ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABI

OF

MASTER OF COMPUTER APPLICATIONS

FOR

M.C.A REGULAR THREE YEAR COURSE

(for the Batches Admitted from 2016-17)

&

M.C.A LATERAL ENTRY COURSE

(for the Batches Admitted from 2018-19)

CHOICE BASED CREDIT SYSTEM

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

(Affiliated to JNTUA Anantapuramu, Approved by AICTE)

Sree Sainath Nagar, A.Rangampet, Near Tirupati - 517 102. A.P.

VISION

To be one of the Nation's premier Engineering Colleges by achieving the highest order of excellence in Teaching and Research.

MISSION

- To foster intellectual curiosity, pursuit and dissemination of knowledge.
- To explore students' potential through academic freedom and integrity.
- To promote technical mastery and nurture skilled professionals to face competition in ever increasing complex world.

QUALITY POLICY

Sree Vidyanikethan Engineering College strives to establish a system of Quality Assurance to continuously address, monitor and evaluate the quality of education offered to students, thus promoting effective teaching proce es for the benefit of students and making the college a Centre of Excellence for Engineering and Technological studies.

VISION AND MISSION OF THE DEPARTMENT

VISION

To become a nation's center of excellence in the field of computer science and applications through teaching, training, and research.

MISSION

- The department of computer applications is established to provide solutions through computer applications.
- Through contemporary curriculum the knowledge of the diverse group of students in dissemination.
- Creating a talent pool of faculty in diverse domains of computer applications through continuous training.
- Domain and transferable skill development for holistic personality of students and employability.
- Inculcating values and Ethics for effective professional practice.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1. Enrolled or completed research studies of societal importance in the core and allied areas of Computer Science.

PEO2. Assume key positions in research, industry and academia.

PEO3. Continued to learn and to adapt to world of constantly evolving technologies in the core or allied areas of Computer Science.

PROGRAM OUTCOMES (POs)

After completion of the program, a successful student will be able to:

PO1. Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO2. Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO3. Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4. 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. Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PO6. Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

PO7. Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO8. Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9. Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective

presentations, and give and understand clear instructions.

PO10. Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

PO11. Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO12. Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of M.C.A Program, MCA graduates will be able to:

PSO1. Apply the knowledge of Mathematical foundation, Business Management and Information Technology to the solutions of real world problems.

PSO2. Analyze, Design and Develop solutions in real time in the domains of technical, managerial, economical and social constraints by using current technologies in Information Management, Software Engineering, Platform Based Development, and Computer Networks skills.

PSO3. Use innovative ideas to create better environment in order to solve complex problems in the domains of Information Management, Software Engineering, Platform Based Development and Computer Networks for the excellence of an individual and society.

PSO4. Apply appropriate techniques, resources, and modern tools to complex real time problems in the domains of Information Management, Software Engineering, Platform Based Development and Computer Networks.

The Challenge of Change

"M*astery of change is in fact the challenge of moving human attention from an old state to a new state. Leaders can shift attention at the right time and to the right place. The real crisis of our times is the crisis of attention. Those who lead are the ones who can hold your attention and move it in a purposeful way. Transformation is nothing but a shift in attention from one form to another. The form of a beautiful butterfly breaks free from a crawling caterpillar. If you pay enough attention, you would be able to see how the butterfly hides within the caterpillar. The leader points out a butterfly when the follower sees only a caterpillar****".***

- Debashis Chatterjee

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

(Affiliated to J.N.T. University Anantapur, Anantapuramu)

ACADEMIC REGULATIONS

CHOICE BASED CREDIT SYSTEM

M.C.A Regular Three Year Post graduate Program

(for the batches admitted from the academic year 2016–17)

&

M.C.A (LATERAL ENTRY Scheme)

(for the batches admitted from the academic year 2018-2019)

For pursuing three year postgraduate Program of study in Master of Computer Applications (MCA) offered by Sree Vidyanikethan Engineering College under Autonomous status and hereinafter referred to as SVEC (Autonomous):

1. Applicability: All the rules specified herein, approved by the Academic Council, shall be in force and applicable to students admitted from the academic year 2016-2017 onwards. Any reference to "College" in these rules and regulations stands for SVEC (Autonomous).

2. Extent: All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. It shall be ratified by Academic Council in the forthcoming meeting. As per the requirements of statutory bodies, Principal, Sree Vidyanikethan Engineering College shall be the Chairman, Academic Council.

3. Admission:

3.1. Admission into the First Year of Three Year MCA Degree Program of study in Computer Applications:

3.1.1. Eligibility: Admission to the MCA post graduate program shall be made subject to the eligibility, qualifications prescribed by the competent authority from time to time. Admissions shall be made on the basis of rank obtained

by the qualifying candidates at the Entrance Test, subject to reservations or policies framed by the Government of Andhra Pradesh from time to time.

3.1.2. Admission Procedure: Admissions are made into the three year MCA Degree Program as per the stipulations of A.P State Council of Higher Education (APSCHE), Government of Andhra Pradesh.

(a) By the Convener, ICET, (for Category-A Seats).

(b) By the Management (for Category-B Seats).

3.2. Admission into the Second Year of Three Year MCA Degree Program of study in Computer Applications (Lateral Entry) applicable to students admitted from the academic year 2018-2019 onwards.

3.2.1. Eligibility: A Candidate Seeking admission into the second year of three year M.C.A Program (Lateral Entry) should have:

(i) BCA degree holders or B.Sc degree holders with Computer Science or Information Technology as one of the Subjects or as decided by the competent authority.

(ii) Candidates qualified in ICET and admitted by the Convener, ICET. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained.

3.2.2. Admission Procedure: **20%** of the sanctioned strength as lateral entry students or as stipulated by APSCHE shall be filled by the Convener, ICET.

4. Duration of the Program:

4.1. Minimum Duration: The program will extend over a period of three years leading to the Degree of Master of Computer Applications (M.C.A) of the JNTUA, Anantapuramu. The three academic years will be divided into six semesters with two semesters per year. An academic year shall consist of two semesters. Each semester shall normally consist of 22 weeks (>=90 working days) having - Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as suggested by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed. Provision is made for lateral entry of students in the

Second Year of the M.C.A program of study and they will be required to satisfy the conditions of admissions thereto prescribed by the JNTUA, Anantapuramu and Government of Andhra Pradesh.

Maximum Duration: The student shall complete all the passing requirements of the M.C.A Program within a maximum duration of 6 years for the regular admitted and 4 years for lateral entry admitted, these durations reckoned from the commencement of the semester to which the student was first admitted to the program.

First Semester (22 weeks)	Instruction Period : I Spell : 7 weeks II Spell : 9 weeks	16 weeks
	Mid-term Examinations: I Mid : 1 week II Mid : 1 week	2 weeks
	Preparation & Practical Examinations	2 weeks
	Semester-end examinations	2 weeks
Semester Break		2 weeks
Second Semester (22 weeks)	Instruction Period: I Spell : 7 weeks II Spell : 9 weeks	16 weeks
	Mid-term Examinations: I Mid : 1 week II Mid : 1 week	2 weeks
	Preparation & Practical Examinations	2 weeks
	Semester-end examinations	2 weeks
Summer Vacation		6 weeks
Project Work (22 weeks)	Submission of Abstract to the DC for Approval Phase-I: Inception and Elaboration Phase-II: Construction and Transition	2 Weeks 8 Weeks 8 Weeks
	Submission of Final Thesis / Dissertation	2 Weeks
	External Viva-Voce Examination	2 Weeks

5. Structure of the Program: Each Program of study shall consist of:

(a) Foundation Courses

(b) Core Courses and Elective Courses

- Foundation Courses are further categorized as :
  - i) HS (Humanities and Social Sciences)
  - ii) BS (Basic Sciences)
  - iii) FC (Foundation Courses)
- Core Courses and Elective Courses are categorized as Professional Courses, which are further subdivided as:
  - i) PC (Professional Core Courses)
  - ii) PE (Professional Electives)
  - iii) Comprehensive Assessment
  - iv) Seminar
  - v) Mini Project
  - vi) PW (Project Work)

S. No	Broad Course Classification	Course Group/ Category	Course Description	Range of Credits
1	Foundation Courses	HS– Humanities and Social Sciences	Includes courses related to Humanities, Accounting and Financial Management and Management.	5%-10%
2		BS– Basic Sciences	Includes – Mathematical Foundations of Computer Science, etc.	10%-15%
3		FC– Foundation Courses	Includes fundamental Computer Application courses.	20%-25%
4	Core Courses	PC– Professional Core	Includes core courses related to the suggestions of the experts, to impart broad based knowledge needed in the Program of study.	55%-70%
5		Mini Project	A course of planned minor Project work.	
6		Comprehensive Assessment	A review of foundations and key concepts of the courses studied.	
7		Seminar	A course of seminar is suggested to enable the students to appreciate the software developments which are going on in industries.	
8		Project Work	A course of planned Application /research work in the form of major project work.	
9	Elective Courses	PE– Professional Electives	Includes Elective courses related to diversify their spectrum of knowledge. The electives can be chosen based on the interest of the student to broaden his individual skills and knowledge.	10% - 20%

Contact Periods: Depending on the complexity and volume of the course, the number of contact periods per week shall be assigned.

6. Credit Courses: All Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Course in an L: P: C (Lecture Periods: Practical Periods: Credits) Structure, based on the following general pattern.

- One Credit - for One Period/ Week/ Semester for Theory/ Lecture (L) Courses;
- Two Credits - for Three Periods/ Week/ Semester for Laboratory/ Practical (P) Courses.
- Other student activities like NCC, NSS, Sports, Study Tour, Guest Lecture etc. will not carry Credits.
- For courses like Seminar/ Mini Project / Comprehensive Assessment /Project Work, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.
- The Three year curriculum of M.C.A Program of study shall have total of **144** credits (26 credits in each semester from I Semester to V Semester and 14 credits in VI Semester). However the curriculum for lateral entry students shall have a total of **92** credits (26 credits in each semester from III to V Semester and 14 credits in VI Semester).

7. Choice Based Credit System (CBCS):

- Choice Based Credit System (CBCS) is introduced based on UGC guidelines in order to promote:
  - Student centered learning
  - Cafeteria approach
  - Students to learn courses of their choice
  - Learning at their own pace
  - Interdisciplinary learning
- A student is introduced to “Choice Based Credit System (CBCS)”
- The total credits for the program is 144 for regular students.

- A student has a choice of registering for credits from the theory courses offered in the program ensuring the total credits in a semester are between 22 and 30.
- For regular admitted batches of MCA Three year program, the student from II to V semesters has the option of registering for one additional theory course from the later semesters or dropping one existing theory course of the current semester within the course structure of the program.
- For Lateral Entry admitted batches of second year of Three year MCA program, the student from III to V semesters has the option of registering for one additional theory course from the later semesters or dropping one existing theory course of the current semester within the course structure of the program.

  However the maximum number of credits the student can register in a particular semester cannot exceed 30 credits.
- Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
- All the registered credits will be considered for the calculation of final CGPA.

8. Course Enrollment and Registration:

8.1. Each student, on admission shall be assigned to a Faculty Advisor (Mentor) who shall advice and counsel the student about the details of the academic Program and the choice of courses considering the student's academic background and career objectives.

8.2. Each student on admission shall register for all the courses prescribed in the curriculum in the student's first semester of study. The student shall enroll for the courses with the help of the student's Faculty Advisor (Mentor). The enrollment for the courses of the Semesters II to V will commence 10 days prior to the last instructional day of the preceding semester for registration process. If the student wishes, the student

may drop or add courses (vide clause 7) within Ten days before commencement of the concerned semester and complete the registration process duly authorized by the Chairman, Board of studies of concern department.

8.3. For the Lateral Entry admitted batches of Second year of Three year MCA program, each student on admission shall register for all the courses prescribed in the curriculum in the student's third semester of study. The student shall enroll for the courses with the help of the student's Faculty Advisor (Mentor). The enrollment for the courses of the Semesters III to V, each student shall follow the course registration process which ever is applicable for the regular admitted batches of M.C.A Three year program.

8.4. If any student fails to register the courses in a semester, he shall undergo the courses as per the program structure.

8.5. After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the Semester-end Examinations.

8.6. No course shall be offered by a department unless a minimum of 20 students register for that course.

9. Massive Open Online Course (MOOC):

A Massive Open Online Course (MOOC) is an online course aimed at unlimited participation and open access via the web. MOOC is a model for delivering learning content online to any person who takes a course, with no limit on attendance.

- A student shall undergo a “Massive Open Online Course (MOOC)” for award of the degree besides other requirements.
- A student is offered this Online Course at the beginning of his III semester of study and the course has to be completed by the end of IV semester. If the student fails to complete the course by the end of IV Semester, it shall be treated as a backlog and needs to be completed before completion of the program for the award of the degree.

- For the regular admitted batches of M.C.A Three year program, the student shall confirm registration by enrolling the course within 10 days prior to the last instructional day of the II semester like other courses.
- For the Lateral Entry admitted batches of Second year of Three year MCA program, the student shall confirm registration by enrolling the course within 10 days after admission into III semester of study.
- The courses will be approved by the Chairman, Academic Council, SVEC based on the recommendations of the Chairman, Board of Studies of concerned program considering current needs.
- A student has a choice of registering for only one MOOC with the recommendation of Chairman, Board of studies of concerned program and duly approved by the Chairman, Academic Council, SVEC.
- The student shall undergo MOOC without disturbing the normal schedule of regular class work.
- One faculty member assigned by the Head of the Department shall be responsible for the periodic monitoring of the course implementation.
- No formal lectures need to be delivered by the faculty member assigned to the students.
- If any student wants to change the MOOC course already registered, he will be given choice to register a new MOOC course in MCA III / IV Semester only, with the recommendation of Chairman, Board of studies of concerned program and duly approved by the Chairman, Academic Council, SVEC.
- Finally, the performance of the student in the course will be evaluated as stipulated by the course provider. A certificate will be issued on successful completion of the course by the course provider.
- The performance in the MOOC will not be considered for the calculation of SGPA and CGPA of the student.
- The MOOC course will be listed in the grade sheets of the student.

