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

ACADEMIC REGULATIONS-2018
COURSE STRUCTURE
AND
DETAILED 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

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)

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

ACADEMIC REGULATIONS FOR MCA

(EFFECTIVE FOR THE STUDENTS ADMITTED INTO THE ACADEMIC YEAR 2018-19)

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 Project Seminar, Comprehensive viva-voce and Project Work successfully 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. For Lateral entry students, shall pursue a course of study for not less than two academic years and in not more than four academic years.

iii. Registers for 116 credits and secure all 116 credits.

iv. Lateral entry students shall register for 77 credits and secure all 77 credits

v. 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), Mini Project(MP), Comprehensive Viva Voice (CVV), Project Seminar(PS), 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	Foundation Courses	HS - Humanities and Social Sciences	Includes subjects related to mathematics, humanities, and management
2	Core Courses	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Computer Applications
		MOOC	Online courses which include inter disciplinary subjects or subjects in an area outside the parent discipline department
3	Elective Courses	CE - Core Electives	Includes electives subjects related to the parent discipline department of Computer Applications
4	Employability Enhancement Courses	PW - Project Work	Mini and major project work
		Comprehensive Viva Voice	Comprehensive Viva Voice (with 2.5 credits)
		Industrial training	Industrial Internship or Industrial visit (non Credit)
		Reasoning and Aptitude	Course which includes mathematical Reasoning skills and Technical skills to understand and solve the real life problems. (with 1.5 Credit)
5	Minor Courses	Communication Skills Lab	Courses which includes improve the communication skills (with 1.5 credit)

3.2 COURSE PATTERN:

The entire course work for MCA is of six semesters. In I-I, I-II, II-I, II-II, III-I semesters the student has to study the course work and during III-II semester the student should carry out project work.

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.

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	-	100	100
Seminar	--	02	100	-	100
Comprehensive viva- voce	--	2.5	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	05	03	5x3+3x1.5=19.5	19.5
I-II	05	03	5x3+3x1.5=19.5	19.5
II-I	05+MOOCS	03	5x3+2+3x1.5=21.5	21.5
II-II	05	03	5x3+3x1.5=19.5	19.5
III-I	05	03	5x3+3x1.5=19.5	19.5
III-II	Comprehensive viva-voce		2.5	2.5
III-II	Project Seminar and Project Work		2 + 12	14
Total Credits				116

4. ATTENDANCE:

- A student shall be eligible to appear for external examinations, if he/ she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- **Shortage of attendance below 65% in aggregate shall in NO case be condoned.**
- Condonation of shortage of attendance in aggregate up to 10% (65% or above but below 75%) in each semester may be granted on valid reasons only.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their external examination of that class and their registration shall stand cancelled.

- A student will not be promoted to the next semester unless he/ she satisfies the attendance requirements of the present semester and can seek re-admission for that semester when offered next.
- A stipulated condonation fee shall be payable to the college towards the shortage of attendance.

5. DISTRIBUTION AND CREDENCE OF MARKS

a. 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. In addition, a seminar for 100 marks and project work for 100 marks shall be evaluated.
- For theory subjects the distribution of marks shall be 40 for internal evaluation and 60 marks for the external examination. There shall be five units in each of the theory subjects

b. INTERNAL EXAMINATIONS:

- During the semester, there shall be t**wo** internal examinations for theory subjects.
- Each internal 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 examination shall be conducted in units-I,II and half of III unit and II- 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.

c. EXTERNAL EXAMINATION:

- The External Examination question paper consists of short answer questions (without choice) for 10 marks and 5 descriptive answer questions of equal credence with internal choice for 50 marks for a total duration of 3 hours.
- All questions have to be answered compulsory. Each question may consists one, two or more sub questions
- 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.

d. MINI PROJECT :

The evaluation of the Mini project work shall be conducted at the end of III year I semester by a three member committee, Consisting of HOD/HOD's nominee, coordinator & project supervisor

e. SEMINAR AND COMPREHENSIVE VIVA-VOCE:

- For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding about the topic and submit the same to the department before making presentation. The report and the presentation shall be evaluated by the three member committee.
- The Seminar and 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 III-II semester by the above three member committee.

  He/ she should to secure 50% marks to acquire the required credits.

f. 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, 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 III- II semester.

6. MINIMUM ACADEMIC REQUIREMENTS:

Academic requirements to be satisfied besides the attendance mentioned in section-**5 :**

a. A student shall be deemed to have satisfied the minimum academic requirements and acquired the credits allotted to each theory, practical, seminar, 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.

b. 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.

c. For Seminar 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.

7. RE-REGISTRATION FOR IMPROVEMENT OF INTERNAL MARKS:

Conditions to avail the benefit of improvement of internal evaluation marks

- The candidate should have completed the course work and obtained examination results for I-I and I-II- semesters.
- He should have passed all the subjects in which the internal marks secured are 50% or above.
- Out of the subjects the candidate has failed in the examination due to lack of internal marks secured being less than 50%, the candidate shall be given one chance for each theory subject and for a maximum of three theory subjects for improvement of internal marks.
- The candidate has to re-register for the chosen subjects and fulfill the academic requirements as and when they are offered.
- For each subject the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of DD in favour of the Principal, SITAMS payable at Chittoor along with a requisition through the HOD/ HOD's nominee of the respective department.
- In case of availing the chance of improvement of internal marks, both the internal marks as well as the external marks secured in the previous attempts for the registered subjects will stand cancelled.

8. 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 III-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.

9. 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.

10. 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.

11. 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.

12. AWARD OF LETTER GRADES:

- 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	0	< 50 (Fail)
AB	0	---------

- **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

- **i 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.

  $SGPA = \Sigma (Ci \times Gi) / \Sigma C_i$

  Where, Ci is the number of credits of the i^{th} subject and Gi is the grade point scored by the student in the i^{th} course.

- **ii 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.

  $CGPA = \Sigma (Ci \times Si) / \Sigma C_i$

  Where „Si" is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

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

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

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

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.

13. 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.

14. REVALUATION AND IMPROVEMENT

- 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 seminar, comprehensive viva-voce, practical and project work.
- A candidate can be allowed to apply for improvement only in theory subjects in the next supplementary examinations of that semester (not more than one chance per subject).

15. NUMBER OF INSTRUCTION DAYS:

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

16. RULES OF DISCIPLINE:

- 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.

17. GENERAL:

- The academic regulations should be read as a whole for purpose of any interpretation.
- Malpractices rules- nature and punishments is appended.
- In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-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.

18. 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	Expulsion from the examination hall and cancellation of the performance in that subject only.

	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)	
(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.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all the external examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

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

Malpractices identified by Invigilators or special invigilators or additional or controller of examinations or Principal

Punishments to the candidates as per the above guidelines.

MCA COURSE STRUCTURE (Regular) (2018 – 19)

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	18MCA111	Discrete Structures and Automata Theory	HS	2	1	-	3	40	60	100
2	18SAH117	English for Career Development	HS	3	-	-	3	40	60	100
3	18MCA112	Management for Computer Professionals	PC	3	-	-	3	40	60	100
4	18MCA113	Programming for Problem Solving	PC	2	1	-	3	40	60	100
5	18MCA114	Computer Organization and Architecture	PC	2	1	-	3	40	60	100
6	18MCA115	Programming for Problem Solving Lab	PC	-	-	3	1.5	40	60	100
7	18MCA116	Information Technology Lab	PC	-	-	3	1.5	40	60	100
8	18SAH118	Communicative English Skills Lab	HS	-	-	3	1.5	40	60	100
Contact periods per week				**12**	**3**	**9**				
Total periods per week				**24**						
Total credits(5 Theory+3 Labs)							**19.5**			
Total marks								**320**	**480**	**800**

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	18SAH123	Probability and Statistics	HS	2	1	-	3	40	60	100
2	18MCA121	Object Oriented Programming through Java	PC	2	1	-	3	40	60	100
3	18MCA122	Database Management Systems	PC	2	1	-	3	40	60	100
4	18MCA123	Data Structures and Algorithms	PC	2	1	-	3	40	60	100
5	18MCA124	Operating Systems	PC	2	1	-	3	40	60	100
6	18MCA125	Object Oriented Programming through Java Lab	PC	-	-	3	1.5	40	60	100
7	18MCA126	Database Management Systems Lab	PC	-	-	3	1.5	40	60	100
8	18MCA127	Data Structures and Algorithms Lab	PC	-	-	3	1.5	40	60	100
Contact periods per week				**10**	**5**	**9**				
Total periods per week				**24**						
Total credits(5 Theory+3 Labs)							**19.5**			
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	18MCA211	Artificial Intelligence	PC	2	1	-	3	40	60	100
2	18MCA212	Computer Networks	PC	2	1	-	3	40	60	100
3	18MCA213	Programming using Python	PC	2	1	-	3	40	60	100
4	18MCA214	Software Engineering	PC	3	-	-	3	40	60	100
5	18MCA215	Linux Programming	PC	2	1	-	3	40	60	100
6	18MCA216	MOOC	MOOC	-	-	-	2	-	100	100
7	18MCA217	Programming using Python Lab	PC	-	-	3	1.5	40	60	100
8	18MCA218	Linux Programming Lab	PC	-	-	3	1.5	40	60	100
9	18MCA219	Programming with R Lab	PC	-	-	3	1.5	40	60	100
Contact periods per week				**11**	**4**	**9**				
Total periods per week				**24**						
Total credits(5 Theory+3 Labs)							**21.5**			
Total marks								**320**	**580**	**900**

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	18MCA221	Data Warehousing & Data Mining	PC	2	1	-	3	40	60	100
2	18MCA222	Web Programming	PC	2	1	-	3	40	60	100
3	18MCA223	Cloud Infrastructure and Services	PC	3	-	-	3	40	60	100
4	18MCA224	**Elective – I**	CE	3	-	-	3	40	60	100
5	18MCA225	**Elective – II**	CE	3	-	-	3	40	60	100
6	18MCA226	Data Warehousing & Data Mining Lab	PC	-	-	3	1.5	40	60	100
7	18MCA227	Web Programming Lab	PC	-	-	3	1.5	40	60	100
8	18MCA228	Reasoning, Aptitude and Technical Lab	PC	-	-	3	1.5	40	60	100
Contact periods per week				**13**	**2**	**9**				
Total periods per week				**24**						
Total credits(5 Theory+3 Labs)							**19.5**			
Total marks								**320**	**480**	**800**

Elective-I
II MCA – II 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	18SAHE221	Computer Oriented Operations Research	CE(HS)	2	1	-	3	40	60	100
2	18MCA224A	Software Quality Assurance	CE	3	-	-	3	40	60	100
3	18MCA224B	Software Testing	CE	3	-	-	3	40	60	100
4	18MCA224C	Software Project Management	CE	3	-	-	3	40	60	100

Elective-II

II MCA – II 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	18MCA225A	Introduction to Data Science	CE	2	1	-	3	40	60	100
2	18MCA225B	Service Oriented Architecture	CE	3	-	-	3	40	60	100
3	18MCA225C	Web Information Retrieval	CE	2	1	-	3	40	60	100
4	18MCA225D	Bio Informatics	CE	3	-	-	3	40	60	100

III 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	18MCA311	Internet of Things	PC	2	1	-	3	40	60	100
2	18MCA312	Big Data Analytics	PC	2	1	-	3	40	60	100
3	18MCA313	Mobile Application using Android	PC	2	1	-	3	40	60	100
4	18MCA314	**Elective – III**	CE	3	-	-	3	40	60	100
5	18MCA315	**Elective –IV**	CE	3	-	-	3	40	60	100
6	18MCA316	Big Data Analytics Lab	PC	-	-	3	1.5	40	60	100
7	18MCA317	Mobile Application using Android Lab	PC	-	-	3	1.5	40	60	100
8	18MCA318	Mini Project	PW	-	-	3	1.5	40	60	100
Contact periods per week				**12**	**3**	**9**				
Total periods per week				**24**						
Total credits(5 Theory+3 Labs)							**19.5**			
Total marks								**320**	**480**	**800**

Elective-III
III 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	18MCA314A	.Net Technologies	CE	3	-	-	3	40	60	100
2	18MCA314B	Wireless Sensor Networks	CE	3	-	-	3	40	60	100
3	18MCA314C	Semantic Web	CE	2	1	-	3	40	60	100
4	18MCA314D	Block Chain Technology	CE	3	-	-	3	40	60	100

Elective-IV
III 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	18MCA315A	Machine Learning	CE	2	1	-	3	40	60	100
2	18MCA315B	Quantum Computing	CE	3	-	-	3	40	60	100
3	18MCA315C	Cryptography and Network Security	CE	2	1	-	3	40	60	100
4	18MCA315D	Design Patterns	CE	3	-	-	3	40	60	100

III MCA- II 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	18MCA321	Comprehensive Viva-Voce	PW	-	-	-	2.5	100	-	100
2	18MCA322	Project Seminar	PW	-	-	-	2	100	-	100
3	18MCA323	Project Dissertation / Thesis	PW	-	-	-	12	40	60	100
Total				0	0	0	**16.5**	**240**	**60**	**300**

SUMMARY OF CREDIT ALLOCATION

S.NO	SUBJECT AREA	CREDITS AS PER SEMESTER						TOTAL CREDITS
		I-I	I-II	II-I	II-II	III-I	III-II	
1.	HS	7.5	3	-	-	-	-	10.5
2.	PC	12	16.5	19.5	13.5	12	-	73.5
3.	CE	-	-	-	6	6	-	12
4.	PW	-	-	-	-	1.5	16.5	18
5	MOOC	-	-	2	-	-	-	2
Total		19.5	19.5	21.5	19.5	19.5	16.5	116

Note: HS- Humanities and Social Science; PC – Professional Core; CE- Core Elective; PW - Project Work.

