	External Exam	Total
1	20MCA111	Discrete Structures and Graph Theory	PC	2	1	-	3	40	60	100
2	20MCA112	C Programming & DataStructures	PC	2	1	-	3	40	60	100
3	20MCA113	Computer Organization and Architecture	PC	2	1	-	3	40	60	100
4	20MCA114	Operating Systems	PC	3	-	-	3	40	60	100
5	20MCA115	Computer Networks	PC	2	1	-	3	40	60	100
6	20MCA116	Database Management Systems	PC	3	-	-	3	40	60	100
7	20MCA117	C Programming & DataStructures Lab	PC	-	-	3	1.5	40	60	100
8	20MCA118	Database Management Systems Lab	PC	-	-	3	1.5	40	60	100
Contact periods per week				**15**	**3**	**6**				
Total periods per week				**24**						
Total credits(6 Theory+2 Labs)							**21**			
Total marks								**320**	**480**	**800**

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I MCA- II Semester

S. No.	Course Code	Subject	Subject Category	Scheme of Instruction Periods per week				Scheme of Examination Maximum Marks		
				L	T	P	C	Internal Exam	External Exam	Total
1	20MCA121	Artificial Intelligence	PC	2	1	-	3	40	60	100
2	20MCA122	Cloud Computing	PC	3	-	-	3	40	60	100
3	20MCA123	Data Warehousing & Data Mining	PC	3	-	-	3	40	60	100
4	20MCA124	Programming using Python	PC	2	1	-	3	40	60	100
5	20MCA125	Object Oriented Programming through Java	PC	2	1	-	3	40	60	100
6	20MCA126	Software Engineering	PC	3	-	-	3	40	60	100
7	20MCA127	MOOC	MOOC	-	-	-	2	-	-	-
8	20MCA128	Programming using Python & Data Mining Lab	PC	-	-	3	1.5	40	60	100
9	20MCA129	Object Oriented Programming through Java Lab	PC	-	-	3	1.5	40	60	100
Contact periods per week				**15**	**3**	**6**				
Total periods per week				**24**						
Total credits(6 Theory+2 Labs+MOOC)							**23**			
Total marks								**320**	**480**	**800**

II MCA- I Semester

S. No.	Course Code	Subject	Subject Category	Scheme of Instruction Periods per week				Scheme of Examination Maximum Marks		
				L	T	P	C	Internal Exam	External Exam	Total
1	20MCA211	Web Technologies	PC	2	1	-	3	40	60	100
2	20MCA212	Machine Learning	PC	2	1	-	3	40	60	100
3	20MCA213	Big Data Analytics	PC	2	1	-	3	40	60	100
4	20MCA214	Mobile Applications using Android	PC	2	1	-	3	40	60	100
5	20MCA215	**Elective – I**	CE	3	-	-	3	40	60	100
6	20MCA216	**Elective – II**	CE	3	-	-	3	40	60	100
7	20MCA217	Web Technology Lab	PC	-	-	3	1.5	40	60	100
8	20MCA218	Bigdata Analytics & Mobile Applications using Android Lab	PC	-	-	3	1.5	40	60	100
9	20MCA219	Comprehensive Viva Voce	CVV	-	-	-	2	100	-	100
Contact periods per week				**14**	**4**	**6**				
Total periods per week				**24**						
Total credits(6 Theory+2 Labs+CVV)							**23**			
Total marks								**420**	**480**	**900**

Elective-I

II MCA – I Semester

S. No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	Internal Exam	External Exam	Total
1	20MCA215A	Web Information Retrieval	CE	3	-	-	3	40	60	100
2	20MCA215B	Design Patterns	CE	3	-	-	3	40	60	100
3	20MCA215C	Service Oriented Architecture	CE	3	-	-	3	40	60	100
4	20MCA215D	Cryptography and Network Security	CE	3	-	-	3	40	60	100
5	20MCA215E	Optimization Techniques	CE	3	-	-	3	40	60	100

Elective-II

II MCA – I Semester

S. No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	Internal Exam	External Exam	Total
1	20MCA216A	Data Science	CE	3	-	-	3	40	60	100
2	20MCA216B	Block Chain Technology	CE	3	-	-	3	40	60	100
3	20MCA216C	Design and Analysis of Algorithms	CE	3	-	-	3	40	60	100
4	20MCA216D	Computer Graphics	CE	3	-	-	3	40	60	100
5	20MCA216E	Visualization Techniques	CE	3	-	-	3	40	60	100

II MCA- II Semester

S. No.	Course Code	Subject	Subject Category	Scheme of Instruction Periods per week				Scheme of Examination Maximum Marks		
				L	T	P	C	Internal Exam	External Exam	Total
1	20MCA221	Internet of Things	PC	3	-	-	3	40	60	100
2	20MCA222	**Elective – III**	CE	3	-	-	3	40	60	100
3	20MCA223	**Elective – IV**	CE	3	-	-	3	40	60	100
4	20MCA224	Project Work	PW	-	-	-	12	40	60	100
Contact periods per week				9						
Total periods per week					9					
Total credits(3 Theory+PW)							21			
Total marks								160	240	400

Elective-III

II MCA – II Semester

S. No	Subject Code	Subject	Subject Category	L	T	P	C	Internal Exam	External Exam	Total
1	20MCA222A	Deep Learning	CE	2	1	-	3	40	60	100
2	20MCA222B	Quantum Computing	CE	3	-	-	3	40	60	100
3	20MCA222C	Ethical Hacking	CE	3	-	-	3	40	60	100
4	20MCA222D	Distributed Systems	CE	3	-	-	3	40	60	100
5	20MCA222E	Object Oriented Analysis and Design	CE	3	-	-	3	40	60	100

Scheme of Instructions Periods per Week (L T P C); Scheme of Examination Maximum Marks (Internal Exam, External Exam, Total)

Elective-IV

II MCA – IISemester

S. No	Subject Code	Subject	Subject Category	L	T	P	C	Internal Exam	External Exam	Total
1	20MCA223A	Natural Language Processing	CE	3	-	-	3	40	60	100
2	20MCA223B	Augment Reality & Virtual Reality	CE	3	-	-	3	40	60	100
3	20MCA223C	Wireless Sensor Networks	CE	3	-	-	3	40	60	100
4	20MCA223D	Semantic Web	CE	3	-	-	3	40	60	100
5	20MCA223E	E-Commerce	CE	3	-	-	3	40	60	100

I MCA - I Semester	L	T	P	C
	2	1	0	3

20MCA111 **DISCRETE STRUCTURES AND GRAPH THEORY**

PREREQUISITES: Basic Mathematics

COURSE EDUCATIONAL OBJECTIVES:
CEO1*: To gain the knowledge on connectives and normal forms.*
CEO2*: To learn the various concepts related to predicate logic.*
CEO3*: To perform the operations associated with sets, functions, and relations and study the basic properties of lattices.*
CEO4*: To understand the concept of groups, Abelian groups and group homomorphism and isomorphism.*
CEO5*: To study the fundamentals of graphs, sub graphs, planar graphs, Hamiltonian graphs, Euler graphs, spanning trees and graph traversals.*

Syllabus:
UNIT - 1: Mathematical Logic
Statements and Notations - Connectives(Negation, Conjunction , Disjunction, Conditional and Biconditional - Statements Formulas and Truth Tables - Well-Formed Formulas, Tautologies - Equivalence of Formulas - Duality Law - Tautological Implications - Normal Forms(DNF, CNF, PDNF, PCNF) - Theory of Inference for Statement Calculus: Validity using Truth tables - Rules of Inference - Consistency of Premises and Indirect Method of Proof.

UNIT - 2: Predicate Calculus
Predicates - The Statement Function - Variables - Quantifiers - Predicate Formulas - Free and Bound Variables - The Universe of Discourse - Theory of Inference for Predicate Calculus: Valid Formulas and Equivalences - Some Valid Formulas over Finite Universes - Special Valid Formulas Involving Quantifiers.

UNIT -3: Relations & Functions
Relations: Properties of Binary Relations, Equivalence - Closure of Relations - Compatibility and Partial Ordering Relations - Hasse Diagram - Lattices (Basic Concepts).

Functions: Inverse function - Composition of Functions - Recursive Functions - Pigeon Hole Principles and its Applications.

UNIT - 4: Algebraic Structures
Algebraic Systems - Examples and General Properties - Semi Groups - Monoids - Groups and Subgroups - Homomorphism and Isomorphism.

UNIT - 5: Graph Theory
Basic Terminology - Multi Graphs - Weighted Graphs - Digraphs and Relations - Representations of Graphs (Incidence Matrix, Adjacency Matrix) - Operations on Graphs - Isomorphism and Sub Graphs. Paths and Circuits - Graph Traversals(DFS, BFS) - Shortest Paths in Weighted Graphs - Eulerian Paths and Circuits - Hamiltonian Paths and Circuits - Planar Graph - Graph Coloring - Spanning Trees - Minimum Spanning Trees - Kruskal's Algorithm - Prim's Algorithm.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Understand** the validity of statements using connectives, tautologies, equivalence, implications and solve the problems using normal forms.	**PO1, PO2,PO3,PO4**
CO2	**Solve** the problems using statement calculus, predicate calculus and **analyze** the equivalence of quantified statements.	**PO1, PO2, PO3**
CO3	**Identify** and describe various types of relations (Compatibility, Partial ordering and Equivalence elations) and **analyze** the functions concepts and distinguish different types of functions	**PO1, PO2, PO3, PO4**
CO4	**Understand** the concept of groups, Abelian groups and **analyze** whether the given set satisfies the properties of group or not	**PO1,PO2**
CO5	**Design** network applications using Prim's and Kruskal's Algorithms and Demonstrate different traversal methods for graphs	**PO1, PO2,PO3,PO4**

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	2	1	-	-	-	-	-	-
CO2	3	3	3	-	2	1	-	-	-	-	-	-
CO3	2	3	3	-	2	1	-	-	-	-	-	-
CO4	2	3	3	2	2	2	-	-	-	-	2	2
CO5	3	3	3	3	2	2	-	-	-	-	2	2

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay and R.Manohar, 27/e, Tata McGraw Hill Publishers, 2006, New Delhi.

2. Elements of Discrete Mathematics – A Computer Oriented Approach, C.L. Liu, D.P. Mohapatra,3/e, Tata McGraw Hill Publishers, 2008, New Delhi.

REFERENCE BOOKS:

1. Discrete and Combinational Mathematics – An Applied introduction, Ralph. P. Grimaldi, 5/e, Pearson Education, 2008, New Delhi.2. Discrete Mathematics and its applications,Kenneth H. Rosen, 6/e, Tata McGraw Hill Publishers, New Delhi.

3. Discrete Mathematics for Computer Science, 4/e, 2007, Gary Haggard, John Schlipf, Sue Whitesides, Thomson Pulication, 2008,New Delhi.

4. Discrete Mathematics for ComuterScientists&Mathematicans, Mott,Kandel, Banker, 2/e, PrenticeHall India, 2007, New Delhi.

5. Discrete Mathematics, Lipschutz, Lipson, Schaum's outlines, 2/e, Tata McGraw Hill Publishers,2006, New Delhi.

I MCA - I Semester	L	T	P	C
	2	1	0	3

20MCA112   **C PROGRAMMING & DATA STRUCTURES**

PREREQUISITES: Knowledge on Information Technology and Logical skills may be helpful.

COURSE EDUCATIONAL OBJECTIVES:

    CEO1   *To explore the fundamental concepts of C*

    CEO2   *To Learn Basic C Functions, Pointers AND Structures.*

    CEO3   *To Understand various Sorting and Searching Techniques*

    CEO4   *To explore the fundamental concepts of Data Structures*

Syllabus:

UNIT - 1 :   **Introduction to the C language**

Introduction, Identifiers, Variables, Constants, Data Types,Type Conversion,Operators & Expressions, Input & output in C, Decision Statements,Loop Control Statements, Arrays, Working with Strings and Standard Functions.

Pointers: Introduction, Features of Pointers, Pointer Declaration, Arithmetic Operations with Pointers, Pointers and Arrays, Pointers and Two Dimensional Arrays, Array of Pointers, Pointers to Pointers

UNIT - 2 : Functions & Structures

Introduction, Definition, Declaration, Return Statement, Types of Functions, Call by Value and Reference, Function as an argument, Function with Operators, Recursion.

Introduction, Features of Structures, Declaration and Initialization of Structures, Array of Structures, Structures and Functions,

UNIT - 3 :   **Implementation of Data Structures**

Concept of Data Structures, Overview of Data Structures.Introduction to Linked List- Single linked lists , Doubly linked lists , Circular linked lists , Circular Double linked lists. **Stacks**: Introduction , Definition , Representation of Stacks- Arrays and Linked lists , Operations on stacks, Evaluation of Arithmetic Expression, **Queues:** Representation of Queues- Arrays and Linked lists , Various Queue structures, Operations on Queues .

UNIT - 4 : Sorting and Searching

Introduction to Sorting and Searching-Insertion Sort, Bubble Sort, Selection Sort, Merge Sort, Radix Sort, Quick Sort and Heap sort, Linear Search, Binary Search and Fibonacci Search.

UNIT - 5 :   Trees and Graphs

Basic Terminologies, Definition and Concepts, Representation of Binary Tree , Operations on Binary Tree - Types of Binary Trees. Introduction, Graph Terminologies, Representation of Graphs, Operations on Graphs.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Demonstrate** about the knowledge of C, different types of logical constructs using looping and processing arrays and strings	PO1,PO2
CO2	**Create** user defined functions for developing program based on the rules for predefined function and originate pointers with different combination for developing program	PO!,PO2,PO3
CO3	**Organize** the logical construct of file processing methodology and evaluate the basic concepts of structures.	PO1,PO2,PO3, PO4
CO4	**Compare and contrast** the functionalities and application of different data structures.	PO1,PO2, PO3
CO5	**Identify**ing suitable algorithms with appropriate data structures for real time software requirements	PO1,PO2,PO3, PO4,PO7

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	2	-	2	-	-	-	2	2
CO5	3	2	2	2	2	-	3	-	-	-	2	2

TEXT BOOKS:
1. *A Structured Programming Approach using C, Behrouz A. Forouzan and Richard F. Gilberg, Cengage Learning, 2ndEdition.*
2. *"C and Data structures", Ashok N. Kamthane, 2009, Pearson Education*

REFERENCE BOOKS:

1. *Programming in C, 3/e, 2008, Stephen G. Kochan, Pearson Education, New Delhi.*
2. *C Programming & Data Structures, 3/e, 2009, B.A.Forouzan and R.F. Gilberg,, Cengage Learning, New Delhi.*
3. *Data Structures using C and C++ , 2/e, 1999, A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Prentice Hall of India Private Limited, New Delhi.*
4. *C and Data Structures, 1/e, 2010, Dr. N.B. Venkateswarlu, Dr. E.V. Prasad, S. Chand & Company Limited, New Delhi.*
5. *Mastering C, 2007, K.R. Venugopal and S.R. Prasad, Tata Mcgraw-Hill, New Delhi.*

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I MCA - I Semester	L	T	P	C
	2	1	0	3

20MCA 113   **COMPUTER ORGANIZATION AND ARCHITECTURE**

PREREQUISITES: Knowledge on Information Technology and Logical skills may be helpful.

COURSE EDUCATIONAL OBJECTIVES:

CEO1   *To understand how computers are constructed out of a set of functional units.*
CEO2   *To understand how these functional units operate, interact and communicate.*
CEO3   *To understand the factors and tradeoffs that affect computer performance.*
CEO4   *To understand concrete representation of data at the machine level.*
CEO5   *To understand how computations are actually performed at the machine level.*

Syllabus:
UNIT - 1 :   Digital Logic Circuits and Digital Components

Digital Logic Circuits: Logic gates - Boolean Algebra - Map Simplification - Combinations Circuits - Flip flops - Sequential Circuits. Digital Components: Integrated circuits – Decoders – Multiplexers – Registers - Shift Registers - Binary Counters - Memory unit.

UNIT - 2 :   Data Representation, Basic Computer Organization

Data Representation: Data types – Complements - Fixed point representation - Floating point representation - Error detection coders. **Basic Computer Organization:** Instruction codes - Computer registers - Computer instructions - Timing and control - Instruction cycle – Memory reference instruction, Input output and interrupt.

UNIT - 3 :   Pipeline and Vector Processing

Parallel Processing – Pipelining - Arithmetic Pipeline - Instruction Pipeline - RISC Pipeline - Vector Processing - Array Processors.

UNIT - 4 :   Micro Programmed Control And Central Processing Unit

Micro programmed Control: Control Memory, Address Sequencing, Micro-program Example, **Design of Control Unit. Central Processing Unit:** General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data transfer and manipulation, Program control, Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer (CISC).

UNIT - 5 :   The Memory

Some Basic Concepts - Semiconductor Ram Memories - Read-Only Memories - Speed, Size and Cost - Cache Memories - Performance Considerations - Virtual Memories.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Understand and model** the structure and functioning of a digital computer and can deal with organizational and architectural issues of a digital computer.	PO1,PO3, PO4
CO2	**Interpret** how computers represent and manipulate data internally.	PO1,PO2, PO3,PO12
CO3	**Conceptualize** instruction level parallelism for high performance processor design	PO1,PO3, PO4, PO5,PO12
CO4	**Understand** the design of Microprogrammed Control Unit and Central Processing Unit.	PO1,PO3, PO4, PO12
CO5	**Explain** memory hierarchy and its impact on computer cost and performance	PO1,PO2, PO3,PO4,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	-	2	2	3	-	-	-	-	-	-	2
CO4	3	-	3	2	-	-	-	-	-	-	-	2
CO5	3	3	2	3	-	-	-	-	-	-	-	2

TEXT BOOKS :

1. *Computer System Architecture, 3/e, 2007, M. Morris Mano, Prentice-Hall of India, New Delhi. [UNIT 1,2,3]*

2. *Computer Organization, 4/e, 1996, V. Carl Hamacher, Zvonko G.Vranesic, Safwat G.Zaky, The McGraw-Hill Companies, Singapore. [UNIT 5]*

REFERENCE BOOKS :

1. *Computer Architecture, Carter Nicholas, 2008, Schaum outline Series, Tata McGraw-Hill, New Delhi.*

2. *Computer Architecture: Pipelined and Parallel Processor Design, 2002, Michael J. Flynn, Narosa Publishing House.*

3. *Computer Architecture and Organization, 3/e, 1998, J.P. Hayes, Tata McGraw-Hill, New Delhi.*

4. *Computer Architecture – A Quantitative Approach, 3/e, 2010, John L. Hennessy, David A. Patterson, New Delhi.*

5. *Computer organization & Architecture Designing for performance, 7/e, 2007, William Stallings, Prentice Hall of India, New Delhi.*

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I MCA - I Semester	L	T	P	C
	3	0	0	3

20MCA114   **OPERATING SYSTEMS**

PREREQUISITES: Basic knowledge on "Computer Organization"

COURSE EDUCATIONAL OBJECTIVES:

CEO1 *To be aware of the evolution and fundamental principles of operating system, processes and their communication.*

CEO2 *To understand the various operating system components like process management and memory management.*

CEO3 *To know about file management and the distributed file system concepts in operating systems.*

CEO4 *To be aware of components of operating system with relevant case study.*

Syllabus:
UNIT - 1 :   Operating Systems Introduction

Definition & Views of OS - Operating Systems objectives and functions - Computer System Architecture - OS Structure - OS Operations. **Evolution of Operating Systems:** Simple Batch - Multi programmed - Time-shared - Parallel - Distributed Systems - Real-Time Systems -Operating System services - User OS Interface - System Calls - Types of System Calls - System Boot.

UNIT - 2 :   Process Concepts and CPU Scheduling

Process Concepts: The Process - Process State - Process Control Block - Processes & Threads. Process Scheduling Principle**:** Scheduling Queues – Schedulers - Context Switch - Preemptive Scheduling –Dispatcher - Scheduling Criteria. **CPU Scheduling:** Scheduling algorithms –FCFS – SJF – Priority - Round Robin - Multi level Queue – Multiple processors.

UNIT - 3 :   Process Coordination & Deadlock

Process Coordination : Synchronization Background - The Critical Section Problem - Peterson's solution - Synchronization Hardware – Semaphores - Classic Problems of Synchronization. **Deadlocks:** System Model -Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection and Recovery from Deadlock.

UNIT - 4 :   Mass Storage Structure & Memory Management

Mass Storage Structure: Overview of Mass Storage Structure - Disk Structure - Disk Attachment - Disk Scheduling - Disk Management. **Memory Management:** Logical & Physical Address Space – Swapping - Contiguous Memory Allocation – Paging - Structure of Page Table – Segmentation - Page Replacement Algorithms.

UNIT - 5 :   File system

 File System   Interface: The Concept of a File - Access methods – Directory & Disk Structure - File System Mounting - File Sharing – File System Implementation.
Case Studies: The **Linux Syste**m-Linux History-Design Principles . **Windows 2000 Operating system**-History-Design Principles .