10. Break of Study from a Program (Gap Year)

10.1. A student is permitted to go on break of study for a maximum period of one year.

10.2. The student shall apply for break of study in advance, in any case, not later than the last date of the first assessment period of any semester. The application downloaded from website and duly filled by the student shall be submitted to the Head of the Department. In the case of start-up for incubation of idea only, the application for break of study shall be forwarded by the Head of the Department to the Principal, SVEC. A sub-committee appointed by the principal shall give recommendations for approval.

10.3. The students permitted to rejoin the Program after break of study shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new regulations shall apply to the Principal, SVEC in the prescribed format through Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.

10.4. The total period for completion of the Program reckoned from, the commencement of the I semester (III Semester for Lateral Entry) to which the student was admitted shall not exceed the maximum period specified in clause 4.2 irrespective of the period of break of study in order that the student may be eligible for the award of the degree (vide clause 18).

10.5. If a student has not reported to the department after approved period of break of study without any intimation, the student is treated as detained in that semester. Such students are eligible for readmission for the semester when offered next.

11. Examination System: All components in any Program of study shall be evaluated through internal evaluation and / or an external evaluation conducted as semester-end examination.

11.1. Distribution of Marks:

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
1	Theory	60	Semester-end examination of 3 hours duration (External evaluation)		The examination question paper in theory courses shall be for a maximum of 60 marks. The question paper shall be of descriptive type with 5 questions, taken one from each unit of syllabus, having internal choice and all 5 questions shall be answered. All questions carry equal marks.
		40	Mid-term Examination of 2 hours duration (Internal evaluation).		The question paper shall be of descriptive type with 5 essay type questions out of which 4 are to be answered and evaluated for 40 marks where each questionis evaluated for 10 marks. Two mid-term examinations each for 40 marks are to be conducted. For a total of 40 marks, 75% of better one of the two and 25% of the other one are added and finalized. **Mid-I:** After first spell of instruction (I to II Units). **Mid-II:** After second spell of instruction (III to V Units).
2	Laboratory	50	Semester-end Lab Examination for 3 hours duration (External evaluation)		50 marks are allotted for laboratory examination during semester-end.
		50	30	Day-to-Day evaluation for Performance in laboratory experiments and Record. (Internal evaluation).	Two laboratory examinations which includes Day-to-Day evaluation and Practical test, each for 50 marks are to be evaluated. For a total of 50 marks 75% of better one of the two and 25% of the other one are added and finalized. **Laboratory examination-I:** Shall be conducted just before I mid-term examinations. **Laboratory examination-II:** Shall be conducted just before II mid-term examinations.
			20	Practical test (Internal evaluation).	
3	Seminar	100	Semester-end Examination		Seminar shall be evaluated at semester-end by the DC as given in 11.2.1.
4	Mini Project	100	50	External evaluation	Semester-end Viva-Voce Examination by IDC as given in 11.2.2.
			50	Internal evaluation	Continuous evaluation by the DC as given in 11.2.2.
5	ComprehensiveAssessment	100	Semester-end Examination		Comprehensive Assessment shall be conducted as given in 11.2.3.
6	Project Work	200	100	External evaluation	Semester-end Project Viva-Voce Examination by Committee as detailed in 11.2.4.
			100	Internal evaluation	Continuous evaluation by the DC as detailed in 11.2.4.

11.2. Seminar / Mini Project / Comprehensive Assessment / Project Work Evaluation:

11.2.1. For the seminar, the student shall collect information through literature survey on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the Department just before presentation. The report and the presentation shall be evaluated at the end of the semester (during Preparation and Practical period) by the Departmental Committee (DC), consisting of concerned supervisor and two senior faculty members. The DC is constituted by the Principal on the recommendations of the Head of the Department.

11.2.2. The Mini project Viva-Voce examination shall be conducted by an Inter Departmental Committee (IDC) consisting of an Expert from relevant departments in S.V.E.C (nominated by the H.O.D), HOD and concerned Supervisor. The IDC is constituted by the Principal on the recommendations of the Head of the Department. The evaluation of mini project shall be made at the end of the semester (during Preparation and Practical's period). The Internal Evaluation shall be made by DC.

11.2.3. Comprehensive Assessment shall be conducted by the department through (i) online with 50 objective questions for 50 marks and (ii) viva-voce for the remaining 50 marks, covering all the courses from MCA I Semester to V Semester. The Viva-voce will be conducted by the DC. The HOD of the department is given the responsibility of preparing question bank/ question paper for conducting the online examination.

11.2.4. Project Work

The project work Viva-Voce examination shall be conducted by a Committee consisting of External examiner (nominated by the Chief Controller of Examinations), HOD and concerned Supervisor. The evaluation of project work shall be conducted at the end of the M.C.A VI Semester. The Internal Evaluation shall be made by the DC on the basis of two project reviews conducted on the topic of the project.

- A candidate shall be allowed to submit the project report only after passing all the courses up to V semester including MOOC course and then take viva-voce examination of the project. The viva-voce examination may be conducted once in three months for all the eligible candidates.
- Three copies of the dissertation certified in the prescribed form by the concerned supervisor and HOD shall be submitted to the Department. One copy is to be submitted to the Chief Controller of Examinations, SVEC and one copy to be sent to the examiner. The examiner shall be nominated by the Chief Controller of the Examinations from the panel of three examiners submitted by the department for a maximum of 10 students at a time for adjudication.
- If the report of the examiner is favorable, Viva-Voce examination shall be conducted by a board consisting of the concerned Supervisor, Head of the Department and the examiner who adjudicated the dissertation. The board shall jointly evaluate the candidates project work. If the report of the examiner is not favorable, the candidate should revise and resubmit the project report followed by Viva-Voce examination.
- The candidates who fail in Viva-Voce examination shall have to re-appear the Viva-Voce examination after three months. Extension of time within the total permissible limit for completing the project is to be obtained from the Chairman, Academic Council, SVEC (Autonomous).
- If a candidate desires to change the topic of the project already chosen, during Phase-II, he has to re-register for Project work with the approval of the DC and repeat Phases-I & II. Marks already earned in Phase-I stand cancelled.
- If a candidate unable to complete the project work after Phase-II and desires to change the topic of the project already chosen, he has to re-register for Project work with the approval of the DC and repeat Phases-I & II. Marks already earned in Phase-I & II stand cancelled.

11.3. Eligibility to appear for the semester-end examination:

11.3.1. A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.

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

11.3.3. Shortage of Attendance below 65% in aggregate shall in no case be condoned.

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

11.3.5. A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable. The student may seek readmission for the semester when offered next. He will not be allowed to register for the courses of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

11.3.6. A stipulated fee shall be payable to the College towards condonation of shortage of attendance.

11.4. Evaluation:

Following procedure governs the evaluation.

11.4.1. Marks for components evaluated internally by the faculty shall be submitted to the Controller of Examinations one week before the commencement of the End examinations. The marks for the internal evaluation components shall be added to the external evaluation marks secured in the Semester-end examinations, to arrive at total marks for any course in that semester.

11.4.2. Performance in all the courses is tabulated course-wise and shall be scrutinized by the Results Committee and moderation is applied if needed and course-wise marks are finalized. Total marks obtained in each course are converted into letter grades.

11.4.3. Student-wise tabulation shall be done and individual grade sheet shall be generated and issued to the student.

11.5. Personal verification / Revaluation / Recounting: Students shall be permitted for personal verification/ request for recounting/ revaluation of the Semester-end examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student shall be issued a revised grade sheet. If there are no changes, the student shall be intimated the same through a notice.

11.6. Supplementary Examination: In addition to the regular semester-end examinations conducted, the College may also schedule and conduct supplementary examinations for all the courses of other semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

12. Re-Registration for Improvement of Internal Marks:

Following are the conditions to avail the benefit of improvement of internal evaluation marks.

12.1. The candidate should have completed the course work and obtained examinations results for I and II semesters.

12.2. Out of the courses the candidate has failed in the examinations due to internal evaluation marks secured being less than 50%, the candidate shall be given one chance for a maximum of 3 theory courses for improvement of internal evaluation marks.

12.3. He should have passed all the remaining courses for which the internal evaluation marks secured more than or equal to 50%.

12.4. The candidate has to register for the chosen courses and fulfill the academic requirements.

12.5. For each course, 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 D.D/Challan in favour of the Principal, Sree Vidyanikethan Engineering College payable at Tirupati along with the requisition through the concerned Head of the Department.

12.6. In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the semester-end examinations marks secured in the previous attempt(s) for the re-registered courses stand cancelled.

13. Academic Requirements for promotion / completion of regular M.C.A Program of Study:

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion/ completion of regular M.C.A Program of study.

For students admitted into M.C.A (Regular) Program:

13.1. A student shall be deemed to have satisfied the minimum academic requirements for each theory, laboratory course, Mini-Project and project work, if he secures not less than 40% of marks in the semester-end examination and a minimum of 50% of marks in the sum total of the internal evaluation and Semester-end examination taken together. For the Seminar and Comprehensive Assessment, he should secure not less than 50% of marks in the semester-end examination.

13.2. A student shall register for all the **144** credits and earn all the **144** credits. Marks obtained in all the **144** credits shall be considered for the calculation of the DIVISION based on CGPA.

13.3. A student who fails to earn **144** credits as indicated in the course structure within **six** academic years from the year of their admission shall forfeit his seat in M.C.A Program and his admission stands cancelled.

For Lateral Entry Students (batches admitted from the academic year 2018-2019):

13.4. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical course and project, if he secures not less than 40% of marks in the semester-end examination and a minimum of 50% of marks in the sum total of the internal evaluation and semester-end examination taken together. For the seminar and comprehensive Viva-Voce, he should secure not less than 50% of marks in the semester-end examination.

13.5. A student shall register for all the **92** credits and earn all the **92** credits. Marks obtained in all the **92** credits shall be considered for the calculation of the DIVISION based on CGPA.

13.6. A student who fails to earn **92** credits as indicated in the course structure within **four** academic years from the year of their admission shall forfeit his seat in M.C.A Program and his admission stands cancelled.

14. Transitory Regulations:

Students who got detained for want of attendance (**or**) who have not fulfilled academic requirements (**or**) who have failed after having undergone the Program in earlier regulations (**or**) who have discontinued and wish to continue the Program are eligible for admission into the unfinished semester from the date of commencement of class work with the same (**or**) equivalent courses as and when courses are offered and they will be in the academic regulations into which they are presently readmitted. A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of **six years** for the award of M.C.A Degree.

15. Grades, Semester Grade Point Average and Cumulative Grade Point Average:

15.1. Grade System: After all the components and sub-components of any course (including laboratory courses) are evaluated, the final total marks obtained shall be converted into letter grades on a "10 point scale" as described below.

Grades conversion and Grade points attached

% of Marks obtained	Grade	Description of Grade	Grade Points (GP)
≥ 95	O	Outstanding	10
≥ 85 to < 95	S	Superior	9
≥ 75 to < 85	A	Excellent	8
≥ 65 to < 75	B	Very Good	7
≥ 55 to < 65	C	Good	6
≥ 50 to <55	D	Pass	5
< 50	F	Fail	0
Not Appeared	N	Absent	0

Pass Marks: A student shall be declared to have passed theory course, laboratory course and project work if he secures minimum of 40% marks in external examination, and a minimum of 50% marks in the sum total of internal evaluation and external examination taken together. For the seminar and comprehensive assessment, he shall be declared to have passed if he secures minimum of 50% of marks in the semester-end examination. Otherwise he shall be awarded fail grade - **F** in such a course irrespective of internal marks. **F** is considered as a fail grade indicating that the student has to pass the semester-end examination in that course in future and obtain a grade other than **F** and **N** for passing the course.

15.2. Semester Grade Point Average (SGPA):

SGPA shall be calculated as given below on a "10 point scale" as an index of the student's performance at the end of each semester:

$$SGPA = \frac{\sum(C \, X \, GP)}{\sum C}$$

Where ***C*** denotes the credits assigned to the courses undertaken in that semester and ***GP*** denotes the grade points earned by the student in the respective courses.

Note: SGPA is calculated only for the candidates who passed all the courses in that Semester.

15.3. Cumulative Grade Point Average (CGPA):

The CGPA for any student is awarded only when he completes the Program i.e., when the student passes in all the courses prescribed in the Program. The CGPA is computed on a 10 point scale as given below:

$$CGPA = \frac{\sum (C \; X \; GP)}{\sum C}$$

Where ***C*** denotes the credits assigned to courses undertaken up to the end of the Program and ***GP*** denotes the grade points earned by the student in the respective courses.

16. Grade Sheet: A grade sheet (Marks Memorandum) shall be issued to each student indicating his performance in all courses registered in that semester indicating the SGPA.

17. Consolidated Grade Sheet: After successful completion of the entire Program of study, a Consolidated Grade Sheet

containing performance of all academic years shall be issued as a final record. Duplicate Consolidated Grade Sheet will also be issued, if required, after payment of requisite fee.

18. Award of Degree: The Degree shall be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Anantapuramu on the recommendations of the Chairman, Academic Council of SVEC (Autonomous).

18.1. Eligibility: A student shall be eligible for the award of M.C.A Degree if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the Program of study to which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained CGPA greater than or equal to 5.0 (Minimum requirement for declaring as passed).
- Has no dues to the College, Hostel, and Library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

18.2. Award of Division: Declaration of Division is based on CGPA.

Awarding of Division

CGPA	Division
> = 7.0	First Class with Distinction
> = 6.0 and < 7.0	First Class
> = 5.0 and < 6.0	Second Class

19. Additional academic regulations:

19.1 A student may appear for any number of supplementary examinations within the stipulated time to fulfill regulatory requirements for award of the degree.

19.2 In case of malpractice/improper conduct during the examinations, guidelines shall be followed as given in the **Annexure-I**.

19.3 Courses such as Project Work, Seminar, Mini Project and Comprehensive Assessment may be repeated only by registering in supplementary examinations.