PERCENTAGE –WISE CREDIT DISTRIBUTION

S.No	Category	Credits Allocated	Percentage –wise Credit Distribution
1	HS- Humanities and Social Sciences	10.5	9.06%
2	PC – Professional Core	73.5	63.36%
3	CE- Core Elective	12	10.34%
4	PW – Project Work	18	15.52 %
5	MOOC	2	1.72%
Total		**116**	**100**%

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

18MCA111 DISCRETE STRUCTURES AND AUTOMATA THEORY

PREREQUISITES: Undergraduate level Mathematics

Course Educational Objectives:

CEO1 To acquire the knowledge of logical operations and predicate calculus needed for computing skill.
CEO2 To acquire the basic knowledge of relations, functions and graph theory concepts needed for designing and solving problems.
CEO3 To acquire the basic knowledge of formal languages to the engineering areas like Compiler Design.
CEO4 To acquire the basic knowledge of finite automata theory and design discrete problems to solve by computers.

UNIT - 1 : Mathematical Logic and Predicates

Propositions-Logical Connectives- Conditionals and Biconditionals- Well formed formulas- Tautologies, Logical Equivalences- Theory of Inference for Statement Calculus- Predicate Calculus- Free & Bound variables- Inference Theory of Predicate Calculus.

UNIT - 2 : Relations and Functions

Introduction- Properties of Binary Relations- Closure of Relations- Warshall's Algorithm- Equivalence Relations and Partitions- Partitional Ordering Relations- Compatible Relation- Functions – Composition of Functions- Recursive Functions- Pigeon Hole Principles & Its Applications.

UNIT - 3 : Recurrence Relations

Generating Functions - Recurrence Relations – Linear Recurrence Relations with constant coefficients- Homogeneous Solutions- Particular Solutions- Total Solutions- Solution by Method of Generating Functions.

UNIT - 4 : Graphs , Trees

Introduction- Basic terminology- Multigraphs and Weighted Graphs- Digraphs and Relations- Representation of Graphs- Operations on Graphs- Paths and Circuits- Graph Traversals: Traversing of a Graph, Depth-First Search , Breadth-First Search- Eulerian Paths and Circuits- Hamiltanian Paths and Circuits- The Travelling Salesperson Problem. Trees – Trees- Spanning Trees- Minimum Spanning Trees, Kruskal's Algorithm, Prim's Algorithm.

UNIT - 5 : Introduction to Automata, Automata with output, Regular Expression and Languages.

Alphabets- String, Languages- Finite Automata (FA)- Transition Graph- Simpler Notation for DFA's- The language of a DFA- Non determinism, Minimization of DFA's.

Introduction, Moore Machine- Mealy Machine- Equivalence of Mealy and Moore Machine's. Regular Expressions- Comparative Study of Regular Expression- Regular Sets and Finite Automata- Construction of FA for Regular Expression- Construction of Regular Expression from DFA.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Check** the validity of the verbal or Symbolic arguments using rules of inference and **Construct** verbal arguments with predicates in symbolic form and also validate them.	PO1,PO2,PO3, PO5,PO6
CO2	**Defining** the Properties of relations, checking the transitive closure of relation, Partial order relation, Inverse functions and Recursive functions based problems.	PO1,PO2,PO3, PO5,PO6
CO3	**Solving** the homogeneous and non-homogeneous linear recurrence relation with constant co-efficient.	PO1,PO2,PO3, PO5,PO6
CO4	**Applying** the Knowledge of Graph Theory to solve real life problems like Construction of telephone network, Railway track, Traveling Salesperson problem.	PO1,PO2,PO3, PO4,PO5,PO6, PO11,PO12
CO5	**Design** of Finite Automata and the **Construct**ion of Finite Automata from the Regular expression and vice-versa.	PO1,PO2,PO3, PO4,PO5,PO6, PO11,PO12

TEXT BOOKS:

1. Elements of Discrete Mathematics- A Computer Oriented Approach, 4/e, 2010, C.L.Liu, D.P. Mohapatra, Tata McGraw-Hill , New Delhi.
2. Discrete Structures and Automata Theory, 2007, Rakesh Dube, Adesh Pandey, Ritu Gupta, Narosa Publishing House, New Delhi.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists & Mathematicians, 2/e, 2006, J.L.Mott, A. Kandel, T.P. Baker, Prentice Hall of India Private Limited , New Delhi.
2. Mathematical Foundation of Computer Science (Discrete Structures), 2006, Dr. D.S. Chandra Sekharaiah, Prism Books Private Limited, Bangalore.
3. Discrete Mathematics and its Applications, 6/e, 2007, Kenneth H. Rosen, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Discrete Mathematical Structures, 5/e, 2007, Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, Prentice Hall of India Private Limited, New Delhi.

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

18SAH117 ENGLISH FOR CAREER DEVELOPMENT

PREREQUISITES: Undergraduate level English

Course Educational Objectives:

CEO1: To develop Knowledge on the usage of grammar in spoken and written communication.

CEO2: To give importance on Speaking Skills by applying proper vocabulary.

CEO3: To acquire Knowledge on use of using right body language while giving presentations.

CEO4: To get knowledge on Reading and Listening skills.

CEO5: To understand the ability to write effective English words.

UNIT-1 Basic English Grammar concepts:

(a)Articles-Prepositions

(b) Tenses-Subject-verb agreement

(c) Vocabulary Development- Synonyms, Antonyms, Oneword Substitutes, Idioms and Phrases, Suffixes and Prefixes

UNIT-2 Annexing Reading and Listening:

(a)Reading-Reasons for poor reading-Improving reading skills-Techniques in reading-Skimming-Scanning-Non-verbal signals-structure of the text-punctuation-Author's view- Reader's Anticipation.

(b)Listening and its types-Barriers to good listening-Qualities of a good listener.

UNIT-3 Informative English skills:

Communication- Nature – Characteristics-Verbal communication-Interpersonal speaking-Public speaking-How to improve verbal communication?

UNIT-4 Non Verbal Communication:

(a) Kinesics- Body Language- Gestures – Proxemics- Chronemics etc

(b) Paralinguistic features

UNIT-5 English for correspondence:

(a)Introduction to Email writing- Email Etiquette-Report Writing-Proposal Writing- Abstract writing

(b) Types of Letters-Letters to Editors-Complaint Letters-Official Letters

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

COURSE OUTCOMES		
CO1	**Understand** the proper usage of grammar in one's career development as a lifelong learning.	PO1, PO9
CO2	**Understand** the importance on speaking skills by applying good vocabulary.	PO1,PO7
CO3	**Understand** the use of proper body language skills while giving Power Point presentations.	PO1,PO7, PO10
CO4	Individual **knowledge** on Reading and Listening skills.	PO1, PO11
CO5	**Understand** how to use effective English words to write their project reports.	PO10, PO11

REFERENCE BOOKS:

1.Business Communication and Soft Skills by K.Srinivasa Krishna and Dr. B.Kuberudu; Excel Books: New Delhi 2008

2. Developing Communication skills by KrishnaMohan and Meera Benarji.

3. Communication Skills: Sanjay Kumar and Pushpa Latha, Oxford University Press. 2011

4. Practical English Usage: Michael Swan, Oxford University Press, 1995

5. Remedial English Grammar: F.T. Wood. Macmillan, 2007

6. English Vocabulary in Use by Oxford University Press New edition.

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

18MCA 112 MANAGEMENT FOR COMPUTER PROFESSIONALS

PREREQUISITES: No prerequisite as such. Knowledge on Information Technology may be helpful.

Course Educational Objectives:

CEO1 Students will be able to have a clear understanding of the Business Process management function.
CEO2 To familiarize with the Enterprise Architecture and Decision Support System.
CEO3 Students will also gain some basic knowledge on IT Risk Management.
CEO4 Gain some basic knowledge about Social media Strategies and Communities.
CEO5 Design supply chain contracts for effective governance of supply chain relationships.

UNIT - 1 : Digital Technology Creates New Levers for Growth and Improved Performance

Digital Technology Transforming How Business is Done-Business Process Management-Competitive Advantage and SWOT Analysis-Enterprise Technology Trends-IT expertise Adds value to Your career.

Data Governance, IT Architecture and Cloud Strategies

Data Governance Strategy – Enterprise IT Architecture – Information and Decision Support Systems-Data Centers and Cloud Computing-Cloud Services Delivery Models- Data Base Management Systems- Big Data and Analytics-Data and Text Mining-Business Intelligence.

UNIT - 2 : Digital Networks and the Triple Bottom Line

Data Networks and API-Wireless and Mobile Infrastructure-Messaging and Collaboration Technology-Sustainability and the Triple Bottom Line-**Cyber Security, Risk Management and Financial Crime**- Data Breaches and Cyber security challenges- IT Risk Management-Mobile, App and Cloud Security Challenges-Financial Crime and Fraud Defenses.

Internet Technologies and Search Strategies - Search Technology-Organic Search and Search Engine Optimization-Paid search Strategies and metrics-Semantic web and search-Recommendation Engines.

UNIT - 3 : Social media Strategies and Metrics

Social media Strategies and Communities-Social Communities and Engagement-Social Monitoring, Metrics and Analytics-Social Media Failures and Lessons learned-Retail Channels-B2C E-Commerce-B2B E-Commerce and E-Procurement-Mobile Commerce and Transactions.

Tactical and Operational Support System - Business Challenges-Manufacturing, Production and Transportation Management Systems-Sales and Marketing Systems-Accounting and Finance Systems-Human Resource Systems and Ethics.

UNIT - 4 : Strategic Enterprise Systems

Enterprise Systems-Enterprise Social Platforms-Enterprise Resource Planning Systems-Supply Chain Management Systems-Customer Relationship Management Systems.

Data Visualization and Geographic Systems – Data Visualization -Enterprise Data Mashups-Digital DashBoards-Geographic Information Systems.

UNIT - 5 : ITIL Process

Incident Management. Change Management. Problem Management, Configuration Management, Release Management, Service Level Management, Continuity Management, Security Management, Capacity Management.

Course Outcomes:
At the end of the course, students will be able to

COURSE OUTCOMES		
CO1	**Demonstrate** the basics of digital technology concepts	PO1,PO2
CO2	**Analyze** how digital networks and internet techniques and search strategies for implementation.	PO1,PO2, PO12
CO3	**Familiarize** with the social media awareness concepts and basic knowledge of IT management.	PO1,PO2, PO12
CO4	**Illustrate** the basic concepts, the terminology and techniques currently used in enterprise system.	PO1,PO2, PO12
CO5	**Enumerate** the different levels of management with reflection of information technology through online based learning.	PO1,PO2, PO12

TEXT BOOKS:

1. Information Technology for Management,1/e, 2016, E. Turban, Linda Volonio, Gregory R. Wood, Wiley India Pvt Ltd. New Delhi.
2. The ITIL Foundation Exam Study Guide, 3/e, 2005, Scott Braden, Briarcove Drive, Richardson, USA.

REFERENCE BOOKS:

1. Management of Technology, International Editions, 2000, Tarek Khalil, Tata McGrew-Hill, New Delhi.
2. TechExcel ITIL Guide, Pink Certified.

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

18MCA113 PROGRAMMING FOR PROBLEM SOLVING

PREREQUISITES: No prerequisite as such. 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 and Pointers.
CEO3 To Explore Basic C Structures and Unions.

UNIT - 1 : Introduction to the C language
History of C-Characteristics of C-Structure of C Program-Elements of C-Input Output in C-Operator & Expression-Operation on Bits.