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Demonstrate** the basic knowledge of operating system components and services	PO1,PO12
CO2	**Relate** the different Process concepts and CPU scheduling Algorithms	PO1,PO2,PO3, PO5,PO12
CO3	**Illustrate** the different Process Synchronization and Deadlock methodology	PO1,PO2,PO3, PO5,PO12
CO4	**Compare and Contrast** different memory management techniques	PO1,PO2,PO3, PO5,PO12
CO5	**Examine** the various File management strategies and comparative study of various operating systems	PO1,PO2,PO3, PO5,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	3	-	-	-	-	-	-	2
CO3	3	3	3	-	3	-	-	-	-	-	-	3
CO4	3	2	3	-	3	-	-	-	-	-	-	2
CO5	3	3	3	-	3	-	-	-	-	-	-	3

TEXT BOOKS:

1. Operating System Principles , 8/e, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley Student Edition.

2. Operating Systems – Internals and Design Principles, 6/e, W. Stallings, Pearson Education.

REFERENCE BOOKS:

1. Operating Systems - A concept based Approach, 2/e, 2006,   D.M.Dhamdhere, TMH, New Delhi.

2. Operating Systems, 3/e, 2007, Deitel & Deitel, Pearson Education, New Delhi.

3. Operating Systems- A Modern Perspective, 2/e, 2002, Gary Nutt, Pearson Education.

4. Operating Systems-Design & Implementation,3/e, 2007, Andrew S Tanenbaum, Pearson Education, New Delhi.

5. Principles of Operating Systems, 1/e, 2010, V Ramesh, Laxmi Publications, New Delhi.

I MCA - I Semester	**L**	**T**	**P**	**C**
	2	**1**	**0**	**3**

20MCA115   **COMPUTER NETWORKS**

PREREQUISITES: Basic knowledge on "Computer Organization and Architecture"

COURSE EDUCATIONAL OBJECTIVES:
- *CEO1 To introduce the basics and various types of Computer Networks.*
- *CEO2 To understand the functionality of each layer of OSI and TCP/IP models and interactions between them with merits and demerits.*
- *CEO3 To gain basic insight of various Protocols and Services.*
- *CEO4 To introduce TCP and UDP Models.*
- *CEO5 To familiarize the Network Applications.*

Syllabus:
UNIT - 1 :   Introduction

Uses of Computer Networks- Network Hardware- Network Software- References Models. The Physical Layer: Guided Transmission Media- Wireless Transmission- Communication Satellites.

UNIT - 2 :   The Data Link Layer

Data link Layer Design Issues- Error Detection and Correction -Elementary Data Link Protocols- Sliding Window Protocols - Example Data Link Protocols. **The Medium Access Control Sublayer:** Multiple Access protocols- Ethernet- Ethernet Cabling- Manchester Encoding- The Ethernet MAC Sublayer Protocol-The Binary Exponential Backoff Algorithm- Ethernet Performance, Wireless LANs

UNIT - 3 :   The Network Layer

Network Layer Design Issues- Routing Algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for Mobile hosts- Congestion Control Algorithms- Quality of Service: Leaky Bucket Algorithm, Token Bucket Algorithm- Internetworking- The Network Layer in the Internet: The IP Protocol, IP Addresses.

UNIT - 4 :   The Transport Layer

The Transport Service- Elements of Transport Protocols- The Internet Transport Protocols: UDP- The Internet Transport Protocols :TCP: Introduction to TCP, The TCP Service Model,The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Transmission Policy, TCP Congestion Control.

UNTI - 5 :   The Application Layer

DNS-The domain name system - Electronic mail- The World Wide Web: Architectural Overview, Static Web Documents, Dynamic Web Documents- HTTP-The Hypertext Transfer Protocol.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Illustrate** basic concepts, terminology and **enumerate** the layers of the different reference models and can explain the function(s) of each layer.	PO1,PO2, PO3
CO2	**Understand** the design issues of data link layer and how standard problems are solved in the context of Wireless networks.	PO1,PO2, PO3,PO4
CO3	**Explore** network design issues and **Learn** various routing and congestion control algorithms	PO1,PO3, PO4,PO5
CO4	**Describe** the elements of transport layer services and protocols	PO1,PO4
CO5	**Conceptualize** the working nature of the applications such as electronic mail, world wide web and domain name systems.	PO1,PO3, PO5,PO6

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-
CO3	3	-	3	3	2	-	-	-	-	-	-	-
CO4	3	-	-	3	-	-	-	-	-	-	-	-
CO5	3	-	2	-	3	3	-	-	-	-	-	-

TEXT BOOKS:.

1. *Computer Networks, 4/e, 2008, Andrew S. Tanenbaum, Pearson Education, New Jersey.*

2. *Data Communications and Networking, 4/e, 2006, Behrouz A. Forouzan, Tata McGraw Hill, New Delhi.*

REFERENCE BOOKS:

1. *Computer Communications and Networking Technologies,1/e, 2001, Michael A.Gallo, William M. Hancock, Cengage Learning, New Delhi.*
2. *Computer Networks: Principles, Technologies and Protocols for Network Design,1/e, 2006, Natalia Olifer, Victor Olifer, Wiley India, New Jersey.*
3. *Computer and Communication Network,1/e, 2007, Nader F. Mir, Pearson Education, New Jersey.*
4. *Computer Networking: A Top-Down Approach Featuring the Internet, 3/e, 2005, James F.Kurose - K.W.Ross, Pearson Education, New Jersey.*
5. *Data and Computer Communications,1/e, 2001, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group, FL United States.*

I MCA - I Semester	**L**	**T**	**P**	**C**
	2	**1**	**0**	**3**

20MCA116　　　　**DATABASE MANAGEMENT SYSTEMS**

PREREQUISITES: Knowledge on Relational algebra may be helpful.

COURSE EDUCATIONAL OBJECTIVES:

CEO1　To expose the students to the fundamentals of Database Management Systems.

CEO2　To make the students understand the relational model and familiarize the students with ER diagrams.

CEO3　To To expose the students to SQL and to familiarize the students with the normalization process.

CEO4　To make the students to understand the fundamentals of Transaction Processing and Query Processing.

CEO5　To make the students to understand the fundamentals of Concurrent Processing and Recoverability.

Syllabus:

UNIT - 1 :　Introduction & Database Design and E-R Model

Database System Applications - Purpose of Database Systems - View of Data - Database Languages - Database Design - Database Architecture - Database Users and Administrators. The Entity-Relationship Model – Entity Sets –Relationship sets –Attributes –Entity-Relationship Diagrams – Weak Entity Sets –Extended E-R Features

UNIT - 2 :　The Relational Model

Introduction to The Relational Model –Integrity Constraints over Relations – Querying Relational Data–Logical Database Design: ER to Relational. Relational Algebra And Calculus – Preliminaries – Relational Algebra – Relational Calculus – Expressive power of Algebra and Calculus.

UNIT - 3 :　SQL & PL/SQL

Interactive SQL Part I - Types of Data Constraints - Computations done on Table Data - Oracle functions - Grouping Data from Tables in SQL - Sub queries – Joins - Concatenation data from table columns using the Union - Intersect and Minus Clause – Views – Sequences - Granting and Revoking Permissions - Advantages of PL/SQL - The Generic PL/SQL block - Control Structure - What is Cursor - Database Triggers - Types of Triggers.

UNIT - 4 :　Relational Database Design & Transaction Management

Schema refinement and Normal Forms – Introduction to schema refinement – Functional Dependencies–Reasoning about FDS – Normal Forms – Properties of Decompositions – Normalizations. Transaction Concept - Transaction States - Concurrency Executions – Serializability – Recoverability - Testing for Serializability.

UNIT - 5 :   Concurrency Control & Recovery System

Lock-Based Protocol   - Timestamp-Based Protocols - Validation-Based Protocols - Deadlock Handling. Failure Classification - Storage Structure - Recovery and Atomicity - Log-Based Recovery - Recovery with Concurrent Transactions .

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

COURSE OUTCOMES		
CO1	**Gain** an insight into the concepts of Databases System and the basic elements of a relational database management system.	PO1, PO2
CO2	**Identify** the data models and Problem Solving using queries in Relational model and mathematical notations of relational algebra.	PO1,PO2,PO4,PO12
CO3	**Able** to learn SQL Query Processing for information retrieval and Visualization.	PO3,PO5,PO11
CO4	**Experiment** Normalization and professional attitudes for the development of Consistent Database and Transaction Management.	PO4,PO11
CO5	**Conceptualize** Concurrency Control and Recovery Techniques to avoid data anomalies.	PO3,PO11,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	3	-	-	-	-	-	-	-	3
CO3	-	-	3	-	3	-	-	-	-	-	3	-
CO4	-	-	-	2	-	-	-	-	-	-	3	-
CO5	-	-	3	-	-	-	-	-	-	-	3	3

TEXT BOOKS :

1. *Database System Concepts, 5/e, 2006, Korth, Silbertz, Sudarshan, TATA McGraw- Hill, New Delhi.*

2. *Data base Management Systems, 3/e, 2003, Raghu Ramakrishnan , Johannes Gehrke, Mc Graw Hill, New Delhi.*

REFERENCE BOOKS :

1. *Fundamentals Of Database Systems, 5/e, 2008, Elmasri,Navathe, Pearson Education, New Delhi.*

2. *Introduction to Database Systems, 8/e, 2008, C.J.Date, Pearson Education, New Delhi.*

3. *Database Management Systems , 1/e, 2011, Peter Rob, A.Anand Rao and Carlos Coronel, Cengage Learning.*

4. *Oracle Database 10g PL/SQL 101, 1/e, 2004, Christopher Allen, TATA McGraw Hill, New Delhi.*

5. *SQL, PL/SQL Programming, 3/e, 2005, Ivan Bayross, BPB Publications, New Delhi.*

I MCA - I Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

20MCA117   **C PROGRAMMING & DATA STRUCTURES LAB**

PREREQUISITES: A course on "C Programming & Data Structures"

COURSE EDUCATIONAL OBJECTIVES:

CEO1 *To acquire knowledge about the basic concept of writing a C program*

CEO2 *Know the role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.*

CEO3 *Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.*

CEO4 *Implement Bubble Sort, selection sort and insertion sort method to sort a given list of integers.*

CEO5 *Demonstrate familiarity with major algorithms and data structures.*

Syllabus:

1. Write a C program to (a)find biggest among 3 numbers.

   (b) find sum of first n numbers.

   (c) find multiplication table for a given input value.

2. Write a C function to remove duplicates from an ordered array. For example, if input array contains 10,10,10,30,40,40,50,80,80,100 then output should be 10,30,40,50,80

3. Write a C program to determine if the given string is a palindrome or not.

4. Write a C program to display the Following pattern called Floyed's Triangle.

   ```
   1
   2   3
   4   5   6
   7   8   9   10
   11  12  13  14  15
   ```

5. Write a C program to print the following patterns

   a.
   ```
   1
   2 2
   3 3 3
   4 4 4 4
   5 5 5 5 5
   6 6 6 6 6 6
   ```

   b.
   ```
   1
   1 2
   1 2 3
   1 2 3 4
   1 2 3 4 5
   ```

   c.
   ```
   1 2 3 4 5
   1 2 3 4
   1 2 3
   1 2
   1
   ```

6. Write a C program to perform addition and multiplication of two given matrices.

7. Write a C program to find the transpose of a given matrix.

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

    (b) implement Queue (its operations) using Arrays.

9. Write a C program that uses functions to perform the following operations using singly linked
    list   i) Creation   ii) insertion   iii) Deletion   iv) Traversal

10. Write a C program that uses functions(a) to perform the following operations using double
    linked list
    (b) Creation   ii) insertion   iii) Deletion   iv) Traversal

14. Write a Program that uses Stack Operations to perform the following

    (a) Converting infix expression to postfix expression
    (b) Evaluation the postfix expression

15.(a)Write a C program that implements the following sorting methods to sort a given list of
integers in ascending order

                1. Bubble sort   2. Selection sort
    (b)Write a C program that implements the following sorting methods to sort a given list of
    integers in ascending order
                1. Quick sort   2. Merge sort

16.(a)Write a C program to demonstrate insert operation in binary search tree
   (n)Write a C Program to Find the Shortest Path Between Two Vertices Using Dijkstra's
    Algorithm

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	Develop an algorithm to implement logics or every program	PO1,PO2
CO2	Demonstrate the basic understating of Operators, Data types, Variables, Expressions, Constants, Looping & Branching for implementing basic programming.	PO1
CO3	Apply Arrays, Structure for constructing the logics for solving complex programs	PO3,PO4
CO4	Formulate effective logics for memory utilization using pointers	PO4,PO5
CO5	Formulate effective logics for secondary memory utilization using files	PO4,PO5
CO6	Demonstrate knowledge on writing program using C for Data Structures to solve real life applications.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to Data Structures implementation for various application during their life time	PO12

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

I MCA - I Semester	L	T	P	C
	0	0	3	1.5

20MCA118   **DATABASE MANAGEMENT SYSTEMS LAB**

PREREQUISITES: A course on "Database Management Systems"

COURSE EDUCATIONAL OBJECTIVES:
CEO1 Learn to create and use a database.
CEO2 Be familiarized with a query language.
CEO3 Have hands on experience on DDL Commands.
CEO4 Have a good understanding of DML Commands and DCL commands.
CEO5 Familiarize advanced SQL queries.
CEO6 Learn to write PL/SQL programs.

Syllabus:
THE FOLLOWING TOPICS NEED TO BE COVERED IN THE LABORATORY SESSIONS

1. DDL COMMANDS.

2. DML COMMANDS.

3. DISTINCT , ORDER BY CLAUSE.

4. ORACLE FUNCTIONS.

5. TYPES OF DATA CONSTRAINTS.

6. COMPUTATIONS DONE ON TABLE DATA.

7. GROUPING DATA FROM TABLES IN SQL.

8. SUBQUERIES.

9. JOINS.

10. CONCATENATING DATA FROM TABLE COLUMNS USING THE UNION, INTERSECT AND MINUS CLAUSE.

11. VIEWS.

12. SEQUENCES.

13. GRANTING AND REVOKING PERMISSIONS.

14. NESTED QUERIES.

15. CURSORS.

16. PROCEDURES.

17. TRIGGERS.

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

	COURSE OUTCOMES	POs related to COs
CO1	**Demonstrate** defining and manipulating the structure of database and its data using basic SQL commands.	PO1
CO2	**Analyze the requirement to implement** a database schema for a given problem-domain.	PO2
CO3	**Enforce** Integrity Constraints on Database Schema using SQL Constraints to develop solutions for Data Constraints	PO3
CO4	**Experiment** the participant analysis in Database Environments towards an information oriented data processing using SQL Functions.	PO4
CO5	**Identify and Solve** Complex query processing using PL/SQL including stored procedures, stored functions, cursors and Triggers	PO5
CO6	**Following** ethical principles in implementing various Data Constraints and Database designs.	PO8
CO7	**Doing** experiments effectively as an individual and as a member in a group.	PO9
CO8	**Communicate** verbally and in written form, the understandings about the Integrity Constraints and Programs.	PO10
CO9	**Updating** their skill related to various database schema implementation for various applications during their life time	PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS :

1. *SQL, PL/SQL Programming 3/e, 2005, Ivan Bayross, BPB Publications, New Delhi.*

2. *Database Management Systems, 3/e, 2003, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill, Boston.*

I MCA - II Semester	**L**	**T**	**P**	**C**
	2	**1**	**0**	**3**

20MCA121   **ARTIFICIAL INTELLIGENCE**

PREREQUISITES: Knowledge on Mathematical logic, Problem solving techniques, Knowledge representation and Learning Techniques may be helpful.

COURSE EDUCATIONAL OBJECTIVES:

CEO1 *To familiarize students with Artificial Intelligence techniques for building well-engineered and efficient intelligent systems.*

CEO2 *In the applied point of view, some cutting edge applications of these systems will also be discussed.*

CEO3 *To have an appreciation and understanding of both the achievements of AI and the theory underlying those achievements.*

CEO4 *To have an appreciation for the engineering issues underlying the design of AI systems.*

CEO5 *To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.*

CEO6 *To have a basic understanding of some of the more advanced topics of AI such as Learning.*

Syllabus:
UNIT - 1

Introduction-What is AI? - The History of Artificial Intelligence - The State of the Art. **Intelligent Agents**: Agents& Environments – Good Behavior: The Concept of Rationality –The Nature of Environments - Structure of Agents.

UNIT - 2

Solving Problems by Searching: Problem Solving Agents – Example Problems- Searching for Solutions-Uninformed Search Strategies -Informed (Heuristic) Search Strategies - Heuristic Functions.

Beyond Classical Search: Local Search Algorithms and Optimization Problems- Local Search in Continuous Spaces- Searching with Nondeterministic Actions- Searching with Partial Observations .

UNIT - 3

Constraint Satisfaction Problems : Defining Constraint Satisfaction Problems- Constraint Propagation: Inference in CSPs- Backtracking search for CSPs.

Logical Agents: Knowledge–Based Agent - The Wumpus World – Logic - Propositional Logic: a Very Simple Logic - Propositional Theorem Proving - Effective Propositional Model Checking - Agents Based on Propositional Logic.

UNIT - 4
First Order Logic: Syntax and Semantic of First-Order Logic - Using First-Order Logic - Knowledge Engineering in First-Order Logic.

Inference in First Order Logic
Propositional Vs First Order Inference-Unification and Lifting-Forward Chaining-Backward Chaining-Resolution.

UNIT - 5
Knowledge Representation: Ontological Engineering - Categories and Objects - Events- Reasoning Systems for Categories - Reasoning with Default Information - The Internet Shopping World.

Quantifying Uncertainty: Acting Under Uncertainty - Basic Probability Notation - Inference Using Full Joint Distributions – Independence - Bayes' Rule and Its Use.

COURSE OUTCOMES:
    On successful completion of this course, students will be able to:

COURSE OUTCOMES		
CO1	**Explain** the key characteristics and structure of intelligent agents	PO1,PO2
CO2	**Solve** search problems by applying a suitable search strategy.	PO1,PO2,PO3, PO4,PO8,PO12
CO3	**Design** of an intelligent agent using propositional logic and first order logic to solve reasoning problems	PO1,PO2, PO3,,PO4,PO5 PO12
CO4	**Construct** a knowledge representation system using logic and ontological engineering to facilitate inference in the given problem domain	PO1,PO2, PO3,,PO4,PO5 ,PO11,PO12
CO5	**Construct** a knowledge base for uncertain knowledge inference using probability distribution and solving problems	PO1,PO2, PO3,,PO4,PO5, PO6,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	2	2	-	-	2	-	-	-	-	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2
CO4	2	3	2	3	3	-	-	-	-	-	2	3
CO5	2	3	3	3	3	1	-	-	-	-	2	3

TEXT BOOKS:

1. *Artificial Intelligence A Modern Approach, 2015, Third Edition , Stuart J. Russell and Peter Norvig Pearson Education.*

REFERENCE BOOKS:

1. *Artificial Intelligence, 3/e, Elaine Rich, Kevin Knight and Shiva shankar B Nair Tata McGraw Hill.*

2. *Artificial Intelligence-Structures and Strategies for Complex Problem Solving, 5/e, George F. Luther, Pearson Education.*

3. *Introduction to Artificial Intelligence, Eugene Charniak and Drew McDermott, Pearson Education.*

I MCA - II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20MCA122   **CLOUD COMPUTING**

PREREQUISITES: A Course on "Computer Networks".
COURSE EDUCATIONAL OBJECTIVES:

- *CEO1   To explore the Basics of Cloud Computing.*
- *CEO2   To Learn about Cloud Computing Technology.*
- *CEO3   To Explore Common Standards in Cloud Computing.*
- *CEO4   To Explore Cloud Service Providers.*
- *CEO5   To understand Business Case for Going to the Cloud.*

Syllabus:

UNIT - 1 :   Cloud Computing Basics

Cloud Computing Overview – What is Cloud Computing, Cloud Components, Infrastructure-Grid Computing, Full Virtualization, Para virtualization, Services-Software as a service, Platform as a Service, Hardware as a Service, First Movers in the Cloud, When you can use cloud computing, Benefits, Limitations, Security Concerns.

UNIT - 2 :   Cloud Computing Technology

Hardware and Infrastructure: Clients, Security, Network, Services; Accessing the Cloud: Platforms, Web Applications, Web APIs, Web Browsers; Cloud Storage: Overview, Cloud Storage Providers; Standards: Application, Client, Infrastructure, Service

UNIT - 3 :   Common Standards in Cloud Computing - End user access to cloud computing

The open cloud consortium - The distributed management task force - Standards for application developers - Standards for messaging - Standards for security - YouTube - Facebook –What is Smartphone- - Smartphone - Mobile operating systems for smart phones - Mobile platform virtualization.

UNIT - 4 : Cloud Computing with the Titans

Google-Google APP Engine, Google Web Toolkit, Microsoft-Azure Services Platform, Windows Live, Exchange Online, Sharepoint Services, Microsoft Dynamics CRM, Amazon-Amazon Elastic Compute Cloud(Amazon EC2), Amazon SimpleDB, Amazon Simple Storage Service(Amazon s3),Amazon Simple Queue Service(Amazon SQS), Salesforce.com-Force.com, Salesforce.com CRM, AppExchange.