19.4 When a student is absent for any examination (Mid-term or Semester-end) he shall be awarded **zero** marks in that component (course) and grading will be done accordingly.

19.5 When a component is cancelled as a penalty, he shall be awarded zero marks in that component.

20. Withholding of Results:

If the candidate has not paid dues to the College/ University (or) if any case of indiscipline is pending against him, the result of the candidate shall be withheld and he will not be allowed/promoted to the next higher semester.

21. Amendments to regulations:

The Academic Council of SVEC (Autonomous) reserves the right to revise, amend, or change the Regulations, Scheme of Examinations, and / or Syllabi or any other policy relevant to the needs of the society or industrial requirements etc., with the recommendations of the Board of Studies.

22. Attendance for student development activity periods indicated in the class time tables shall be considered as in the case of a regular course for calculation of overall percentage of attendance in a semester.

23. General: The words such as “he”, “him”, “his” and “himself” shall be understood to include all students irrespective of gender connotation.

Note: ***Failure to read and understand the regulations is not an excuse.***

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

Sree Sainath Nagar, A. Rangampet – 517 102

COURSE STRUCTURE

REGULATIONS: SVEC-16

MASTER OF COMPUTER APPLICATIONS

S. No	Course Code	Course Title	L	T	P	Credits	Max. Marks		
							IE	EE	Total
MCA I- Semester									
Theory									
1.	16MC1HS01	Accounting and Financial Management	4	-	-	4	40	60	100
2.	16MC1BS01	Mathematical Foundations of Computer Science	4	-	-	4	40	60	100
3.	16MC10101	Computer Organization	4	-	-	4	40	60	100
4.	16MC10102	Operating Systems	4	-	-	4	40	60	100
5.	16MC10103	Programming in C	4	-	-	4	40	60	100
Practical									
6.	16MC1HS31	English Language Laboratory	-	-	3	2	50	50	100
7.	16MC10131	IT Lab	-	-	3	2	50	50	100
8.	16MC10132	Programming in C Lab	-	-	3	2	50	50	100
TOTAL			**20**	-	**9**	**26**	**350**	**450**	**800**

S. No	Course Code	Course Title	L	T	P	Credits	Max. Marks		
							IE	EE	Total
MCA II- Semester									
Theory									
1.	16MC2BS01	Probability and Statistics	4	-	-	4	40	60	100
2.	16MC20101	Database Management Systems	4	-	-	4	40	60	100
3.	16MC20102	Data Structures	4	-	-	4	40	60	100
4.	16MC20103	Object Oriented Programming through JAVA	4	-	-	4	40	60	100
5.	16MC20104	Software Engineering	4	-	-	4	40	60	100
Practical									
6.	16MC20131	Database Management Systems Lab	-	-	3	2	50	50	100
7.	16MC20132	Data Structures Through C Lab	-	-	3	2	50	50	100
8.	16MC20133	Object Oriented Programming Through JAVA Lab	-	-	3	2	50	50	100
TOTAL			**20**	-	**9**	**26**	**350**	**450**	**800**

S. No	Course Code	Course Title	L	T	P	Credits	Max. Marks		
							IE	EE	Total
MCA III- Semester									
Theory									
1.	16MC3HS01	Organizational Behavior and Human Resource Management	4	-	-	4	40	60	100
2.	16MC3BS01	Operations Research	4	-	-	4	40	60	100
3.	16MC30101	Computer Networks	4	-	-	4	40	60	100
4.	16MC30102	Data Warehousing and Data Mining	4	-	-	4	40	60	100
5.	16MC30103	Object Oriented Analysis and Design	4	-	-	4	40	60	100
Practical									
6.	16MC30131	Computer Networks Lab	-	-	3	2	50	50	100
7.	16MC30132	Data Warehousing and Data Mining Lab	-	-	3	2	50	50	100
8.	16MC30133	Object Oriented Analysis and Design Lab	-	-	3	2	50	50	100
TOTAL			**20**	-	**9**	**26**	**350**	**450**	**800**

S. No	Course Code	Course Title	L	T	P	Credits	Max. Marks		
							IE	EE	Total
MCA IV- Semester									
Theory									
1	16MC40101	Big Data Analytics	4	-	-	4	40	60	100
2	16MC40102	LINUX Programming	4	-	-	4	40	60	100
3	16MC40103	Web Programming	4	-	-	4	40	60	100
4	**Professional Elective – I**		4	-	-	4	40	60	100
	16MC40104	i. Service Oriented Architecture							
	16MC40105	ii. Internet of Things							
	16MC40106	iii. Computer Forensics							
	16MC40107	iv. E-Commerce							
5	**Professional Elective – II**		4	-	-	4	40	60	100
	16MC40108	i. Software Project Management							
	16MC40109	ii. Information Retrieval Systems							
	16MC40110	iii. Wireless Networks							
	16MC40111	iv. Business Intelligence							
Practical									
6	16MC4HS31	Soft Skills Laboratory	-	-	3	2	50	50	100
7	16MC40131	Big Data Analytics Lab	-	-	3	2	50	50	100
8	16MC40132	LINUX and Web Programming Lab	-	-	3	2	50	50	100
9	16MC4MOOC	**Massive Open Online Course (MOOC)**	--	-	-	--	--	--	--
TOTAL			**20**	-	**9**	**26**	**350**	**450**	**800**

S. No	Course Code	Course Title	L	T	P	Credits	Max. Marks		
							IE	EE	Total
MCA V- Semester									
Theory									
1	16MC50101	Cloud Computing	4	-	-	4	40	60	100
2	16MC50102	Mobile Application Development	4	-	-	4	40	60	100
3	16MC50103	Software Testing	4	-	-	4	40	60	100
4	**Professional Elective – III**		4	-	-	4	40	60	100
	16MC50104	i. Software Quality Assurance							
	16MC50105	ii. Semantic Web							
	16MC50106	iii. Information Security							
	16MC50107	iv. Enterprise Resource Planning							
5	**Professional Elective –IV**		4	-	-	4	40	60	100
	16MC50108	i. Management Information Systems							
	16MC50109	ii. Bioinformatics							
	16MC50110	iii. Ethical Hacking							
	16MC50111	iv. Multimedia and Rich Internet Application Development							
Practical									
6	16MC50131	Cloud Computing Lab	-	-	3	2	50	50	100
7	16MC50132	Mini Project	-	-	-	2	50	50	100
8	16MC50133	Comprehensive Assessment	-	-	-	2	-	100	100
		TOTAL	**20**	-	**3**	**26**	**300**	**500**	**800**

S. No.	Course Code	Course Title	Credits	Max. Marks		
				IE	EE	Total
VI Semester						
1.	16MC60131	Seminar	2	--	100	100
2.	16MC60132	Project Work	12	100	100	200
TOTAL			**14**	**100**	**200**	**300**

Total Credits : 144

Total Marks : 4300

MCA I - SEMESTER

(16MC1HS01) ACCOUNTING AND FINANCIAL MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE: —

COURSE DESCRIPTION:

General accounting principles; Computerized Accounting; Financial Management; Break Even Analysis and Capital Budgeting; Financial Statements.

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

CO1. Demonstrate Knowledge in:

- Basic Principles and concepts of Financial Accountancy.
- Basic concepts of Financial Management.

CO2. Develop skills in:

- Managerial decision making of an organization.
- Practice of Financial Accounting and Financial Management.

CO3. Ascertain the profitability and soundness of the organization.

CO4. Analyze and synthesize financial information to provide valid conclusions.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO ACCOUNTING (11 Periods)

Principles, concepts and conventions, double entry system of accounting, classification of accounts, journal, ledger and trial balance.

UNIT – II: PREPARATION OF FINANCIAL STATEMENTS (11 Periods)

Trading account, profit and loss account and balance sheet (with simple adjustments).

UNIT – III: FINANCIAL MANAGEMENT (11 Periods)

Meaning and scope, role and objectives. Goals of Financial Management: Capital and its significance: Types of capital and cost of capital, methods and sources of raising capital.

UNIT – IV: FINANCIAL STATEMENT ANALYSIS THROUGH RATIOS (11 Periods)

Liquidity Ratios – Profitability Ratios – Solvancy Ratios – and Activity Ratios (Simple Problems).

Business Analysis: Concept of Break Even Point (BEP), cost-volume-profit analysis, determination of BEP, margin of safety and profit/volume (P/V) ratio – (Simple Problems).

UNIT – V: CAPITAL BUDGETING (11 Periods)

Features, proposals, methods of capital budgeting, payback period method, Accounting Rate of Return (ARR), time value of money, Net Present Value method (NPV), Profitability Index (PI) and Internal Rate of Return (IRR) – simple problems.

Total Periods: 55

TEXT BOOKS:

1. A.R. Aryasri, "*Accounting and Financial Management*," Tata McGraw Hill Education Pvt. Ltd., 2010.
2. James C Van Horne, "*Financial Management and Policy*," Prentice-Hall of India/Pearson, 12th Edition, 2001.

REFERENCE BOOKS:

1. S.P. Jain and K.L. Narang*, "Financial Accounting,"* Kalyani Publishers, Ludhiana, 6th Edition, 2002.
2. P.C. Tulsian, *"Financial Accounting,"* Pearson Education, 2004.
3. I.M. Pandey," *Financial Management,*" Vikas Publishing House Pvt. Ltd., 10th Edition, 2010.

MCA I - SEMESTER

(16MC1BS01) MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION:

Mathematical logic and predicates, functions and relations; algebraic structures; mathematical reasoning; recurrence relations; graphs and trees.

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

CO1. Gain knowledge in

- Mathematical concepts
- Mathematical logic
- Programming languages
- Discrete mathematical structures
- Recurrence relations and
- Graph theory

CO2. Formulate Complex Computing problems with substantial conclusions using:

- Mathematical reasoning
- Recurrence relations and
- Graph theory

CO3. Design and develop mathematical models in Computer Science for real time problems/ business applications.

CO4. Express statements with the precision of formal logic and synthesize arguments to test their validity and prove a given statement using mathematical induction or using direct and indirect methods.

CO5. Apply the principles of discrete mathematical Structures to solve complex Application Software.

DETAILED SYLLABUS:

UNIT-I: MATHEMATICAL LOGIC AND PREDICATES

(12 Periods)

Mathematical Logic and Predicates: Statements and notations, Connectives, Well formed formulas, Truth Tables, Tautology, Normal forms.

Predicates: Predicate calculus, Rules of inference, Consistency, Proof of contradiction.

UNIT-II: FUNCTIONS AND RELATIONS (10 Periods)

Relations: Properties of binary relations, Equivalence relations, Partial ordering relations, Hasse diagrams.

Functions: Inverse Functions, Composition of functions, Recursive functions, Lattice and its Properties.

UNIT-III: ALGEBRAIC STRUCTURES AND MATHEMATICAL REASONING (12 Periods)

Algebraic structures: Algebraic system Examples and general properties, Semi groups and monoids, Groups, Homomorphism, Isomorphism.

Mathematical Reasoning: Methods of Proof, Mathematical Induction, The Inclusion- Exclusion Principle, The Pigeonhole principle.

UNIT-IV: RECURRENCE RELATIONS (10 Periods)

Recurrence Relation: Generating functions of Sequences, Calculating co-efficient of Generating function, Homogeneous Recurrence relation, solving recurrence relations by substitution and generating functions, methods of characteristic roots.

UNIT-V: GRAPHS AND TREES (11 Periods)

Graphs: Introduction to Graphs, Types of Graphs, Graphical representations, Paths and Circuits, Euler and Hamiltonian Paths and Circuits, Graph Coloring.

Trees: Introduction to Trees, Binary Search Trees, Spanning Trees, Depth-First Search, Breadth-First Search, Minimum Spanning Trees, Kruskal's Algorithm, Prim's Algorithm.

Total Periods: 55

TEXT BOOKS:

1. Trembly J.P. and Manohar.P, "*Discrete Mathematical Structures with applications to computer science*," Tata Mc Graw Hill: New Delhi, 2003.
2. Kenneth H. Rosen, "*Discrete Mathematics and its Applications*," Tata McGraw Hill: New Delhi, 6th edition, 2008.

REFERENCE BOOKS:

1. J.L. Mott, A. Kandel, T.P Baker, "*Discrete Mathematics for Computer Scientists and Mathematicians,*" Prentice Hall India, 2004.
2. Dr. D. S. Chandrasekharaiaha, "*Mathematical Foundations of computer science (discrete Structures)*," Prism Books Pvt. Ltd: India, 2006.

MCA I - SEMESTER

(16MC10101) COMPUTER ORGANIZATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:—

COURSE DESCRIPTION: Representation of data types used in digital computers; implementation of types of codes; construction of logical circuits by using logic gates; representation of types of instructions, instruction formats; description of the complete computer; representation of memory organization and input-output organization.

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

CO1. Understand the basic components of a system that optimizes resources:

- Processor
- Memories
- Input/output and Organization

CO2. Solve arithmetic operations on different types of number systems.

CO3. Design the system that must be cost effective with respect to the business needs.

CO4. Synthesize the system that can face new technical challenges.

CO5. Select an innovative system that works with diverse environments.

DETAILED SYLLABUS:

UNIT - I: DATA REPRESENTATION (10 Periods)

Data types, complements, fixed-point representation, floating-point representation, other binary codes and error detection codes, digital computers, logic gates, Boolean algebra and map simplification.

UNIT - II: DIGITAL LOGIC CIRCUITS AND DIGITAL COMPONENTS (11 Periods)

Combinational circuits, flip-flops, sequential circuits, integrated circuits, decoders, multiplexers, shift registers, binary counters.

UNIT - III: CENTRAL PROCESSING UNIT (10 Periods)

Introduction, general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, Reduced Instruction Set Computer (RISC), CISC.

UNIT - IV: BASIC COMPUTER ORGANIZATION AND DESIGN (12 Periods)

Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, Memory Reference Instructions, input-output and interrupt, complete computer description, design of basic computer.