UNIT - 2 : Control Structure & Arrays
Control Structure: Compound Statement- if-else-Loops-break Statement –Continue-goto-switch.
Arrays: One Dimension Array-Two Dimension Array-Array with more than One Dimension-Introduction to String.

UNIT - 3 : Functions & Pointers
Functions: Advantage of Functions-Library Function-User Defined Function-Definition-Function Call-Function Declaration-Return Statement-Function Argument-Types of Functions-More About Functions Declarations-Local, Global & Static Variables-Recursion.

Pointers: About Memory-Address Operator-Pointer Variable-Pointer Arithmetic-Precedence of Dereferencing Operator-Pointer Comparison-Pointer to Pointer-Pointer & One Dimensional Array-Subscripting Pointer Variable-Pointer & Two Dimensional Array-Subscripting Pointer to an Array-Pointer & Function- Function Returning Pointer- Arrays of Pointer-Void Pointer-Dynamic Memory Allocation.

UNIT - 4 : String, Structures & Union
String: String Variable-String Library Function-String Pointer-Arrays of String-Arrays of Pointer to String.

Structures & Union: Definition of Structure-Declaration Structure Variable-Initialization of Structure Variables-Accessing member of a Structure-Assignment of Structure Variable-Storage of Structure in Memory- Size of Structure-Arrays of Structure-Arrays within Structure-Nested Structure-Pointer to Structure-Pointer within Structure- Structure & Function-Self Referential Structure-Union-Typedef

UNIT - 5 : File Handling

Text & Binary Mode-Concept of Buffer-Opening a File-Closing a File-EOF-Structure of General File Program-Predefined File Pointer-Character I/O- Integer I/O-String I/O-Formatted I/O- Block Read / Write-Random Access File-Other File Function-Enumeration-Storage Class-Lvalue & Rvalue

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Demonstrate** above basic understanding of C and Programming structure	PO1,PO8
CO2	**Apply** different types of logical construct using looping, branching and Arrays	PO2,PO3,PO8
CO3	**Create** user defined functions for program development based on the rules adapted by predefined function and originate pointers with different combination for program development	PO1,PO2, PO3,PO8
CO4	**Apply** different string operations, structure & union operations for program development	PO1,PO2, PO3,PO8
CO5	**Organize** file processing methodology for program development	PO1,PO2,PO3, PO4,PO8

TEXT BOOKS:

1. C in Depth, S. K. Srivastava & Deepali Srivastava, 2/e, BPB Publications.

REFERENCE BOOKS:

1. A Structured Programming Approach using C, 2/e, Behrouz A. Forouzan and Richard F. Gilberg, Cengage Learning.
2. C and Data structures, 2009, Ashok N. Kamthane, Pearson Education.
3. Programming in C, 3/e, 2008, Stephen G. Kochan, Pearson Education, New Delhi.
4. C Programming & Data Structures, 3/e, 2009, B.A.Forouzan and R.F. Gilberg,, Cengage Learning, New Delhi.
5. 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.
6. C and Data Structures, 1/e, 2010, Dr. N.B. Venkateswarlu, Dr. E.V. Prasad, S. Chand & Company Limited, New Delhi.
7. Mastering C, 2007, K.R. Venugopal and S.R. Prasad, Tata Mcgraw-Hill, New Delhi.

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

18MCA 114 COMPUTER ORGANIZATION AND ARCHITECTURE

PREREQUISITES: No prerequisite as such. 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.

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 : Introduction to 8085 Microprocessor

Microprocessor Based system -Hardware and Interfacing: Microprocessors - Microcomputers and Assembly Language - 8085 Microprocessor Architecture - The 8085 MPU, Example of an 8085 based Microcomputer - Programming the 8085 - Introduction to 8085 Assembly language Programming.

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
CO3	**Conceptualize** instruction level parallelism for high performance processor design	PO1,PO3, PO4, PO5
CO4	**Learn** the microprocessor architecture and study Assembly Language Programming.	PO1,PO3, PO4,PO5
CO5	**Explain** memory hierarchy and its impact on computer cost and performance	PO1,PO2, PO3,PO5

TEXT BOOKS :

1. Computer System Architecture, 3/e, 2007, M. Morris Mano, Prentice-Hall of India, New Delhi. [UNIT 1,2,3]
2. Microprocessor Architecture, Programming and Applications with 8085/8080A, 3/e, Ramesh S Goankar, New age International Publishers, New Delhi.[Unit 4]
3. 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.

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

18MCA 115 PROGRAMMING FOR PROBLEM SOLVING LAB

PREREQUISITES: A Course on "Programming for Problem Solving"

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 Know the role of Functions involving the idea of modularity.
CEO5 Learn concept of Array and pointers dealing with memory management and files.

Syllabus:

Implement the Following by using C Language

1. To Calculate Area & Circumference of a Circle.
2. To Swap Two numbers With & Without using Temporary Variable.
3. To print the size of every Data type.
4. To Calculate Bill Amount for an item given its quantity sold, amount, discount & tax.
5. To find biggest among 3 numbers.
6. To find sum of first n numbers.
7. To find multiplication table for a given input value.
8. To generate Odd or Even number upto 100 and super number from 1000 to 9999.
9. To generate Fibonacci series for a given input.
10. To obtain sum of the first 10 terms of the following series for any
    Positive integer value of X: X +X3 /3! +X5/5! ! +X7/7! + …
11. To reverse the digits of a given number. For example, the number 9876 should be returned as 6789.
12. 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.
13. Apply recursive call to do the following:
    a) Find the factorial of a given number.
    b) Compute ${}^{n}C_{r}$ value.
14. To convert uppercase string to lowercase string & Vice Versa without using string function.

15. To convert the two-dimensional array into one-dimensional array.
16. To find Binary Equivalent of a given number.
17. To display the Following pattern called Floyed's Triangle.
18. To print the Various patterns.
19. To perform addition of two given matrices.
20. To perform multiplication of two given matrices.
21. To find the transpose of a given matrix.
22. To Calculate Salary for 5 Employees using Structure.
23. To copy the Content from one file to another file.
24. To count the number of vowels present in a file.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Demonstrate** the knowledge on basic usage of operators, datatypes, variable declaration, looping & branching, arrays, strings, pointers, structures & union and files	PO1
CO2	**Analyse** & Develop an algorithm for every problem to be solved	PO2
CO3	**Implement** every program based logic involved in Algorithm	PO3
CO4	**Test** every program for different inputs to get effective solutions	PO4
CO5	**Use** appropriate software to implement program and to obtain solution	PO5
CO6	**Relate** programming principles to implement every program	PO8
CO7	**Inspect** every program individually for effective practice	PO9
CO8	The result and bugs of every program is **observed** and **recorded** in observation	PO10
CO9	**Assess** the technological changes in which it correlates to change and need	PO12

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

18MCA116 INFORMATION TECHNOLOGY LAB

PREREQUISITES: No prerequisite as such. Knowledge on operating computer System may be helpful.

Course Educational Objectives:

To train the student on:
CEO1. Identification of Functional parts of PC.
CEO2. Practicing basic operation of operating system commands.
CEO3. To apply knowledge and skills of IT to create word documents, excel spread sheets, power point presentations, database using Ms-access and maintenance of PC.

Syllabus:

1. **Identifying of various hardware parts and usage of System.**
2. **Implementing DOS Commands.**
3. **Implementing Windows basic operations.**
4. **Implementing 6 exercise using following options in MS Word**

Introduction to MSWord, Menus, Shortcuts, Document types, Opening Files - New & Existing, Saving Files, Formatting page and Setting Margins, Converting files to different formats- Importing, Exporting, Sending files to others, Editing text documents , Inserting,. Deleting,. Cut, Copy, paste, Undo, Redo, Find, Search, Replace, Using Tool bars - Ruler , Using Icons

Setting Font Styles - Font selection, style, size, color etc., Type face - Bold Italic, underline, Case settings, Highlighting, Special symbols, Setting Paragraph style – Alignments, Indents, . Line space, Margins, Bullets and Numbering, Setting Page Style – Formatting, Border& Shading, Columns, Header & footer, Setting Footnotes, Inserting manual Page break, Column break and line break, Creating sections and frames, Inserting Clip arts, pictures, and other files, Anchoring & Wrapping, Setting Document Styles - Table of Contents, Index, Page Numbering, data &Time, Author etc.

Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, Inserting Pictures/Files etc., Drawing Pictures, Formatting &Editing pictures, Grouping and ordering, Rotating. Spell Checks, Mail merge, Security.

5. **Implementing 6 exercise using following options in MS Excel**

Spreadsheet & its Applications, Opening spreadsheet, Menus & Toolbars & icons, Shortcuts, Shortcuts
Opening a File, Saving Files, Setting Margins, Converting files to different formats, Importing, Exporting and Sending files to others, Spreadsheet addressing- Rows, Columns & Cells, Referring cells and Selecting cells., Entering and Editing Data - Entering Data, Cut, Copy, paste, Undo, Redo, Find, Search & Replace, Filling continuous rows, columns, Inserting - Data, cells, column, rows & sheets, Manual breaks., Computing data - Setting Formula, Finding total in a column or row,

Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulas.

Formatting - Cell, row, column & Sheet, Alignment, Font, Border &shading, Highlighting values, Hiding/Locking Cells., Worksheet - Sheet Name, Row& Column Headers, Row Height, Column Width, Visibility - Row, Column, Sheet, Security, Formatting worksheet - Sheet Formatting & style - background, color, Borders & shading, Anchoring objects, Formatting layout for Graphics, Clipart etc., Sorting, Filtering, Validation, Consolidation, Subtotal, Selecting charts -Formatting charts, label, scaling etc.,

6. Implementing 2 exercise using following options in MS power point

Opening new Presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts. Setting presentation style, Adding Text to the presentation, Adding style, Color, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout, Inserting pictures, movies, tables, etc into the presentation, Drawing Pictures using Draw, Setting Animation & transition effect , Adding audio and video.

7. Implementing 2 exercise using following options in MS Access

Database concepts, Tables, Queries, Creating Tables, Table Design, Indexing, Entering data, Importing data.

8. Usage of MS Outlook.

Course Outcomes:

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

COURSE OUTCOMES		POs related to COs
CO1	**Apply** Knowledge of Information Technology to identify various parts of the PC and Operating System functionalities	PO1
CO2	**Analyze** the data and generate reports for decision making	PO2
CO3	**Design** documents and presentations Using word processor and PowerPoint	PO3
CO4	**Experiment** various MS office elements by designing documents, database and reports as per the requirement.	PO4
CO5	**Engage** in identifying new tools and techniques to make the work faster and effective.	PO5
CO6	**Practice** of ethical code of conduct in the usage of computer hardware and software.	PO8
CO7	Doing **experiment**s effectively as an individual and as a member in a group.	PO9
CO8	**Communicate** verbally and in written form to express the problems and solutions in an easy manner.	PO10
CO9	**Updating** their skill related to various editing techniques, shortcuts, report generation for various applications during their life time.	PO12

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

18SAH118 COMMUNICATIVE ENGLISH SKILLS LAB

PREREQUISITES: A course on **"**English For Career Development"

Course Educational Objectives:

CEO1: To Provide Knowledge on Pronouncing English words by suing Phonetic sounds.

CEO2: To Acquire knowledge on the contemporary English Language.

CEO3: To cultivate self confidence in one's life by performing presentation skills and Role plays.

CEO4: Knowledge on writing resumes and cover letter.

CEO5: To develop knowledge to speak in a group and attend interviews confidently.

Topics to be covered:

1. PRONUNCIATION OF WORDS
Sounds of English-Vowels-Consonants-Diphthongs-Plural Morphemes& Past Tense Marker- Stress Rules and Intonation

2. COMMUNICATE EFFECTIVELY
Colloquial and formal – Expressing likes and Dislikes – Expressing sorry –Expressing wishes – Giving Opinion – Greetings – Making phone calls – Making suggestions – Requests and offers- Socializing.

Situational Role plays - At Doctor – Complaining – Complementing – Finding room – Making an appointment – Opening Conversation – Thanking.

3. PRESENTATION STRATEGIES
Do's and Don'ts while Preparing and Presenting PPTS –Poster Presentations

4. WRITING SKILLS
Resume cover letter and reference - Resume Objective summary and profile – Resume structure and presentation – Email Writing.