UNIT - 5 : A Business Case Study

The Business Case for Going to the Cloud: Cloud Computing Services, How Those Applications Help Your Business, Deleting Your Datacenter, Salesforce.com, Thomson Reuters

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Articulate** the main concepts, key technologies, strengths, and limitations of cloud computing	PO1,PO3,PO6
CO2	**Conceptualize** Hardware and Infrastructure requirements and Understand what are the techniques for cloud storage.	PO1,PO3, PO5,PO6
CO3	**Understand** the standards for security, messaging and applications, and also end user accessibility to cloud.	PO1,PO2,PO3, PO5,PO6, PO8,PO10
CO4	**Aware** the various services provided by big titans of cloud computing	PO1,PO6,PO7, PO9,PO11,PO12
CO5	**Illustrate** business case for going to cloud and how those applications helps the Business	PO1,PO3, PO5,PO11,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	3	-	-	-	-	-	-	-
CO3	3	2	3	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	2	-	-	-	-	3
CO5	3	-	3	-	2	-	-	-	-	-		3

TEXT BOOKS:

1. *"Cloud Computing implementation, management and security", 1/e, 2009, John W. Rittinghouse, James F. Ransome, CRC Press, Taylor & Francis group, US.*

2. *"Cloud Computing: A practical approach", 1/e, 2009, Anthony T.velte, Toby J.velte Robert Elsenpeter, Tata Mc Graw Hill edition, India.*

REFERENCE BOOKS:

1. *"Cloud Computing: Principles and Paradigms ", 1/e, 2013, Rajkumar Buyya, James Broberg and Andrzej Goscinski , Wiley Pvt. Ltd., India.*

2. *"Cloud Computing: Concepts, Technology & Architecture ", 1/e, 2013, Thomas Erl, Ricardo Puttini and Zaigham Mahmood , PHI, New Delhi.*

3. *"Cloud Application Architectures", 1/e, 2009, George Reese, Oreilly publishers, California.*

4. *"Cloud Computing and SOA convergence in your enterprise", 1/e, 2010, David S. Linthicum, Addison- Wesley, Boston, US.*

I MCA - II Semester	L	T	P	C
	2	1	0	3

20MCA123   **DATA WAREHOUSING & DATA MINING**

PREREQUISITES: A Course on "Data Base Management System" and "Artificial Intelligence"

COURSE EDUCATIONAL OBJECTIVES:

CEO1 To understand and implement classical models and algorithms in data warehousing and data mining.

CEO2 To make the student acquaint with the tools and techniques used for KDD, and other data repositories and evaluate different models used for OLAP and data pre-processing.

CEO3 To Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis.

CEO4 To design and implement systems for data mining, evaluate the performance of different data mining algorithms.

CEO5 To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Syllabus:
UNIT - 1 :   Introduction and Data Pre-Processing

Motivation and Importance- What is Data Mining- Data Mining on What Kind of data -Data Mining Functionalities-Classification of Data Mining Systems- Data Mining Task Primitives-Major Issues in Data Mining- Why Preprocess the data-Data Cleaning-Data Integration- Data Transformation- Data Reduction.

UNIT - 2 :   Data Warehouse and OLAP Technology

What is a Data Warehouse-Multi dimensional data model- Schemas for multi dimensional database-OLAP operations in the Multi dimensional data model-Data Warehouse Architecture-Data Warehouse Implementation-From Data Warehousing to Data Mining.

UNIT - 3 :   Mining Frequent Patterns , Associations and Correlations

Basic Concepts and a Road Map, Efficient and Scalable Frequent Itemset Mining Methods, The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Mining Frequent Itemset without Candidate Generation, Mining various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT - 4 :   Classification & Prediction

What is Classification, What is Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Support Vector Machines, Lazy Learners, Prediction, Linear Regression and non- Linear Regression , Accuracy and Error Measures.

UNIT - 5 :   Cluster Analysis and Applications

What is Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, K-Means Method, Hierarchical Methods, Agglomerative & Devise Hierarchical Clustering, Density Based Methods, DBSCAN: A Density – Based Clustering Method Based on Connected Regions with

sufficiently High Density, Grid-Based Methods, STING: Statistical Information Grid, Data Mining Applications.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Identifying** data mining tools **analyze** various datamining algorithms to solve the realtime problems.	PO1,PO2,PO3, PO4,PO5
CO2	**Using** multi dimensional data model design a data warehouse and **Apply** the OLAP technology to solve decision making problems.	PO1,PO2,PO3, PO4,PO5,
CO3	**Apply** the minig techniques like frequent patterns, association rules on transactional databases.	PO1,PO2,PO3, PO4,PO5
CO4	**Apply** different Classification models to solve the classification problems.	PO1,PO2,PO3, PO4,PO5,PO11, PO12
CO5	**Apply**ing different clustering Algorithms to find clusters of the given dataset and **explore** recent trends in data mining such as text mining ,spatial data mining, multimedia data mining.	PO1,PO2,PO3, PO4,PO5,PO11, PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	-	-	-	-	-	-	-
CO2	2	3	3	2	3	-	-	-	-	-	-	-
CO3	3	3	2	2	3	-	-	-	-	-	-	-
CO4	3	3	3	3	3	-	-	-	-	-	3	3
CO5	3	3	3	2	3	3	-	-	-	-	3	3

TEXT BOOKS :
1. *Data Mining: Concepts and Techniques, 2/e, 2009, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, New Delhi, India.*
2. *Introduction to Data Mining, 2006, Pang - Ning Tan, Micael Steinbach and Vipin Kumar, Pearson education, New Delhi, India.*

REFERENCE BOOKS :
1. *Data Mining: Introductory and Advanced topics, 2008, Margaret H. Dunham, Pearson Education, New Delhi, India.*
2. *Building the Data Warehouse, 4/e, 2008, W.H. Inmon , Wiley-India, Fourth Edition, New Delhi, India.*
3. *Insight into Data Mining Theory and Practice, 2010, K.P. Soman, Shyam Diwaker, V. Ajay, PHI Learning Private Limited, New Delhi, India.*
4. *Data Mining Techniques, 2007, Arun K. Pujari, Tata Mc- Graw Hill, New Delhi, India.*
5. *Data Mining A tutorial Based Primer, 2003, Richard J. Roiger and Michael W. Geatz, Pearson Education, Singapore.*

I MCA - II Semester	L	T	P	C
	2	1	0	3

20MCA124   **PROGRAMMING USING PYTHON**

PREREQUISITES: A Course on "C Programming" may be useful

COURSE EDUCATIONAL OBJECTIVES:

CEO1 To differentiate the syntax of python from other programming languages.
CEO2 To get familiar in writing simple programs using python language.
CEO3 To develop Python programs with conditionals and loops.
CEO4 To define Python functions and call them.
CEO5 To use Python data structures –-modules, lists, tuples, dictionaries.
CEO6 To do input/output with files in Python.

Syllabus:
UNIT – 1:   Introduction
The Python Programming Language, What is a program, debugging, syntax errors, runtime errors, semantic errors, Experimental debugging, formal & natural languages, The first program, Comments, Variables, Expressions and Statements, Program Flow-Conditionals, Iteration.

UNIT – 2:   Functions & Strings
Functions, Function calls, Flow of Execution, Functions that require arguments, Functions that return values, Variables & Parameters are local, Return Values, Program development, Debugging with print, Composition, Boolean Functions, Local Variables, String Handling, Strings.

UNIT – 3:   Recursion, Lists, Dictionaries And Sets
Recursive Functions, Recursive Problem Solving, Iteration Vs Recursion, List Structures, Lists in Python, Iterating over Lists in Python, More on Python Lists, Dictionaries and Sets-Dictionary type in Python, Set data type.

UNIT –4:   Object Oriented Programming
What is Object Oriented Programming, Encapsulation, Inheritance, Polymorphism, Object-Oriented Design Using UML, and Computational Problem Solving – Vehicle Rental Agency Program.

UNIT – 5:   Files, Modules, Exceptions
About Files, Writing our First File, Reading a file line-at-a-time, Turning a file into a list of lines, Reading the Whole file at once, An Example, Directories.
Modules – Random numbers, The time module, The math module, Creating your own modules, Namespaces, Scope and lookup rules, Attributes and the dot operator, Three import statement variants, Exceptions.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Develop** algorithmic solutions to simple computational problems.	PO1,PO3
CO2	**Analyze** to Read, write and execute Python programs using Functions and Strings.	PO1,PO2
CO3	**Experiment** Object Oriented Programming concepts in python	PO1,PO3
CO4	**Design** compound data using Python lists, tuples, and dictionaries.	PO1,PO2
CO5	**Conceptualize** and achieve knowledge to handle data in files.	PO1,PO4, PO5

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	2	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	3	-
CO5	-	-	-	3	3	-	-	-	-	-	-	3

TEXT BOOKS:

1. *How to Think Like a Computer Scientist: Learning With Python 3, Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers.*

2. *Introduction to Computer Science using Python: A Computational Problem-Solving Focus, 2016, Charles Dierbach, Wiley India Edition.*

REFERENCE BOOKS:

1. *Fundamentals of Python, Cengage Learning, 3/e, 2012, Kenneth Lambert and B.L. Juneja.*

2. *Python Programming: A Modern Approach, Vamsi Kurama, Pearson*

3. *Learning Python, Mark Lutz, Orielly*

4. *Introduction to Python, Kenneth A. Lambert, Cengage*

I MCA - II Semester	L	T	P	C
	2	1	0	3

20MCA125   **OBJECT ORIENTED PROGRAMMING THROUGH   JAVA**

PREREQUISITES: *A course on "C Programming" may be useful*

COURSE EDUCATIONAL OBJECTIVES:

CEO1	*To learn Java basic concepts.*
CEO2	*To Explore Java Inheritance, Interfaces and Collection Framework.*
CEO3	*To Create and use Java Packages.*
CEO4	*To Design Applets using swing package.*
CEO5	*To Learn Handling of Exceptions and Events.*

Syllabus:

UNIT - 1 :   **Fundamentals of Object-Oriented Programming & Java Evolution**

Introduction, Object-Oriented Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of OOP, Applications of OOP, Java History, Java Features, How Java differs from c and c++, Java Environment, constants, Data Types, Variables, Type Conversion and Casting, Automatic Type Promotion in Expression, Arrays, Operators and Expressions, Control Statements.

UNIT - 2 :   **Inheritance and Packages**

Introduction, Defining a Class, Adding Variables, Adding Methods, Creating Objects, Accessing Class members, Constructors, Method Overloading, Static members, Inheritance, Overriding Methods, Final Variables ,Methods and classes, Abstract Methods and Classes, Visibility control, Packages-Introduction, Java API Package, Using System Package, Naming Conventions, Creating Packages, Accessing a Package.

UNIT - 3 :   **Interfaces and Collection Framework**

Interfaces-Defining an Interface, Implementing Interfaces, Interfaces can be extended, Collections Overview: The Collection Interfaces – The List Interface, The Set Interface, The Collections Classes – Hash Set, Stack, Linked List, Array List, Vector, Accessing a Collection Via an Iterator, String, String Buffer Class, Utility classes – String Tokenizer, Scanner

UNIT - 4 :   **Exception Handling, Multithreading and Applets**

Exception Handling Fundamentals, Exception types, Uncaught Exception, Using try and caught, Multiple catch Clauses, Nested try statements, throw, throws, finally, Java's Built-in Exceptions, user defined Exceptions, Multithreaded Programming – Thread States, Life Cycle of a Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities. Applets: How Applets differ from Applications, Building Applet Code, Applet Life Cycle, Designing a web page, Applet tag, Adding Applet to HTML File, Running the Applet.

UNIT - 5 :   **Event handling and Swings**

Two Event Handling Mechanism, The Delegation Event Model, Event Classes, Sources of Events, Event Listeners Interfaces, Adapter Classes. Swings - The Origins of Swings, Swing is Built on the AWT, Swing Features , Swing Components and Containers , A Simple Swing Application, Event Handling, Creating a Swing Applet-Exploring Swing.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Experiment** Object Oriented Programming Concepts such as class, object, abstraction to solve real world problems using Java.	PO1,PO2, PO3,PO12
CO2	**Explore** how to organize various classes as packages and types of inheritance to solve the given problem	PO2,PO3, PO4, PO5
CO3	**Identify and Solve** problems using java Interfaces and Collection framework	PO2,PO3, PO4, PO5
CO4	**Handle** the run time errors using exceptional handling mechanism and concurrent tasks using threads	PO1,PO2, PO3 , PO5, PO12
CO5	**Design** Internet Applications using java Applets and components of swing package	PO2,PO3

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	3
CO2	-	3	3	3	2	-	-	-	-	-	-	-
CO3	-	3	3	3	2	-	-	-	-	-	-	-
CO4	2	2	2	-	3	-	-	-	-	-	-	-
CO5	-	2	3	-	-	-	-	-	-	-	-	2

TEXT BOOKS:

1. *Java: The Complete Reference, 7/e, 2008, Herbert schildt , Tata McGraw Hill- New Delhi.*

2. *"Programming with Java", 3/e, E. Balaguruswamy, Tata McGraw Hill- New Delhi*

REFERENCE BOOKS:

1. *Core Java- Volume 1-Fundamentals, 8/e, 2012, Cay S. Horstmann and Gary Cornell- Pearson Education, New Delhi.*
2. *Core Java- Volume2-Advanced Features, 8/e, 2012, Cay.S. Horstmann and Gary Cornell, Pearson Education, New Delhi.*
3. *Advanced Programming in Java 2, 2/e, 2005, K. Somasundaram , Jaico Publishing House, New Delhi.*
4. *Maurach's Beginning Java2-D.Lowe ,1/e, 2005, J.Murach A. Steelman- Shroff Publishers and Distributors, New Delhi.*

5. *Introduction to Java Programming, 6/e, 2006, Y. Daniel Liang, Pearson Education, New Delhi.*

I MCA - II Semester

L	T	P	C
3	0	0	3

20MCA126   **SOFTWARE ENGINEERING**

PREREQUISITES: Knowledge on Information Technology may be helpful.

COURSE EDUCATIONAL OBJECTIVES:

CEO1 *To Understand, Analyze and Model User's Requirements.*

CEO2 *To select appropriate process model to apply for all Stages of Software Development Life Cycle (SDLC).*

CEO3 *To select and apply appropriate Design Methodology.*

CEO4 *To decide the feasibility of using and applying Agile Development Process.*

CEO5 *Assure Software Quality, select and apply appropriate Testing Strategies.*

Syllabus:
UNIT - 1 :   Introduction to Software Engineering and A Generic view of Process

The Evolving role of Software - Changing nature of Software - Legacy Software - Software myths. A layered technology- A Process Framework- CMMI- Process assessment - Personal and team Process Models.

UNIT - 2 :   Process Models

The waterfall model- Incremental process models- Evolutionary process models- Specialized Process Models- Agile process - Agile process Model: Extreme programming.

UNIT - 3 :   Software Requirements and System Models

Functional and non-functional requirements- User requirements- System requirements- Interface specification- The software requirements document-Feasibility studies- Requirements elicitation and analysis- Requirements validation- Requirements management. Context Models- Behavioral models- Data models- structured methods.

UNIT - 4 :   Design Engineering& Architecture, Testing Strategies

Design process and Design quality- Design concepts- the design model - Creating an architectural design: software architecture- Data design- Architectural styles and patterns- Architectural Design. A strategic approach to software testing- Test strategies for conventional Software - Validation testing- System testing- The art of debugging.

UNIT - 5 :   Testing Tactics, Software Measurement and Estimation

Software testing fundamentals - White-Box testing- Basis path testing- Control structure Testing-Black box testing. Size oriented metrics- Function oriented metrics- Metrics for software quality-Empirical Estimation Models: - Quality Management: Software quality assurance- Formal Technical Reviews.

COURSE OUTCOMES:
   On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Demonstrate** the processes of software development.	PO1,PO2
CO2	**Analyze** the customer business requirements and choose the appropriate Process model for the project.	PO1,PO2, PO12
CO3	**Build** the prototype for Software business case and analyze the requirements of software project.	PO1,PO2, PO12
CO4	**Design** the System based on Architectural styles and Design patterns. .	PO1,PO2, PO3,PO12
CO5	**Design** test cases and Define metrics for standardization and assuring quality standards. .	PO1,PO2,PO3, PO4,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	3	-	-	-	-	-	3
CO3	3	3	-	-	-	3	-	-	-	-	-	3
CO4	3	3	-	-	-	3	-	-	-	-	-	3
CO5	3	3	3	2	-	3	-	-	-	-	-	3

TEXT BOOKS:

1. *Software Engineering, A practitioner's Approach, 7/e , Roger S Pressman, Tata McGraw-Hill International Edition .*

2. *Software Engineering, 8/e , Ian Sommerville, Pearson Education, India.*

REFERENCE BOOKS:

1. *Fundamentals of Software Engineering , 2/e, 2005, Rajib Mall , Prentice Hall Inc, India.*

2. *Software Engineering: A Precise Approach , 1/e, 2010, Pankaj Jalote , Wiley, India.*

3. *Software Engineering: A Primer , 1/e, 2008, Waman S Jawadekar , Tata McGraw Hill , India.*

4. *Software Engineering - Principles and Practices ,1/e, Deepak Jain , Oxford University Press.*

I MCA - II Semester	L	T	P	C
	0	0	3	1.5

20MCA127   PROGRAMMING USING PYTHON & DATA MINING LAB

PREREQUISITES: Courses on "Programming using Python"and "Data Mining"

COURSE EDUCATIONAL OBJECTIVES:

CEO1	*To develop, test, and debug programs with data and expressions.*
CEO2	*To write python programs with control structures and functions.*
CEO3	*To write a program with compound data using Python lists, tuples, dictionaries.*
CEO4	*To write python programs for file handling.*
CEO5	*Be familiar with the algorithms of data mining.*
CEO6	*Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.*

PROGRAMMING USING PYTHON LAB

Recommended Systems/Software Requirements:

- *For Windows: IDLE/ Spyder python development environment.*
- *For Linux: Default python version installed/ higher version.*

LIST OF EXERCISES:

1. Write python program to
    a. check the given number is prime or not.
    b. find sum of natural number using recursion.
2. With the help of string array or list, display a simple calendar in python program without using the calendar module.
3. a) Write a program to sum a series of (positive) integers entered by the user, excluding all numbers that are greater than 100.
    b) Write a program, in which the user can enter any number of positive and negative integer values that displays the number of positive values entered, as well as the number of negative values.

4. a) Write a program containing a pair of nested while loops that displays the integer values 1–100, ten numbers per row, with the columns aligned as shown below
```
 1  2  3  4  5  6  7  8  9  10
11 12 13 14 15 16 17 18 19  20
21 22 23 24 25 26 27 28 29  30
-   -   -     -      -      -
-   -   -     -      -      -
91 92 93 94 95 96 97 98 99 100
```

    b) Display the integer values 1–100 as given in question a) using only *one* while loop.
5. Write and test a function
    a. removeDuplicates(somelist) that removes duplicate values from a list.

b. innerProd(x,y) that computes the inner product of two (same length) lists.
6. Design a user interface in python to function a simple calculator.
7. Show the functionalities of the Boolean operators and Boolean functions in performing a choice of colors via mouse clicks in Rectangles.
   Demonstrate the different types of plots with necessary features using Matplotlib: Bar chart, Polar plot, pie charts, histograms, contour plot.
8. Demonstrate class and inheritance in python.
   Demonstrate various image processes using python imaging library
       a. Convert RGB to grey
       b. Blur effects
       c. display only edges
9. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters. Write the updated content in another file and display it.
10. Write a program to demonstrate the user-defined exception handling mechanism in Python.
11. Write a GUI Script for creating text label in a window.
12. Write a Python Script to create a command button. When the button is clicked the event should be handled and the message on the window should change from "Hello" to "Good Bye".

DATA MINING LAB

SOFTWARE: WEKA, R- Tool or any other equivalent tool.

LIST OF EXPERIMENTS

1. Data Cleaning & Data Normalization.

2. Apriori & FP - Growth Algorithm.

3. Decision Tree Classification.

4. Bayesian & K- Nearest Neighbor Classification.

5. Linear Regression based Prediction Analysis.

6. K - means & Hierarchical clustering.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Experiment and debug** simple Python programs. **Demonstrate** knowledge on solving Data Mining Tasks using Mining Frequent Patterns, Classification Models and Clustering Algorithms .	PO1
CO2	**Implement** Python programs with conditionals and loops.	P02
CO3	**Develop** Python programs step-wise by defining functions and calling them. **Apply** Data Cleaning and Data Normalization to fill the missing values and to Normalize the values.	PO3
CO4	**Examine the usage of** Python lists, tuples, dictionaries for representing compound data **Analyze** the given data set to determine Frequent Patterns and Association rules by **Apply**ing Frequent pattern Mining and Association Rule Mining Algorithms.	PO4
CO5	**Implement** Practical and real world data analysis **. Create** a dataset , Select and Apply a Decision Tree Algorithm to **Construct** a Decision Tree model and **Apply** it to predict the class label of data tuples whose class label is unknown and also **Apply** Bayesian Classification model to solve classification problems using any modern tool.	PO5
CO6	Following ethical principles in **implement**ing object oriented programming in python. Follow ethical principles in **Analyz**ing, **designi**ng and **implement**ing various Data Analysis Tasks.	PO8
CO7	Do **experiments** effectively as an individual and as a member in a group.	PO9
CO8	**Communicate** verbally and in written form, the understandings about the python packages and Programs and Datamining experiments	PO10
CO9	**Continue** updating their skill related to Data Mining Tasks implementation for various application during their life time	PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

I MCA - II Semester	L	T	P	C
	0	0	3	1.5

20MCA128   **OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

PREREQUISITES: A course on "Object Oriented Programming Through Java"

COURSE EDUCATIONAL OBJECTIVES:

CEO1   *To Practice Basic Java Programs.*

CEO2   *To Illustrate Class, Object Concepts.*

CEO3   *To Illustrate Inheritance, Interface, packages, Abstract Classes Concept.*

CEO4   *To Handle Exceptions and Events.*

CEO5   *To Develop Applets.*

Syllabus:

1) Write a Java program
   a) To Find Sum of N Numbers.
   b) To Find Product of N Numbers.
   c) To Print Even Numbers and Odd Numbers from 1 to N.
2) Write a Java Program to Print sum of Individual Numbers in a Given Number.
3) Write a Java Program to Print Armstrong Numbers from 1 to 1000.
4) Write a Java Program to Print whether a given number is Super Number or not.
5) Write a Java program that prints all real solutions to the Quadratic Equation $Ax^2 + Bx + C = 0$. Read A, B, C and use the Quadratic Formula. If the discriminate b^2 -4ac is negative, display a message stating that there are no real solutions.
6) Write a java program that uses both recursive and non-recursive methods.
   a) To find the factorial of a given number.
   b) To compute Ncr.
7) The Fibonacci sequence is defined by the following rule : The first two values in the sequence are one and one. Every subsequent value is the sum of the two values preceding it.
   Write a java program that uses both recursive and non-recursive functions to print the nth value in the Fibonacci sequence.
8) Write a java program that prompts the user for an integer and then prints out all the prime numbers up to that integer.
9) Write a Java program to find both the largest and smallest number   in a list of integers.
10) Write a Java Program to sort list of Numbers in both ascending Order and Descending Order.
11) Write a Java program to perform
    a) Addition of two Matrices
    b) Subtraction of two Matrices
    c) Multiplication of two Matrices
12) Write a Java program to perform the following operations:
    a) Concatenation of two Strings.

b) Comparison of two Strings.