UNIT- V: MEMORY ORGANIZATION AND INPUT-OUTPUT ORGANIZATION (12 Periods)

Memory Organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory.

Input-Output Organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupts, Direct Memory Access (DMA) and Input-Output Processor (IOP).

Total Periods: 55

TEXT BOOK:

1. M. Morris Mano, "*Computer System Architecture*", Pearson Education, 3rd Edition, 2008.

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, "*Structured Computer Organization,"* Pearson Education, 5th Edition, 2007.
2. William H. Gothmann, "*Digital Electronics – An Introduction to Theory and Practice,*" Prentice Hall, 2nd Edition, 1982.

MCA I - SEMESTER

(16MC10102) OPERATING SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:—

COURSE DESCRIPTION: Design and implementation of operating system structure; Evaluation of Multithreading and CPU scheduling algorithms; Solving deadlocks and synchronization problems ; Implementation of memory management techniques; security threats ;

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

CO1. Explore knowledge in-

- Operating system structure
- Process scheduling
- Process and thread synchronization

CO2. Analyze the performance of-

- CPU scheduling algorithms
- Page replacement Algorithms and
- Deadlocks

CO3. Design and implement software solutions for process and memory management.

CO4. Compare and contrast paging techniques using virtual memory.

CO5. Evaluate the key trade-offs between multiple approaches of operating system design.

CO6. Communicate effectively with operating system through application programs.

DETAILED SYLLABUS:

UNIT – I: OPERATING SYSTEM INTRODUCTION (11 periods)

System Structures: Role of Operating Systems, Operating-system services, user operating system interface, System calls, types of system calls, System programs, Operating System design and implementation, Operating system structure, virtual machines.

Processes: Process concept, Process scheduling, Operations on processes, Interprocess communication, Examples of IPC systems

UNIT - II: PROCESS MANAGEMENT (11 periods)

Multithreaded Programming: Multithreaded models, thread libraries, threading issues, operating System Examples.

Process Scheduling: Basic concepts, scheduling criteria, scheduling algorithms, Multiple-processor scheduling, algorithm evaluation.

UNIT - III: PROCESS COORDINATION (11 periods)

Synchronization: Background, The Critical-section problem, Peterson's Solution, Synchronization hardware, Semaphores, classic problems of Synchronization, Critical regions, Monitors.

Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT – IV: MEMORY MANAGEMENT (11 periods)

Memory Management strategies: Background, Swapping, Contiguous memory allocation, Paging, Structure of page table, Segmentation.

Virtual Memory Management: Background, Demand paging, Copy on write, Page replacement, Allocation of frames, Thrashing.

UNIT – V: PROTECTION AND SECURITY (11 periods)

System Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights.

System Security: The Security problem, Program threats, System and Network Threats.

Total Periods: 55

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *"Operating System Concepts,"* John Wiley & Sons. Inc, 8th Edition, 2010.

REFERENCE BOOKS:

1. Achyut S. Godbole, *"Operating Systems,"* Tata McGrawHill, 2nd Edition, 2005.
2. William Stallings, *"Operating Systems: Internals and Design Principles,"* Pearson Education, 6th Edition, 2008.

MCA I-SEMESTER

(16MC10103) PROGRAMMING in C

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION:

Computer systems and Environments; Analysis and Efficiency of algorithms done with problem solving approaches; basic elements of C and data types; working with conditional and unconditional statements along with iterations; Handling strings and derived data types using modular programming; Handling files and dealing with preprocess directives; Command line argument and its usage; develop programs to solve real world problems.

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

CO1. Exhibit knowledge in

- C Tokens
- Input/output Formatting styles
- Control statements
- Data types
- Dynamic allocation functions
- Preprocess Directives

CO2. Analyze the efficiency of algorithms to solve computational problems using top down approach.

CO3. Design and develop the solutions using the techniques-parameter passing mechanism, command line arguments and recursion for real world problems.

CO4. Implement the concepts of modular programming language which includes functions, pointers and structures to solve complex problems.

CO5. Adapt preprocess directives, sequential and random access to text/binary files for persistent data storage for real world applications using Turbo C.

CO6. Engage lifelong learning and develop programming competency.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO COMPUTERS, PROBLEM SOLVING AND C LANGUAGE (11 Periods)

Computer Systems, Computing Environments, The Problem, Solving Aspect, Creating and Running Programs; Implementation of Algorithms, The Efficiency of Algorithms, The Analysis of Algorithms; Introduction to the C Language: Structure of a C Program, Identifiers, Types, Variables, Constants, keywords, Expressions, precedence and Associativity, Evaluating Expressions, Type Conversion.

UNIT - II: PROGRAM CONTROL STATEMENTS, ARRAYS AND STRINGS (11 Periods)

Program Control Statements: Two way selection: if, if else, nested if else. Multi way selection- else if ladder and switch statement. Repetition: concept of loop, for loop, while loop, do while loop. Break, continue and goto statement.

Arrays, Strings: Array concept, types of array: one dimensional, two dimensional and multi-dimensional arrays. Introduction to string, string representation and initialization, array of strings, string manipulation functions.

UNIT - III: MODULAR PROGRAMMING (11 Periods)

Pointers: Introduction, declaration and initialization, arithmetic operations on pointers, Array of pointers, pointer to an array, Dynamic memory management functions: malloc, calloc and realloc and free.

Functions: Introduction to function, system defined and user defined function. Local and global variable. Parameter passing mechanism: pass by value and pass by reference. Scope, Storage classes, Recursion: recursive function, application of recursion: factorial calculation and Fibonacci number generation.

UNIT - IV: DERIVED DATA TYPES (11 Periods)

Derived Data Types: Introduction to structure: structure declaration and initialization, anonymous structure, accessing operators, nested structure**.** Array of structure, array within a structure, pointer to structure, passing structures through function. Union: declaration, initialization and its usage. Typedef, enumerated types and bit field. Application of structure with pointer: static and dynamic linked list representation.

UNIT-V: FILES AND PREPROCESSOR DIRECTIVES

(11 Periods)

Introduction to files, types of files: binary and text file. Operations on File: open, close, read, write, seek, and etc., read data from files, writing data to files. Program to implement sequential access and random access. Preprocessor directive statements and its usage. Command line argument and its usage.

Total Periods: 55

TEXT BOOKS:

1. B.A. Forouzan, *"A Structured programming approach using C*," Cengage learning, 3rd Edition, 2007.
2. R.G.Dromey, "*How to Solve it by Computer*", Pearson Education, 2007.

REFERENCE BOOKS:

1. Herbert Schiltz*,"Turbo C/C++ The complete Reference,"* Tata McGraw-Hill, 2007.
2. BS Gottrifried, A. Mittal, *"Programming in C – A practical approach,"* PHI, Tata MC Grawhill, 2007.

MCA I - SEMESTER

(16MC1HS31) ENGLISH LANGUAGE LABORATORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: English at Under Graduation level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

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

CO1. Demonstrate knowledge in

- Phonetics
- Information Transfer

CO2. Analyse the functional knowledge in

- Vocabulary
- Grammar

CO3. Design and develop functional skills for professional practice.

CO4. Apply the techniques of Listening and Reading skills to comprehend listening and Reading comprehension.

CO5. Function effectively as an individual and as a member in diverse teams to demonstrate

- Just A Minute
- Role Play

CO6. Communicate effectively in public speaking in formal and informal situations.

CO7. Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

LIST OF EXERCISES:

1. Phonetics
2. Vocabulary Building
3. Functional Grammar
4. Just a Minute
5. Elocution/Impromptu
6. Giving Directions/Conversation Starters
7. Role Play
8. Public Speaking
9. Describing People, Places, Objects and Events.
10. Reading Comprehension
11. Listening Comprehension
12. Information Transfer

Total Lab Slots: 10

REFERENCE BOOKS:

1. D. Sudha Rani, "*A Manual for English Language Laboratories,*" Pearson, Noida, 2010.
2. D. Sudha Rani, *"Advanced Communication Skills Laboratory Manual,"* Pearson, Noida, 2012.
3. R. Manivannan and G. Immanuel, *"Communication Skills Laboratory,"* VK Publications, Sivakasi, 2013
4. Nira Kumar, *"English Language Laboratories,"* PHI Learning Pvt. Ltd., New Delhi, 2011.

SUGGESTED SOFTWARE:

1. ETNL Language Lab Software Version 4.0
2. GEMS – Globarena E- Mentoring System
3. Speech Solutions
4. English Pronunciation Dictionary by Daniel Jones
5. Learning to Speak English 8.1, The Learning Company – 4 CDs.
6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.

8. Dorling Kindersley Series Grammar.
9. Language in Use 1, 2 & 3
10. Cambridge Advanced Learner's Dictionary - 3rd Edition
11. Centronix - Phonetics
12. Let's Talk English, Regional Institute of English South India.
13. The Ultimate English Tutor.

MCA I - SEMESTER

(16MC10131) IT LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: —

COURSE DESCRIPTION: Peripherals of a computer and disassembling & assembling the PC; Linux file system and File handling utilities & Text processing utilities; Productivity tools including Word, Excel, Power Point, Access, publisher.

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

CO1. Acquire skills in:

- Identification of Functional parts of PC
- Operating Systems

CO2. Identify the appropriate features to design documents, excel spread sheets and power point presentations.

CO3. Design documents, excel spread sheets, power point presentations, Access database and personal websites effectively.

CO4. Update knowledge and skills in PC maintenance and usage of latest Operating Systems and MS-Office.

CO5. Practice of ethical code of conduct in the usage of computer hardware and software.

CO6. Engage in life-long learning and attitude to work in teams.

CO7. Work together to customize the existing tools.

LIST OF EXERCISES:

PC Hardware

1. Identify the peripherals of a computer, components in a CPU and its functions. Block diagram of CPU along with the configuration of each peripheral.
2. Demonstrating disassembling and assembling the PC back to working condition.

3. Introduction to Operating Systems, important of Operating System, components of OS, Installation of Microsoft Windows-XP Operating Systems.

4. Basic MS-DOS commands – Internal and External Commands.

5. Introduction to Linux file system, perform File handling utilities and Text processing utilities.

6. Introduction to Linux - vi editor and Shell Script

7. a) Write a shell Script to generate Fibonacci series.

b) Write a Shell Script to find factorial of a given number.

MS-Office

MS Word

8. a) Design a visiting card in MS-Word (2''x3.5").

b) Perform Mail merge in MS-Word.

MS Excel

9. a) Create a spreadsheet for generating student mark list.

b) Create a spreadsheet for generating all charts

c) Import external data to Ms-excel, perform sorting and filter operations on that data.

MS Power Point

10. a) Create text and images with effects.

b) Prepare a power point presentation on department of MCA which includes Animations, design, sound effects and images.

MS Access

11. Create Access database which consists of at least 3 tables

12. Perform Queries, form design and Reports on above tables.

MS Publisher

13. Create a website using the features**:** Home page, About us, Department, Contact page etc.

REFERENCE BOOKS:

1. ITL Education, *"Introduction to Information Technology,"* Pearson, 2nd Edition, 2005.
2. John Walken bach, *"Microsoft Office 2010 Bible,"* Wiley India Pvt. Ltd, 2010.
3. Peter Norton, *"Introduction to Computers,"* Tata McGraw-Hill, 7th edition, New Delhi 2012.
4. Vikas Gupta, *"Comdex Information Technology Course Tool Kit,"* WILEY Dreamtech, 2nd edition, New Delhi 2006.
5. Sumitabha Das, *"UNIX Concepts and Applications,"* 4th Edition, TMH, 2008.

MCA I - SEMESTER

(16MC10132) PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "Programming in C".

COURSE DESCRIPTION: Program design and problem solving using the C programming language; Programming topics include control structures, functions, arrays, Strings, pointers, and file I/O and the usage of the preprocessor.

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

CO1. Solve problems using knowledge in

- C Tokens
- Input/output Formatting styles
- Control statements
- Data types

CO2. Design and develop the solutions using the techniques-parameter passing mechanism, command line arguments and handling files for real world problems making use of analysis of algorithms and verification.

CO3. Demonstrate the concepts of C as modular programming language which includes functions, pointers and structures to solve real world complex problems.

CO4. Engage lifelong learning and develop programming competency.

LIST OF EXERCISES

1. a) Write an Algorithm and flow chart to read the name and print the name
   b) Write an Algorithm and flow chart to add two numbers.
   c) Write an Algorithm and a flow chart to calculate area of square.

d) Write Algorithm and flow chart to find the largest of two numbers.

2. a) Write a C Program to find the sum of individual digits of a positive integer.

b) Write a C Program to find the roots of a quadratic equation.

c) Write a C program to read in a three digit number produce following output

(assuming that the input is 347)

3 hundreds

4 tens

7 units

d) Write a program to generate Fibonacci series.

3. Write a C non recursive and recursive function for the following task

a) Calculating Factorial

b) Minimum/maximum value from the given input

c) Nth Fibonacci number

d) GCD of a Given Number

4. a) Write a C Program to Add, Subtract and Multiply Two Matrices Using Functions (Passing arrays as arguments to the function)

b) Write a C program to determine if the given string is a palindrome or not

5. a) Write a C Program to Insert a Substring into a Given Main String from a given Position.

b) Write a C Program to Delete n Characters from a Given Position in a Give String.

6. a) Write a program to swap two numbers using pointers.

b) Write a program to find sum of given array using pointers.

7. Write a C program that uses functions to perform the

following operations:

a) Reading a complex number

b) Writing a complex number

c) Addition of two complex numbers

d) Multiplication of two complex numbers

8. a) Write a C program for Electricity Bill Tacking different categories of users, different slabs in each category. (Using Nested If Else Statement)

   b) Write a c program to evaluate the following using loops

      i)1+x2/2!+x4/4!+...up to 5 terms

      ii) x+x3/3!+x5/5!+...up to 5 terms

9. a)Write a c program to check whether the given number is

      i) prime or not

      ii) perfect or abundant or deficient

   b) Write a c program to find the mean, mode, median, and variance of list of values by using one dimensional array.