5. SPEAKING SKILLS
(a) Preparing for GD – Strategies for GD – Tips for preparation – Types of GD- Do's and Don'ts – Mock GD-Debates

(b) Interview Skills

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

COURSE OUTCOMES		POS related to COS
CO1	**Communicate** effectively using phonetic sounds	PO1
CO2	**Demonstrate** in using contemporary English while Communicating.	PO10
CO3	**Display** self confidence by performing presentation skills and Role plays.	PO10
CO4	**Make** good presentations with effective writing skills	PO10
CO5	**Exhibit** one's candidature to participate in discussion in group to get individual confidence.	PO9

SOFT WARE SUGGESTED: *WALDEN- HYDERABAD*
Minimum Requirements of AECS Lab:
The English Language Lab shall have two parts:

- Computer Assisted Language Learning (CALL) Lab the Computer Aided Language Lab for 60 students with 60 systems, on e master console, LAN facility and English language software for self study learners.
- The Advanced Communication Skills Lab with movable chairs and audio visual aids with PA system projector, a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component)
Computer Network with LAN with minimum 60 multimedia systems with the following specifications:

- P-IV Processor-speed-2.8GHZ, RAM-512 MB minimum, Hard Disk-80GB.
- Headphones of High quality.

Reference Books suggested:

- Everyday Dialogues in English, 2006, Robert J.Dixson, Prentice-Hall of India Ltd., New Delhi.
- Body Language- Your Success Mantra, 2009, Dr.Shalini Verma, S.Chand&Co., New Delhi.
- A Handbook for English Language Laboratories, 2009, E.Sureshkumar, P.Sreehari, Foundation Books, Cambridge University Press, Chennai.

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

18SAH123 PROBABILITY AND STATISTICS

PREREQUISITES: Basic Mathematics

Course Educational Objectives:

CE01: The course is designed to equip the students with the necessary mathematical skills and Techniques that are essential for an engineering course.

CEO2: To provide knowledge on

- Applying Probability, Generation of Random variables
- Generating Mean, Variance and Standard Deviations for Discrete and Continuous Statistical Data
- Applying Various Statistical Distributions suitable for the available statistical data
- Evaluating sampling data and Estimating the population parameters
- Constructing a curve, or mathematical function, that has the best fit to a series of data points, possibly subject to constraints.
- Using appropriate test of Significance for the analysis of sampling data
- Using ANOVA to test whether there are any statistically significant differences between the means of three or more independent (unrelated) groups

CEO3 : To develop skill to analyze the discrete and continuous data using appropriate Statistical Distributions like Binomial, Poisson, Normal..etc

CEO4: To develop skill to design different graphical representations like pie chart, Bar graph, scatter Diagram, line graph, Regression line etc.,

CEO5: To inculcate skill to investigate different applications of statistical distributions and the Corresponding conclusions required for the analysis of sample data.

CEO6: To develop skill to apply the concept of test of significance using t-test, f-test, chi-square test, ANOVA suitable of the required conclusion.

UNIT - 1: Probability and Random variables

Probability: Sample space and events - Probability - The axioms of probability - Some elementary theorems - Conditional probability - Baye's theorem.

Random variables: Discrete and continuous distributions – Statistical Parameters (Mean, Variance and Standard Deviation) of distribution functions.

UNIT - 2: Probability Distributions

Binomial - Poisson and Normal distributions - Related properties.

UNIT - 3: Sampling distribution and Estimation

Sampling distribution: Populations and samples - Sampling distributions of mean (known and unknown) - Proportions - Sums and differences.

Estimation: Point estimation - Interval estimation - Bayesian estimation.

UNIT - 4: Test of Hypothesis and Test of Significance

Test of Hypothesis: Means - Hypothesis concerning one and two means - Type I and Type II errors - One tail, two-tail tests.

Test of Significance: Student's t-test - F-test - Chi-square test of goodness of fit.

UNIT - 5: Curve fitting & ANNOVA

Curve fitting: The method of least squares – Linear, Parabola, Exponential and Power form.

ANNOVA: ANNOVA for one-way and two-way classification data.

Course Outcomes:

After the completion of this course, a successful student is able to

COURSE OUTCOMES		POs related to
CO1	**Demonstrate** knowledge on use the probability and Random Variables in the field of engineering	PO1,PO2, PO3
CO2	**Demonstrate** knowledge in probability distributions and **develop** analytical skills for the problems involving means, probability	PO1,PO2, PO3
CO3	**Construct** confidence intervals on parameters for a single sample	PO1,PO2,
CO4	**Demonstrate** knowledge in testing of hypotheses and Tests of significance for small and large samples and **Develop** skills for analyzing the data with suitable tests of significance for practical situations through probability distributions	PO1,PO2, PO3,PO4, PO12
CO5	**Demonstrate** knowledge on constructing a curve, or mathematical function, that has the best fit to a series of data points, possibly subject	PO1,PO2, PO3,PO4,

Text Books:

1. Fundamentals of Mathematical Statistics, 10/e, 2001, S.C. Gupta, V.K. Kapoor, S. Chand and Company Publishers, New Delhi.
2. Probability and Statistics, 2012, T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad , S. Chand and Company Publishers, New Delhi.

Reference Books:

1. Probability and Statistics, 2011, V. Ravindranath, T.S.R. Murthy, I.K. International Pvt. Ltd, New Delhi.
2. Probability and Statistics for Engineers, 6/e, 2006, Johnson A. Richard, Miler & Fruends, Pearson Education, New Delhi.
3. Higher Engineering Mathematics, 34/e, 1999, Dr. B. S. Grewal, Khanna Publishers, Delhi
4. Probability and Statistics for Engineers, 2011, Dr. J. Ravichandran, Wiley-India Publishers, New Delhi.
5. Probability and Statistics for Engineers and Scientists, 7/e, 2002, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Pearson Education Asia, New Delhi.

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

18MCA121 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

PREREQUISITES: A course on "Programming for Problem Solving"

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.

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, Interfaces 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

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
	2	1	0	3

18MCA122 DATABASE MANAGEMENT SYSTEMS

PREREQUISITES: No prerequisite as such. 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**.**

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

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. Database Management Systems, 1/e, 2002, Alexis Leon and Mathews Leon, Vikas Publishing, New Delhi.
6. SQL, PL/SQL Programming, 3/e, 2005, Ivan Bayross, BPB Publications, New Delhi.

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

18MCA123 DATA STRUCTURES AND ALGORITHMS

PREREQUISITES: A course on "Programming for Problem Solving" and Knowledge of Tree structure and Graph theory may be helpful.

Course Educational Objectives:

CEO1 To explore the fundamental concepts of Data Structures.

CEO2 To Explore various data Structures like Stack, Linked List, Queues, Trees and Graphs.

CEO3 To Understand various Sorting and Searching Techniques.

UNIT - 1 : Introduction and Overview & Linked lists

Definition, Concept of Data Structures, Overview of Data Structures. Definition, Single linked lists, Doubly linked lists, Circular linked lists, Circular Double linked lists, Applications of Linked list: Sparse Matrix Manipulation, Polynomial Representation.

UNIT - 2 : Stacks and Queues

Introduction, Definition, Representation of Stacks- Arrays and Linked lists, Operations on stacks, Applications of stacks-Evaluation of Arithmetic Expression, Implementation of Recursion, Factorial Calculations, Towers of Hanoi. Introduction, Definition, Representation of Queues- Arrays and Linked lists, Various Queue structures, Operations on Queues, Applications.

UNIT - 3 : 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 - 4 : Trees

Basic Terminologies, Definition and Concepts, Representation of Binary Tree, Operations on Binary Tree - Types of Binary Trees

UNIT - 5 : Graphs

Introduction, Graph Terminologies, Representation of Graphs, Operations on Graphs, Application of Graph Structures

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Explain** the organization and operations of data structures stack, queues, trees, graphs, sorting and searching.	PO1,PO2
CO2	**Compare** and **Contrast** the functionalities and application of different data structures.	PO1,PO2,PO3
CO3	**Demonstrate** specific search and sort algorithms using data structures given Specific user requirements.	PO1,PO2,PO3, PO4
CO4	**Identify**ing suitable algorithms with appropriate data structures for real time software requirements.	PO1,PO2,PO3 PO4,PO5,PO7, PO11,PO12
CO5	**Modify** the existing operations of data structures for changing needs of the software requirements.	PO1,PO2,PO3 PO4,PO5,PO7, PO11,PO12

TEXT BOOKS:

1. Classic Data Structures, 2/e, 2009, Samanta, Prentice Hall of India Private Limited, New Delhi.
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.

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

18MCA124 OPERATING SYSTEMS

PREREQUISITES: A course on "Computer Organization and Architecture"

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.

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 : I/O Systems &File system

I/O Systems: Overview, I/O Hardware, Application of I/O Interface, kernel I/O Subsystem Transferring I/O Request in to Hardware Operations, Streams. **File System Interface:** The Concept of a File - Access methods – Directory & Disk Structure - File System Mounting - File Sharing – File System Implementation.

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 I/O management and File management strategies	PO1,PO2,PO3, PO5,PO12

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 - II Semester	L	T	P	C
	0	0	3	1.5

18MCA215 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

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.

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

18MCA126 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

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
	0	0	3	1.5

18MCA127 DATA STRUCTURES AND ALGORITHMS LAB

PREREQUISITES: A course on "Data Structures And Algorithms"

Course Educational Objectives:

CEO1 Stack operations to perform the following: Converting infix expression into postfix expression, Evaluating the postfix expression.
CEO2 Implement Bubble Sort, selection sort and insertion sort method to sort a given list of integers.
CEO3 Demonstrate familiarity with major algorithms and data structures.

Syllabus:

Exercise 1: Write C programs that implement stack (its operations) using Arrays.

Exercise 2: Write C programs that implement Queue (its operations) using Arrays.

Exercise 3: Write C Program that implement operations on Stack using Pointers.

Exercise 4: Write C Program that implement operations on Queue using pointers

Exercise 5: Write a C program that uses functions to perform the following operations using singly linked list

i) Creation ii) insertion iii) Deletion iv) Traversal

Exercise 6: Write a C program that uses functions to perform the following operations using double linked list

i) Creation ii) insertion iii) Deletion iv) Traversal

Exercise 7: Write a C program that uses functions to perform the following operations using Circular linked list

i) Creation ii) insertion iii) Deletion iv) Traversal

Exercise 8: Write a C Program that uses Stack Operations to perform Converting infix expression to postfix expression

Exercise 9: Write a C Program that uses Stack Operations to perform Evaluate the postfix expression.

Exercise 10: Write a C program that implements Bubble sort method to sort a given list of integers in ascending order.

Exercise 11: Write a C program that implements Selection sort method to sort a given list of integers in ascending order.

Exercise 12 : Write a C program that implements the Quick sort method to sort a given list of integers in ascending order.

Exercise 13 : Write a C program that implements the Merge sort method to sort a given list of integers in ascending order.

Exercise 14: Write a C programs using non - recursive functions to perform the Linear Search operation for a key value in a given list of integers.

Exercise 15: Write a C programs using non - recursive functions to perform the Binary Search operation for a key value in a given list of integers.

Exercise 16: Write a C program to create Binary Search Tree and perform operations on it.

Exercise 17: Write a C Program to Find the Shortest Path Between Two Vertices Using Dijkstra's Algorithm.

Exercise 18: Write a C Program to Apply the Prim's Algorithm to Find the Minimum Spanning Tree of a Graph.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Demonstrate** knowledge on writing program using C for Data Structures to solve real life applications.	PO1
CO2	**Analyse** the given problem and Identify suitable algorithm and data structure to solve the problem	PO2
CO3	**Design** of algorithms for the given problem specifications and **identify** the appropriate data structure to develop real time applications.	PO3
CO4	**Write** C programs to implement the following linear and Nonlinear Data Structures a)Stack b) Queue c)singly linked list, d) double linked list, e)Circular linked list f) graph h) Tree	PO4
CO5	**Apply** different sorting methods to sort a given list of integers in ascending order and **Execute** the Search operations for a key value in a given list of integers.	PO5
CO6	**Follow** ethical principles in Analyzing, designing and implementing various Data Structures.	PO8
CO7	Do **experiment**s 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

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

18MCA211 ARTIFICIAL INTELLIGENCE

PREREQUISITES: Knowledge on Mathematical logic, Problem solving techniques, Kowledge 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.

UNIT - 1 : Introduction

What is AI? - The History of Artificial Intelligence - The State of the Art. **Intelligent Agents**: Agents& Environments - Structure of Agents. **Solving Problems by Searching:** Problem Solving Agents – Example Problems- Searching for Solutions

UNIT - 2 : Search Strategies

Uninformed Search Strategies -Avoiding Repeated States. Informed Search and Exploration: Informed (Heuristic) Search Strategies - Heuristic Functions - Local Search Algorithms and Optimization Problems- Local Search in Continuous Spaces – Defining Constraint Satisfaction Problems- Constraint Propagation: Inference in CSPs.