13) Write a Java program that uses functions to perform the following operations:
   a) Inserting a sub-string in to the given main string from a given position.
   b) Deleting n characters from a given position in a given string.

14) Write a Java program that checks whether a given string is a palindrome or not.

15) Write a Java program to make frequency count of words in a given text.

16) Write a Java Program to sort set of Names in both ascending Order and Descending Order.

17) Write a Java Program to Perform
   a) Linear Search
   b) Binary Search

18) Write a Java Program to Illustrate
   a) Constructor OverLoading
   b) Method OverLoading

19) Write a Java Program to Illustrate
   a) Single Inheritance
   b) Hierarchical Inheritance
   c) MultiLevel Inheritance

20) Write a Java Program to Illustrate
   a) Interfaces
   b) Abstract Class

21) Write a Java Program to Illustrate Method Overriding concept.

22) Write a Java program that illustrates the following

   a) Creation of simple package.
   b) Accessing a Package

23) Write a Java programs that illustrates the following
   a) Handling predefined Exceptions.
   b) Handling User Defined Exceptions .

24) Write a Java program that creates a user interface to perform integer divisions. the user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the result field when the divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a number format exception. If Num2 were Zero, the program would throw an Arithmetic Exception display the exception in a message dialog box.

25) Write a Java Program for Creating Multiple Threads

   a) By Extending Thread Class

   b) By Implementing Runnable Interfaces

26) Write a Java program that correctly implements producer consumer problem using the concept of Inter Thread Communication.

27) Write a Java Program to Illustrate the Following Collection Classes

   a) Stack

   b) HashSet

   c) LinkedList

   d) Vector

28) Develop an Applet in Java that displays a simple message.

29) Develop an Applet to Illustrate
   a) Graphics Class Methods
   b) Color Class Methods
   c) Font Class Methods

30) Develop an Applet to Illustrate Different Layouts

31) Develop an Applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "compute" is clicked.

32) Write a Java program 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.

33) Write a Java program for handling

   a)   Mouse Events

   b)   Keyboard Events.

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

	COURSE OUTCOMES	POs related to COs
CO1	**Apply** Knowledge of OOPS concept Through Java Language to Solve Complex Problems	PO1
CO2	**Analyze** the Real World problems to be solved by Using OOPS concepts like Polymorphism, Inheritance, Encapsulation, etc..	PO2
CO3	**Design** and **Develop** solutions for solving many Real World Problems.	PO3
CO4	**Investigate** for exceptions and handle it using exception Handling Mechanism	PO4
CO5	**Select** appropriate Techniques to implement Stand Alone, Distributed and Internet applications	PO5
CO6	**Follow** ethical principles in developing various types of applications .	PO8
CO7	**Implement** Applications as a Individual or as a Member of the group	PO9
CO8	**Communicate** verbally and in written form about the Applications/Programs developed through the Language.	PO10
CO9	**Continue** updating their skill related to OOPS concepts for **develop**ing applications during their life time	PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-

CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS :

1. *Java: How to Program, 5/e, 2005, P.J.Deitel and H.M.Deitel , Low Price Edition-India.*
2. *Core Java- Volume 1-Fundamentals, 8/e, 2012, Cay S.Horstmann and Gary Cornell- Pearson Education, New Delhi.*
3. *Core Java- Volume2-Advanced Features, 8/e, 2012, Cay.S. Horstmann and Gary Cornell, Pearson Education, New Delhi.*
4. *Introduction to Java Programming, 6/e, 2006, Y. Daniel Liang, Pearson Education, New Delhi.*
5. *Java:,The Complete Reference" , 7/e , 2008, Herbert schildt ,Tata McGraw Hill- New Delhi.*

II MCA - I Semester

L	T	P	C
2	1	0	3

20MCA211   **WEB TECHNOLOGIES**

PREREQUISITES: A Course on "Object Oriented Programming through JAVA".
COURSE EDUCATIONAL OBJECTIVES:

  CEO1   *To Learn Basics of HTML and XML.*

  CEO2   *To Understand and practice JavaScript, a client side Scripting language.*

  CEO3   *To Explore Server side Technologies like Servlet and JSP*

  CEO4   *To Explore PHP and MySQL Basics.*

Syllabus:

UNIT - 1 :   HTML , XML & JavaScript
HTML- Tables, Basic Text Markup, Images, Lists, Forms, Frames, CSS, Introduction to XML –The syntax of XML, XML Document Structure, Document Type Definitions, Introduction to JavaScript, Objects in JavaScripts-Regular Expressions, Built-in Objects.

UNIT - 2 :   Servlets & JSP
Life Cycle of a Servlet - A simple Servlet- The Servlet API - The Javax. Servlet Package - Reading Servlet Parameters - The javax. Servlet. HTTP Package - handling Http Request & Responses - using Cookie - Session Tracking, Java Server Pages – Motivation for JSP, JSP Documents, Scriptlets, Expression Language, JSTL Control Action Elements.

UNIT - 3 :   Introduction to PHP
History, General Features, PHP Basics, Code embedding web pages, Commenting the code, Output Data to Browser, Datatypes, Identifiers, String Interpolation.

UNIT - 4 :   Object Oriented Concepts in PHP
Object Oriented PHP, Object Cloning, Interfaces, Inheritance, Namespace, working with files & operating system.

UNIT - 5 :   MySQL Basics
An Overview, MySQL Architecture, The MySQL Engine, MySQL Datatypes, MySQL Operators, MySQL Function, Accessing Database in PHP, Updating Database, Creating a new Database, Working with Data, Joins.

COURSE OUTCOMES:

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

	COURSE OUTCOMES	
CO1	**Design** simple web pages using HTML and perform client side validations using Java script	PO1,PO3,PO5
CO2	**Develop** web Applications using server side Technologies like Servlet, JSP.	PO2,PO3,PO4,PO9
CO3	**Execute** programs in PHP, a widely used Server Side Scripting Languages	PO2,PO3,PO4,PO9,PO12
CO4	**Experiment** Object Oriented Programming Concepts such as Inheritance, Interface to solve real world problems using PHP.	PO1,PO2,PO3,PO9,PO11
CO5	**Devise** a Complete web Application by connecting it with MySQL.	PO1,PO2, PO4,PO11

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	3	-	-	-	-	-	-	-
CO2	-	3	3	2	-	-	-	-	2	-	-	-
CO3	-	3	3	3	-	-	-	-	2	-	-	3
CO4	3	3	2	2	-	-	-	-	3	-	3	-
CO5	3	3	-	3	-	-	-	-	-	-	3	3

TEXT BOOKS :

1. *Programming World Wide Web , 7/e, 2002, Sebesta, Pearson, Singapore.*

2. *Beginning PHP and MySQL from Novice to Professionals, W.Jason GilMore, APress Berkeley, CA, USA.*

REFERENCE BOOKS :

1. *MySQL- The Complete Reference, 2004, Vikram Vaswani, Tata MCGraw Hill.*

2. *Web Programming, building internet applications, 2/e, 2007, Chris Bates, Wiley, New Delhi.*

3. *The complete Reference Java, 7/e, 2008, Herbert Schildt, TATA Mcgraw- Hill, New Delhi.*

4. *Java Server Pages, 3/e, 2008,   Hans Bergsten, SPD O'Reilly, New Delhi.An Introduction to Web*

II MCA - I Semester	L	T	P	C
	2	1	0	3

20MCA212 **MACHINE LEARNING**

PREREQUISITES : *A course on "Artificial Intelligence"*

COURSE EDUCATIONAL OBJECTIVES:

>*CEO1* *To introduce students to the basic concepts and techniques of Machine Learning.*
>*CEO2* *To have a thorough understanding of the Supervised and Unsupervised learning techniques*
>*CEO3* *To study the various probability based learning techniques.*
>*CEO4* *To understand graphical models of machine learning algorithms.*

Syllabus:

UNIT - 1 :

Introduction: Learning- Types of Machine Learning- Supervised Learning- Regression, Classification-The Machine Learning Process.

Preliminaries: Some Terminology-Knowing what you know : Testing Machine Learning Algorithms-Turning Data into Probabilities-Some Basic Statistics-The Bias-Variance Tradeoff.

UNIT – 2 :

Neurons, Neural Networks and Linear Discriminants: The brain and the Neuron-Neural Networks-The Perceptron- The Perceptron Learning Algorithm, An example of Perceptron Learning: Logic Functions—Linear Separability- The Perceptron Convergence Theorem-The Exclusive or (XOR) Function, Pre-processing. Data Preparation-Linear Regression.

The Multi-Layer Perceptron: Going Forwards -Going backwards : Back Propagation of Error- The Multi-Layer Perceptron in Practice-Examples of Using the MLP- A Regression Problem, Classification with the MLP, A Classification Example: The Iris Dataset -Deriving Back Propagation.

UNIT – 3 :

Dimensionality Reduction: Linear Discriminant Analysis(LDA)-Principal Components Analysis(PCA)-Factor Analysis-Independent Components Analysis(ICA)-Locally Linear Embedding- ISOMAP.

Probabilistic Learning: Gaussian Mixture Models-The Expectation-Maximisation(EM) Algorithm, Information Criteria-Nearest Neighbour Methods- Efficient Distance Computations:The KDTree-Distance Measures.

UNIT – 4 :

Support Vector Machines: Optimal Separation- Kernels-The Support Vector Machine Algorithm-Extensions to the SVM.

Evolutionary Learning: The Genetic Algorithm(GA)-Generating offspring: Genetic Operators- Using genetic algorithms-Genetic Programming.

UNIT – 5 :
Learning with Trees:Using Decision Trees-Constructing Decision trees-Classification and Regression Trees(CART)-Classification Example.

Graphical Models-Bayesian Networks-Markov Random Fields-Hidden Markov Models(HMMS)-Tracking Methods-The Kalman Filter, The Particle Filter.

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

COURSE OUTCOMES		
CO1	**Defining** the types of Machine learning and distinguish between supervised, unsupervised and semi-supervised learning.	PO1,PO2
CO2	**Apply** the suitable machine learning strategy to solve the engineering problems.	PO1,PO2,PO3, PO4,PO5,PO8, PO11,PO12
CO3	**Understand** various probabilistic learning algorithms and reducing the dimensions using different techniques.	PO1,PO2,PO3, PO4,PO5,PO6
CO4	**Applying** the Support Vector Machine to solve non-linearly separable problems and genetic algorithms to solve real life problems.	PO1,PO2,PO3, PO4,PO5,PO6, PO8, PO11,PO12
CO5	**Construction** of a decision tree and design systems that uses the appropriate graph models of machine learning.	PO1,PO2,PO3, PO4,PO5, PO11,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	3	3	-	-	2	-	-	2	2
CO3	3	2	3	2	3	2	-	-	-	-	-	-
CO4	2	2	3	2	3	2	-	2	-	-	2	3
CO5	3	2	3	2	3	-	-	-	-	-	2	3

TEXT BOOK:

1. Machine Learning- An Algorithmic Perspective", 2/e, 2014, Stephen arsland, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series.

REFERENCE BOOKS:

1. "Pattern Recognition and Machine Learning", 2007, Christopher Bishop, Springer.

2. "Machine Learning: A Probabilistic Perspective", 2012, Kevin P. Murphy, MIT Press.

3. "Introduction to Machine Learning", MIT Press, 3/e, 2014, Ethem Alpaydin.

4. "Machine Learning", 1997, Tom Mitchell, McGraw-Hill.

II MCA - I Semester	L	T	P	C
	2	1	0	3

20MCA213   **BIG DATA ANALYTICS**

PREREQUISITES: Courses on "DataBase Management Systems" , "Object Oriented Programming through JAVA" and knowledge on Intelligence Techniques.
COURSE EDUCATIONAL OBJECTIVES:

  CEO1   To explore the fundamental concepts of Big Data.
  CEO2   To Learn Basic concepts of Hadoop.
  CEO3   To Write Hadoop MapReduce Programs for analyzing Big data.
  CEO4   To Explore Hadoop Ecosystem.

Syllabus:

UNIT - 1 :   Understanding Big Data

What is BigData, Concepts and Terminology - Datasets, Data Analysis, Data Analytics, Big Data Characteristics – volume, velocity, variety, veracity, value, Different Types of Data – Structured Data, Unstructured Data, Semi-Structured Data, Case Study Background.

UNIT - 2 :   Hadoop Basics

Brief history of hadoop, Apache hadoop and the hadoop ecosystem. A weather dataset, analyzing the data with unix tools, analyzing the data with hadoop , Understanding different Hadoop modes, understanding Hadoop Features-Understanding HDFS, Understanding MapReduce, Learning the HDFS and Mapreduce Architecture-Understanding the HDFS architecture, Understanding the MapReduce Architecture, Understanding the HDFS and MapReduce architecture by plot.

UNIT - 3 :   Writing Hadoop MapReduce Programs

understanding the basics of MapReduce, Introducing Hadoop MapReduce-Listing Hadoop mapReduce entities, Understanding the Hadoop MapReduce scenario, Understanding the limitations of MapReduce, understanding the Hadoop MapReduce Fundamentals,Writing a Hadoop MapReduce example-Understanding the steps to run a MapReduce job.

UNIT - 4 :   Working with Pig and Hive

Pig -Execution Types, An Example, Pig Latin-Structure, Statements,Types, Schemas, Functions, Data Processing Operators.Hive – An example, Tables –Managed Tables and External tables, Partitions and Buckets, Importing data, Altering Data, Dropping Tables, Querying Data-Sorting and Aggragating, Mapreduce Scripts.

UNIT - 5 :   **HBase, Zookeeper, Sqoop**

HBase Overview – Limitations of Hadoop, what is HBase,HBase and HDFS,Storage Mechansim in HBase,Features of HBase, Applications of HBase. ZooKeeper Overview – what is ZooKeeper,

Distributed Application, Benefits of Distributed Applications,Challenges of Distributed Applications, What is Apache Zookeeper meant for, Benefits of ZooKeeper.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Realize** characteristics of Big Data and various types of data like structured, unstructured and semistructured	PO1,PO2, PO10,PO11, PO12
CO2	**Understand** two major components of Hadoop	PO1,PO2, PO3,PO4, PO5,PO10, PO11
CO3	**Analyze** Big data using Hadoop Map Reduce programs	PO2,PO4, PO5,PO11, PO12
CO4	get **Acquainted** with two Data Access Components of Hadoop Ecosystem called pig and hive	PO1,PO3, PO4
CO5	Acquire **Knowledge** on Data Storage Component of Hadoop Ecosystem called Hbase, Data Integration Component of Hadoop Ecosystem like sqoop and Monitoring, Management and Orchestration of Hadoop Ecosystem component like zookeeper	PO1,PO2, PO3,PO4

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	3	3	2
CO2	3	3	2	3	2	-	-	-	-	3	2	-
CO3	-	3	-	3	3	-	-	-	-	-	3	3
CO4	3	-	3	3	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-

TEXT BOOKS:

   1. *Big Data Fundamentals: Concepts, Drivers & Techniques", 1/e, 2016, Thomas Erl, Wajid Khattak, Paul Buhler, Prentice Hall.*

   2. *"Hadoop:The Definitive Guide," 3/e, 2012, Tom White, O'REILLY Publications.*

REFERENCE BOOKS:

   1. *Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics , 2012, Bill Franks, John Wiley & Sons..*
   2. *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, 2012, Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, McGraw-Hill.*
   3. *Intelligent Data Analysis, 2007, Michael Berthhold, David J.Hand, Springer.*

4. *Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming data, 2011, Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, McGraw hill.*
5. *Big Data for Dummies, 2012, Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, John Wiley & Sons*

II MCA - I Semester	L	T	P	C
	2	1	0	3

20MCA214   **MOBILE APPLICATIONS USING ANDROID**

PREREQUISITES: Courses on "Object Oriented Programming through JAVA" and " Operating Systems".

COURSE EDUCATIONAL OBJECTIVES:

CEO1 *To get awareness about Basic Structure of Android OS with suspect to Mobile Applications, Mobile devices and Tools.*

CEO2 *To get awareness about various components and uses interface, services and Databases.*

Syllabus:

UNIT - 1 :   Introduction

Background, Android: An Open platform for mobile development, Native Android Applications, Android SDK Features, Open Handset Alliance, Why Develop for Mobile and Android, Development Framework, Types of Android Applications, Developing for Mobile and Embedded Devices, Android Development Tools.

UNIT - 2 :   Creating Applications

Application Manifest File, Using Manifest Editor , Externalizing Resources, Android Application Life Cycle, Application Priority and its States, Android Application Class, Android Activities.

UNIT - 3 :   Building User Interfaces & Databases

Fundamental Android UI Design, Layouts, Fragments, Creating new Views, Adaptors, Android Database, SQLite, Content Values and Cursors, Working with SQLite Databases.

UNIT - 4 :   Content Providers & Services

Creating & Using Content Providers, Adding search to your Application, Native Android Content Provider, Introducing services, Using Background Threads, Using Alarms.

UNIT - 5 :   Android Components

Action Bar, Menus & Action Bar Action Items, Dialogs, Notification, Designing, Collection view Widgets, Live Folders, Quick Search Box, Creating Application Widgets.

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

COURSE OUTCOMES		
CO1	**Understand** the basic structure of Android operating system.	PO1,PO2,PO4
CO2	**Demonstrate** the creation of mobile applications.	PO1,PO2,PO4,PO5,PO8,PO12
CO3	**Interpret** the database design concepts for different mobile applications.	PO1,PO3,PO4,PO5
CO4	**Enumerate** the different services applied for mobile application development.	PO1,PO4,PO6,PO7
CO5	**Compare** various components and its uses for mobile application development.	PO1,PO4,PO5,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	-	-	-	-	-	-	-
CO2	3	3	-	3	2	-	-	3	-	-	-	3
CO3	3	-	2	3	3	-	-	-	-	-	-	3
CO4	3	-	-	3	-	2	3	-	-	-	-	-
CO5	3	-	-	2	3	-	-	-	-	-	-	3

TEXT BOOK

1. *Professional Android 4 Application Development, 2012, Reto Meier, Wiley India.*

REFERENCE BOOKS

1. *Android Studio Development Essentials, 2014, Neil Smyth, Techopedia.*

2. *Android Programming Succinctly, 2014, Ryon Hodson, Syncfusion Inc.*

II MCA - I Semester	**L**	**T**	**P**	**C**
	2	**1**	**0**	**3**

20MCA215A   **WEB INFORMATION RETRIEVAL**
(Elective –I)

PREREQUISITES: Knowledge on Information Retrieval Techniques and Mathematical modeling may be helpful.
COURSE EDUCATIONAL OBJECTIVES:

- *CEO1* *To present the scientific underpinnings of the field of Information Search and Retrieval.*
- *CEO2* *To learn the important concepts, algorithms, and data/file structures that are necessary to specify, design, and implement Information Retrieval (IR) systems.*
- *CEO3* *To appreciate the capabilities and limitations of information retrieval systems.*
- *CEO4* *To understand the design and implementation of retrieval systems for text and other media.*
- *CEO5* *To evaluate the performance of an information retrieval system.*
- *CEO6* *To identify current research problems in information retrieval.*

Syllabus:
UNIT-1
Introduction to Information Retrieval : What is Information Retrieval- Evaluating an Information Retrieval System .

The Information Retrieval Process : A Bird's Eye View- A Closer look at Text- Data Structures for Indexing .

UNIT-2
Information Retrieval Models : Similarity and Matching Strategies- Boolean Model- Vector Space Model- Probabilistic Model.

Classification and Clustering : Addressing Information Overload with Machine Learning- Classification – Clustering- Application for Clustering.

UNIT-3
Search Engines: The Search Challenge- Brief History of Search Engine- Architecture and Components- Crawling- Indexing.

Link Analysis: The Web Graph- Link Based Ranking- Page Rank- Hypertext Induced Topic Search- The Value of Link BasedAnalysis.

UNIT-4

Recommendation and Diversification for the Web: Pruning Information- Recommendation Systems- Result Diversification

Publishing Data on the Data: Operations for Publishing Data on the Data- The Deep Web- Web API's- Microformats- RDFa- Linked Data.

UNIT-5

Semantic Search: Understanding Semantic Search- Semantic Model- Resources- Queries- Semantic Matching- Constructing the Semantic Model- Semantic Resources Annotation.