10. a) Write a menu driven program to read a list of numbers and perform the following operations

      i) print the list

      ii) delete duplicates from the list

      iii) reverse the list.

   b) Write a c program that consists of recursive functions to find

      i) factorial of a given number

      ii) print the Pascal triangle using binomial theorem.

11. Write a menu driven program to read list of student names and perform the following operations using array of character pointers.

   a) to insert a student name

   b) to delete a name

   c) to print the names.

12. a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(**Note:** The file name and n are specified on the command line.)

13. a) Write a C program to display the contents of a file.

b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

REFERENCE BOOKS:

1. BS Gottrifried, A.Mittal, *"Programming in C – A practical approach,"* PHI, Tata MC Grawhill, 2008.
2. M.T. Somashekara, *"Problem Solving with C",* PHI Learning Private Limited: New Delhi, 2012.

MCA II - SEMESTER

(16MC2BS01) PROBABILITY AND STATISTICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:—

COURSE DESCRIPTION: Fundamental concepts of Probability; probability distributions; random variables; sampling, correlation and regression analysis; statistical quality control; testing of hypothesis.

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

CO1. Acquire knowledge of probability and probability distributions, random variables, sampling, testing of hypothesis, correlation and regression analysis and statistical quality control.

CO2. Identify the association between variables using Correlation and Regression Analysis.

CO3. Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance.

CO4. Use testing of hypothesis for drawing valid inferences in research problems and making decisions in industry.

CO5. Adapt and apply theorems and probability distributions to compute solutions based on practical situations.

CO6. Asses the quality of the products produced in an industry using control charts.

DETAILED SYLLABUS:

UNIT-I: PROBABILITY AND RANDOM VARIABLES

(13 Periods)

Probability : Random experiment, event, sample space, definitions of probability, Addition and Multiplication theorems of probability, conditional probability, Baye's theorem.

Random Variables: Discrete and continuous random variables, probability mass function and probability density function of a random variable, Distribution function and its properties, problems on random variable. Mathematical expectation of a random variable.

UNIT-II: PROBABILITY DISTRIBUTIONS AND STATISTICAL QUALITY CONTROL (14 Periods)

Discrete Distributions: Binomial Distribution, Mean and variance of Binomial distribution, Poisson distribution, Mean and variance of Poisson distribution.

Continuous Distributions: Normal Distribution- Mean, variance and area properties.

Statistical Quality Control: Construction of quality control charts $\overline{X}$, R, p, np and c-charts.

UNIT-III: CORRELATION AND REGRESSION ANALYSIS

(09 Periods)

Correlation Analysis: Types of correlation, Karl Pearson's coefficient of Correlation and Spearman's rank correlation coefficient.

Regression Analysis: Fitting of two lines of regression, regression coefficients.

UNIT-IV: SAMPLING DISTRIBUTIONS, ESTIMATION AND TEST OF SIGNIFICANCE FOR LARGE SAMPLES (10 Periods)

Sampling distributions and estimation: Population, sample, parameter, statistic, sampling distribution of sample mean and sample S.D, standard error of a statistic. Point estimation and Interval estimation.

Test of significance for large samples: Null hypothesis and Alternative hypothesis, Type-I and Type-II errors, Level of significance, Critical Region, one tailed and two tailed tests. Test of Significance for single proportion, Difference of two Proportions, Single mean, Difference of two Means.

UNIT-V: TEST OF SIGNIFICANCE FOR SMALL SAMPLES

(09 Periods)

Student's t-test: Single Mean, Difference of two sample means. Paired t-test, F-test for equality of two population variances. Chi-square test of goodness of fit and independence of attributes.

Total Periods: 55

TEXT BOOKS:

1. T. K. V. Iyengar, B. Krishna Gandhi etal, *"Probability and Statistics,"* S. Chand and Company LTD: New Delhi, 3rd Edition, 2011.
2. S.P. Gupta, *"Statistical Methods,"* Sultan and Chand, New Delhi, 34th Edition, 2005.

REFERENCE BOOKS:

1. Shanaz Bhatul, *"Text book of Probability and Statistics",* RIDGE Publications, 2nd Edition, 2007.
2. S.C. Gupta and V.K. Kapoor, *"Fundamentals of Applied Statistics,"* S.Chand and Sons: New Delhi, 2010.

MCA II-Semester

(16MC20101) DATABASE MANAGEMENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION: Concepts of relational database and its design; Representation of ER diagram to Relational model; SQL queries; Normal forms; Recovery and concurrency control mechanism, Storage and indexing mechanism.

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

CO1. Gain in-depth knowledge in

- Database models and database architecture
- Transaction processing and recovery management
- Storage and Indexing mechanism

CO2. Analyze the complex problems of real world applications.

CO3. Design Relational Database Schema for a given Entity Relationship model.

CO4. Interpret the data by applying normalization techniques for the development of database application projects.

CO5. Use Structured Query Language DDL/DML/DCL commands to solve real time applications.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO CONCEPTUAL MODELING AND DATABASE DESIGN (11 Periods)

Introduction and Conceptual Modeling: Database System Applications, database systems versus file systems, view of data: data abstraction, instances and schemas, data models: the entity-relationship model, relational models and other data models, database languages, database users and administrators, database system structure, history of database systems.

Introduction to Database design: Database design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

UNIT – II RELATIONAL MODEL AND BASIC SQL

(10 Periods)

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /altering Tables and Views.

Case Study: ER diagram for banking enterprise and university database

Basic SQL: SQL data definition and data types - CREATE table command in SQL, attribute data types in SQL, Specifying constraints in SQL- specifying attribute constraints and attribute defaults, specifying key and referential integrity constraints, specifying constraints on tuples using CKECK.

UNIT – III: SQL AND SCHEMA REFINEMENT AND NORMAL FORMS (12 Periods)

SQL : Form of Basic SQL Query- Examples of Basic SQL Queries, Introduction to Nested Queries, correlated Nested Queries, Set-Comparison Operators, Aggregate Operators, NULL values- Comparison using Null values- Logical connectives- AND, OR and NOT- Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Triggers and Active Databases.

Schema Refinement and Normal Forms: Introduction to Schema Refinement- Problems Caused by redundancy, Decompositions, Problem related to decomposition, Functional Dependencies, Normal Forms – FIRST, SECOND, THIRD Normal forms, BCNF, Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition.

UNIT - IV: OVERVIEW OF TRANSACTION MANAGEMENT, CRASH RECOVERY AND CONCURRENCY CONTROL

(11 Periods)

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

Concurrency Control: 2PL, Serializability and recoverability, Introduction to Lock Management, Lock Conversions.

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

UNIT - V: OVERVIEW OF STORAGE AND INDEXING

(11 Periods)

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

Storing Data: The Memory Hierarchy- Magnetic disks, Performance implications of disk structure; Redundant Arrays of Independent Disks.

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

Total Periods: 55

TEXT BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, "Data base Management Systems," Tata McGraw-Hill, 3rd Edition, 2007.
2. RamezElmasri, Shamkant B. Navathe, "Database Systems," Pearson Education, 6th Edition, 2013.

REFERENCE BOOKS:

1. A.Silberschatz, H.F. Korth, S.Sudarshan, "Data base System Concepts," McGraw hill, 6th edition, 2006.
2. C. J. Date, "Introduction to Database Systems," Pearson Education, 7th Edition, 2004.
3. M. L. Gillenson, "Fundamentals of Database Management Systems," Wiley Student Edition, 2nd Edition, 2012.
4. Peter Rob and Carlos Coronel, "Database Systems Design, Implementation and Management," Cengage Learning, 8th Edition, 2009.

MCA II-SEMESTER

(16MC20102) DATA STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Programming in C".

COURSE DESCRIPTION: Writing Pseudo code using algorithms for implementing Abstract Data Type; Implementation of Stack, Queue, LIST, Graph, Tree ADT's and its applications; Implementation of Sorting and Searching techniques; Implementation of Binary Search Tree ADT, AVL- height balanced trees and its applications.

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

CO1. Gain knowledge in linear and non-linear data structures to solve computing problems.

CO2. Identify and analyze the usage of various data structures, operations and associated algorithms.

CO3. Design and develop variety of algorithms and programs in order to solve computing problems.

CO4. Choose the appropriate data structure and algorithm design method to get an optimal solution for complex real world problem.

CO5. Apply searching, sorting, tree traversal and graph traversal techniques to optimize the complexities of an application.

CO6. Communicate effectively about complex computing activities by writing documentation.

DETAILED SYLLABUS:

UNIT – I: BASIC CONCEPTS AND STACKS (11 Periods)

Basic Concepts: Algorithm**,** Pseudocode, The Abstract Data Type, Model for an Abstract Data Type, ADT Implementations.

Stacks: Concepts of Stack**,** Basic Stack Operations, Representation of Stack using arrays, Applications- Recursion, Infix to Postfix Transformation, Evaluating Postfix Expressions.

UNIT – II: QUEUES AND GENERAL LINEAR LISTS

(12 Periods)

Queues: Concepts of Queue, Basic Queue Operations, Representation of Queue using arrays, Various Queue Structures: Circular Queue, Double ended queue, Priority queue, Applications –Simulation.

General Linear Lists: Basic Operations, Implementations- Single linked list, Double linked list, Circular Linked List, Applications- Stacks using Linked List, Queue using Linked List**,** Polynomial Addition, Sparse Matrix Implementation.

UNIT – III: SORTING AND SEARCHING (10 Periods)

Sorting: Sort Concepts, Sort Stability, Sort Efficiency, Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge sort, Heap Sort**..**

Searching: Sequential Search, Binary Search, Analyzing Search Algorithms.

UNIT – IV: TREES (12 Periods)

Trees: Basic Tree Concepts, Binary Trees, General Trees; Binary Search Trees: Basic Concepts, BST Operations, Binary Search Tree ADT, BST Applications, Threaded Trees.

AVL Search Trees: AVL Tree Basic Concepts, AVL Tree Implementations, AVL Tree Abstract Data Type, AVL Tree Algorithms.

UNIT – V: GRAPHS (10 Periods)

Graphs: Basic Concepts, Operations, Graph Storage Structures, Graph Algorithms, Graph ADT.

Application of Graph Structures: Dijkstra's Algorithm, Topological Sorting**,** Minimum Spanning Tree: Kruskals, Prim's Algorithm, Euler's and Hamiltonian Circuits**.**

Total Periods: 55

TEXT BOOKS:

1. Richard F.Gilberg & Behrouz A. Forouzan, "*Data Structures A Pseudocode Approach with C,"* Thomson, 2nd Edition, 2004.
2. D Samanta, "Classic Data Structures," PHI Publications, New Delhi, 2nd Edition, 2009.

REFERENCE BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C,” Second Edition, Pearson Education, 2002.
2. Ellis Horowitz, Sartaj Sahni, “Fundamentals of Computer Algorithms”, Galgotia book source, New Delhi, 1983.
3. Jean Paul Tremblay and Paul G. Soresson, “An Introduction to Data Structures with Applications”, McGraw Hill International editions, 1983.

MCA II-SEMESTER
(16MC20103) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Programming in C".

COURSE DESCRIPTION: Basic Principles of Object Oriented Programming, Representation of Java Classes and methods; Inheritance and Polymorphism using Java, Creation of Packages and Interfaces; Implementation of Utility Classes and Input/ output; Exception handling mechanism and multithreading; Event handling techniques and GUI applications by using AWT and Swings.

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

CO1. Understand the usage of Object-Oriented Principles.
CO2. Analyze to solve real world problems by using Java Programming language.
CO3. Develop and execute various GUI Applications using AWT and Swings.
CO4. Adapt and design applications using Java IDE tools.
CO5. Recognize the need to engage independent learning for continual development as an application professional.
CO6. Communicate effectively about complex computing activities by writing documentation.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO JAVA PROGRAMMING

(12 Periods)

Introduction to Java Programming: History of Java, Java Buzzwords, Object-Oriented Programming, First Simple Program, Data Type, Variables, Operators, Control Statements, Arrays, Introducing Classes: Class Fundamentals, Declaring Objects, Introducing Methods, Constructors, this Keyword, Garbage Collection, finalize() Method; Overloading Methods, Access Control, static Keyword, final Keyword, Introducing Nested and Inner Classes, String Class.

UNIT - II: INHERITANCE AND POLYMORPHISM

(10 Periods)

Inheritance and Polymorphism: Inheritance Basics, Using super, Creating Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes, final with Inheritance, Object Class.

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces; Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces can be Extended.

UNIT - III: UTILITY CLASSES AND INPUT/OUTPUT

(10 Periods)

Utility Classes: Introduction to Java Collections, Overview of Java Collection Frame Work, Commonly Used Collection Interfaces: Set, List, Queue, Map; Commonly used Collection Classes: Hash Set, LinkedHashSet, Linked List, Stack, Array List, Vector, Hash table; Iteration over Collections: Iterator Interface, ListIterator Interface and Enumeration Interface; StringTokenizer, Date, Calendar.

Input/output: Stream Classes: Byte Streams, Character Streams, Console Class, Stream I/O, Serialization.

UNIT - IV: EXCEPTION HANDLING AND MULTITHREADING
(10 Periods)

Exception Handling: Fundamentals of Exception Handling, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating your own Exception Subclasses', Chained Exceptions.

Multithreading: Java Thread Model, Thread life Cycle, Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Interthread Communication, Suspending, Resuming and Stopping Threads.

UNIT - V: EVENT HANDLING AND GUI PROGRAMMING WITH JAVA **(13 Periods)**

Event Handling: Delegation Event Model, Event Classes, Sources of Events, Event Listener Interfaces.

GUI Programming with Java: Abstract Window Toolkit (AWT): AWT Classes, Windows Fundamentals, Working with Frame Windows, Graphics and Color, AWT Controls: Labels, Buttons, Check Boxes, Lists, Scroll Bars, Text Field, Text Area, Layout Managers; Applets: Applet Basics, Applet Architecture, Applet Skeleton, Applet Display Methods, Passing Parameters to Applets.