UNIT - 3 : Knowledge and Reasoning

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

UNIT - 4 : Inference in First Order Logic

Propositional Vs First Order Inference-Unification and Lifting-Forward Chaining-Backward Chaining-Resolution. **Knowledge Representation:** Ontological Engineering - Categories and Objects - Events- Reasoning Systems for Categories - Reasoning with Default Information - The Internet Shopping World.

UNIT - 5 : Uncertain Knowledge, Reasoning and Learning

Quantifying Uncertainty: Acting Under Uncertainty - Basic Probability Notation - Inference Using Full Joint Distributions – Independence - Bayes' Rule and Its Use. **Learning from Examples:** Forms of Learning - Supervised Learning - Learning Decision Trees – Artificial Neural Networks- Support Vector Machines- Ensemble Learning-Practical Machine Learning.

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 using different machine learning techniques	PO1,PO2, PO3,,PO4,PO5, PO6,PO12

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.

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

18MCA212 COMPUTER NETWORKS

PREREQUISITES: A course 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.

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

TEXT BOOKS: Illustrate basic concepts, terminology and **enumerate** the layers of the different reference models and can explain the function(s) of each layer.

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.

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

18MCA213 PROGRAMMING USING PYTHON

PREREQUISITES: A Course on "Programming for Problem Solving"

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.

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

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 BOOK:

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

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

18MCA214 SOFTWARE ENGINEERING

PREREQUISITES: No prerequisite is required. 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 Apply it to 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.

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

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach, 6/e ,2005, Roger S Pressman, Tata McGraw-Hill International Edition .
2. Software Engineering, 7/e ,2004, IanSommerville, 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.
5. Software Engineering – A Supporting Processes, 1/e, 2005, Richard H. Thayer and Merlin Dorfman, Wiley.

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

18MCA215 LINUX PROGRAMMING

PREREQUISITES: A Course on "Operating Systems"

Course Educational Objectives:

CEO1 To Explore Unix Operating system.
CEO2 To Explore commands to work with files and directories.
CEO3 To know about basic Shell scripting.
CEO4 To understand Unix filter commands.

UNIT – 1: Basics of Unix

What is Unix, why is Unix important, the Structure of Unix operating system, widely used Unix variants, choosing a Unix variant, Getting Started – Logging in, Entering commands, logging out.

UNIT – 2: Working with files and directories

Directories, The Hierarchical File Structure, UNIX System File Types ,Common Commands for Files and Directories, Searching for Files, More About Listing, Files Permissions, Viewing Long Files, Printing Files.

UNIT – 3: Text editing, Shell Scripting

Editing with vi, The Shell Language vs. Other Programming Languages, A Sample Shell Script ,Other Ways to Execute Scripts, Putting Comments in Shell Scripts, Working with Variables, Using Command-Line Arguments, Arithmetic Operations,Conditional Execution Writing Loops ,Shell Input and Output.

UNIT – 4: Using unix and windows together, awk and sed

Moving to unix if you are a windows user, terminal emulation, Sharing Files and Applications Across UNIX and Windows Machines-Accessing Your UNIX Files from a Windows Machine running unix and windows together on the same machine, awk and sed.

UNIT – 5: Filters and Utilities

Finding Patterns in Files, Compressing and Packaging Files , Counting Lines, Words, and File Size, Working with Columns and Fields, Sorting the Contents of Files, Comparing Files, Examining File Contents, Editing and Formatting Files, Saving Output, Working with Dates and Times, Performing Mathematical Calculations.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Gain** insight into Basic Unix commands.	PO1,PO2,PO4,PO5
CO2	**Work** with Files and Directories commands	PO2,PO4,PO9
CO3	**Execute** basic shell scripting Programs.	PO1,PO2,PO3,PO12
CO4	K**now** more about awk and sed	PO2,PO5
CO5	**Experiment** various Filters and Utilities Commands.	PO2,PO3

TEXT BOOKS:

1. The Complete Reference UNIX, 2/e, 2007, Kenneth H. Rosen, Douglas A. Host, Rachel Klee, James Farber, Richard Rosinksi, Tata McGrew-Hill Publishing company Limited, New Delhi.
2. Introduction to Unix & Shell Programming, 2008, M.G.Venkateshmurthy, Pearson Education, New Delhi.

REFERENCE BOOKS :

1. Beginning Linux programming, 4/e, 2008, N.Mathew, R.Stones, Rocks, Willey India Edition, New Delhi.
2. Unix- Concepts and Applications, 4/e, 2006, Sumitabha das, Tata Mcgraw - Hill, New Delhi.
3. Unix and shell programming, 2008, D.A.Forouzal and R.F. Gilberg, Cengage Learning India private limited, New Delhi.

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

18MCA217 PROGRAMMING USING PYTHON LAB

PREREQUISITES: A Course on "Programming using Python"

Course Educational Objectives:

CEO1 To develop, test, and debug simple Python programs.
CEO2 To develop programs with data and expressions.
CEO3 To write python programs with control structures.
CEO4 To develop Python programs with functions.
CEO5 To write a program with compound data using Python lists, tuples, dictionaries.
CEO6 To write python programs for file handling.

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 8a) 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”.

Course Outcomes:

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

COURSE OUTCOMES		POs related to COs
CO1	**Experiment and debug** simple Python programs.	PO1
CO2	**Implement** Python programs with conditionals and loops.	PO2
CO3	**Develop** Python programs step-wise by defining functions and calling them.	PO3
CO4	**Examine the usage of** Python lists, tuples, dictionaries for representing compound data	PO4
CO5	**Implement** Practical and real world data analysis	PO5
CO6	Following ethical principles in **implement**ing object oriented programming in python.	PO8
CO7	Doing **experiment**s 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.	PO10
CO9	**Updating** their skill related to various python applications during their life time	PO12

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

18MCA218 LINUX PROGRAMMING LAB

PREREQUISITES: A Course on "LINUX Programming"

Course Educational Objectives:

CEO1 To Practice Basic Unix Commands for Files and Directories.
CEO2 To Practice Vi editor and to know about awk .
CEO3 To Explore Basic Shell Script Programs.

Syllabus:
Practice the Following commands in UNIX.

1. Entering commands.
2. Common Commands for Files and Directories.
3. Searching Files.
4. More about Listing Files.
5. Permission Commands.
6. Commands for viewing Long Files, to Print Files.
7. Editing with vi Editor.
8. Finding Patterns in Files.
9. Compressing and Packing Files.
10. Counting Lines , words and File Size.
11. Working with Columns and Fields.
12. Sorting the Contents of Files.
13. Comparing Files.
14. Editing and Formatting Files.
15. Working with Dates and Times.
16. Performing Mathematical Calculations.
17. Standard input and Output (Redirection Commands).
18. Exploring awk & sed.
19. Write a Shell Script that copies multiple files to a directory.
20. Write a Shell Script (small calculator) that adds, subtracts, multiplies and divides the given two integers. There are two division options: one returns the quotient and the other returns reminder. The Script requires 3 arguments : The operation to be used and two integer numbers. The options are add(-a), subtract(-s), multiply(-m), quotient(-c) and reminder (-r).
21. Write a Shell Script that counts the number of lines and words present in a given file.
22. Write a Shell Script that displays the list of all files in the given directory.
23. Write a Shell Script to generate a Multiplication Table.
24. Write a Shell Script to reverse the rows and columns of a matrix.

Course Outcomes:

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

COURSE OUTCOMES		POs related to COs
CO1	**Demonstrate** knowledge on working in the Unix environment	PO1
CO2	**Analyze** the way in which programs and files are manipulated in the Unix environment	PO2
CO3	**Design** and **develop** algorithms and programs using various shell scripting .	PO3
CO4	**Conduct** investigation and test the networking commands in managing multiple users	PO4
CO5	Use appropriate design tools to **understand** the networking implementation in the Unix multiuser environment	PO5
CO6	**Follow** ethical principles in **design**ing and implementing multitasking and multiuser environment.	PO8
CO7	Do **experiment**s 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 **updat**ing their skill related to Verilog HDL and FPGA implementation for various application during their life time	PO12

TEXT BOOKS:

1. The Complete Reference UNIX, 2/e, 2007, Kenneth H. Rosen, Douglas A. Host, Rachel Klee, James Farber, Richard Rosinksi, Tata McGrew-Hill Publishing company Limited, New Delhi.
2. Introduction to Unix & Shell Programming, 2008, M.G.Venkateshmurthy, Pearson Education, New Delhi.

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

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

18MCA219 PROGRAMMING WITH R LAB

PREREQUISITES: A courses on "Programming for Problem solving" and Kowledge on statistical techniques may be helpful.

Course Educational Objectives:

CEO1 Master the use of the R interactive environment.
CEO2 Managing data in R.
CEO3 Statistical Methods using R.
CEO4 Mathematical operations Using R.

EXCERSCISES:

1) Implement Basic R Mathematical Commands.
2) Implement R Programs to Illustrate Decision Making and Loops.
3) Exercises on Lists using R Tool.
4) Implement R Vectors.
5) Implement R Matrices.
6) Implement R Data Frames.
7) Implement R Statistical Methods.
8) Implement R Functions.
9) Illustrate R Charts & Graphs.
10) Extract Data From CSV, Excel and Database Files.
11) Illustrate Prediction using Linear Regression.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**List** motivation for Learning a Programming language and any modern tool.	PO1
CO2	**Import, Review, Manipulate, Summarize** and **Analyse** Data sets in R.	PO2
CO3	**Implement** Basic R Mathematical Commands, Lists, Vectors Matrices, Data Frames, Statistical Methods, Functions.	PO3
CO4	**Extract** Data From CSV, Excel and Database Files , **Analyze** , **Design** and **Apply** R Programs to Illustrate Decision Making Loops, Charts and Graphs.	PO4
CO5	**Create** a dataset , Select and **Develop** a Program to **Apply** Linear Regression model for Prediction Analysis using any Modern Tool.	PO5
CO6	Follow ethical principles in **Analyzing, designing** and **implementing** various Big Data Analytics Tasks.	PO8
CO7	Do **experiments** effectively as an individual and as a member in a group.	P09
CO8	**Communicate** verbally and in written form, the understandings about the experiments.	PO10
CO9	**Continue** updating their skill related to Big data Analytics Tasks implementation for various application during their life time	PO12

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

18MCA221 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.

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, Advanced Techniques 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, Mining Time-Series Data, Spatial Data Mining, Multimedia Data Mining, Text Mining, 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 dataming 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

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.

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

18MCA222 WEB PROGRAMMING

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.

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

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 - II Sem	L	T	P	C
	3	0	0	3

18MCA223 CLOUD INFRASTRUCTURE AND SERVICES

PREREQUISITES: A Course on "Computer Networks".
Course Educational Objectives:

CEO1 To explore the Basics of Cloud Computing.
CEO2 To Learn how to Build Cloud Networks.
CEO3 To Explore Federation presence, Identity, privacy in the cloud-security.
CEO4 To Learn Common Standards in Cloud Computing.
CEO5 To Explore Cloud Service Providers.

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 : Building Cloud Networks - Virtualization Practicum

The evolution from the MSP Model to cloud computing and software-as-a-service, The cloud Data Center, Service-Oriented Architecture as a step toward Cloud computing, Basic approach to a Data center-based SOA. Downloading sun xVM virtualBox, Installing Sun xVM VirtualBox, Adding a Guest Operating System to VirtualBox.

UNIT - 3 : Federation Presence, Identity and Privacy in the cloud-Security in the cloud

Federation in the cloud, Presence in the cloud, Privacy and its relation to cloud based information system, Security in the Cloud, Cloud security challenges, Software-as-a-service security.

UNIT - 4 : 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 - 5 : 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.

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** and **Apply** suitable virtualization concept and Cloud Resource Management	PO1,PO3, PO5,PO6
CO3	**Assess** the core issues of cloud computing such as security, privacy, and interoperability.	PO1,PO2,PO3, PO5,PO6,PO8
CO4	**Understand** the standards for security, messaging and applications, and also end user accessibility to cloud.	PO1,PO6,PO7
CO5	**Aware** the various services provided by big titans of cloud computing	PO1,PO3,PO5

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.
5. "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More", 1/e, 2013, Kris Jamsa , Jones & Bartlett Learning, Massachusetts, US.

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

18SAH221 COMPUTER ORIENTED OPERATIONS RESEARCH

(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

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

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 - II Semester	L	T	P	C
	3	0	0	3

18MCA224A SOFTWARE QUALITY ASSURANCE

(Elective –I)

PREREQUISITES: A Course on "Software Engineering".