Multimedia Search: Motivations and Challenges of Multimedia Search- MIR Architecture- MIR Meta Data – MIR Content Processing.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

COURSE OUTCOMES		
CO1	**Explain** the Principles of Information Retrieval and Retrieval models.	PO1
CO2	**Apply** appropriate Classification algorithms and Clustering algorithms to classify and cluster the web documents.	PO1,PO2, PO3
CO3	**Describe** different Processing steps in searching documents using search engines and **Analyzing** the link analysis, page rank algorithm.	PO1,PO2, PO3
CO4	**Explain** the advanced Semantic based Models in Web Search System.	PO1,PO2, PO3,PO5,PO11, PO12
CO5	**Design** of a Recommender system and Knowing different Diversifications for the web.	PO1,PO2,PO3,PO4, PO5,PO6, PO11, PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	2	3	1	-	-	-	3	-	-	-	-	-
CO4	2	1	1	-	2	-	2	-	-	-	2	2
CO5	2	2	3	1	2	1	2	-	-	-	2	3

TEXT BOOK :

1. *Web information Retrieval ,Ceri S, Bozzon A, Barmbilla M, Della Valle E, Frasternali P, Quarteroni S. Springer Publication, 2013.*

REFERENCE BOOKS :
1. *Introduction to Information Retrieval , 1/e, 2008, Christopher D. Manning and Prabhakar Raghavan, Cambridge University Press(Online).*
2. *Information Storage and Retrieval, 2006, Robert Korfhage, John Wiley & Sons, New Delhi, India.*
3. *Information Retrieval Data structures & Algorithms, 2008, William B. Frakes, Ricardo Baeza-Yates, Pearson Education, NewDelhi, India.*

II MCA - I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20MCA215B   **DESIGN PATTERNS**

(Elective – I)

PREREQUISITES: A course on "Software Engineering"

COURSE EDUCATIONAL OBJECTIVE:

CEO1 *To provide an understanding of hands on experience with the principles and process of gathering requirements for, formally specifying, designing, implementing, testing and maintaining a large software system.*

CEO2 *To gain experience with designing a project in order to make division of labor and concurrent development possible.*

Syllabus:

UNIT - 1 :   Introduction

What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT - 2 :   A Case Study

Designing a Document Editor : Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary .

UNIT - 3 :   Creational Patterns & Structural Pattern Part-I

One of a kind Object(Singleton), Baking with OO Goodness(Factory Pattern), Builder, Prototype, Structural Pattern Part-I - Adapter, Bridge, Composite.

UNIT - 4 :   Structural Pattern Part-II & Behavioral Patterns Part-I

 Decorator, Facade, Flyweight, Proxy. Behavioral Patterns Part-I - Chain of Responsibility, Command, Interpreter, Iterator.

UNIT - 5 :   Behavioral Patterns Part-II

Mediator, Memento, Observer, State, Strategy, Template Method ,Visitor, Better Living with Pattern: Pattern in the Real world.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Illustrate** the basic principles, procedures, components and usage of design patterns	PO1
CO2	**Analyze** the design patterns in documents structure and maintenance	PO2
CO3	**Examine** on various types as created patterns for designing different applications	PO1,PO2,PO3, PO5, PO12
CO4	**Examine** on various types of structural patterns for designing different applications	PO1,PO2,PO3, PO5,PO12
CO5	**Examine** on various types of behavioral patterns for designing different applications	PO1,PO2,PO3, PO5,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	-	-	-	2
CO4	3	3	3	-	3	-	-	-	-	-	-	2
CO5	3	3	3	-	3	-	-	-	-	-	-	2

TEXT BOOKS :

1. *Design Patterns, Erich Gamma, Pearson Education*

2. *Head First Design Patterns, 5/e, Eric Freeman, O'reilly, SPD Publishers, Mumbai.*

REFERENCE BOOKS :

1. *Design Patterns Explained, 2/e, Alan Shalloway, Pearson Education, New Delhi.*

2. *Design Pattern in Java Software, 2009, Steven John & Wake, Pearson Education, New Delhi.*

3. *Elements of Re-usable Object Oriented Software, 2010, Erich Gamma, Pearson Education, New Delhi.*

4. *Pattern Oriented Software Architecture, F.Buschmann & others, ,John Wiley & Sons.*

II MCA - I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20MCA215C   **SERVICE ORIENTED ARCHITECTURE**

(Elective –I)

PREREQUISITES: Courses on "Computer Networks" and "Operating Systems".
COURSE EDUCATIONAL OBJECTIVES:

CEO1 To provide fundamental concepts of SOA & Web Service Architecture.
CEO2 To gain knowledge about SOAP, WSDL, UDDI and XML to create web services.
CEO3 To gain knowledge about various protocol, transaction procedure, data exchange in service orientation.

Syllabus:
UNIT - 1 :   Introduction to SOA
Fundamentals of SOA-Evolution of SOA: A SOA Timeline-Continuing Evolution of SOA. Service Oriented Business & Government-SOA Architecture Concepts-Service Governance, Processes, Guidelines, Principles, Method & Tools-Key Service characteristics-Technical & Business Benefits of SOA

UNIT - 2 :   SOA & Web Services
The Web Service Plafrom-Service Contract-Service Level Data Model-Service discovery-Service Level Integration Process-Atomic & Composite Service-A Retrospective on SOA

UNIT - 3 :   SOA & Web Service for Integration, SOA & Multi Channel Access
SOA & Web Service for Integration : Overview of Integration-Integration & Interoperability using XML & Web Service-Two approaches for using XML & Web Services for integration & Interoperability-Applying SOA & Web Services for Integration-Enterprise Service Bus Pattern.
SOA & Multi Channel Access: Business Benefits-SOA for Multi Channel access-Presentation Tier-Channel Access Tier-Communication Infrastructure-Business Service access Tier-Business Service Tier.

UNIT - 4 :   SOA & Business Process Management, Metadata Management
SOA & Business Process Management: Basic BPM Concept-Example Business Process-Combining BPM, SOA & Web Services-Orchestration & Choreography Specification.
Metadata Management: Approach to Metadata Management-Metadata Specification-Policy-WS Metadata Exchange

UNIT - 5 :   Advanced Messaging & Transaction Processing

Advanced Messaging: Reliable Messaging-Notification. **Transaction Processing:** Transaction Paradigm-Impact of Web Service for Transaction Protocol & coordination-Transaction Specification

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Emphasize** on basic knowledge of service Oriented Architecture pertaining to evolution , principles, concepts and benefits	PO1
CO2	**Relate** Service Oriented Architecture and web services components	PO1,PO2, PO3
CO3	**Analyze** the integration and access method of service oriented architecture and web services.	PO1,PO2, PO3
CO4	**Apply** SOA with various business process specification and Management	PO1,PO2, PO3,PO4
CO5	**Integrate** the various components of messaging and transactions with web services	PO1,PO2, PO3,PO4, PO5

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	3	-	-	-	-	-	-	-	-
CO5	3	2	2	3	3	-	-	-	-	-	-	-

TEXT BOOKS :

1. *Understanding SOA with Web Services, 2009, Eric Newcomer and Greg Lomow, Pearson Education.*
2. *Service Oriented Architecture –Concepts,Technology and Design,2013,Thomas Erl, Pearson Education.*

REFERENCE BOOKS :

1. *Applied SOA-SOA and Design Strategies, 2008, Michael Rosen and others, Wiley Publishers*
2. *SOA Security, 2008, Ramarao Kanneganti and Prasad Chodavarapu, Dream tech Press.*
3. *Developing Java Web Services, 2008, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.*
4. *Developing Enterprise Web Services, 2008, S. Chatterjee, J. Webber, Pearson Education.*

II MCA - I Semester

L	T	P	C
3	0	0	3

20MCA 215D **CRYPTOGRAPHY & NETWORK SECURITY**

(Elective- I)

PREREQUISITES: A course on "Computer Networks"

COUSE EDUCATIONAL OBJECTIVES :

CEO1. *To understand the different types of modern cryptographic techniques.*

CEO2. *To Study the concepts of public key encryption and number theory.*

CEO3. *To learn authentication standards and applications.*
CEO4. *To learn the network security and applications.*
CEO5. *To study the concepts of main security threats and techniques to diminish these threats in communication networks.*

Syllabus:

UNIT- 1:

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES.

UNIT- 2:

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security of RSA.

UNIT- 3:

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA). Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm.

UNIT- 4:

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos Electronic mail security: pretty good privacy (PGP), S/MIME.

UNIT- 5:

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, transaction (SET) .System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Classify** the symmetric encryption techniques and **describe** basic concepts of system level security	PO1,PO3
CO2	**Illustrate** various Public key cryptographic techniques	PO2,PO3,PO4
CO3	**Evaluate** the authentication and hash algorithms.	PO1,PO2,PO12
CO4	**Understand** the Key Management and distribution	PO1,PO5
CO5	**Discuss** authentication applications and **summarize** the intrusion detection and its solutions to overcome the attacks.	PO1,PO2, PO5,PO6

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	-	-	-	-	-	-
CO2	-	2	3	2	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	-	-	-	2	-	-	-	-	-	-	-
CO5	3	2	-	-	3	2	-	-	-	-	-	-

TEXT BOOKS:

1. "Cryptography and Network Security: Principals and Practice", William Stallings, Pearson Education.

2. Cryptography and Network Security, Behrouz A. Frouzan, TMH

REFERENCE BOOKS:

1. "Applied Cryptography", Bruce Schiener, John Wiley & Sons

2.*" Network Security and Cryptography", Bernard Menezes, Cengage Learning.*

3. *"Cryptography and Network Security", Atul Kahate, TMH*

II MCA I Semester	L	T	P	C
	2	1	0	3

20MCA215E **OPTIMIZATION TECHNIQUES**

(Elective –I)

PREREQUISITES: Under Graduate level Mathematics

COURSE EDUCATIONAL OBJECTIVES:

CEO1: To create awareness, about optimization in utilization of resources

CEO2: To develop mathematical skills to **Formulate** and solve mathematical model (linear
 programming problem) for a physical situations like production, distribution of goods
 and economics

CEO3: To develop mathematical skills to **Solve** the problem of transporting the products
 from origins to destinations with least transportation cost and solving assignment
 problems

CEO4: **To learn** the resources required for a project and generate a plan and work schedule

CEO5: To apply Operations research techniques like Replacement problem and PERT/CPM
 in Research and Industrial operations

Syllabus:

UNIT – 1:   Basics of operation research and Linear Programming

Definition of O.R, necessity of operations research, scope of O.R, Phases of O.R, Models in O.R.

Introduction, mathematical formulation of LPP, Graphical Solution of LPP , Simplex Method, Artificial variable techniques, Degeneracy and cycling.

Duality theorems and its applications, Dual Simplex Method.

UNIT – 2:   Transportation Problem and Assignment Models

Introduction, Mathematical Formulation, Methods for Finding Initial basic feasible solutions ,Optimum Solution of a Transportation Problems, Degeneracy in Transportation Problems, Unbalanced Transportation Problems, Maximization in Transportation Problems.

Introduction and formulation , Hungarian Assignment Algorithm, Variations of the Assignment Problem and Travelling Salesman Problem.

UNIT - 3:   Game theory and Sequencing Models

Introduction and some basic terminologies, two – person zero – sum game, Solution methods of games without saddle point.

Introduction and basic assumption, Processing n jobs through two machines, processing of n jobs three machines and m machines, Processing two jobs on n machines.

UNIT – 4:   Replacement Models, Inventory Models and EOQ Models

Introduction, Replacement of items that deteriorate with time, Group Replacement Policy.
Introduction, Cost involved in inventory problems.
Purchasing problem with and without shortages, Production problem with and Without shortages

UNIT – 5:   Scheduling by PERT and CPM

Introduction, Network Constructions, Rules of network constructions , Fulkerson's Role of numbering events , Critical Path Method (CPM),and PERT procedure with problems, Resource analysis in network scheduling.

COURSE OUTCOMES:

On successful completion of the course the student will be able to,

COURSE OUTCOMES		
CO1	Understand the meaning of Operations Research and how to use it, how to write linear program in the event of minimum cost or maximum profit and to solve complex computational problems using Linear Programming Problem(LPP)	PO1,PO2, PO3,PO12
CO2	Understand Transportation Problem, Assignment Problem and Analyze and design the data, to synthesize transformation by using operational models like Transportation Problem, Assignment Problem	PO1,PO2, PO3,PO12
CO3	Understand Game theory and Sequencing models, Analyze and design the data, to synthesize transformation by using operational models like Game theory and sequencing models	PO1,PO2, PO3,PO12
CO4	Understand Replacement Models, Inventory Models and EOQ Models in the fields of business, research and industry, Analyze and design the data , to synthesize transformation by using operational models like Replacement Models, Inventory Models and EOQ Models	PO1,PO2, PO3,PO12
CO5	Understand Inventory models PERT/CPM etc., in the fields of business research and industry, Analyze and design the data, to synthesize transformation by using operational models like PERT/CPM	PO1,PO2, PO3,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	3
CO2	3	2	3	-	-	-	-	-	-	-	-	2

CO3	3	3	2	-	-	-	-	-	-	-	-	3
CO4	3	3	2	-	-	-	-	-	-	-	-	3
CO5	3	3	2	-	-	-	-	-	-	-	-	3

TEXT BOOKS
1. *Operations Research, 2005 A.M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education, New Delhi.*
2. *Operations Research, 2009, P Sankara Iyer , Tata McGraw-hill, New Delhi.*

REFERENCE BOOKS
1. *Operations Research , 2007, S.D Sharma , Kedar Nath Ram Nath & Co, Meerut.*
2. *Operations Research , 2/e, 2007, R. Panneeselvam , Pentice Hall of India (PHI), New Delhi.*
3. *Operation Research – Theory & Applications, 4/e, 2009, J.K. Sharma, Macmillan India Ltd, New Delhi.*
4. *Operation Research, 13/e, 2007, Kanti Swarup, P.K.Gupta, Man Mohan, Sultan Chand & Sons, New Delhi.*
5. *Operation Research, 8/e, 2007, Hadmy A, Taha, Pearson Education, New Delhi..*

II MCA - I Semester	**L**	**T**	**P**	**C**
	2	**1**	**0**	**3**

20MCA216A   **DATA SCIENCE**

(Elective –II)

PREREQUISITES: A Course on "Artificial Intelligence", Data Mining and Knowledge on basic

linear algebra may be helpful.

COURSE EDUCATIONAL OBJECTIVES:

CEO1: To learn what is data science and skills needed to be a Data Scientist.

CEO2: To learn about Data Science Process ,Data Exploration and Data Visualization.

CEO3 : To learn the Machine learning algorithms to solve Classification and Prediction problems.

CEO4: To learn how to Evaluate the models using different evaluation measures.

CEO5: To learn how to Design a Recommendation Engine and Feature selection methods.

Syllabus:
UNIT-1
Introduction: AI, machine learning and Data Science- what is Data Science-Case for Data Science-Data Science classification- Data Science Algorithms.

UNIT-2
Data Science Process: Prior knowledge- Data Preparation- Modeling – Application- Knowledge

Data Exploration: Objectives of Data Exploration- Data sets- Descriptive Statistics- Data Visualization.

UNIT-3
Classification: Decision trees- Rule Induction- K-Nearest neighbours- Naive Bayesian- Artificial Neural networks- Support vector Machines.

Regression methods : Linear Regression- Logistic Regression

UNIT-4
Model Evaluation : Confusion Matrix- ROC and AUC – Lift curves.

Recommendation Engines : Why do we need Recommendation engine- Applications of Recommendation engines - Recommendation Engine Concepts - collaborative filtering- Content based Filtering- Hybrid Recommenders,

UNIT-5
Feature Selection: Classifying Feature selection methods- Principal Component Analysis- Information theory based filtering – Chi Square based filtering - Wrapper type Feature selection

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

COURSE OUTCOMES		
CO1	**Able** to describe what is data science and the skill sets needed to be a data scientist.	PO1,PO2,PO3, PO4 ,PO5,PO6,PO7,PO8
CO2	**Able** to describe about Data Science process, Data preparation , Data Exploration and Data Visualization. the basic terms used in statistical inference and **Identifying** the right probability distributor used for statistical modeling	PO1,PO2,PO3, PO4, PO5,PO6, PO7,PO8
CO3	To **analyze** the complex engineering problem and **apply** the machine learning algorithms such as Classification and Regression models to solve the problems..	PO1,PO2,PO3, PO4, PO5,PO6, PO7,PO8
CO4	To **evaluate** the models using confusion matrix, ROC curves. To **build** a recommendation engine and study about its applications.	PO1,PO2,PO3, PO4 ,PO5,PO6, PO7,PO8
CO5	To **Understand** the feature selection methods **used** in Data science.	PO1,PO2,PO3, PO4, PO5,PO6, PO7,PO8

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	2	2	-	1	-	-	-	-
CO2	2	3	2	3	3	2	2	1	-	-	-	-
CO3	3	2	3	2	2	1	2	1	-	-	-	-
CO4	2	3	3	3	2	1	2	1	-	-	-	-
CO5	2	3	3	3	2	1	2	1	-	-	-	-

TEXT BOOK:

1. Data Science Concepts and Practice by Vijay Kotu, Bala Deshpande , second edition, Morgan Kaufman publications.

REFERENCE BOOKS:

1. Doing Data Science Straight talk from the Frontline, 2014, Rachel Schutt & Cathy O'Reilly.

2. Foundations of Data Science- Avrin Blum, John Hopcroft and Ravindran Kannan, 2018.

II MCA - I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20MCA216B   **BLOCK CHAIN TECHNOLOGY**
(Elective- II)

PREREQUISITE: Courses on "Data base Management Systems" and "Data Warehousing and Data mining"

COURSE EDUCATIONAL OBJECTIVES:
CEO1   To provide fundamental concepts of Block Chain Mechanisms.
CEO2   To gain knowledge about different Architecture of various Block Chains.
CEO3   To gain knowledge about the Applications of Block Chain.

Syllabus:
UNIT - 1 :   Block Chain
Distributed System-History of Block Chain-Introduction to Block chain-Types of Block Chain-CAP Theorem-Benefits & Limitations of Block Chain.

UNIT - 2 :   Decentralization
Decentralization using Block Chain-Method of Block Chain-Toutes to Block Chain-Block Chain & Full Eco System-Decentralized Applications-Platform for Decentralization.

UNIT - 3 :   Bitcoin & Alternative Coin
Bitcoin-Transaction-Block Chain-Bitcoin Payment-Bitcoin Limitation-Namecoin-Litecoin-Primcoin-Zcash.

UNIT - 4 :   Ethereum 101
Introduction-Ethereum Block Chain-Elements of Ethereum Block Chain-Accounts0 Types of AccountsEther-Messages-Mining-Clients & Wallets-Ethereum Network.

UNIT - 5 :   Block Chain outside of Currencies, Scalability & Other Challenges
Block Chain outside of Currencies: Internet of Things-Government-Health-Finance-Medical.
Scalability & Other Challenges: Scalability-Privacy-Security.

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

COURSE OUTCOMES		
CO1	**Understand** the preliminary history and principles of block chain architecture components and techniques	PO1
CO2	**Relate** the platform for decentralization with block chain technology	PO1,PO2,PO3
CO3	**Apply** Bit-coin system by using block chain technology	PO1,PO2, PO3,PO4,PO5
CO4	**Design** hyper ledger applications using block chain technology	PO1,PO2,PO3, PO4,PO5
CO5	**Relate** general applications by using block chain technology and other challenges	PO1,PO2,PO3, PO4,PO5

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	3	3	-	-	-	-	-	-	-
CO4	3	2	2	3	3	-	-	-	-	-	-	-
CO5	3	2	2	3	3	-	-	-	-	-	-	-

TEXT BOOK :

1. *Mastering Block Chain, 2017, Imran Bashir, Packt publishing Limited.*

REFERENCE BOOKS :

1. *Mastering the Bitcoin-Programming the Open Block Chain, 2017, Andreas M Antonopoulos,O'Reilly Publication.*
2. *Block Chain-Blue Print for a New Economy, 2015,Melanie Swan, O'Reilly Publication.*
3. *Block Chain Revolution, 2016, Don Tapscott, Portfolio Penguin Publications.*

II MCA - I Semester	**L**	**T**	**P**	**C**
	2	**1**	**0**	**3**

20MCA216C   **DESIGN AND ANALYSIS OF ALOGRITHMS**

(Elective –II)

PREREQUISITES: Any Programming Language Course is required.

COURSE EDUCATIONAL OBJECTIVES:

CEO1: To gain knowledge of time complexity, space complexity and Disjoint sets.
CEO2: Todesign searching and sorting algorithms along with greedy method.
CEO3: To analyze Asymptotic Runtime Complexity of Algorithms including Formulating
*   Recurrence Relations.*
CEO4: To understand the branch and bound algorithms for solving the complex problems.
CEO5:To determine the computational complexity and analyze the approximation algorithms.

Syllabus:

UNIT – 1:   Introduction and Growth of Functions, Divider and Conquer

Algorithm, Correctness of an Algorithms, Expressing Algorithm, The Ram model, Analysis of Algorithms, Approaches to Algorithms Design. Asymptotic Notation, Names of Bounding Function, Ө-Notation, O-Notation(Big-oh), Ω-Notation(Big-Omega), O-Notation(Little-oh), ω-Notation. General method, Binary Search, Quick Sort, Merge Sort, Strassen's matrix multiplication.

UNIT - 2:   Greedy method

The General method, Knapsack Problem, Job sequencing with dead lines, Minimum cost spanning trees, Optimal Storage on tapes, Single source shortest paths.