Swings: Introduction to Swings, Hierarchy of Swing Components, JFrame, JWindow, JDialog, JPanel ; Swing Components: JLabel, JTextField, JButton, JToggleButton, Check Boxes, Radio Buttons, JTabbedPane, JScrollPane, JList, JComboBox, Trees, JTable.

Total Periods: 55

TEXT BOOK:

1. Herbert Schildt, "*The Complete Reference Java*", Tata McGraw-Hill, 7th Edition, 2007.

REFERENCE BOOKS:

1. B. Eswar Reddy, T. V. Suresh Kumar and P. Ragavan, *"Object Oriented Programming with Java,"* Pearson Sanguine Publications, 2nd Edition, 2011.
2. H. M. Dietel and P. J. Dietel, *"Java How to Program,"* Pearson Education/ PHI, 5th Edition, 2009.

MCA II-SEMESTER

(16MC20104) SOFTWARE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:- -

COURSE DESCRIPTION: Software engineering core principles process models and agile process; design concepts and design issues; quality management principles; software configuration and product metrics; project estimation and risk management maintenance.

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

CO1. Understand concepts-process, models, methodologies and principles of software engineering.

CO2. Identify and classify user requirements and software requirement specification.

CO3. Analyze the architecture and Design application software using design engineering principles.

CO4. Estimate and maintain software configuration management by synthesis of development process to provide valid conclusions.

CO5. Apply risk and metrics management principles for quality assurance.

CO6. Test and communicate quality of an application and as per needs of the stakeholder.

DETAILED SYLLABUS:

UNIT-I: SOFTWARE PROCESS AND SOFTWARE PRINCIPLES (12 periods)

The nature of Software , Software Myths, **Software Process Models:** A Generic Process Model, Process Models, Core Principles - Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles.

Understanding Requirements: Requirements Engineering, Eliciting Requirements, Functional and non functional Requirements, Developing Use Cases, Validating Requirements, Introduction to Agile Processes - extreme Programming.

UNIT - II: SOFTWARE DESIGN AND SOFTWARE ARCHITECTURE (12 periods)

Design concepts - Abstraction - Modularity - Refinement - **Architectural design** - Software Architecture, Architecture Design, Architecture Style, Architectural Mapping Using Data Flow. **Component Level Design:** Component, Component Based Development. **User Interface Design:** The Golden Rules, Interface analysis and design, Interface design steps. Design Evaluation. **Web App Design:** Aesthetic, Content, Architecture, Navigation and Component level Design - Design issues.

UNIT - III: QUALITY MANAGEMENT PRINCIPLES

(11 periods)

Quality, Quality Control, Quality Assurance, **Review Techniques**-Informal Reviews, Formal Technical Reviews, Software Testing strategies, Unit Testing, Integration Testing, System Testing, Debugging Process, - Equivalence class Partitioning (ECP) , Boundary Value Analysis(BVA), White Box Testing, Black Box Testing. **Testing Web Applications:** Content, User Interface, Navigation, Configuration, Security and Performance Testing.

UNIT - IV: SOFTWARE CONFIGURATION MANAGEMENT AND PROJECT METRICS (10 periods)

Software Configuration Management, **The SCM process:** Identification of objects, Version Control - Change control, Content Management, Change Management. **Software measurement** - - Size-oriented metrics and function point metrics .Object oriented Metrics, Use Case Oriented Metrics

UNIT V – PROJECT ESTIMATION, RISK MANAGEMENT AND MAINTENANCE (10 periods)

Software Sizing, Problem Based Estimation Process Based Estimation, Estimation with Use Cases. Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation,

Monitoring and Management, RMMM Plan. Software Maintenance, Software Supportability, Software Reengineering - Software reengineering process model - Reverse engineering to understand data, and processing

Total Periods: 55

TEXT BOOK:

1. Roger S. Pressman, “Software Engineering, A practitioner’s Approach”, McGraw-Hill International Edition, 7th edition, 2010.

REFERENCE BOOKS:

1. K. K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International Publishers, 3rd edition, 2007.
2. Shely Cashman Rosenblatt, “Systems Analysis and Design”, Thomson Publications, 6th edition, 2006.

MCA - II Semester

(16MC20131) DATABASE MANAGEMENT SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:A Course on "Database Management Systems".

COURSE DESCRIPTION: Analyze problems and design of ER diagrams; Creation of Data Definition commands; Normalization techniques; Implementation of functions; Creation of Views, Indexes and Sequences; Implementation of simple and complex queries using Oracle SQL; Creation of packages and triggers.

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

CO1. Impart knowledge in applying normalization techniques for development of application software to realistic problems.

CO2. Formulate queries using SQL DDL/DML/DCL commands.

CO3. Design a database using ER diagrams, convert ER diagrams into relation schemas.

CO4. Improve the database performance by optimizing the queries using Indexing and Hashing techniques.

CO5. Exploit their knowledge in developing database applications using SQL language.

LIST OF EXERCISES

1. Creation of DDL Commands

Using SQL, create simple DDL Commands (CREATE, ALTER, DROP, RENAME, TRUNCATE) on the following schema of tables. EMP (Empno number (5), Ename varchar2 (20), Sal number (8, 2), Designation varchar2 (20), Address varchar2 (20)), DEPT (Deptno number (3), Dname varchar2 (20), Location varchar2 (25))

2. Creation of DML Commands

Implement various DML commands and execute simple SQL queries.

3. Creation of Table level and Column level Constraints

Implement table level and column level constraints like Domain Integrity constraints (NOT NULL, CHECK), Entity integrity constraints (UNIQUE, PRIMARRY KEY) and Referential integrity constraints (FOREIGN KEY).

4. Retrieving of data using comparison operators and logical operators

Practice of simple SQL queries using comparison operators (=, !=, >, <, >=, <=, <>, between, in, not in, null) and logical operators(and, or, not).

5. ER diagram for an University database

Construct an ER diagram for a University database application. Identify the Relations and include necessary integrity constraints.

An University has many departments, where each department has multiple Instructors. An Instructor belongs to only one department. Each department offers multiple Courses, each of which is taught by a single Instructor. A student may enroll for many courses offered by the department.

Implement the following queries:

i. Find the names of all the students whose total credits are greater than 100
ii. Find the course-id and grades of all courses taken by any student named 'Tanaka'
iii. Find the ID and name of instructors who have taught a course in the Computer Science department.
iv. Find the courses which are offered in both 'Fall' and 'Spring' semester (not necessarily in the same year).
v. Find the names of all the instructors from Computer Science department.
vi. Find the course-id and titles of all courses taught by an instructor named 'Srinivasan'

vii. Find names of instructors who have taught at least one course in Spring 2009

6. Single Row Functions

Implement queries using Single row functions such as Numeric functions, Date functions, Conversion functions and String functions.

7. Group functions

Practice Group functions such as Sum, Avg, Max, Min, Count.

8. Group by Having Clause

Implement SQL queries using Group By and Having Clause.

9. Creation of VIEWS

Creation of tables using Simple View and Complex View

10. Synonym and Sequences

Implementation of Synonym and Sequences.

11. JOINS

Practice queries using JOINS and OUTER JOINS.

12. SUBQUERIES

Implementation queries using SUBQUERIES.

13. PL/SQL basic programs

a) Write a simple PL/SQL program to accept a number from user and test whether it is divisible by a number

b) Write a PL/SQL program to check whether the input is a character, number or a special character.

c) Write a PL/SQL code to update the salary of an employee based on given bonus and department number.

14. PL/SQL CURSOR programs

Write a PL/SQL program for generation of Electricity Bill using CURSORS.

Create a table for Electricity bill consists of Customer_no, Customer_name, Customer_type, Prev_met_read, Curr_ met_read, Month_name. Assume there are three Customer types namely Industrial, Agriculture and Domestic. Calculate the total charges based on the type of customer.

15. Triggers

Generate a database trigger to update the salary of an employee before/after performing any DML operations.

16. Procedures

Write a procedure which takes the department_id as an input parameter and lists the names of all employees \ belonging to that department.

17. Functions

Write a Pl/Sql block of code that lists the highest salary drawn by an employee in each of the departments. It should make use of a function dept_highest which return the highest salary drawn by an employee for the given department.

18. Packages

Create a package to find the salary of an Employee by providing employee_id as an argument.

REFERENCE BOOKS:

1. Ivan Bayross, "*SQL, PL/SQL The Programming Language of ORACLE,"* BPB Publications, 2002.
2. Dr. P. S. Deshpande, *"SQL & PL/SQL for Oracle 10g Black Book,"* Dreamtech Press, 2007.
3. J. J. Patrick, *"SQL Fundamentals,"* Pearson Education, 2nd Edition, 2002.
4. Rick F. Vander Lans,"*Introduction to SQL*," Addison-Wesley Professional, 4th Edition, 2007.

MCA - II SEMESTER
(16MC20132) DATA STRUCTURES THROUGH C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on "Programming in C Lab" and "Data Structures".

COURSE DESCRIPTION

Implementing logical and physical representation of data, complexity and their efficiency. Implementing linked lists and their different variations, queues, stacks and their applications; tree structures and their different variations; Solving problems using graphs, sorting and searching techniques.

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

CO1. Apply abstract data type and their basic usability in different applications through C programming language.

CO2. Identify and analyze suitable data structures to solve computing problems.

CO3. Design and develop variety of c programs using data structures in order to solve computing problems.

CO4. Choose the appropriate data structure and algorithm design method to get an optimal solution for complex real world problem.

CO5. Apply searching, sorting, tree traversal and graph traversal techniques to optimize the complexities of an application.

CO6. Work together or as an individual to customize the applications.

LIST OF EXERCISES

1. Write C programs that implement stack and its operations using
   a) Arrays b) Pointers

2. Write C programs that uses Stack operations to perform the following:

   a) Converting infix expression into postfix expression

   b) Evaluating the postfix expression

3. Write C programs that implement Queue and its operations using

   a) Arrays b) Pointers

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

   i) Creation ii) Insertion

   iii) Deletion iv) Traversal

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

   i) Creation ii) Insertion

   iii) Deletion iv) Traversal

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

   i) Creation ii) Insertion

   iii) Deletion iv) Traversal

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

   i) Bubble sort ii) Selection sort

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

   i) Quick sort ii) Merge sort

9. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:

   i) Linear search ii) Binary search

10. Write a C program to create Binary Search Tree and perform operations on it.

11. a) Write a C program to implement recursive Tree traversal techniques.
    b) Write a C program to implement non-recursive Tree traversal techniques.
12. Write a C program to create AVL-tree and perform operations on it.
13. Write a C program to implement Heap Sort.
14. Write a C program to implement Graph traversal Techniques (BFS, DFS)
15. Write a C Program to implement Prim's Algorithm

REFERENCE BOOKS:

1. P. Padmanabham, "*C programming and Data Structures,"* BS Publications, 3rd Edition, 2008.
2. M.T. Somashekara, "Problem Solving with C", PHI Learning Private Limited: New Delhi, 2012.
3. E. Karthikeyan, "A Textbook on C Fundamentals, Data Structures and Problem Solving," Prentice Hall of India Private Limited: New Delhi, 2008.

MCA II-SEMESTER

(16MC20133) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on "Programming in C Lab" and "Object oriented Programming through JAVA".

COURSE DESCRIPTION: Implementation of recursive and non recursive functions; Usage of StringTokenizer class; Implementation of method overloading; Basic String Operations; Creation of package and Interfaces; Handling predefined and user defined exceptions; Creation of File and its Operations; Implementation of multithreading; Creating and testing Applets; Usage of Event handling techniques and GUI applications by using AWT and Swings.

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

CO1. Understand the basic concepts and structure of a Java Program.

CO2. Analyze to solve real world problems by using Java Programming language.

CO3. Develop and execute various GUI Applications using AWT and Swings.

CO4. Adopt and design applications using Java IDEs tools.

CO5. Recognize the need to engage independent learning for continual development as an application professional.

CO6. Work together to customize the existing applications.

LIST OF EXERCISES

1. a) Write a Java program that prints all real solutions to the quadratic equation ax2 + bx+ c = 0. Read in a, b, c and use the quadratic formula. If the discriminant b2 -4ac is negative, display a message stating that there are no real solutions.

b) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. 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.

2. a) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.

   b) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)

3. Write a Java program to find both the largest and smallest number in a list of integers.

4. Write a Java program to illustrate method overloading.

5. Write a Java program to sort a list of names in ascending order.

6. Write a Java program to implement the matrix ADT using a class. The operations supported by this ADT are:

   a) Reading a matrix.
   b) Printing a matrix.
   c) Addition of matrices.
   d) Subtraction of matrices.
   e) Multiplication of matrices.

7. Write a Java Program that uses a recursive function to compute nCr.

   (Note: n and r values are given.)

8. Write a Java program to perform the following operations:

   a) Concatenation of two strings.

   b) Comparison of two strings.

9. Write a Java program to perform the following operations:

   a) Read line of Text and make word cap.

   b) Read a line of text and count number of vowels and consonants.

10. a) Write a Java program that makes frequency count of letters in a given text.

    b) Write a Java program that uses functions to perform the following operations:

i. Inserting a sub-string in to the given main string from a given position.

ii. Deleting n characters from a given position in a given string.

11. a) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

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

12. Write a Java program that illustrates the following:

    a) Creation of simple package.

    b) Accessing a package.

    c) Implementing interfaces.

13. Write a Java program that illustrates the following:

    a) Handling predefined exceptions

    b) Handling user defined exceptions

14. a) Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

    b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

    c) Write a Java program that displays the number of characters, lines and words in a text file.

Note: Filename, number of the byte in the file to be changed and the new character is specified on the command line.

15. a) Write a Java program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.

    b) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

16. a) Write a java program to demonstrate various GUI components in java (AWT) with appropriate Event Handling.

b) 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. (Using SWINGS)

17. a) Develop an applet in Java that displays a simple message.

    b) 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.

18. 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.

19. Write a Java program for handling mouse events.

20. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.