Course Educational Objectives:

CEO1 To Understand about Environment about Software Quality.
CEO2 To have Knowledge about Appropriate Procedure for various Quality Standards.
CEO3 To understand about Software Quality Standards and to Select Apply Appropriate Quality Standards.

UNIT - 1 : Introduction to SQA

Software Quality Challenge: Uniqueness of SQA-The Environment of which SQA methods are developed. **Software Quality:** What is Software?-Software Errors, Faults & Failures-Classification of Software Errors. Definition: Software Quality-Software Quality Assurance- Software Quality Assurance & Software Engineering. **Software Factors:** Need for Software Quality Requirements-Classification of Software Quality Requirement in to Software Factors-Product Operation & Revision for Software Quality Factors-Product Transition for Software Quality Factors-A Alternative Model for Software Quality Factor—Software Compliances with Software Quality Factor. **Components of SQA:** SQA Systems-Pre Project Component-Software Project Life Cycle Component-Infrastructure Component for Error Prevention & Improvement-Management SQA Component-SQA Standards ,System Certification & Assessment Components.

UNIT - 2 : Pre Project Software Quality Components

Contract Review: Introduction-The Correct Review Process & its Stage-Contract Review Objectives-Implementation of Contract Review-Contract Review Subjects-Contract Review for Internal Projects. **Development & Quality Plan:** Development Plan & Quality Plan Objectives-Elements of the Development Plan-Elements of the Quality Plan-Development & Quality Plan for Small Projects & Internal Projects.

UNIT - 3 : SQA Components in the Project Life Cycle-I

Integrity Quality Activities in the Project Life Cycle: Classic & Other Software Development Methodologies-Factor Affecting Intensity of Quality Assurance-Verification, Validation &Qualification-A Model for SQA Defect Removal. Assuring the Quality of Software Maintenance Components: Introduction-The Foundation of High Quality-Pre-maintenance Software Quality Components-Maintenance SQA Tools.

UNIT - 4 : SQA Components in the Project Life Cycle-II & Software Quality Infrastructure Components-I

Assuring the Quality of External Participants Contributions: Introduction-Types of External Participants-Risk & Benefits-Assuring Quality for External Participants Objectives-SQA Tools Assuring Quality for External Participants. **CASE Tool & Effect on Software Quality:** What is

CASE Tool?-The Contribution of CASE tool to Software Product Quality-The Contribution of CASE to Software Maintenance Quality-The Contribution of CASE tool to Improved Project Management. **Procedures & Work Instructions:** The Need for Procedures & Work Instructions-Procedure & Procedure Manuals-Work Instructions & Work Instruction Manuals-Procedure & Work Instructions. **Supporting Quality Devices:** Templates-Checklists.

UNIT - 5 : Software Quality Infrastructure Components-II

Configuration Management: Software Configuration, Its Items & Its Management-Software Configuration Management-Tasks & Organization-Software Change Control-Release of Software Configuration Versions-Provision of SCM Information Services-SCM Audits-Computerized Tools for Managing Software Configuration. **Documentation Control:** Introduction-Control Documents & Quality Records-The Controlled Documents List-Control Document Preparation-Issues of Controlled Document Approval-Issues of Controlled Document Storage & Retrieval.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Gain an Insight** into the basic concept of assuring software quality factors and components	PO1
CO2	**Develop** the quality plan for project initiation to assure software quality	PO1,PO2, PO3
CO3	**Classify** the activities involved in Project life cycle to assure the software quality	PO2,PO3
CO4	**Analyze** the various infrastructure components to ensure the software quality	PO1,PO2, PO3,PO4
CO5	**Prepare** by understanding documentation methodology to assure the software quality	PO1,PO2, PO3,PO4

TEXT BOOKS:

1. Software Quality Assurance – From Theory to Implementation, 2004, Daniel Galin, Pearson Education.

REFERENCE BOOKS:

1. Software Quality Assurance – Principles & Practices, 2016, Nina S & Godbole, Alpha Science International Ltd.

2. Handbook of Software Quality Assurance, 4/e, Gordon Schulmeyer, Artech House.

II MCA - II Semester

L	T	P	C
3	0	0	3

18MCA224B **SOFTWARE TESTING**

(Elective –I)

PREREQUISITES: A Course on "Software Engineering".

Course Educational Objectives:

CEO1 To explore Different types of Bugs.
CEO2 To Learn about Path testing using Flow Graphs.
CEO3 To Learn basics of Data flow testing.
CEO4 To understand applications of Node Reduction Algorithm.
CEO5 To Acquire Basic Knowledge of Testing Tools like Win Runner and Load Runner.

UNIT - 1 : Introduction To Testing

Purpose of testing – Some Dichotomies – A Model for testing – The Consequences of bugs – A Taxonomy of bugs.

UNIT - 2 : Path testing & Data Flow Testing

Path Testing Basics – Predicates, Path Predicates and Achievable Paths - Dataflow Testing Basics – Data flow testing strategies.

UNIT - 3 : Paths, Path products and Regular expressions

Path products & path expression – A Reduction Procedure- Applications - Regular Expressions & Flow Anomaly Detection.

UNIT - 4 : Graph Matrices and its Application

Motivational overview – The Matrix of a Graph – The Powers of a Matrix - Node Reduction Algorithm.

UNIT - 5 : Testing Tools

Manual testing and its Limitations - Need for Automated Testing Tools - Taxonomy of Testing Tools, Introduction to Win Runner – Load Runner- Selenium.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Understand** purpose, types and levels of Testing	PO1,PO2,PO3, PO9,PO12
CO2	Get **Familiarized** with Path Testing, one of the structural Testing Technique	PO1,PO2,PO3, PO11
CO3	**Infer** the Applications of Node Reduction Algorithm	PO1,PO2,PO3, PO4,PO5
CO4	**Distinguish** between Node Reduction Algorithm on Graphs and Graph Matrix	PO1,PO2,PO4, PO5
CO5	**Execute** Testcases in WinRunner and LoadRunner	PO2,PO5,PO9, PO11,PO12

TEXT BOOKS :

1. Software Testing Techniques, 2/e, 1990, Boris Beizer, Dreamtech, New Delhi, India.
2. Software Testing Tools, 2/e, 2004, Dr.K.V.K.K.Prasad , Dreamtech, New Delhi, India.

REFERENCE BOOKS :

1. A Practitoner s Guide To Test Automation Using Selenium ,1/e, 2012, Aditya Garg, Ashish Mishra, Mcgraw Higher Ed
2. The craft of software testing, 2/e, 1995, Brian Marick, Pearson Education, New Delhi, India.
3. Software Testing Techniques, 1/e, 2008 , SPD, New Delhi, India.
4. Software Testing in the Real World, 1/e, 2008, Edward Kit, Pearson Education, New Delhi, India.
5. Effective methods of Software Testing, 3/e, 2000, Perry, John Wiley, India.
6. Art of Software Testing, 3/e, 2011, Meyers, John Wiley, India.

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

18MCA224C SOFTWARE PROJECT MANAGEMENT

(Elective –I)

PREREQUISITES: A Course on "Software Engineering".

Course Educational Objectives:

CEO1 The student should be made to understand the overview of software project management, project planning and Step Wise framework in project planning.
CEO2 The students should be made to learn about how to assess the projects and to find the cost of the project using cost benefit evaluation techniques and to evaluate the risks involved in the project.
CEO3 The student should be made to understand the activity plan for a project and to estimate the overall duration of the project by analyzing the risks involved in it.
CEO4 The student should be made to learn how to monitor the progress of projects and to assess the risk of slippage so that project's requirements can be controlled.

UNIT - 1 : Conventional Software Management

The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation. Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT -2 : The old way and the new

The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT - 3 : Model based software architectures

A Management perspective and technical perspective. Work Flows of the process: Software process workflows, Iteration workflows. Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule, estimating, Iteration planning process, Pragmatic planning. Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT - 4 : Process Automation

Automation Building blocks, The Project Environment. Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminates.

UNIT - 5 : Future Software Project Management

Modern Project Profiles, Next generation Software economics, modern process transitions. Case Study: The COCOMO Cost Estimation Model.

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Understand the basics of project culture, training the people and choosing tools for** effective project management.	**PO1,PO2, PO3,PO5**
CO2	**Learn and Apply** principles of conventional software engineering and modern software management.	**PO1,PO2, PO3,PO4, PO5, PO11**
CO3	**Conceptualize** the software process workflow and Architecture. Identify major mile stones and do periodic status assessments.	**PO1,PO2, PO3,PO4, PO5, PO11**
CO4	**Monitor** the progress of projects in work breakdown structures and to **assess** iterative process planning, and also cost and schedule estimation.	**PO1,PO2, PO3,PO4, PO5,PO11**
CO5	**Identify** the management indicators and Quality indicators that influence modern project profiles and next generation software economies.	**PO1,PO2, PO4,PO5, PO11**

TEXT BOOK :

1. Software Project Management, 2005, Walker Royce, Pearson Education.

REFERENCE BOOKS :

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.

2. Software Project Management, Joel Henry, Pearson Education.

3. Software Project Management in practice, 2005, Pankaj Jalote, Pearson Education.

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

18MCA225A INTRODUCTION TO DATA SCIENCE

(Elective –II)

PREREQUISITES: A Course on "Artificial Intelligence" and Kowledge 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 identify probability distributions commonly used as foundation for statistical modeling.
CEO3 To describe the data science process and how its components interact.
CEO4 To apply basic machine learning algorithms like linear regression, K- Nearest Neighbors, K-Means etc. for prediction modeling.
CEO5 To identify common approaches used for feature generator.
CEO6 To identify basic feature selection algorithms.

UNIT – 1 :

Introduction- What is Data Science: Big Data and Data Science Hype-Getting past the Hype- Why Now?-Data fixation-The Current Landscape. Statistical Inference, Exploratory Data Analysis and the Data Science Process: Statistical Thinking in the age of Big Data-Statistical Inference, Populations and Samples, Populations and Samples of Big Data, Modeling- Exploratory Data Analysis- Philosophy of Exploratory Data Analysis- The Data Science Process- A Data Scientists Role in this process- Case Study- Real Direct.

UNIT - 2:

Algorithms: Machine Learning Algorithms- Three Basic algorithms- Linear Regression, K- Nearest Neighbors (K-NN),K-Means. Spam Filters, Naïve Bayes and Wrangling: Learning by Example-Why wont Linear Regression work for filtering spam, how About K –Nearest Neighbors- Naïve Bayes-Bayes Law, A spam filter for individual words, A spam filter that combines words-Laplace smoothing-comparing Naïve Bayes to K-NN-Sample code in Basch-scrapping the web-APIs and other tools.

UNIT - 3:

Extracting Meaning from Data: Background-Data Science Competitions, Crowd sourcing-the Kaggle Model-A single contestant, Their customers-Thought Experiment: What are the ethical implications of a Robo –Grader-Feature Selection-User Retention, Filters, Wrappers, Decision Trees, Entropy, The Decision Tree Algorithm, Handling Continuous Variables indecision Trees, Random Forests, User Retention: Interpretability Versus Predictive power-David Huffaker: Google's Hybrid approach to social research, Motivating from Descriptive to Predictive, Social at Google, privacy, thought Experiment: What is the best way to decrease concern and increase understanding and control.

UNIT - 4:

Recommendation Engines: Building a User- Facing Data Product at Scale :A real world recommendation engine-Nearest neighbor algorithm review-Some Problems with nearest Neighbors-Machine Learning classification-The Dimensionality problem-singular value decomposition(SVD)-Important Properties of SVD-Principal Component Analysis(PCA)-Build your own recommendation system.

Social Networks: Social Network Analysis-Terminology from social networks-centrality measures, The Industry of Centrality Measure-Thought Experiment- Morning side analytics- How Visualizations Help us Find schools of Fish- More Background on Social Network Analysis from a Statistical point of view- Representations of Networks and Eigen value Centrality-The Erdos- Renyi Model-The Exponential Random Graph Model.

UNIT – 5 :

Machine Learning-Introduction-The Perceptron algorithm-Kernel Functions-Generating to New Data- Over fitting and uniform Convergence-Online Learning-Learning disjunctions, The Halving Algorithm, The Perceptron algorithm-Online to Batch Conversion-Support Vector Machines-Deep Learning-Generative Adversarial Networks(GANs)-Further current Directions-Semi Supervised Learning, Active Learning, Multitask Learning.