UNIT - 3:   Dynamic Programming

The General method, Multi Stage Graphs, All-Pairs Shortest Paths Problem, Single-Source Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack Problem, Travelling Sales Person Problem, Flow Shop Scheduling.

UNIT - 4:   Backtracking

The General method, The 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles.

UNIT - 5:   Branch and Bound

The method – Least Cost Search - The 15-Puzzle – Control Abstractions for LC Search – Bounding-FIFO Branch-and-Bound , 0/1 Knapsack problem, Travelling Sales Person.

COURSE OUTCOMES:
On successful completion of the course the student will be able to,

	Course Outcomes	POs related to COs
CO1	To gain knowledge of time complexity, space complexity and Disjoint sets.	PO1, PO2
CO2	To design searching and sorting algorithms along with greedy method.	PO1, PO2, PO3, PO4
CO3	To analyze Asymptotic Runtime Complexity of Algorithms including Formulating Recurrence Relations.	PO1, PO2, PO3, PO4
CO4	To understand the branch and bound algorithms for solving the complex problems.	PO1, PO2, PO3, PO4
CO5	To determine the computational complexity and analyze the approximation algorithms.	PO1, PO2

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS :

1. *Design Analysis and Algorithms, 2011, Hari Mohan Pandey, University Science Press,   New Delhi.*

2. *Fundamentals of Computer Algorithms, 2005, Ellis Horowitz, SatrajSahni and Rajasekharan, Galgotia Publications Private Limited New Delhi.*

REFERENCE BOOKS :

1. *Introduction to Algorithms, 2/e, 2006, T.H.Cormen,C.E.Leiserson, R.L.Rivest,andC.Stein,PHI./ Pearson Education, New Delhi.*

2. *Data structures and Algorithm Analysis in C++, 2/e, Allen Weiss, Pearson education, New Delhi.*

3. *Design and Analysis of Algorithms, 2004, Aho, Ullman and Hopcroft, Pearson Eduction.*

4. *Introduction to the Design and Analysis of Algorithm , 2005, R.C.T. Leo, S.S. T.seng, R.C. Chang, Y.T. Tsai, Mc. GrawHill Education, Asia.*

5. *Design and Analysis of Algorithms, 2008, Prabhakar Gupta, Vineet Agarwal, Manish Varshney, Prentice-Hall of India Private Limited, New Delhi.*

II MCA - I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20MCA216D   **COMPUTER GRAPHICS**
                              (Elective-II)

PREREQUISITES: Any programming language course.
COURSE EDUCATIONAL OBJECTIVES:
   CEO1: To understand computational development of graphics with mathematics
   CEO2:To provide in-depth knowledge of transformation shape modeling of 2D and 3D application.
   CEO3:To provide in-depth knowledge of display systems, image synthesis,of 2D and 3D application.
   CEO4: To provide knowledge of viewing pipeline methods.
   CEO5: To provide in-depth knowledge of computer animation techniques.

Syllabus:
UNIT-1
Introduction: Application areas of Computer Graphics - overview of graphics systems - video-display devices - raster scan systems - random scan systems - graphics monitors and work stations and input devices.

OutputPrimitives: Points and lines - line drawing algorithms - mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm - boundary-fill and flood-fill algorithms.

UNIT-2
2-D Geometrical transforms: Translation - scaling - rotation - reflection and shear transformations - matrix representations and homogeneous coordinates - composite transforms - transformations between coordinate systems.

3-D Geometric transformations: Translation - rotation - scaling - reflection and shear transformations - composite transformations -

UNIT-3

2-D Viewing: The viewing pipeline - viewing coordinate reference frame - window to view-port coordinate transformation - viewing functions - Cohen-Sutherland and Liang -Barsky line clipping algorithms - Sutherland –Hodgeman polygon clipping algorithm

3-D viewing: Viewing pipeline - viewing coordinates - view volume and general projection transforms and clipping3-D Object representation: Polygon surfaces - quadric surfaces -spline representation -Hermite curve - Bezier curve and B-spline curves - Bezier and B-spline surfaces. Basic illumination models - polygon rendering methods

UNIT-4

Visible surface detection methods: Classification - back-face detection - depth-buffer - A buffer method - scan-line - depth sorting - BSP-tree methods - area sub-division and Octree Methods - Ray-casting Method - Curved Surfaces - Curved- Surface Representations - Surface Contour Plots - Wireframe Methods - Visibility- Detection Functions.

UNIT-5

Computer animation: Design of animation sequence - general computer animation functions - raster animation - computer animation languages - key frame systems - motion specifications.

COURSE OUTCOMES:
On successful completion of the course the student will be able to,

	COURSE OUTCOMES	POs related to COs
CO1	*Able to draw line, circle and ellipse using algorithms.*	PO1, PO2
CO2	*Enhance the perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information.*	PO1, PO2, PO3, PO4
CO3	*Able to apply the 2D and 3D Viewing Pipeline techniques.*	PO1, PO2, PO3, PO4
CO4	*Able to apply methods for detecting visual surface detection.*	PO1, PO2, PO3, PO4
CO5	*Gain proficiency in 3D computer graphics API programming. Able to design Animation for the objects.*	PO1, PO2

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	2	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-	-	-
CO4	3	2	2	3	3	-	-	-	-	-	-	-
CO5	3	3	-	-	3	-	-	-	-	-	-	-

TEXT BOOKS
1. *Computer Graphics C version - Donald Hearn and M. Pauline Baker - Pearson education.*
2. *Computer Graphics Principles & practice - Foley -VanDam -Feiner and Hughes - second edition - Pearson Education.*

REFERENCE BOOKS
1. *Computer Graphics -Zhigandxiang - Roy Plastock -Schaum's outlines -Second edition - Tata McGraw hill edition.*
2. *Procedural elements for Computer Graphics - David F Rogers - Tata McGraw hill - 2nd edition.*
3. *Principles of Interactive Computer Graphics -Neuman and Sproul - TMH.*
4. *Principles of Computer Graphics -Shalini -Govil-Pai - Springer.*

II MCA - II Semester

L	T	P	C
3	0	0	3

20MCA216E   **VISUALIZATION TECHNIQUES**
(Elective- II)

PREREQUISITES: A Course on Data Mining and Knowledge on Data Analysis Tool
COURSE EDUCATIONAL OBJECTIVES:

CEO1: *To provide in-depth knowledge on Data Analysis with Data Visulization Method*

CEO2: To understand how accurately represent voluminous complex data set in web and from other data sources

CEO3: To understand the methodologies used to visualize large data sets

CEO4: To understand the process involved in data visualization and security aspects involved in data visualization

Syllabus:

UNIT - 1 :   **From Data to Visualization,**   **Visualizing Data: Mapping Data onto Aesthetics, Coordinate Systems and Axes, Color Scales**

From Data to Visualization- **Visualizing Data: Mapping Data onto Aesthetics**:Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics - **Coordinate Systems and Axes**: Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes - **Color Scales:** Color as a Tool to Distinguish, Color to Represent Data Values, Color as a Tool to Highlight.

UNIT - 2 :   **Directory of Visualizations, Visualizing Amounts, Visualizing Distributions: Histograms and Density Plots, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots**

Directory of Visualizations: Amounts, Distributions, Proportions, x–y relationships, Geospatial Data, Uncertainty- **Visualizing Amounts**: Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps -**Visualizing Distributions: Histograms and Density Plots**: Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time - **Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots**: Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile-Quantile Plots

UNIT - 3 :   Visualizing Many Distributions at Once , Visualizing Proportions , Visualizing Nested Proportions , Visualizing Associations Among Two or More Quantitative Variables
Visualizing Many Distributions at Once: Visualizing Distributions Along the Vertical Axis Visualizing Distributions Along the Horizontal Axis- **Visualizing Proportions**: A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total- **Visualizing Nested Proportions:** Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies, Parallel Sets- **Visualizing Associations Among Two or More Quantitative Variables:** Scatterplots, Correlograms, Dimension Reduction, Paired Data

UNIT - 4 : Visualizing Time Series and Other Functions of an Independent Variable, Visualizing Trends, Visualizing Geospatial Data, Visualizing Uncertainty
Visualizing Time Series and Other Functions of an Independent Variable: Individual Time Series, Multiple Time Series and Dose–Response Curves, Time Series of Two or More Response Variables- **Visualizing Trends:** Smoothing, Showing Trends with a Defined Functional Form Detrending and Time-Series Decomposition-**Visualizing Geospatial Data:** Projections, Layers, Choropleth Mapping, Cartograms-**Visualizing Uncertainty:** Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots

UNIT - 5 : The Principle of Proportional Ink, Handling Overlapping Points, Common Pitfalls of Color Use, Redundant Coding, Multi panel Figures, Titles, Captions and Tables, Balance the Data and the Context
The Principle of Proportional Ink: Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations-**Handling Overlapping Points:** Partial Transparency and Jittering, 2D Histograms, Contour Lines- **Common Pitfalls of Color Use:** Encoding Too Much

or Irrelevant Information Using Nonmonotonic Color Scales to Encode Data Values, Not Designing for Color-Vision Deficiency-**Redundant Coding**: Designing Legends with Redundant Coding, Designing Figures Without Legends-**Multi panel Figures:** Small Multiples, Compound Figures-**Titles, Captions and Tables:** Figure Titles and Captions, Axis and Legend Titles, Tables- **Balance the Data and the Context:** Providing the Appropriate Amount of Context, Background Grids, Paired Data

COURSE OUTCOMES:
On successful completion of the course the student will be able to,

	COURSE OUTCOMES	POs related to COs
CO1	**Demonstrate** the processes of Data visualization, coordinates system and color scaling	PO1,PO2
CO2	**Relate** the Plotting method by using different visualization method	PO1,PO2, PO3,
CO3	**Relate** the Plotting method by using multi distribution visualization method.	PO1,PO2, PO3
CO4	**Apply** the time series procedure .on visualization method	PO1,PO2, PO3
CO5	**Understand** the application of colouring , figuring and texting method in visualization	PO1,PO2,PO3,

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	2	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-	-	-
CO4	3	3	3	-	2	-	-	-	-	-	-	-
CO5	3	3	3	2	2	-	-	-	-	-	-	-

TEXT BOOK:

1. *Fundamentals of Data Visualization, Claus O. Wilke, April 2019, O'Reilly Media, Inc., ISBN: 9781492031086*

REFERECE BOOKS

1. Scott Murray, "Interactive data visualization for the web", O"Reilly Media, Inc., 2013.

2. Ben Fry, "Visualizing Data", O"Reilly Media, Inc., 2007.

3. Greg Conti, "Security Data Visualization: Graphical Techniques for Network Analysis",

No Starch Press Inc, 2007.

II MCA - I Semester

L	T	P	C
0	0	3	1.5

20MCA217   **WEB TECHNOLOGIES LAB**

PREREQUISITES: A course on "Web Technologies".
COURSE EDUCATIONAL OBJECTIVES:

CEO1 To Design Static Web pages using HTML and Dynamic Web Page using PHP.
CEO2 To Learn a Scripting language called Java Script-used to do Client side Validation.
CEO3 To Learn XML & MySQL tool for Defining a database for Web Applications.
CEO4 To Explore Server Side Technologies like Servlets and JSP.

Hardware and Software required

1. A working computer system with either Windows or Linux.
2. A web browser either IE or firefox.
3. Tomcat web server and Apache web server.
4. XML editor like Altova Xml-spy [www.Altova.com/**XML**Spy – free] , Stylusstudio , etc.,
5. A database either Mysql or Oracle.
6. JVM(Java virtual machine) must be installed on your system.

Syllabus:

Exercise : 1

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

1) 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.

2) LOGIN PAGE

3) CATOLOGUE 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:

Snap shot of Cover Page. , Author Name., Publisher.,   Price., Add to cart button.

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

Exercise-2:

4) CART PAGE

The cart page contains the details about the books which are added to the cart.

Exercise-3:

REGISTRATION PAGE

Create a "*registration form* "with the following fields

> 1)Name(Textfield)
> 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)

VALIDATION

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

Name (Name should contains alphabets and the length should not be less than 6 characters).

Password (Password should not be less than 6 characters length).

E-mail id (should not contain any invalid and must follow the standard pattern.

name@domain.com)

Phone number (Phone number should contain 10 digits only).

Note : validation of the login page can also be done with these parameters.

Exercise-4:

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

Use different font, styles:

Set a background image for both the page and single elements on the page.
Control the repetition of the image with the background-repeat property.

Define styles for links.

Work with layers.

Add a customized cursor.

Exercise-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.

Hint: You can use some xml editors like XML-spy.

Exercise-6:
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.

Exercise-7:

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).

Exercise-8:

Write a JSP which does the following job:

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.

IMPLEMENT THE FOLLOWING USING PHP & MySQL
Exercise-9:
    i.   Simple Arithmetic, Logical and Relation operation
    ii.   Arrays
Exercise-10:
    i.   String Handling
Exercise-11:
    i.   Exception handling
    ii.   Functions , Date & Time
Exercise-12:
    i.   File Operations
Exercise-13:
    i.   Various DDL, DML operations in MySQL
    ii.
Exercise-14:
    i.   Join Operations in MySQL.
    ii.   Connection Establishment Between PHP and MySql Database.

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

	COURSE OUTCOMES	POs related to COs
CO1	**Demonstrate** Knowledge on HTML, Javascript, Servlet, JSP and PHP to develop an web applications	PO1
CO2	**Analyze** the Real World problems to be solved by technologies like 7Servlet, JSP and PHP	PO2
CO3	**Design** and **Develop** solutions for web applications.	PO3
CO4	Manually **Test** the functionality of the web application	PO4
CO5	Select appropriate design tools and procedure to **implement** web applications	PO5
CO6	Follow ethical principles in **design**ing, and **implementing** various Technologies.	PO8
CO7	Do **experiment**s effectively as an individual and as a member in a group.	PO9
CO8	**Communicat**e verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue **updating** their skill related to various web technologies like servlet, JSP,PHP for implementating various web applications during their life time	PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

II MCA - I Semester   L   T   P   C

                                                                    0   0   3   1.5

20MCA218   **BIGDATA ANALYTICS &**

                          MOBILE APPLICATIONS USING ANDROID LAB

PREREQUISITES: A courses on "Mobile Applications Using Android" and " Big Data Analytics"

COURSE EDUCATIONAL OBJECTIVES:

CEO1: The students are inculcate with development of Mobile APPS by using Android Studio.
CEO2: To Explore SQLite Data Storage and User Interface Designs.
CEO3: To implement Map Reduce programs for processing big data.
CEO4: To understand storage of Data into HDFS.
CEO5: To gain knowledge about Hadoop Ecosystem components like PigLatin script and Hive.

List of Experiments

Mobile Applications using Android Lab

1) Exercises must be practiced based on the theoretical concepts covered in the subject "Mobile Application using Android"

2) Every student must develop a small mobile app by taking their own example.

Big Data Analytics Lab

1) Procedure to install   and set Hadoop in the following 3 modes

    a) Standalone mode

    b) Pseudo mode

    c) Fully distributed mode

2) Perform HDFS basic Command-line file operations.

3) Implement Word Count Program using MapReduce.

4) Implement an MR Program that processes weather Dataset.

5) Implement an MR Program to analyse Patient Dataset.

6) Install, Run Pig and Illustrate PigLatin scripts to load, store and dump data .

7) Illustrate Pig Latin scripts to sort, group, join, project, and filter your data.

8) Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

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

COURSE OUTCOMES		POs related to COs
CO1	**Understand** the background Android and Android development **Acquire** fundamental Knowledge of storing Big Data in HDFS, file operation commands, Basic Pig Script commands.	PO1
CO2	**Analyze** the basic installation setup for Android project development. **Analyze** Weather and Patient Data sets Using Hadoop Components.	PO2
CO3	**Create** and build Android Project development . **Develop** Big Data Applications using Pig Script.	PO3
CO4	**Examining** Application errors using Lint tool. Manually **Conduct Investigations** on Big Data Applications	PO4
CO5	**Design** of user interface for mobile apps using Android development tools . Use **Appropriate tools and Techniques** for solving Real World Big Data Problems	PO5
CO6	Follow **Ethics** while developing Mobile applications Follow **ethical Principles** for storing and analyzing Big data	PO8
CO7	Deal with Applications as an **individual and as a member in a group**	PO9
CO8	**Communicate** verbally and in written form about both Android and Big Data Applications. .	PO10
CO9	**Continuously Update** their skills related to Mobile Application Development and Big Data Analytics.	PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-

CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

II MCA - I Semester	**L**	**T**	**P**	**C**
	0	**0**	**0**	**2.5**

20MCA219   **COMPREHENSIVE VIVA -VOCE**

PREREQUISITES: All core cources.

Course Educational Objectives:

CEO1   The students to review all core courses.

A Student has to undergo a Comprehensive Viva - Voce pertaining to the student specialization will be conducted for 100 marks at the end of II-I Semester by the three member committee. He/She should secure 50% marks to acquire the required credits.

Course Outcomes:
On completion of Comprehensive work the student will be able to:

COURSE OUTCOMES		POs related to COs
CO1	**Demonstrate** in-depth knowledge on Core Subjects of Computer Applications.	PO1
CO2	**Identify, analyze and formulate** complex problem.	PO2
CO3	**Design** solutions to the Complex Problems.	PO3

CO4	Write and **Execute** test cases to the applications.	PO4
CO5	**Understand** the usage of appropriate techniques and tools necessary for solving real Time Applications.	PO5

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-

II MCA - II Semester   **L   T   P   C**

                                                                          3   0   0   3

20MCA221   **INTERNET OF THINGS**

PREREQUISITES: Courses on "Computer Networks " and "Artificial Intelligence".
COURSE EDUCATIONAL OBJECTIVES:

CEO1   To understand the basics of Internet of Things.
CEO2   To get an idea of some of the application areas where Internet of Things can be
*   applied.*
CEO3   To understand the middleware for Internet of Things.
CEO4   To understand the concepts of Web of Things.
CEO5   To understand the IOT protocols.

Syllabus:
UNIT -1:   Introduction to internet of Things

Introduction, Definition and characteristics of IoT - Physical Design of IoT-Things in IoT, IoT protocols-Logical design of IoT- IoT Functional blocks, IoT Communication Models, IoT Communication APIs- IoT Enabling Technologies- Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication protocols, Embedded Systems-IoT Levels and Deployment Templates-Iot Level-1,IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6.

Domain Specific IoTs-Introduction-Home Automation-Smart lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors-Cities-Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Emergency Response-Environment-Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest fire detection, River Floods Detection-Energy- Smart Grids, Renewable Energy Systems, Prognostics-Retail-Inventory Management, Smart Payments, Smart Vending Machines-Logistics-Route Generation and Scheduling, Fleet Tracking, Shipment Monitoring ,Remote Vehicle Diagnostics.

Agriculture-Smart Irrigation, Green House Control. Industry-Machine Diagnosis and Prognosis, Indoor Air Quality Monitoring. Health and Lifestyle- Health and fitness Monitoring, Wearable Electronics.

UNIT – 2 :   IoT and M2M

Introduction-M2M-Difference between IoT and M2M-SDN and NFV for IoT-Software Defined Networking, Network Function Virtualization-IoT system Management with NETCONF-YANG.

Need for IoT Systems Management- Simple Network Management Protocol(SNMP)-Limitations of SNMP-Network Operator Requirements-NETCONF-YANG-IoT Systems Management with NETCONF-YANG-Netopeer.

UNIT – 3 :   Developing Internet Of Things

IoT platforms Design Methodology: Introduction-IoT design Methodology-Step 1:Purpose and Requirements specification, Step 2:Process specification, step 3:Domain model Specification, step 4:Information Model Specification ,step 5:Service Specifications, step 6:IoT Level Specification, Step 7:Functional view specification, step 8:Operational view specification, step 9:Device and Component Integration, Step 10:Application Development-Case study on IoT system for weather Monitoring-Motivation for using Python- IoT systems-Logical Design using Python-Introduction-Installing Python-Python data Types & Data Structures- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions- Control Flow-if,for,while,range,break/continue,pass-Functions-Modules-Packages-File Handling-Date/Time Operations-Classes-Python Packages of interest for IoT- JSON, XML, HTTP Lib & URL Lib ,SMTP Lib.

UNIT - 4:   Integrated Billing Solutions in the Internet of Things

Cost of RFID and the Internet of Things, Benefits of RFID and the Internet of things, Cost Benefit sharing, A technical framework for Integrating Billing Capabilities into the EPC global Network-Business Models for the Internet of Things-Business Models and Business Model Innovation-Value creation in the Internet of Things-Exemplary Business Model Scenarios for the Internet of Things-Product as a Service(Paas),Information Service Provider, End-User Involvement, Right-time Business Analysis and Decision Making.

UNIT – 5 :   Web of things

From the internet of things to the web of things-Designing RESTful smart things-Modeling Functionality as Linked Resources-Representing Resources, Servicing Through a Uniform Interface, Syndicate Things, things calling back: web hooks web enabling Constrained Devices-Physical Mashups: Recomposing the Physical World-Energy Aware Mashup: Energies Visible, Business Intelligence Mashup: RESTful EPICS,A Mashup editor for the Smart Home-Future of Web of things-Real time web of things, Finding and Describing Smart Things, Sharing Smart Things-Discussing the future Web of things-Conclusion- Semantic Web-Semantic web services, Semantic web services processes and Lifecycle-Ontology-Ontology Engineering Methodologies, Application of Ontology Engineering in the Internet of Things, Ontology and the Organizational Perspective, Ontology and the I-T system Perspective, Ontology and the Data Perspective, Ontologies in Multi-agent Systems, The Role of a Top-Level Ontology.