REFERENCE BOOKS:

1. Herbert Schildt, "*The Complete Reference Java*", Tata McGraw-Hill, 7th Edition, 2007.
2. B. Eswar Reddy, T. V. Suresh Kumar and P. Ragavan, "*Object Oriented Programming with Java*," Pearson Sanguine Publications, 2nd Edition, 2011.
3. H. M. Dietel and P. J. Dietel, "*Java How to Program*," Pearson Education PHI, 5th Edition, 2009.

MCA - III Semester

(16MC3HS01) ORGANIZATIONAL BEHAVIOR AND HUMAN RESOURCE MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE REQUISITE: —

COURSE DESCRIPTION : Managements; Functions of Management; Elements of Corporate Planning Process; Environmental Analysis; Management of Change; Organizational Behavior; Individual Behavior; Concepts of Personality; Perception; Learning; HRM; Human Resource Planning; Job Design and Job Design; Recruitment; Selection; Training; BPO.

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

CO1. Demonstrate knowledge on managing behavior in an organization.

CO2. Develop requisite skills for:

Effective Human Resource Management.

Optimum utilization of Human Resource.

CO3. Develops effective communication among the work group of an organization.

CO4. Provide life-long learning for effective operation of an organization.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO MANAGEMENT (11 Periods)

Concepts of Management and organization- Nature and Importance of Management, Functions of Management, Systems Approach to Management, managerial skills.

UNIT-II: ORGANIZATIONAL AND INDIVIDUAL BEHAVIOUR (11 Periods)

Concept and meaning of Organizational Behavior(OB), characteristics of OB, Individual Behavior and individual differences – Behavioral theories affecting organization.

UNIT-III: Group Dynamics: Formal and informal groups – group dynamics – leadership, motivation – attitude and beliefs – management of change.

UNIT-IV: NATURE AND SCOPE OF HRM (11 Periods)

Functions and objectives of HRM. **HR PLANNING** : Nature and importance of HRP, factors affecting HRP, job analysis, nature, process of job analysis, job design, factors affecting job design, contemporary issues in job design.

UNIT-V: RECRUITMENT, SELECTION AND TRAINING (11 Periods)

Nature and importance of recruitment, recruitment process, selection process, barriers to effective selection, - Nature of training and development, Designing Training Programmes, career development, Business Process Outsourcing (BPO).

Total Periods: 55

TEXT BOOKS:

1. Prof. K. Aswathappa, "*Human resource management, text and cases*," McGraw Hill Publishing company ltd., 7th Edition, 2013.
2. L. M. Prasad, *Organizational behavior*, Sultan Chand and Sons', 4th Edition, 2006.

REFERENCE BOOKS:

1. Fred Luthans, "*Organizational behavior*," McGraw Hill Higher Education, 10th Edition, 2011.
2. Shashi K. Gupta and Rosy Joshi, "*Organizational Behavior,"* Kalyani Publications, 4th Edition, 2008.
3. P. Subba rao, "*Personnel and Human resource management*," Himalaya Publishing House Pvt. Ltd., 4th Edition, 2009.

MCA III-Semester

(16MC3BS01) OPERATIONS RESEARCH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION: Operations research techniques; Linear Programming Problems; Transportation problem; Assignment problem; sequencing problem; Replacement problem; Inventory models; simulation models and PERT/CPM in project management.

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

CO1. Demonstrate knowledge on:

- Linear Programming Problem
- Utilization of Resources
- Transportation Problem, Assignment Problem, sequencing problem and replacement problem
- Inventory models PERT/CPM and
- Simulation

CO2. Analyze literature and solve complex computational problems using Linear Programming Problem (LPP) techniques.

CO3. Design and solve problems using LPP models, Transportation Problem, Assignment Problem, Sequencing Problem that meet optimized utilization of resources.

CO4. Synthesize data transformation by using complex operational models in Inventory, simulation models and Game Theory.

CO5. Apply operational modeling techniques-PERT and CPM in Project Management system.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO OPERATIONS RESEARCH AND LPP

(10 Periods)

Introduction to OR: Introduction, modeling in OR- Phases of OR study.

Linear Programming: Formulation of LPP, Graphical solution of LPP, Simplex method, artificial variable technique- Big M-method.

UNIT-II: TRANSPORTATION AND ASSIGNMENT PROBLEM

(11 Periods)

Transportation Problem: Finding an initial basic feasible solution using North-West corner rule, Least cost Entry method, Vogel's Approximation Method. Degeneracy in Transportation Problem, Optimality test - MODI method, Unbalanced Transportation Problem.

Assignment Problem: Hungarian method of Assignment Problem, Traveling salesman Problem and its restrictions.

UNIT-III: SEQUENCING PROBLEM AND REPLACEMENT PROBLEM **(10 Periods)**

Sequencing Problem: Optimal solution for processing n-jobs through two machines, n-jobs through three machines.

Replacement Problem: Introduction, Replacement of items that deteriorate when money value is constant and variable - Individual Replacement policy and group Replacement policy.

UNIT-IV: THEORY OF GAMES AND SIMULATION

(11 Periods)

Theory of Games: Introduction, types of games, optimal strategy, Maxmin-Minimax Principle, solution of games with saddle point, Rectangular games without saddle point, principle of dominance.

Simulation: Types of simulation, random variable, Mote-Carlo Technique or Monte-Carlo simulation.

UNIT-V: INVENTORY MODELS AND PROJECT MANAGEMENT BY PERT / CPM (13 Periods)

Inventory Models: Introduction of Inventory–Reasons for maintaining Inventory, Types of inventory costs, Deterministic Inventory Models: EOQ Models with and without shortages - Purchasing and Manufacturing Models with and without shortages.

Project Management by PERT / CPM: Basic steps in PERT/ CPM technique, rules of drawing network diagrams, Fulkerson's rule: Critical Path Method (CPM), Programme Evaluation and Review Technique (PERT).

Total Periods: 55

TEXT BOOKS:

1. S. D. Sharma, "*Operations Research*," Kedar Nath Ram Nath and Company, 15th Edition, 2006.
2. S. Kalavathy, "*Operations Research*," Vikas Publishing House Pvt.Ltd, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Prem Kumar Gupta and D.S. HIRA, "*Operations Research*," S.Chand and Company Ltd., 2008.
2. P.K. Gupta and Man Mohan, "*Problems in Operations Research*," Sultan Chand and Sons, 2007.
3. Hamdy A. Taha, *"Operations Research,"* Pearson Publications, 8th Edition, 2007.
4. J.K. Sharma, "*Operations Research Theory and Applications*," Mc Millan India Ltd, 4th Edition, 2009.

MCA – III Semester

(16MC30101) COMPUTER NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION:

Computer network Applications; The physical layer; The data link layer; The medium access control sub-layer; The network layer; The transport layer; The application layer.

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

CO1. Demonstrate knowledge on:

- Concepts of computer networks
- Functionality of reference models and layers
- Interfaces between layers

CO2. Analyze issues related to data link layer and transport layers using channel allocation and connection management schemes.

CO3. Design techniques for error detection and correction mechanisms suitable to ensure data integrity, access control techniques.

CO4. Investigate diverse techniques used in service user and provider layers in terms of reliability, data integrity, collision resistance and access control mechanisms.

CO5. Apply algorithms and use simulators to calculate least-cost paths for a given network.

CO6. Use the skills by using diverse communication standards and networks with the technology advancements in data communication.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION AND PHYSICAL LAYER

(12 Periods)

Introduction: Uses of Computer Networks, Network Hardware-LAN, MAN and WAN, Topologies, Wireless Network-system interconnection, Wireless LAN, Wireless WAN. Internetworks, Network Software-Protocol hierarchies, Design issues for the layers, Connection Oriented and Connection less Service, Service Primitives, The relationship of Services to Protocols, Reference Models-OSI, TCP/IP.

The Physical Layer: Guided Transmission media-Magnetic Media, Twisted Pairs, Coaxial Cable, Fiber Optics. Wireless Transmission-The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared Transmission and Light Transmission, Communication Satellites, Multiplexing-Frequency Division Multiplexing, Wavelength Division Multiplexing, Time Division Multiplexing.

UNIT-II: THE DATA LINK LAYER (12 Periods)

The Data Link Layer: Data Link layer design issues, Error Detection and Correction, Elementary Data Link protocols-Unrestricted simplex protocol, Simplex stop-and-wait protocol, Simplex protocol for a noisy channel. Sliding Window protocols-One-bit sliding window protocol, Protocol using Go back N, Protocol using Selective Repeat.

The Medium Access Control Sub layer-The Channel Allocation problem, Multiple access protocols-ALOHA, Pure ALOHA, Slotted ALOHA. Carrier Sense Multiple Access protocols-Persistent and Non persistent CSMA-CSMA with collision detection. Collision-Free protocols- Bit map protocol, Token Passing, Binary countdown, Limited Contention protocols, Wireless LAN Protocols.

UNIT-III: THE NETWORK LAYER (13 Periods)

Network layer design issues, Routing Algorithms-Optimality principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for Mobile Hosts, Routing in Ad Hoc Networks, Congestion Control Algorithms-Congestion Prevention Policies, Jitter Control, Techniques for achieving good

quality of service, Congestion control for multicasting, Internetworking, The Network layer in the Internet.

UNIT-IV: THE TRANSPORT LAYER (11 Periods)

The Transport service, Elements of Transport protocols-Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing and Crash recovery, A simple Transport protocol, The Internet Transport protocols-Introduction to UDP, Remote Procedure Call, Real time transport Protocol, Introduction to TCP, The TCP Service Model, TCP protocol and TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Transmission Policy, TCP Sliding Window, TCP Timer Management, TCP Congestion Control.

UNIT-V: THE APPLICATION LAYER AND NETWORK SECURITY

(7 Periods)

The Application Layer: Introduction to Application Layer, DNS-The Domain name space, Resource records and Name servers. Electronic Mail-Architecture and services, the user agent, message formats, message transfer and Final Delivery.

Total Periods: 55

TEXT BOOK:

1. Andrew S Tanenbaum, David J. Wetherall, "*Computer Networks*," Pearson Education, 5th Edition, 2011.

REFERENCE BOOKS:

1. Forouzan Behrouz A and MosharrafFirouz, "*Computer Networks A Top-Down Approach*," Tata McGraw Hill publications, 4th Edition, 2007.
2. William Stallings, "*Data & Computer Communications*," Pearson Education Asia, 6th Edition, 2001.
3. Prakash C. Gupta, "*Data communications and Computer Networks*," Prentice Hall of India, 2nd Edition, 2014.

MCA III – Semester

(16MC30102) DATA WAREHOUSING AND DATA MINING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on "Data Base Management Systems".

COURSE DESCRIPTION: Data Warehouse Components and Architecture; Data mining Functionalities; Data Preprocessing; Association Rule Mining; Classification and Clustering; Multimedia, Text, Web Data Mining and Applications.

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

CO1. Demonstrate knowledge on:

- Schemas of Data warehouse
- Data preprocessing methods
- Classification and Clustering techniques

CO2. Analyze frequent itemsets using Apriori and FP growth algorithms.

CO3. Design and develop solutions for different classification and prediction models.

CO4. Solve complex problems by adapting appropriate analysis and interpretation of different types of text, multimedia and web data.

CO5. Use WEKA tool for creation of weather, hospital, banking dataset and perform preprocessing on these datasets.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION AND DATA WAREHOUSE COMPONENTS (10 periods)

Introduction: The need for Data Warehousing, Paradigm Shift, Business Problem Definition, operational and informational Data Stores, Data Warehouse Definition and Characteristics, Data Warehouse Architecture.

Data Warehouse Components: Overall Architecture, Data Warehouse Database, Sourcing, Acquisition , Cleanup and Transformation tools, meta data, data marts, Data Warehouse Administration and Management .

UNIT-II: BUILDING A DATA WAREHOUSE AND INTRODUCTION TO DATAMINING (12 periods)

Building A Data Warehouse: Business Consideration, Design considerations, Technical considerations, Implementation considerations, integrated solutions, Benefits of Data Warehousing, Multidimensional Data Model-From tables and spread sheets to Data Cubes and Star, Snowflake and fact constellation Schemas

Introduction to Data Mining: Motivated Data Mining, Definition of Data Mining, Kinds of Data, Data mining Functionalities, classification of Data mining systems, Data mining primitives, Integration of Data mining Systems with a Database or Data Warehouse System, Major issues in Data Mining.

UNIT-III: DATA PREPROCESSING AND ASSOCIATION RULE MINING (12 periods)

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Association Rule Mining: Basic Concepts, The Apriori algorithm for finding frequent itemsets using candidate generation, Generating association rules from frequent itemsets, Mining frequent itemsets without candidate generation.

UNIT-IV: CLASSIFICATION AND CLUSTERING (11 periods)

Classification: Definition of classification, Definition of prediction, issues in classification and prediction, Classification by Decision Tree Induction, Bayesian Classification, Accuracy and Error measures, evaluating the accuracy of a classifier or predictor, bagging.

Clustering: Introduction to cluster Analysis**,** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning methods - k-means and k-mediods methods, CLARANS, Hierarchical Methods**-**Agglomerative and divisive hierarchical clustering.

UNIT-V: MULTIMEDIA, TEXT AND WEB DATA MINING APPLICATION (10 periods)

Mining different types of data: Multimedia Data Mining, Text Mining - Text data analysis and informational retrieval, text mining approaches, Mining the World Wide Web- Mining web page layout structure, Mining web's link structures, Web usage mining.

Data Mining Applications: Financial data Analysis, Retail Industry, Telecommunication Industry.

Total Periods: 55

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, *"Data Mining–Concepts and Techniques,"* Morgan Kaufmann Publishers, 2nd Edition, 2006
2. Berson Alex and Stephen J Smith, *"Data Warehousing, Data Mining and OLAP,"* Tata McGraw-Hill, 2004.

REFERENCE BOOKS:

1. Ralph Kimball, Margy Ross, Warren Thornthwaite and Joy Mundy, Bob Becker, *"The Data Warehouse Life cycle Tool kit,"* John Wiley & Sons Inc, 2nd Edition, 2007.
2. William H Inmon, *"Building the Data Warehouse,"* John Wiley & Sons Inc, 4th Edition, 2005.
3. Arun K Pujari, *"Data Mining Techniques,"* Universities Press (India) Pvt. Ltd, 2nd Edition, 2001.