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	To **analyze** the complex engineering problem and **apply** the three basic machine learning algorithms to get the solving problems.	PO1,PO2,PO3, PO4, PO5,PO6, PO7,PO8
CO3	**Knowing** 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
CO4	To carry out the statistical modeling and **analysis** by using basic and advanced tools like R.	PO1,PO2,PO3, PO4 ,PO5,PO6, PO7,PO8
CO5	To **build** a recommendation system using dimensionality reduction techniques and doing experiments on social networks.	PO1,PO2,PO3, PO4, PO5,PO6, PO7,PO8

TEXT 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.

REFERENCE BOOKS:

1. Data Science for Business: What you need to know about Data Mining and Data Analytic thinking, 2013, Foster Provost and Tom Fawcett.

2. Elements of statistical learning, 2009, Trevor-Hastie, Robert Tibshirani and Jerome Friedman.

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

18MCA225B SERVICE ORIENTED ARCHITECTURE

(Elective –II)

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.

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

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 - II Semester	L	T	P	C
	2	1	0	3

18MCA225C **WEB INFORMATION RETRIEVAL**
(Elective –II)

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.

UNIT - 1: Introduction to Information retrieval

What is Information Retrieval- Defining Relevance, Dealing with Large, Unstructured Data Collections, Formal Characterization, Typical Information Retrieval Tasks. Evaluating an Information Retrieval System- Aspects of Information Retrieval Evaluation, Precision, Recall and their Trade Offs, Ranked Retrieval, Standard Test Collections. Information Retrieval Models: Similarity and Matching Strategies- Boolean Model, Evaluating Boolean Similarity, Extensions and Limitations of the Boolean Model. Vector Space Model- Evaluating Vector Similarity, Weighting schemes and tf X idf- Evaluation of the Vector Space Model, Probabilistic Model- Binary Independence Model-Bootstrapping Relevance Estimation-Iterative Refinement and Relevance Feedback, Evaluation of the Probabilistic Model.

UNIT – 2: Classification and clustering

Addressing information Overload with Machine Learning-Classification-Naïve Bayes Classifiers, Regression Classifiers, Decision Trees, Support Vector Machines. Clustering-Data Processing, similarity Function Selection, Cluster Analysis, Cluster Validation, Labeling. Application Scenarios for Clustering-Search Results Clustering, Database Clustering. Natural Language Processing for search. Challenges of Natural Language Processing-Dealing with Ambiguity, Leveraging Probability. Modeling Natural Language Tasks with machine Learning-Language Models-Hidden Markov Models, Conditional Random Fields. Question Answering systems-What is Question Answering? Question answering Phases, Deep Question Answering, Shallow semantic Structures for Text Representation, Answer Reranking.

UNIT – 3: Search Engines

The Search Challenge - A brief History of Search Engines- Architecture and Components-Crawling-Crawling Process, Architecture of Web Crwalers, DNS Resolution and URL Filtering, Duplicate Elimination, Distribution and Parallelization, Maintenance of the URL Frontier, Crawling Directives. Indexing-Distributed Indexing, Dynamic Indexing, Caching Exercises. Link Analysis- The web graph-Link Based Ranking, Page Rank-Random surfer Interpretation, Managing Dangling Nodes, Managing Disconnected Graphs, Efficient Computation of the Pagerank vector, use of Pagerank in Google. Hypertext-Induced Topic Search(HITS)-Building the query-Induced Neighborhood Graph,

Computing the Hub and Authority scores, Uniqueness of Hub and Authority scores, Issue in HITS application, On the Value of Link-Based Analysis.

UNIT - 4: Recommendation and Diversification for the Web

Pruning Information-Recommendation systems-User Profiling, Types of Recommender Systems, Content Based Recommendation Techniques, Collaborative Filtering Techniques. Result Diversification-Scope, Diversification Definition, Diversity Criteria, Balancing Relevance and Diversity, Diversification Approaches, Multi Domain Diversification. Advertising in Search: Web Monetization-Advertising on the web-Terminology of online Advertising, Auctions-First Price Auctions, Second-Price Auctions, Pragmatic Details of Auction Implementation, Federated Advertising, Exercises.

UNIT – 5: Advanced aspects of Web Search

Publishing Data on the web-Options for Publishing data on the Web, The Deep Web, Web APIS, Micro formats, RDFa, Linked Data, Conclusion and Outlook. Semantic Search-Understanding Semantic Search, Semantic Model, Resources-System Perspective, User Perspective, Queries- User Perspective, system Perspective, Query Translation and Presentation-Semantic Matching-Constructing the semantic Model, semantic Resources Annotation, Conclusions and outlook.

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

TEXT BOOK :

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

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 - II Semester	L	T	P	C
	3	0	0	3

18MCA 225D **BIOINFORMATICS**
(Elective- II)

PREREQUISITES: Courses on "Programming on problem solving", "Operating System" and "DataBase Management Systems".

Course Educational Objectives

CEO1 To Develop bioinformatics tools with programming skills.

CEO2 To Apply computational based solutions for biological perspectives.

CEO3 To Let the students know the recent evolution in biological science.

CEO4 To Practice life-long learning of applied biological science.

UNIT -1

Introduction : Basic UNIX commands – TELNET – FTP – protocols – hardware – topology -search engines – search algorithms – Perl programming.

UNIT -2

Databases: Data management – data life cycle – database technology – interfaces and implementation – biological databases and their uses.

UNIT -3

Pattern Matching & Machine Leaning: Pairwise sequence alignment – local vs. global alignment – multiple sequence alignment – dot matrix analysis – substitution matrices – dynamic programming – bayesian methods – tools – BLAST – FASTA- machine learning – neural networks – statistical methods – Hidden Markov models – Homology Modeling.

UNIT -4

Phylogeny: Introduction; mutations; irrelevant mutations; controls; mutations as a measure of time; distances; reconstruction; distances between species; estimating time intervals from distances.

UNIT -5

Advanced Topics In Bioinformatics: Biomolecular and cellular computing – micro array analysis – systems biology.

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

COURSE OUTCOMES		
CO1	**Understand** the basics of UNIX commands, topology and protocols, and able to **develop** Perl programs	PO1,PO3
CO2	**Describe** the contents of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze the results in light of molecular biological knowledge.	PO2,PO3, PO5
CO3	**Examine** advantages and disadvantages of different machine learning techniques in bioinformatics.	PO2,PO3, PO4
CO4	**Learn** the evolutionary development and diversification of a species or group of organisms	PO1,PO2
CO5	**Acquire** the knowledge of Biomolecular and Cellular computing	PO1,PO5

TEXT BOOKS:

1. Bioinformatics Computing, 2002, B. Bergeron, PHI.

2. Instant Notes In Bioinformatics, 2000, Westhead, D.R., Parish, J.H., Twyman, R.M., BIOS Scientific Publishers.

REFERENCE BOOK:

1. Developing Bioinformatics Skills, O'Reilly, 1999, C. Gibas & P. Jambeck.

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

18MCA226 DATA WAREHOUSING & DATA MINING LAB

PREREQUISITES: A course on "Data Warehousing and Data Mining".

Course Educational Objectives:

CEO1 Be familiar with the algorithms of data mining.

CEO2 Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.

CEO3 Be exposed to web mining and text mining.

LIST OF EXPERIMENTS

1. Creation of a Data Cube.
2. OLAP operations on a Data Cube.
3. Data Cleaning.
4. Data Normalization.
5. Apriori Algorithm.
6. FP - Growth Algorithm.
7. Decision Tree Classification.
8. Bayesian Classification.
9. Support Vector Machines.
10. K- Nearest Neighbor Classification.
11. Linear Regression based Prediction Analysis.
12. K - means clustering.
13. Hierarchical clustering.
14. Outlier Detection.
15. Text Mining.

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

Course Outcomes:

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

COURSE OUTCOMES		
CO1	**Demonstrate** knowledge on Design of Data cube and solving Data Mining Tasks using Mining Frequent Patterns, Classification Models and Clustering Algorithms .	PO1
CO2	**Apply** multi dimensional data model to **design** a data cube for a Central theme and The OLAP Operations like Roll-Up, Drill-Down, slice, Dice, Pivot on a Data cube using R-Tool.	P02
CO3	**Apply** Data Cleaning and Data Normalization to fill the missing values and to Normalize the values.	PO3
CO4	**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	**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	**Develop** a program for Support Vector Machines using a R Tool to solve classification problems and **Apply**ing different clustering Algorithms to find clusters of the given data set and determining Outlier data objects. .	PO5
CO7	Follow ethical principles in **Analyz**ing, **designi**ng and **implement**ing various Data Analysis Tasks.	PO8
CO8	Do **experiments** effectively as an individual and as a member in a group and **Communicate** verbally and in written form, the understandings about the experiments	P09, PO10
CO9	**Continue** updating their skill related to Data Mining Tasks implementation for various application during their life time	PO12

II MCA - II Semester

L	T	P	C
0	0	3	1.5

18MCA227 WEB PROGRAMMING LAB

PREREQUISITES: A course on "Web Programming".
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 servelet 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

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

18MCA228 REASONING, APTITUDE AND TECHNICAL LAB

PREREQUISITES: Basic mathematics, basic programming, logical and reasoning skills may be helpful.

Course Educational Objective:

CEO1 To Acquire the Analysis Skill.
CEO2 To Acquire Knowledge on Basic Reasoning and Aptitude.

Syllabus:

Exercise 1:

Numbers and Fractions – H.C.F and L.C.M - Simplification and Roots.

Exercise 2:

Averages – Partnership and Percentages- Ratio and proportions - Profit and Loss.

Exercise 3:

Share - Simple interest and Compound Interest.

Exercise 4:

Series - Coding and Decoding - Blood relation - Venn Diagrams.

Calendar and Clocks - Data interpretation, tabulation and Bar graphs.

Exercise 5:

Puzzle test- Problems on ages - Time and Distance.

Exercise 6:

Time and Work - Pipes and Cisterns - Problems on Trains.

Exercise 7:

Boats and streams- Allegation and Mixture - Permutation and Combination.

Exercise 8:

Probability - Area, Volume & surface areas - Height and Distance.

Pie charts and Line graphs – Data Sufficiency.

Exercise 9:

Basics and History of C, functions, pointers, strings, files in C-language.

Exercise 10:

Oops concepts, Debugging programs in C++ and Java.

Exercise 11:

SQL Queries & Sub Queries, PLSQL Programming, Views, Cursors, Triggers.

Exercise 12:

Unix utilities, Concepts of Computer Networks and Operating System.

Course Outcomes:

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

COURSE OUTCOMES		POs related to COs
CO1	**Formulate** the problem quantitatively and use appropriate arithmetical methods to solve the problem	PO1
CO2	**Demonstrate** various principles involved in solving problems provide quick job functions	PO2
CO3	**Analyze** programming methodologies and design solutions to significant computational problems	PO3
CO4	**Examine** complex algorithms and techniques to conclude alternative solutions	PO4
CO5	**Implement** software systems that meet specified design and performance requirements	PO5
CO6	**Work** effectively in teams to **design** and implement solutions to computational problems	PO8
CO7	**Recognize** the need for and able to communicate orally and technically	PO9
CO8	**Understand** best practices and standards of application to assist in creating effective project plans	PO10
CO9	**Updating** quantitative and technical skill related to various applications further.	PO12

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

18MCA311 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.

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

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.

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

18MCA312 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.

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

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

III MCA - I Semester	L	T	P	C
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18MCA313 MOBILE APPLICATION 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.

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,PO5,PO8
CO3	**Interpret** the database design concepts for different mobile applications.	PO1,PO3,PO5
CO4	**Enumerate** the different services applied for mobile application development.	PO1,PO6,PO7
CO5	**Compare** various components and its uses for mobile application development.	PO1,PO5,PO12

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.

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

18MCA314 . NET TECHNOLOGIES

(Electives- III)

PREREQUISITES: A course on "Web Programming" and Basic Programming Skills.
Course Educational Objectives:

CEO1 To explore the knowledge on different types of applications of .net.
CEO2 To know about the design methodologies with concentration on object oriented concepts.
CEO3 Giving the students a complete knowledge on .net framework and .net environment.
CEO4 To provide the knowledge on developing internet applications and how to design and implement complete applications over the web.
CEO5 To acquire basic knowledge of developing client server applications and to provide basic knowledge on web services.
CEO6 Giving the students a quick review on web servers, client side programming, server side programming and various web technologies.

UNIT – 1: Introduction to C# & .NET Framework

The C# Environment, Overview of C#, Literals, Variables and Data Types, Operators and Expressions.

UNIT – 2: Programming with C#

Decision Making and Branching, Decision Making and Looping, Methods in C#, Handling Arrays, Manipulating Strings, Structures and Enumerations

UNIT – 3: Object Oriented Programming

Classes and Objects, Inheritance and Polymorphism, Interfaces, Operator Overloading, Delegates and Events, Managing Errors and Exceptions, Multithreading in C#.