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

COURSE OUTCOMES		
CO1	**Demonstrate** the basic introduction about IoT technologies, Domain specific application	PO1
CO2	**Summarize** about IoT with machine to machine and system management	PO1,PO2, PO3
CO3	**Outline** IoT specification, implementation and protocols	PO1,PO2, PO3,PO5
CO4	**Apply** IoT in billing solution	PO1,PO2, PO3,PO4
CO5	**Relate** web of things with IoT and apply IoT in semantic web and ontology.	PO1,PO2, PO3,PO4, PO5

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	3	-	-	-	-	-	-	-	3
CO3	-	-	3	-	-	-	-	-	-	-	-	-

CO4	-	-	-	2	-	-	2	-	-	-	-	-
CO5	-	-	3	-	-	-	2	-	-	-	-	3

TEXT BOOKS :

1.Internet of Things, A hands-ON approach, Arshdeep Bahga, Vijay Madisetti.

2.Architecting the Internet of Things, Dieter Uckelmann,Mark Harrison, Florian Michahelles.

REFERENCE BOOKS:

1. *Networks, Crowds, and Markets: Reasoning About a Highly Connected World, 2010, David Easley and Jon Kleinberg, Cambridge University Press.*

2. *The Internet of Things: Applications to the Smart Grid and Building Automation, 2012, Olivier*

   Hersent, Omar Elloumi and David Boswarthick – Wiley.

3. *The Internet of Things – Key applications and Protocols, 2012, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley.*

II MCA - II Semester

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2	1	0	3

20MCA222A **DEEP LEARNING**
(Elective- III)

PREREQUISITES: A Course on "Machine learning", Artificial Neural Networks and Knowledge on basic linear algebra may be helpful.

COURSE EDUCATIONAL OBJECTIVES:
  CEO1   To learn the basic knowledge about Linear algebra and Probability theory for Deeplearning.
  CEO2   To study about conditional probability and Bayes rule for constructing models in Deep learning.
  CEO3   To describe and apply the Deep Feed Forward Networks to solve problems.
  CEO4   To describe Regularization for Deep learning and apply it to Deep learning models.
  CEO5   To describe and model the Convolution Networks and apply it .
  CEO6   To model the Sequence model and apply it to solve the real life problems.

Syllabus:
UNIT –1
Linear Algebra: Scalars, Vectors, Matrices and Tensors- Multiplying Matrices and Vectors-
Identity and Inverse Matrices – Linear Independence and Spans- Norms – Special kind of Matrices

and Matrices - Eigendecomposition- Singular Value Decomposition –The Trace Operator- The Determinant.

Probability and Information Theory: Why Probability- Random Variables- Probability Distributions- Marginal Probability- Conditional Probability-

UNIT-2

The Chain Rule of Conditional Probabilities- Independence and Conditional Independence- Expectation, Variance, Covariance- Common Probability Distribution- Bayes Rule.

Deep FeedForward Networks : Learning XOR - Gradient based Learning- Hidden units- Architecture Design- Back-Propagation and Other Differentiation Algorithms.

UNIT- 3

Regularization for Deep Learning : Parameter Norm Penalties - Norm Penalties as Constraint Optimization- Regularization and Under- Constrained Problems – Dataset Augmentation- Semi – Supervised Learning- Multi Task Learning- Sparse Representations – Adversarial Learning- Tangent Distance, Tangent Prop and Manifold Tangent Classifier.

UNIT-4

Convolution Networks : The Convolution Operation - Motivation- Pooling - Convolution and Pooling as an Infinitely Strong Prior - Variants of the Basic Convolution Function - Structured Outputs - Data Types- Efficient Convolution Algorithms- Random or Unsupervised Features.

UNIT-5

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs- Recurrent Neural Networks- Bidirectional RNN's- Encoder-Decoder Sequence to Sequence Architecture- Deep Recurrent Networks- Recursive Neural Networks - The Challenge of Long term Dependencies- Echo State Networks- The Long Short Term Memory and Other Gated RNNs – Optimization for Long –Terms Dependencies.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

	COURSE OUTCOMES	
CO1	Learn topics such as linear algebra ,probability theory, Bayes models.	PO1, PO2
CO2	Understand the architectures in Deep Neural networks and training Deep Neural Networks.	PO1, PO2
CO3	Understand and Implementation of the Regularization for improving the performance of Deep Neural models.	PO1,PO2, PO3, PO5,
CO4	Learn topics such as convolutional neural networks, Pooling and Unsupervised filters and apply the same to solve real world problems..	PO1,PO2, PO3,PO4,PO5
CO5	Learn topic such as Sequence Modeling, Recurrent and Recursive Net and implement the same to solve problems. Differentiate between machine learning, deep learning and artificial	PO1,PO2, PO3,PO4,PO5

	intelligence		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	-	3	-	-	-	-	-	-	-
CO4	3	2	3	2	3	-	-	-	-	-	-	-
CO5	3	2	3	2	3	-	-	-	-	-	-	-

TEXT BOOK:

1. Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press.

REFERENCE BOOKS:

1.Introduction to Deep Learning Sandro Skansi, Springer

2. Fundamentals of Deep Learning Designing Next-Generation Machine Intelligence Algorithms First Edition Nikhil Buduma, Nicholas Lacascio, O'Reilly Publication

II MCA - II Semester   **L   T   P   C**

                                                             3   0   0   3

20MCA222B   **QUANTUM COMPUTING**
                              (Elective- III)

PREREQUISITE: A course on "Artificial Intelligence"

COURSE EDUCATIONAL OBJECTIVES :

CEO1.Understand the building blocks of quantum computer.
CEO2.Understand the principles, quantum information and limitation of quantum operations
       formalizing.
CEO3.Gain knowledge about the quantum error and its correction.

Syllabus:
UNIT – 1 :   Foundation
Overview of traditional computing – Church-Turing thesis – circuit model of computation – reversible computation – quantum physics – quantum physics and computation – Dirac notation and Hilbert Spaces – dual vectors – operators – the spectral theorem – functions of operators – tensor products – Schmidt decomposition theorem.

UNIT – 2 :   Qubits And Quantum Model Of Computation

State of a quantum system – time evolution of a closed system – composite systems – measurement – mixed states and general quantum operations – quantum circuit model – quantum gates – universal sets of quantum gates – unitary transformations – quantum circuits.

UNIT – 3 :   Quantum Algorithms

Super dense coding – quantum teleportation – applications of teleportation – probabilistic versus quantum algorithms – phase kick-back – the Deutsch algorithm – the Deutsch- Jozsa algorithm – Simon's algorithm – Quantum phase estimation and quantum Fourier Transform – eigen value estimation.

UNIT – 4 :   Quantum Algorithms

Order-finding problem – eigen value estimation approach to order finding – Shor's algorithm for order finding – finding discrete logarithms – hidden subgroups – Grover's quantum search algorithm – amplitude amplification – quantum amplitude estimation – quantum counting – searching without knowing the success probability.

UNIT - 5 :   Quantum Computational Complexity And Error Correction

Computational complexity – black-box model – lower bounds for searching – general black-box lower bounds – polynomial method – block sensitivity – adversary methods – classical error correction – classical three-bit code – fault tolerance – quantum error correction – three- and nine-qubit quantum codes – fault-tolerant quantum computation.

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

COURSE OUTCOMES		
CO1	**Demonstrate** the foundation of Quantum Computing	PO1
CO2	**Relate** Quantum Models of computation with Quantum mechanics	PO1,PO2,PO3,PO12
CO3	**Explore** Quantum Computing algorithms and operations for coding, teleportation and transformation	PO1,PO2, PO3,PO4
CO4	**Explore** Quantum Computing algorithms and operations for grouping, counting and searching	PO1,PO2,PO3, PO4
CO5	**Describe** the Quantum Computational complexity and physical realization	PO1,PO2,PO3, PO4,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3	2	2	-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
MCA   DEPARTMENT

CO4	3	2	3	2	-	-	2	-	-	-	-	-
CO5	3	2	3	2	-	-	2	-	-	-	-	3

TEXT BOOK:

1. "An introduction to Quantum Computing", 1999, P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press.

REFERENCE BOOK:

1. "Quantum Computing" , 2007, V. Sahni, Tata McGraw-Hill Publishing Company.

II MCA - II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20MCA222C　　　　　　　　　　　**ETHICAL HACKING**

(Elective – III)

PREREQUISITES: A course on "Computer Networks"

COURSE EDUCATIONAL OBJECTIVES:

　　CEO1: To learn about how systems vulnerabilities manifest themselves and why hackers continue to enjoy success breaking into systems, despite increasing attention paid to cyber defense.

　　CEO2: To gain experience with a systematic hacking methodology.

　　CEO3: To learn about and experiment with hacking tools that can be applied at different stages of the hacking process.

Syllabus:

UNIT - 1 :　　**Introduction to Ethical Hacking, Ethics, and Legality**:

Ethical Hacking Terminology, Different Types of Hacking Technologies, Different Phases Involved in Ethical Hacking and Stages of Ethical Hacking: Passive and Active Reconnaissance, Scanning, Gaining Access, Maintaining Access, Covering Tracks, Hacktivism, Types of Hacker Classes, Skills Required to Become an Ethical Hacker, Vulnerability Research, Ways to Conduct Ethical Hacking, Creating a Security Evaluation Plan, Types of Ethical Hacks, Testing Types, Ethical Hacking Report

Footprinting and Social Engineering: Footprinting , Information Gathering Methodology, Competitive Intelligence ,DNS Enumeration Who is and ARIN Lookups, Types of DNS Records, Traceroute, E- Mail Tracking , Web Spiders, Social Engineering, Common Types Of Attacks, Insider Attacks, Identity Theft, Phishing Attacks, Online Scams, URL Obfuscation, Social-Engineering Countermeasures.

UNIT - 2 :   Scanning and Enumeration

Scanning, types of Scanning , CEH Scanning Methodology ,Ping Sweep Techniques, Nmap Command Switches, SYN, Stealth, XMAS, NULL, IDLE, and FIN Scans, TCP Communication Flag Types, War-Dialing Techniques, Banner Grabbing and OS Fingerprinting Techniques, Proxy Servers, Anonymizers , HTTP Tunneling Techniques, IP Spoofing Techniques, Enumeration, Null Sessions, SNMP Enumeration, Windows 2000 DNS Zone Transfer, Steps Involved in Performing Enumeration.

System Hacking

Understanding Password - Cracking Techniques, Understanding the LAN Manager Hash Cracking Windows 2000 Passwords, Redirecting the SMB Logon to the Attacker SMB Redirection, SMB Relay MITM Attacks and Countermeasures NetBIOS DoS Attacks, Password - Cracking Countermeasures, Understanding Different Types of Passwords Passive Online Attacks, Active Online Attacks, Offline Attacks Nonelectronic Attacks,

UNIT - 3 :   Trojans, Backdoors, Viruses, and Worms

Trojans and Backdoors, Overt and Covert Channels, Types of Trojans, Reverse-Connecting Trojans, Netcat Trojan, Indications of a Trojan Attack, Wrapping, Trojan Construction Kit and Trojan Makers, Countermeasure Techniques in preventing Trojans, Trojan - Evading Techniques, System File Verification Sub- objective to Trojan Countermeasures Viruses and Worms, Difference between a Virus and a Worm ,Types of Viruses, Understand Antivirus Evasion Techniques, Understand Virus Detection Methods

Sniffers

Protocols Susceptible to Sniffing, Active and Passive Sniffing, ARP Poisoning, Ethereal Capture and Display Filters, MAC Flooding, DNS Spoofing Techniques, Sniffing Countermeasures

Denial of Service and Session Hijacking

MCA -R13 Regulations 87 Denial of Service, Types of DoS Attacks, DDoS Attacks, BOTs/BOTNETs, "Smurf" Attack, "SYN" Flooding, DoS/DDoS Countermeasures, Session Hijacking, Spoofing vs. Hijacking, Types of Session Hijacking, Sequence Prediction, Steps in Performing Session Hijacking, Prevention of Session Hijacking.

UNIT - 4 :   Hacking Web Servers, Web Application Vulnerabilities, and Web- Based Password Cracking Techniques

Hacking Web Servers, Types of Web Server Vulnerabilities, Attacks against Web Servers, IIS Unicode Exploits, Patch Management Techniques, Web Server Hardening Methods Web Application Vulnerabilities, Objectives of Web Application Hacking, Anatomy of an Attack, Web Application Threats, Google Hacking, Web Application Countermeasures Web_Based Password Cracking Techniques, Authentication Types, Password Cracker, Password Attacks: Classification ,Password-Cracking Countermeasures

SQL Injection and Buffer Overflows

SQL Injection, Steps to Conduct SQL Injection, SQL Server Vulnerabilities, SQL Injection Countermeasures Buffer Overflows, Types of Buffer Overflows and Methods of Detection, Stack-Based Buffer Overflows, Buffer Overflow Mutation Techniques

UNIT - 5 :   Linux Hacking

Linux Basics, Compile a Linux Kernel, GCC Compilation Commands, Install Linux Kernel Modules, Linux Hardening Methods Penetration Testing Methodologies Security Assessments

Penetration Testing Methodologies,

Penetration Testing Steps, Pen - Test Legal Framework, Automated Penetration Testing Tools Pen_Test Deliverables

COURSE OUTCOMES:

On successful completion of this course, students will be able to

COURSE OUTCOMES		POs mapping
CO1	**Understand** the Ethical Hacking terminology and technology.	**PO1,PO3**
CO2	**Demonstrate** the knowledge on Footprinting, information gathering methodologies and competitive intelligence.	**PO1,PO3, PO4,PO12**
CO3	**Analyze** various scanning and enumeration methodologiesand **illustrate** system hacking and cracking techniques.	**PO1,PO2, PO3,PO4, PO12**
CO4	**Learn** various types of viruses, Understand Antivirus Evasion Techniques and Understand Virus Detection Methods.	**PO1,PO3, PO4,PO5, PO12**
CO5	**Identify** the steps to follow the Penetration Testing and use proper testing tools.	**PO1,PO3, PO5, PO12**

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	-	-	-	-	-	-	-
CO2	3	-	3	3	-	-	-	-	-	-	-	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3
CO4	3	-	3	2	3	-	-	-	-	-	-	3
CO5	3	2	3	-	3	-	-	-	-	-	-	3

TEXT BOOK:

1. *CEH official Certified Ethical Hacking Review Guide, Wiley India Edition*

REFERENCE BOOKS:

1. *Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group–2008.*

2. *Ankit Fadia " Ethical Hacking" second edition Macmillan India Ltd, 2006*

3. *Ethical Hacking & Network Defense, Michael T. Simpson edition3. Hacking Exposed Windows, Joel Scambray, cissp, Stuart Mcclure, Cissp, Third Edition, Tata Mc Graw hill edition*

4. *Hacking Exposed Window server 2003, Joel Scambray Stuart Mcclure, Tata Mc Graw hill edition*

II MCA - II Semester	L	T	P	C
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20MCA222D   **DISTRIBUTED SYSTEMS**
                          (Elective-III)

PREREQUISITES: A course on " Computer Networks" is required.

COURSE EDUCATIONAL OBJECTIVES:

> *CEO1: To understand basics of distributed systems, Networking, Inter process communication.*
> *CEO2: To create an awareness of Distributed Objects and Remote Invocation.*
> *CEO3: To gain the knowledge about the concepts related to Distributed Systems like Name Services and Concurrency Control.*
> *CEO4: To analyze the key issues related to Distributed Transactions.*
> *CEO5: Tomanage the distributed transactions in real time databases.*

Syllabus
UNIT – 1:   Distributed Systems , System Models ,Networking & Internetworking
Introduction - Examples of distributed systems - Resource sharing and web – Challenges.
Introduction - Architectural Models -Fundamental models .
Introduction - Types of network- Network principles- Internet protocols.

UNIT – 2:   IPC, Distributed objects and Remote Invocation,Distributed File Systems
The API for the Internet Protocols- External data Representation and marshalling- client Server communication- Group communication.
Introduction - Communication between distributed objects – Remote procedure call - Events and notifications - Case study: Java RMI
Distributed file systems: File Service architecture - Case study: Sun network file system – The Andrew file system

UNIT – 3:   Name Services and Peer to Peer Systems
Introduction - Name services and the domain name system - Directory services - Case study of the global name service - Case study of the X.500 directory service
Napster and its legacy - Peer to peer middleware - Routing overlays - Overlay case studies : Pastry, Tapestry - Application case studies : Squirrel , Ocean store

UNIT – 4:   **Synchronization in Distributed Systems**
Clock synchronization- mutual Exclusion- Election Algorithms- Atomic Transactions- DeadLocks in Distributed Systems

UNIT – 5:   Distributed Transactions and Replication
Introduction- Flat and Nested Distributed Transactions- Atomic commit protocols- Concurrency control in distributed transactions- Distributed deadlocks- Transaction recovery.
Introduction- System model and group communication- Fault tolerant services- Transactions with replicated data.

COURSE OUTCOMES:
On successful completion of this course, the students should be able to:

COURSE OUTCOMES		POs related to COs
CO1	Distinguish characteristics of distributes systems.	PO1, PO2
CO2	Gain knowledge about howthe Distributed objects are used for remote invocation	PO1, PO2
CO3	Analyze the directory services in distributed systems.	PO1, PO2, PO3, PO4
CO4	Manage the concurrency control in distributed systems.	PO1, PO2, PO3, PO5
CO5	Implement distributed transactions in real time data bases.	PO1, PO2, PO3, PO4,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-

CO4	3	3	2	-	2	-	-	-	-	-	-	-
CO5	2	3	3	3	-	-	-	-	-	-	-	3

TEXT BOOKS :
    1. Distributed Systems Concepts and Design, 4/e, 2011, G Coulouris, J Dollimore and T Kindberg, Pearson Education, New Delhi.
    2. Distributed Operating Systems, 1/e, 2009, A.S.Tanenbaum, Pearson Education, New Delhi.
REFERENCE BOOKS :
    1. *Distributed Operating Systems Concepts and Design, 1/e, 1998, Pradeep K.Sinha, PHI, New Delhi.*
    2. Advanced Concepts in Operating Systems, 1/e, 2001, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition, India.
    3. Reliable Distributed Systems, 1/e, 2005, K.P.Birman, Springer, New York.
    4. Distributed Systems: Principles and Paradigms, 2/e, 2008, A.S. Tanenbaum and M.V. Steen, Pearson Education, New York.
    5. Distributed Systems, 2/e, 2010, S.Ghosh, Chapman and Hall/CRC, Taylor & Francis Group, US.

II MCA - II Semester   **L**   **T**   **P**   **C**

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20MCA222E   <u>**OBJECT ORIENTED ANALYSIS & DESIGN**</u>

                                (Elective-III)

PREREQUISITES: A Course on "Software Engineering"

COURSE EDUCATIONAL OBJECTIVES:

    CEO1   *To explore the Basic Building Blocks of UML*

    CEO2   *To Learn about Structural Modeling Diagrams*

    CEO3   *To Learn about Behavioral Modeling Diagrams*

    CEO4   *To Learn Architectural Modeling Diagrams*

    CEO5   *To Analysis and Design Library management system using UML*

Syllabus:

UNIT - 1 :   **Introduction to UML**

Importance of modeling- principles of modeling- object oriented modeling- conceptual model of the UML- Architecture- Software Development Life Cycle.Basic Structural Modeling: Classes-Relationships- common Mechanisms- and diagrams.Advanced Structural Modeling:Advanced classes- advanced relationships- Interfaces- Types and Roles- Packages.

UNIT - 2 :   Class & Object Diagrams

Terms and concepts- common modeling techniques for Class & Object Diagrams-Interactions-Interaction diagrams.

UNIT - 3 :   Basic Behavioral Modeling

Use cases- Use case Diagrams- Activity Diagrams.Advanced Behavioral Modeling- state machines-processes and Threads- Time and space- statechart diagrams.

UNIT - 4 :   Architectural Modeling

Components- Deployment- Component diagrams and Deployment diagrams.

UNIT - 5 :   A process for using UML,Case Study-Automation of Library Management System.

COURSE OUTCOMES:

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

COURSE OUTCOMES		
CO1	**Understand** the importance and key principles of modeling, Learn Conceptual model of UML	PO1,PO2,PO4.
CO2	**Familiarize** with the application of the Unified Modeling Language towards analysis and design using Class and Object Diagrams	PO1,PO2, PO3
CO3	**Master** with the basic and Advanced behavioral modeling.	PO1,PO2, PO4
CO4	**Develop** an Architectural model using component and deployment diagrams and can Learn Reverse and Forward engineering.	PO1,PO2, PO3
CO5	**Draw**various UML diagrams for Library Management System and draw for any real time system.	PO1,PO2,PO3,PO4, PO5,PO10,PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3	2	-	2	-	-	-	-	-	-	-	3
CO2	3	2	3	-	-	-	-	-	-	-	-	3
CO3	3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	2	3	-	-	-	-	-	-	-	-	3
CO5	3	3	3	2	3	-	-	-	-	2	-	3

TEXT BOOKS :

1. *The Unified Modeling Language User Guide, 2/e, 2005, Grady Booch, James Rumbaugh and Ivar Jacobson, Pearson Education, New Delhi, India.*
2. *UML 2 Toolkit, 1/e, 2003, Hans,Erik Eriksson, Magnus Penker , Brian Lyons and David Fado, WILEY Dreamtech India Pvt. Ltd., India.*

REFERENCE BOOKS:
1. *Fundamentals of Object Oriented Design in UML, 1/e, 1999, Meilir Page, Jones, Pearson Education, India.*
2. *Modelling Software Systems Using UML2, 1/e, 2010, Pascal Roques, WILEY Dreamtech India Pvt. Ltd.*
3. *Object Oriented Analysis & Design, 1/e, 2004, Atul Kahate, The McGrawHill Companies, Hyderabad, India.*
4. *Practical Object Oriented Design with UML, 2/e, 2005, Mark Priestley, TATA McGraw Hill, Hyderabad, India.*
5. *Object-Oriented Analysis and Design with Applications, 3/e, 2007, Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, Pearson Education, India.*

II MCA - II Semester

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20MCA223A   **NATURAL LANGUAGE PROCESSING**
                                       (Elective- IV)

PREREQUISITES: A Course on "Artificial Intelligence", Machine Learning and Knowledge on basic linear algebra may be helpful.

COURSE EDUCATIONAL OBJECTIVES:
CEO1: To understand the algorithms available for the processing of linguistic information and

computational properties of natural languages.

CEO2: To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.

CEO3: To familiarize various NLP software libraries and data sets publicly available.

CEO4: To develop systems for various NLP problems with moderate complexity.

CEO5: To learn various strategies for NLP system evaluation and error analysis.

Syllabus:
UNIT- 1

Regular Expressions, Text Normalization, Edit Distance: Regular Expressions- words-Corpora- Text Normalization- Minimum Edit Distance.

N-gram Language Models: N-Grams- Evaluating Language Models- Generalizations and Zeros- Smoothing- Kneser-Ney Smoothing – The Web and Stupid Backoff.

UNIT- 2
Naive Bayes and Sentiment Classification: Naive Bayes Classifiers- Training the Naive Bayes Classifier- Example- Optimizing for Sentiment Analysis – Naive Bayes for other text classification tasks- Naive Bayes as a Language Model- Evaluation : Precision, Recall, F-measure- Test sets and Cross-Validation.

Logistic Regression: Classification, The sigmoid- Learning in Logistic Regression – The cross-entropy loss function- Gradient Descent- Regularization- Multinomial logistic regression- Interpreting models- Deriving the Gradient Equation

UNIT- 3
Neural Networks and Neural Language Models: Units-The OR Problem-Feed- Forward Neural Networks- Training Neural Networks- Natural Language Models.

Vector Semantics and Embeddings: Lexical Semantics- Vector Semantics- words and Vectors- Cosine for measuring similarity- TF-IDF-Weighting terms in the vector-Applications of the TF-IDF vector model- Pointwise Mutual Information- Word2vec- Visualizing Embeddings- Semantic properties of embeddings- Bias and Embeddings- Evaluating Vector Models.

UNIT- 4
Part-of-Speech Tagging: English Word Classes- The Penn Treebank Part-of- Speech Tagset- Part-of-Speech Tagging- HMM Part-of-Speech Tagging – Maximum Entropy Markov Models Bidirectionality- Part-of-Speech Tagging for Morphological Rich Languages

UNIT- 5
Sequence Processing with Recurrent Networks: Simple Recurrent Neural Networks- Applications of Recurrent Neural Networks .

Encoder-Decoder Models, Attention and Contextual Embeddings: Encoder-Decoder Networks- Attention- Applications of Encoder-Decoder Networks.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

COURSE OUTCOMES		
CO1	Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.	PO1,PO2,

CO2	Demonstrate understanding of the relationship between NLP and statistics & machine learning.	PO1,PO2,
CO3	Discover various linguistic and statistical features relevant to the basic NLP task such as Semantic and Embedding analysis and other tasks like spelling correction, morphological analysis, parts-of-speech tagging.	PO1, PO2 PO5
CO4	Develop systems for various NLP problems with moderate complexity and solve it with deep neural network models	PO1, PO2, PO3, PO5
CO5	Evaluate NLP systems, identify shortcomings and suggest solutions for these shortcomings	PO1, PO3, PO5.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	2	-	-	-	-	-
CO3	3	3	-	3	-	-	2	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	3	-	2	-	-	2	-	3

TEXT BOOK:

1. Speech and Language Processing An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Daniel Jurafsky, James H. Martin Third Edition, 2019,

REFERENCE BOOKS:

1. Foundations of Statistical Natural Language Processing, Christopher D. Manning, Hinrich Schutze, MIT Press England.

2. Natural Language Processing with Python, Steven Bird, Ewan Klein and Edward Loper, First edition, O'Reilly Publication.

II MCA - II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20MCA223B   **AUGMENT REALITY & VIRTUAL REALITY**

(Elective- IV)

PREREQUISITES: Need to have a coding background and understand the different programming languages and basic Knowledge on Graphics.

COURCE EDUCATIONAL OBJECTIVES:
CEO1: To establish and cultivate a broad and comprehensive understanding of this rapidly evolving and commercially viable field of Computer Science
CEO2: To practice skills in a safe environment and in a manner that utilizes a participant's motor skills
CEO3: Integrating AR/VR development can provide Improved Experience for Learning
CEO4: Increasing Efficiency In Business, Unmatchable Virtual Experience
CEO5: Increase In User Engagement, Boost In Brand Loyalty, Mobility, Better Advertising of products and many more.

Syllabus :

 UNIT- 1 : Introduction to Virtual Reality

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

UNIT- 2 : Computer Graphics And Geometric Modelling

Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Colour theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms. Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

UNIT -3 : Virtual Environment

Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system.

Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT- 4 : Augmented Reality

Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

UNIT- 5 : Development Tools and Frameworks

Human factors: Introduction, the eye, the ear, the somatic senses, Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems.

Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML.

COURSE OUTCOMES:
    After completion of this course, student will be able to:

COURSE OUTCOMES		
CO1	To understand fundamental computer vision, computer graphics and human-computer interaction techniques related to VR/AR.	PO1,PO3
CO2	To understand geometric modeling and Virtual environment.	PO1,PO2
CO3	To relate and differentiate VR/AR technology.	PO1,PO3
CO4	To use various types of Hardware and software in virtual	PO2,PO3

	Reality systems	
CO5	To implement Virtual/Augmented Reality applications.	PO4, PO5

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	3	-	-	2	-	-	-	-	-
CO4	-	3	-	-	-	-	2	-	-	-	-	-
CO5	-	-	-	3	3	-	2	-	-	-	-	-

TEXT BOOKS:
1. *Grigore C. Burdea, Philippe Coiffet , Virtual Reality Technology, Wiley 2016*
2. *Alan B. Craig, Understanding Augmented Reality, Concepts andApplications, Morgan Kaufmann, 2013.*

REFERENCE BOOKS:

1. *Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.*
2. *John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.*
3. *Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.*

II MCA - II Semester

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20MCA223C   **WIRELESS SENSOR NETWORKS**

(Elective- IV)

PREREQUISITES: A course on " Computer Networks"
COUSE EDUCATIONAL OBJECTIVES :

CEO1 *To study about Wireless Sensor Networks, Protocol Stack and Standards.*
CEO2 *To study about fundamentals of Transmission Technology, its protocols and applications.*
CEO3 *To study about WSN Routing techniques and Issues Related to Network Management.*
Syllabus:

UNIT – 1:
Wireless Networks -What Is an Ad Hoc Network? Types of Ad hoc Mobile Communications - Types of Mobile Host Movements - Challenges Facing Ad Hoc Mobile Networks-Ad hoc wireless Internet. Introduction and Overview of Wireless Sensor Networks: Introduction: Background of sensor network Technologies, Applications of sensor networks and Basic Overview of technology: Basic

sensor Network architectural elements, Brief historical survey of sensor networks, Challenges and Hurdles.

UNIT – 2:

Basic Wireless Sensor Technology: Introduction, sensor node technology: overview, hardware and software, Sensor Taxonomy, WN Operating Environments. Wireless Transmission Technology: Introduction, Radio technology primer: propagation and propagation impairments, Modulation, Available wireless technologies: Campus Applications, MAN/WAN Applications. Medium Access Control Protocols for sensor networks: Introduction, Background, Fundamentals of MAC Protocols: performance requirements, common protocols. MAC protocols for WSNs: Schedule-Based Protocols, Random-Access Based protocols.

UNIT – 3:

Routing protocols for wireless sensor networks: Introduction, Background, Data dissemination, Routing challenges and Design issues in wireless sensor networks: Network scale and time varying characteristics, Resource Constraints, Sensor applications Data Models. Routing strategies in wireless sensor networks: WSN Routing techniques, Flooding and its variants, Sensor protocols for information via negotiation, Low- energy adaptive clustering hierarchy, Power- efficient gathering in sensor information systems, Directed diffusion, Geographical routing.

UNIT - 4:

Transport Control Protocols for Wireless Sensor Networks: Traditional Transport Control protocols: TCP, UDP, Mobile IP, Feasibility of using TCP or UDP for WSN's. Transport protocol design issues, Examples of Existing Transport Control Protocols: CODA, ESRT. Performance of transport Control Protocols: congestion, packet loss recovery.

UNIT – 5:

Network Management for Wireless Sensor Networks: Introduction, Network Management Requirements, Traditional Network Management Models: SNMP, Telecom operation Map. Network management design issues, examples of management architecture: MANNA, Other Issues Related to Network Management: Naming, Localization.

COURSE OUTCOMES:
   On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Describe** the basic Wireless Sensor Network technology and supporting protocols, with emphasis placed on Challenges Facing Ad Hoc Mobile Networks and provide a survey of sensor technology	PO1,PO2,PO4
CO2	**Illustrate** the wireless transmission technology and the medium access control protocols for sensor networks	PO1,PO3
CO3	**Learn** key routing protocols for sensor networks and main design issues	PO1,PO3
CO4	**Analyze** the feasibility of using TCP or UDP for WSN's and transport layer protocols for sensor networks.	PO2,PO4

CO5	**Understand** the Sensor management, sensor network middleware, operating systems.	PO1,PO11

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	3	-	-	-	-	-	-	-	-
CO2	3	-	2	-	2	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-	-
CO4	3	3	-	3	-	-	-	-	-	-	-	-
CO5	3	2.5	-	-	-	-	-	-	-	-	2	-

TEXT BOOKS:

1. Ad Hoc Wireless Networks Architectures and Protocols, 2004, C. Siva Ram Murthy and B. S. Manoj, Prentice Hall, PTR.

2. Wireless Sensor Networks Technology, Protocols, and Applications, Kazen, Sohraby, Daniel Minoli, Taieb Znati Wiley Publications.

REFERENCE BOOKS:

1.Wireless Sensor Networks, Ragavendra, C.S.; Sivalingam, Krishna M; Znati, Taieb, Wiley India Edition.

2.Wireless Sensor Networks, S.AnandaMurgan Tech India Publication Series.

IIMCA - II Semester

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20MCA223D   **SEMANTIC WEB**

(Elective- IV)

PREREQUISITES: Courses on "Artificial Intelligence" and "Information Retrieval Systems".

COURSE EDUCATIONAL OBJECTIVES:

CEO1 The main objective of the course is to develop a critical appreciation of semantic technologies as they are currently being developed.
CEO2 To explain the features, rationale and advantages of Semantic Web technology.
CEO3 To explain the concepts of graph-based RDF model and RDF Schema.
CEO4 To analyze the requirements and features of web ontology language (OWL).
CEO5 To discuss the methodologies in ontology engineering and research issues in Semantic Web technology.

Syllabus:

UNIT - 1 :   Web Intelligence

Empowering the Information Age-Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of Today's Web, The Next generation Web - What is Decidable: Mathematical Logic, Kurt Godel, knowledge Representation, Computational Logic, AI , The Semantic Web-What is Machine Intelligence:What is Machine Intelligence -Alan Turing-Turing test-Machine Intelligence- Description Logic- Ontology - Inference Engines - Software Agents-Limitations and Capabilities.

UNIT - 2 :   Ontology in Computer Science

Defining the term Ontology-Differences among taxonomies- Thesauri and Ontologies-Classifying Ontologies- Web Ontology description languages-Ontologies- Categories and intelligence.
Knowledge Representation in Description Logic Introduction-Example-Family of Attribute Languages-Inference problems.

UNIT - 3 :   RDF and RDF Schema

Introduction- Xml essentials- RDF-RDF Schema- A Summary of RDF/RDF Schema Vocabulary.

UNIT - 4 :   OWL

Introduction- Requirements for web ontology Description Languages- Header Information, Versioning and Annotation Properties-Properties- Classes-Individuals- Data types- A summary of the OWL Vocabulary.

UNIT - 5 :   Semantic Web Services

Introduction- Web Service Essentials- OWL–S Service Ontology-OWL–S example- Semantic Web applications-Semantic Search, Semantic Bioinformatics, E-Learning.

COURSE OUTCOMES:
   On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Acquire** the knowledge of overall architecture of the semantic web.	PO1,PO2,PO3
CO2	**Applying** Description Logic to construct a knowledge Base.	PO1,PO2,PO3, PO4,PO5
CO3	**Design** an ontology using Resource Description Framework(RDF) and RDF schema models.	PO1,PO2, PO3,PO4,PO5, PO8
CO4	**Defining** the requirements for web ontology description languages and designing ontology using web ontology language.	PO1,PO2, PO3,PO4,PO5,PO6 PO8
CO5	**Applying** Semantic Web and Ontology technologies to solve real life problems.	PO1,PO2, PO3,PO4,PO5,PO6 PO8,PO11, PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-	-	-	-	-	-	-
CO2	3	3	2	3	3	-	2	-	-	-	-	-
CO3	2	2	3	2	3	-	-	2	-	-	-	-
CO4	3	2	3	2	3	1	2	2	-	-	-	-
CO5	3	2	3	3	3	2	2	2	-	-	2	2

TEXT BOOKS :

1. *Thinking on The Web, 2/e, 2010, H. Peter Alesso and Craig F. Smith, Wiley India, New Delhi, India. (Unit 1,5)*

2. *Semantic Web Concepts, Technologies and Applications, 2010, Karin K. Breitman, Marco Antonio Casanova, Walter TruszKowski, Springer International Edition, NewDelhi, India. (Unit 2,3,4,5)*

REFERENCE BOOKS :

1. *A Semantic Web Primer, 2/e, 2008, Grigoris Antoniou and Frank VanHarmelen, The MIT Press, Cambridge Massachusetts, London, England, England (Online).*

2. *Towards the Semantic Web: Ontology Driven Knowledge Management, 2004, John Davis Dieter Fensal, Frank Van Harmelen, John Wiley&Sons, Ltd. England.*

3. *Information Sharing on the Semantic Web, 2010, Heiner Stuckenschmidt, Frank Van Harmelen, Springer International Edition, NewDelhi, India.*

4. *Creating the Semantic Web with RDF, 2001, John Hjelm, Wiley, New Delhi, India.*

IIMCA - II Semester

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20MCA223E   **E - COMMERCE**
                                          (Elective- IV)

PREREQUISITES: Courses on
COURSE EDUCATIONAL OBJECTIVES

> *CEO1: The fundamental principles of e‑Business and e‑ Commerce and the role of Management,*
> *CEO2: The underlying used technologies with emphasis on Internet Technologies*
> *CEO3:The application of tools and services to the development of small scale e‑Commerce applications.*

Syllabus:

UNIT – 1 : Introduction: Electronic Commerce Framework - Electronic Commerce and Media Convergence - The Anatomy of E-Commerce Application - Electronic Commerce Organization Applications

The Network Infrastructure for Electronic Commerce: Market Forces Influencing the I- Way - Components of the I Way - Network Access Equipment - the Last Mlle: Local Roads and Access Ramps - Global Information Distribution: Networks: Public Policy Issues Shaping the I-Way.

UNIT – 2: The Internet as a Network Infrastructure: The Internet Terminology - Chronological History of the Internet NSFNET: Architecture and Components: Globalization of the Academic Internet -

Internet Governance: The Internet Society –An Overview of Internet Applications –Electronic Commerce - World Wide Web(WWW) as the Architecture: Web Background: Hypertext Publishing - Technology behind the Web: Security and the Web-Consumer-Oriented Electronic Commerce: Oriented Applications - Mercantile Process Models Mercantile Models from the Consumer's Perspective - Mercantile Models from the Merchant's Perspective. Case study: E-Commerce/High Security (Pci)

UNIT – 3: Electronic Payment Systems: Types of Electronic Payment Systems - Smart Cards and Electronic Payment Systems - Credit Card-Based Electronic Payment systems: Risk and Electronic Payment Systems Designing Electronic Payment systems – Inter organizational Commerce
EDI: Legal - security, and Privacy Issues:EDI and Electronic Commerce – EDI Implementation - MIME, and Value- Added Networks : Standardization and EDI -EDI Software Implementation: EDI Envelope for Message Transport: Value- Added Networks (VANs) - Internet – Based EDI.Case study: Social Media Marketing

UNIT – 4 : Intra organization Electronic Commerce: Internal Information System: Macro forces and Internal Commerce - Work-Flow Automation and Coordination - Customization and Internal Commerce -
Supply Chain Management (SCM): The Corporate Digital Library: Dimensions of Internal Electronic Commerce Systems - Making a Business Case for a Document Library - Types of Digital Document Library - Types of Digital Documents - Issues behind Document Infrastructure - Corporate Data Warehouses. Case study: Email Marketing - Email Personalization

UNIT – 5: M-Commerce: Introduction to Mobile Commerce - Limitations - history - applications - architecture - transaction models - payment methods - advantages – disadvantages.
Mobile app marketing case study: O2 Priority Moments gets small businesses on side.

COURSE OUTCOMES:
   On successful completion of this course, students will be able to

COURSE OUTCOMES		
CO1	**Understand** the basic structure and architecture of electronic commerce	**PO1**
CO2	**Relate** the platform and governance of electronic governance	**PO1,PO2, PO3**
CO3	**Design** electronic payment system and electronic data exchange model using electronic commerce	**PO1,PO2, PO3,PO4**

CO4	**Understand and Apply** the Intra Organizational electronic commerce and Supply Chain Management in various scenario	**PO1,PO2, PO3,PO4**
CO5	**Understand and Design** of Mobile Commerce concepts and architecture	**PO1,PO2, PO3,PO4**

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	3	2	-	-	-	-	-	-	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-
CO5	3	2	3	3	-	-	-	-	-	-	-	-

TEXT BOOKS
1. *Frontiers of Electronic Commerce,Ravi Kalakota and Andrew B.Whinston.Pearson Education.*
2. *ECommerce,Henry Chan, Raymond Lee. TharanDillan and E.Chany,Wiley,2003.*

REFERENCES
1. *Web Commrece Technology, DanjelMinoli and EmunaMimoli, Tata MicGraw Hill, 1999.*
2. *A Electronic Commerce, Marilyn Greenstein and Todd M Feinman, TaraMcGraw Hill Edition.*
3. *M-Commerce: Book Your Business with the Power of Mobile Commerce, Paul*

	L	T	P	C
II MCA - II Semester	**0**	**0**	**0**	**12**

20MCA224   **PROJECT WORK**

PREREQUISITES: Students must have Programming skills, Software Engineering skills and Mathematical & Logical skills. Knowledge on Advanced techniques and Algorithms and Minor Project may be helpful.

COURSE EDUCATIONAL OBJECTIVES:

CEO1. To develop the ability to solve a specific problem, right from its identification and literature review till the successful solution of the same.

CEO2. The main objective of the Project Work is for the students to learn and experience all the major phases and processes involved in solving real life engineering applications.

The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design/ fabrication/ analysis for a specific application, a research project with a focus on an application needed by the industry/ society, a computer project, a management project, or a design and analysis project. A project topic must be selected by the students in consultation with their guides. To train the students in preparing project reports and to face reviews and viva- voce examination.

Out of a total of 100 marks for the project work,40 marks shall be for internal evaluation and 60 marks for the external examination (viva-voce). The internal evaluation shall be done by the committee, consisting of HOD/HOD's nominee, co-coordinator and project supervisor on the basis of two seminars to be given by each student on the topic of his /her project. The viva-voce shall be conducted by a committee consisting of HOD/HOD's nominee, co-coordinator, project supervisor and an external examiner. The evaluation of project work shall be conducted at the end of the II- II semester

COURSE OUTCOMES:
On completion of project work the student will be able to:

COURSE OUTCOMES		POs related to COs
CO1	Demonstrate in-depth knowledge on the project topic.	PO1
CO2	Identify, analyze and formulate complex problem chosen for project work to attain substantiated conclusions.	PO2
CO3	Design solutions to the chosen project problem.	PO3
CO4	Undertake investigation of project problem to provide valid conclusions.	PO4
CO5	Use the appropriate techniques, resources and modern engineering tools necessary for project work.	PO5
CO6	Apply project results for sustainable development of the society.	PO6

CO7	Understand the impact of project results in the context of environmental sustainability.	PO7
CO8	Understand professional and ethical responsibilities while executing the project work.	PO8
CO9	Function effectively as individual and a member in the project team.	PO9
CO10	Develop communication skills, both oral and written for preparing and presenting project report.	PO10
CO11	Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.	PO11
CO12	Engage in lifelong learning to improve knowledge and competence in the chosen area of the project.	PO12

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-
CO7	-	-	-	-	-	-	3	-	-	-	-	-
CO8	-	-	-	-	-	-	-	3	-	-	-	-
CO9	-	-	-	-	-	-	-	-	3	-	-	-
CO10	-	-	-	-	-	-	-	-	-	3	-	-
CO11	-	-	-	-	-	-	-	-	-	-	3	-
CO12	-	-	-	-	-	-	-	-	-	-	-	3