UNIT – 4: Working with ASP.NET

The features of ASP.NET, The Anatomy of ASP.NET pages, Introducing Web Forms, The Code Behind Feature, Using HTML controls, Web controls for Displaying and Formatting Data, Web Controls for Creating Buttons, Web Control for Inputting text, Web Controls for Selecting Choices, Creating a Simple ASP.NET Application, Validation Controls, Data List Controls. User Controls.

UNIT – 5: Web Services and ADO.NET

Building Web Services: The Need for web services, Overview of Web services, Web service Description Language, Web service wire formats, web services discovery, creating a simple web service, Managing State in Web Services, Using Transactions in Web Services.
Accessing Data with ADO.NET: Overview of Data Access on the Web, ADO.NET programming Objects and Architecture, Displaying Database Data, Programming with DataList and DataGrid Controls, Working with the DataSet and DataTable objects.

Course Outcomes:
At the end of the course, students will be able to

COURSE OUTCOMES		
CO1	**Acquire** the knowledge on the basics of .net framework and .net environment.	PO1,PO3
CO2	**Experiment** Programming and Object Oriented Programming Concepts in C#.NET.	PO1,PO2
CO3	**Explore** web applications using various web technologies like ASP.NET, HTML and CSS.	PO1,PO5
CO4	**Elicit** the basic terminology to develop web applications using .ASP.NET.	PO1,PO5
CO5	**Proficiency** in Web Services and ADO.NET application development environments.	PO1,PO4

TEXT BOOKS :

1. Programming in C#, 2/e, 2008, E. Balagurusamy, Tata McGraw – Hill Publishing Company Limited, New Delhi.
2. ASP.NET and VB.NET Web Programming, 2002, Matt J. Crouch, Pearson Education, New Delhi.

REFERENCE BOOKS :

1. Programming Microsoft Visual Basic .NET (Core Reference), 2006, Francesco Balena, Microsoft Press, New Delhi..
2. Microsoft ADO.NET Step by Step, 2002, Rebecca M. Riordan, Microsoft Press, New Delhi.
3. Professional ASP.NET 2.0 XML, 2006, Thiru Thangarathinam ,Wiley Publishing.
4. Building Microsoft® ASP.NET Applications for Mobile Devices, 2/e, 2003, Andy Wigley, Peter Roxburgh , Microsoft Press.
5. NET Framework Essentials, 3/e, 2003, Thuan L. Thai, Hoang Lam, O'Reilly & Associates, United States of America.

II MCA - II Semester	L	T	P	C
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18MCA314B WIRELESS SENSOR NETWORKS

(Electives- III)

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.

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

TEXT BOOK:

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 BOOK:

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.

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

18MCA314C **SEMANTIC WEB**

(Electives- III)

PREREQUISITES: Courses on "Artificial Intelligence" and "Information Retrieval Systems".

PREREQUISITES: --
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.

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

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.
5. Introduction to the Semantic Web and Semantic Web Services, 2010, Liyang Yu, Chapman Hall, New York.

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

18MCA314D BLOCK CHAIN TECHNOLOGY
(Electives- III)

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.

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-Alternative Coin-Theoretical Foundation-Bitcoin Limitation-Name Coin-Lite Coin-Prim Coin-Zcash.

UNIT - 4 : Hyper Ledger & Alternative Block Chain

Hyper Ledger: Projects-Hyper Ledger as Protocol-Fabric-Hyper Ledger Fabric-Sawtooth Lake-Corda. **Alternative Block Chain:** Block Chain-Platform.

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

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.

III MCA - I Semester	L	T	P	C
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18MCA315A **MACHINE LEARNING**
(Electives- IV)

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-Weight Space, The Curse of Dimensionality-Knowing what you know : Testing Machine Learning Algorithms-Overfitting, Training, testing and validation sets, The confusion Matrix, Accuracy Metrics, The Receiver Operator Characteristic(ROC) Curve, Unbalanced Datasets, Measurement Precision-Turning Data into Probabilities-Minimising Risk, The Naïve Bayes Classifier-Some Basic Statistics-Averages, Variance and Covariance, The Gaussian-The Bias-Variance Tradeoff.

UNIT – 2 :

Neurons, Neural Networks and Linear Discriminants: The brain and the Neuron-HebbsRule, McCulloch and Pitts Neurons-Limitations of the McCulloch and Pitts Neuronal Model-Neural Networks-The Perceptron-The learning rate of the Bias Input, The Perceptron Learning Algorithm, An example of Perceptron Learning: Logic Functions—Linear Separability- The Perceptron Convergence Theorem-The Exclusive or (XOR) Function, A useful Insight, Another Example: The Pima Indian Dataset, Preprocessing. Data Preparation-Linear Regression.

The Multi-Layer Perceptron: Going Forwards -Going backwards : Back Propagation of Error- The Multi-layer perceptron Algorithm, Initialising the weights, Different Output Activation Functions, Sequential and Batch Training, Local Minima, Picking up Momentum, The Multi-Layer Perceptron in Practice-Amount of Training data, Number of Hidden Layers, When to stop Learning-Examples of Using the MLP- A Regression Problem, Classification with the MLP, A Classification Example: The Iris Dataset, Time-Series Prediction, A Recipe for using the MLP-Deriving Back Propagation-The Network Output and the Error, The Error of the Network, Requirements of an activation Function, Back-Propagation of Error, The Output Activation Functions, An alternative Error Function.

UNIT – 3 :

Dimensionality Reduction: Linear Discriminant Analysis(LDA)-Principal Components Analysis(PCA)-Relation with the Multi-Layer Perceptron, Kernel 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-Nearest Neighbour Smoothing, Efficient Distance Computations-the KDTree, Distance Measures.

UNIT – 4 :

Support Vector Machines: Optimal Separation-The Margin and support Vectors, A constrained Optimization Problem-Slack Variables for Non-Linearly Separable Problems-Kernels-Choosing Kernels, Example: XOR. The Support Vector Machine Algorithm-Implementation Examples-Extensions to the SVM- Multi-Class Classification, SVM Regression. Evolutionary Learning: The Genetic Algorithm(GA)-String Representation, Evaluating Fitness, Population, generating Offspring-Parent Selection.

Generating offspring: Genetic Operators- Crossover, Mutation, Elitism, Tournaments and Niching-Using genetic algorithms-Map Colouring, Punctuated Equilibrium, Example: The Knapsack Problem, Example: The Four Peaks Problem, Limitations of the GA, Training Neural Networks with Genetic Algorithms-Genetic Programming-Combining sampling with evolutionary Learning.

UNIT – 5 :

Learning with Trees:Using Decision Trees-Constructing Decision trees-Quick Aside: Entropy in Information Theory,ID3,Implementing Trees and Graphs in Python, Implementation of the Decision Tree, Dealing with Continuous Variables, Computational Complexity-Classification and Regression Trees(CART)-Gini Impurity, Regression in Trees-Classification Example.

Graphical Models-Bayesian Networks-Example: Exam Fear, Approximate Inference, Making Bayesian Networks-Markov Random Fields-Hidden Markov Models(HMMS)-The forward Algorithm, The Viterbi Algorithm, The Baum-Welch or Forward-Backward Algorithm-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

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.

III MCA - I Semester

L	T	P	C
3	0	0	3

18MCA315B **QUANTUM COMPUTING**
(Electives- IV)

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.

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
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

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.

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

18MCA 315C CRYPTOGRAPHY & NETWORK SECURITY

(Electives- IV)

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.

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
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

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

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

18MCA315D **DESIGN PATTERNS**
(Electives- IV)

PREREQUISITES: Courses on "Software Engineering" and "Object Oriented Analysis and Design"

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.

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	**Analyse** 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

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.

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

18MCA316 BIG DATA ANALYTICS LAB

PREREQUISITES: A course on "Big data Analytics"

Course Educational Objectives

CEO1 To Understand Setting up of Hadoop Cluster.
CEO2 To Realize storage of Big Data into HDFS.
CEO3 To implement Map Reduce programs for processing big data.
CEO4 To Explore PigLatin script.
CEO5 To Explore Hive commands.

List of Experiments

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:

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

COURSE OUTCOMES		POs related to COs
CO1	**Acquire** fundamental Knowledge of storing Big Data in HDFS, file operation commands, Basic Pig Script commands	PO1
CO2	**Analyze** Weather and Patient Data sets Using Hadoop Components	PO2

CO3	**Develop** Big Data Applications using Pig Script .	PO3
CO4	Manually **Conduct Investigations** on Big Data Applications	PO4
CO5	**Use** Appropriate tools and Techniques for **solving** Real World Big Data Problems	PO5
CO6	Follow ethical Principles for storing and **analyzin**g Big data	PO8
CO7	**Deal** with Big Data effectively as an individual and as a member in a group	PO9
CO8	**Communicate** verbally and in written form about the Big Data Applications. .	PO10
CO9	Continuously **Update** their skills related to Big Data and its analytics	PO12

TEXTBOOKS

1. "Hadoop:The Definitive Guide**,"** 3/e, 2012, Tom White, O'REILLY Publications.
2. "Big Data for Dummies", 2012, Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, John Wiley & Sons.

III MCA - I Semester

L	T	P	C
0	0	3	1.5

18MCA317 MOBILE APPLICATION USING ANDROID LAB

PREREQUISITES: A course on "Mobile Application Using Android"

Course Educational Objectives:

CEO1 The students will inculcate with development of Mobile APPS by using Android Studio.

EXERCISES:

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.

Course Outcomes:

COURSE OUTCOMES		POs related to COs
CO1	**Understand** the background Android and Android development	PO1
CO2	**Analyse** the basic installation setup for Android project development	PO2
CO3	**Create** and **build** Android Project development	PO3
CO4	**Design** application manifest file using using manifest editor for Android development	PO4
CO5	**Design** of user interface for mobile apps using Android development	PO5
CO6	**Apply** and **construct** for working with SQLite databases	PO8
CO7	**Apply** the concept of Android content providers	PO9
CO8	**Apply** various Android components to **build** mobile apps using Android development	PO10
CO9	**Design** and **develop** own mobile apps in reeal time environment by applying Android concepts	PO12

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

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

18MCA321 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 III-II 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
CO6	**Understand** professional and ethical responsibilities for developing and executing an Application.	PO8
CO7	**Function** effectively as individual and a member in the project team.	PO9
CO8	**Develop** communication skills, both oral and written for preparing and presenting project and Seminar report.	PO10
CO9	**Engage** in lifelong learning to **improve** knowledge and competence in the chosen area of the project.	PO12

III MCA - II Semester

L	T	P	C
0	0	0	2

18MCA322 **PROJECT SEMINAR**

PREREQUISITES: No prerequisite is required as such, knowledge on recent technological developments may be useful.

Course Educational Objectives:

CEO1 The students should collect information on specialized topic and prepare a technical

CEO2 skills and presentation skills acquired by the students in the course of MCA and to analyze computer report, showing his understanding about the topic.

The objective of the Seminar is to evaluate the skills required for the computer application professionals viz., logical skills, design and analysis skills, technical skills, development skills, communication application capabilities.

For the Seminar the students shall collect the information on any latest technology relevant to computer applications and prepare a report showing his/her understanding about the topic and submit the same to the department before making presentation. The report and the presentation shall be evaluated by the three member committee which carries 100 marks. He/She has to score 50% marks to obtain required credits.

Course Outcomes:

On completion of Seminar work the student will be able to:

COURSE OUTCOMES		POs related to COs
CO1	**Demonstrate** in-depth knowledge on the Seminar topic	PO1
CO2	**Identify, analyze and formulate** the complex Problem.	PO2
CO3	**Design** solutions to the chosen seminar problem.	PO3
CO4	**Undertake** investigation of the seminar problem to provide valid conclusions.	PO4
CO5	Use the appropriate techniques, resources and modern engineering tools necessary for **simulating** the seminar problem.	PO5

CO6	**Apply** Seminar results for sustainable development of the society.	PO6
CO7	**Understand** the impact of seminar results in the context of environmental sustainability.	PO7
CO8	**Understand** professional and ethical responsibilities for implementing the seminar problem.	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 seminar report.	PO10
CO11	**Demonstrate** knowledge and understanding of cost and time analysis required for carrying out the seminar as a project.	PO11
CO12	**Engage** in lifelong learning to improve knowledge and competence in the chosen area of the seminar.	PO12

III MCA - II Semester	L	T	P	C
	0	0	0	12

18MCA323 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 III- 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