MCA III – Semester

(16MC30103) OBJECT ORIENTED ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Object Oriented Programming Through JAVA" and "Software Engineering"

COURSE DESCRIPTION:

Things and Classes; Relationships; Class Diagrams; Object Diagrams; Usecase Diagrams; Interaction Diagrams; Activity Diagrams; State Chart Diagrams; Component Diagrams; Deployment Diagrams.

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

CO1. Demonstrate knowledge on Things, principles of Object Oriented Development.

CO2. Analyze the specifications of Class, Use case, Activity, Sequence and State diagrams and develop models using pre conditions and post conditions.

CO3. Design application artifacts to construct the Logical, Behavioral and Architectural model of an Application.

CO4. Solve complex behavior using common modeling techniques of things.

CO5. Make use of UML Tool such as Rational Rose or Visual Paradigm to design Class, Use Case, Sequence, Collaboration, Activity, State Chart, Component and Deployment Diagrams for the an Application.

DETAILED SYLLABUS:

UNIT -I: INTRODUCTION TO UML (11 Periods)

The meaning of Object Orientation, object identity, Importance of modeling, principles of modeling, object oriented modeling, An overview of UML, conceptual model of the UML, Architecture.

Classes - Terms and concepts, Common Modeling Techniques.

Relationships - Modeling simple dependencies, single Inheritance and structural relationships, Common Mechanisms and UML Diagrams.

UNIT-II: STRUCTURAL MODELING (12 Periods)

Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Instances.

Class Diagrams - Terms, concepts, modeling techniques for Class Diagram, Modeling Simple collaboration, Logical database Schema, Forward and Reverse Engineering.

Object Diagrams – Modeling object structures, Forward and Reverse engineering.

UNIT-III: BASIC BEHAVIORAL MODELING (11 Periods)

Use cases - Terms and Concepts, Common Modeling techniques.

Use case Diagrams - Terms and Concepts, Common Modeling Techniques.

Sequence Diagrams - Terms and Concepts, Modeling flows of control by time ordering; **Collaboration Diagrams –** Terms and Concepts, Modeling flows of control by Organization, Forward and Reverse Engineering.

UNIT-IV: ADVANCED BEHAVIORAL MODELING (11 Periods)

Activity Diagrams - Terms and Concepts, Modeling a workflow, Modeling an operation, forward and reverse Engineering.

Events and Signals, State Machines, State Chart Diagrams – Modeling Reactive Objects.

UNIT-V: ARCHITECTURAL MODELING (10 Periods)

Component Diagrams – Terms and Concepts, Modeling Source Code, Modeling Physical Database, Forward and Reverse Engineering;

Deployment Diagrams – Terms and Concepts, Modeling Embedded System, Modeling Distributed System, Forward and Reverse Engineering.

Case Study: The Unified Library Application.

Total Periods: 55

TEXT BOOK:

1. Grady Booch, James Ram Baugh and Ivar Jacobson, "*The Unified Modeling Language User Guide*," Pearson Education, 1999.

REFERENCE BOOKS:

1. John W. Satzinger, Robert B Jackson and Stephen D Burd, "*Object-Oriented Analysis and Design with the Unified Process,"* Cengage Learning, 2004.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons and David Fado, "UML 2: Toolkit," Wiley India Pvt. Ltd., 2004.

MCA – III Semester
(16MC30131) COMPUTER NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "Computer Networks".

COURSE DESCRIPTION: Implementing error detection and correction techniques; sliding window protocol; simulation of dynamic routing algorithms; congestion controlling mechanism; simulation of various Transport layer protocols.

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

CO1. Demonstrate knowledge on the concepts of networks, topologies, network devices and network simulators.

CO2. Analyze Error detection and correction mechanisms to verify and correct the data.

CO3. Develop networking protocols like TCP/IP, UDP, RPC, ARP and RARP.

CO4. Investigate congestion control mechanisms such as Leaky Bucket algorithm to achieve flow control.

CO5. Simulate dynamic routing protocols such as Distance Vector and Link state routing algorithms using NS2 simulator.

CO6. Adapt policies and mechanisms to avoid unauthorized access over the network through access control mechanisms and authentication.

CO7. Effectively communicate the routing paths through network simulators through visualization.

CO8. Advanced communication techniques can be applied by an individual to interact with remote machine through client server programming.

LIST OF EXERCISES:

1. Implement the Data Link layer error detecting method using CRC-CCITT (16-bits).
2. Implement the Data Link layer error detection and correction techniques using Hamming Code.

3. Simulate the Sliding Window Protocols used in Data Link layer to achieve flow control.
4. Simulate the congestion control using Leaky bucket algorithm.
5. Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.
6. Implementation of Socket Programming using UDP.
7. Write a program to implement subnetting and find the subnet masks.
8. a) Write a program to implement Remote Procedure Call using Remote Command Execution.

   b) Implementation of RMI.
9. Write a program to simulate Address Resolution Protocol (ARP) and Reverse Address Resolution Protocols (RARP) used in Transport Layer.
10. Study of Network Simulator-NS2.
11. Simulate any Dynamic Routing Protocol used to route the packets in Network Layer.
12. **Minor Project:**

    a) Design a simple textual chat application that resembles Talk command in UNIX.

    b) Implementation of ping server and client application using sockets.

REFERENCE BOOKS:

1. Andrew S Tanenbaum, David J. Wetherall, "*Computer Networks*," Pearson Education, 5th Edition, 2011.
2. Forouzan Behrouz A and MosharrafFirouz, "*Computer Networks A Top-Down Approach*," Tata McGraw Hill publications, 4th Edition, 2007.
3. http://www.ns2blogger.in.

MCA III – Semester
(16MC30132) DATA WAREHOUSING AND DATA MINING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

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

COURSE DESCRIPTION:

Develop Transformations using Data Warehouse ETL tool; Creation of Datasets; Data Preprocessing; Association Rule Mining; Classification and Clustering; Multimedia, Text, Web Data Mining and Applications.

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

CO1. Demonstrate knowledge on:
- Data acquisition process
- Data preprocessing methods
- Data Mining algorithms

CO2. Analyze frequent itemsets using Apriori and FP-growth algorithms.

CO3. Design and construct data acquisition process from one data source to other target data source using data warehouse ETL tool.

CO4. Develop solutions for complex computing problems by applying appropriate data mining algorithms to evaluate the accuracy and error measures using WEKA components.

CO5. Use WEKA tool to preprocess weather, hospital, and banking datasets to discover knowledge for making future predictions effectively.

CO6. Communicate effectively in implementing data mining problems with respect to documentation and visualization of hidden patterns.

CO7. Apply the knowledge of data mining to assess and provide computing solutions for societal issues.

CO8. Function effectively as an individual and as a member in a team to manage and implement data mining application in multidisciplinary environment.

LIST OF EXERCISES

PART –A

Creation of Active/Passive transformations using Data Warehouse (Extract, Transform, Load) ETL Tool

1. Construct data acquisition process to extract, transform and load data from different databases.
2. Design and implement data acquisition process to perform
   a) Expression Transformation
   b) Joiner Transformation
3. Design and implement data acquisition process to perform
   a) Aggregator Transformation
   b) Source Qualifier Transformation
4. Design and implement data acquisition process to perform
   a) Filter Transformation
   b) Router Transformation
5. Design and implement data acquisition process to perform
   a) Ranker Transformation
   b) Sorter Transformation

PART -B

Working with Data Mining - WEKA tool.

6. Creation on weather nominal and student results data sets in .arff and .csv formats
7. Perform data preprocessing steps on weather nominal and student information data sets as follows:
   a) Handling of missing values for categorical and nominal values.
   b) Selection of relevant attributes.
   c) Applying normalization techniques
8. Perform Association rule mining algorithm on preprocessed data set.
9. Perform classification and prediction on processed data set using J48 and ID3 algorithms.

10. Use Experimenter WEKA component to evaluate the accuracy and error measures of a classifier or predictor.
11. Verify ID3 classifier performance using Gain ration and Ranker method using a Knowledge flow WEKA component.
12. Minor Project

    Step 1 : Creation of data set.

    Step 2: Apply preprocessing techniques on constructed data sets.

    Step 3: Implement appropriate data mining algorithms such as:

    a. Apriori algorithm – to find frequent itemsets using various support and confidence levels
    b. FP growth association mining
    c. ID3 decision tree classifier
    d. Build a confusion matrix to compute sensitivity, specificity, precision, recall, weighted accuracy and correlation between the attributes.

    Data sets: Super Market data, Health data, Banking system, Weather forecasting, social media and Iris data.

REFERENCE BOOKS:

1. Ian H. Witten, Eibe Frank, and Mark,"*A Data Mining: Practical Machine Learning Tools and Techniques,"* Hall Morgan Kaufmann, 3rd Edition, 2011.
2. Ralph Kimball, *"The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling,"* John Wiley & Sons Inc, 3rd Edition, 2013.
3. G. K. Gupta, *"Introduction to Data Mining with Case Studies,"* PHI, New Delhi, 3rd Edition, 2009.

MCA – III Semester

(16MC30133) OBJECT ORIENTED ANALYSIS AND DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "Object Oriented Analysis and Design".

COURSE DESCRIPTION:

Analyze specifications; Design Class Diagrams; Object Diagrams; Usecase Diagrams; Interaction Diagrams; Activity Diagrams; State Chart Diagrams; Component Diagrams; Deployment Diagrams

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

CO1. Demonstrate knowledge on:

- Library Management System
- ATM Application
- Online Bookshop
- Railway Reservation System

CO2. Analyze applications and specifications to develop static and behavioral models.

CO3. Design and construct the Logical, Behavioral and Architectural model of an Application.

CO4. Construct a project from beginning to end using UML Tool, Rational Rose for an Application Software.

CO5. Communicate effectively with all the team members about various logical and behavioral objects of an Application Software.

CO6. Asses the common modeling techniques to be applied for a system for the societal applications.

LIST OF EXERCISES

Design of Applications

- Library Management System
- ATM Application
- Online Bookshop
- Railway Reservation System

1. IDE of Rational Rose or Visual Paradigm.
2. Analyze and construct UseCase diagrams for the above applications.
3. Analyze and construct Class diagrams for the above applications.
4. Construct sequence diagram for use cases of Library Management System and ATM Application.
5. Construct sequence diagram for use cases of Online Bookshop and Railway Reservation System.
6. Construct Collaboration diagram for use cases of Library Management System and ATM Application.
7. Construct Collaboration diagram for use cases of Online Bookshop and Railway Reservation System.
8. Construct Activity diagram for use cases of Library Management System and ATM Application.
9. Construct Activity diagram for use cases of Online Bookshop and Railway Reservation System.
10. Construct State Chart diagram for use cases of Library Management System and ATM Application.
11. Construct State Chart diagram for use cases of Online Bookshop and Railway Reservation System.
12. Analyze and construct Component diagrams for the above applications.
13. Analyze and construct Deployment diagrams for the above applications.

REFERENCE BOOKS:

1. Grady Booch, James Ram Baugh and Ivar Jacobson, "*The Unified Modeling Language User Guide,"* Pearson Education, 1999.
2. www.uml.org.
3. Rational Software Development Training Manual.

MCA IV-SEMESTER

(16MC40101) **BIG DATA ANALYTICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Data warehousing and Data Mining" and "Object Oriented Programming through JAVA".

COURSE DESCRIPTION:

Big data Analytics usage and Outcomes; Types of big data; Challenges of analyzing big data; Analytics tools for big data; Requirements of Hadoop; Adapting Hadoop File systems and I/O; MapReduce Application; Administration of Hadoop; Big data analytics; R Programming on Hadoop.

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

CO1. Acquire knowledge on
- Basic concepts of Big Data Analytics and current trends in Big Data
- MapReduce and R Tool
- HDFS and MapReduce in Big Data Hadoop.

CO2. Analyze the big data types as Structured, unstructured and semi-structured.

CO3. Design and develop methods using Map Reduce technique to solve:
- Varieties of data formats in Hadoop Framework for an application.
- Methods, Dimensions, and practices for Big Data applications.

CO4. Solve complex problems in Big Data by adopting appropriate techniques to provide insights for small and medium business.

CO5. Apply modern tools like HIVE and R to perform analytics in an user friendly environment on Hadoop platform.

CO6. Demonstrate knowledge as an individual to manage Weather sensors application.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO BIG DATA ANALYTICS

(11 periods)

Defining Big Data Analytics : Introduction to Big data, Usage of big data- Basic analytics, Advanced analytics, Operationalized analytics, Monetizing analytics; Modifying Business Intelligence Products to Handle Big Data: Analytical algorithms, Infrastructure support; Big Data Analytics Examples , Big Data Analytics Solutions.

Meet Hadoop: Data Storage and Analysis, Comparison with Other Systems, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem.

UNIT-II: HADOOP **(10 Periods)**

MapReduce: A Weather Dataset Ecosystem, Analyzing the Data with UNIX Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes.

The Hadoop Distributed File system: The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File systems.

Hadoop I/O: Data Integrity, Compression, Serialization, File-Based Data Structures.

UNIT – III: APPLICATIONS OF HADOOP MAPREDUCE

(11 Periods)

Developing a MapReduce Application: The Configuration API, Configuring the Development Environment, Writing a Unit Test, Running Locally on Test Data, Running on a Cluster.

How MapReduce Works: Anatomy of a MapReduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution.

MapReduce Types and Formats: MapReduce Types, Input Formats, Output Formats.

UNIT -IV: FEATURES AND ADMINISTERING HADOOP

(11 Periods)

MapReduce Features: Counters, Sorting, Joins, Side Data Distribution, MapReduce Library Classes.

Setting Up a Hadoop Cluster: Cluster Specification, Cluster Setup and Installation, SSH Configuration, Hadoop Configuration, Security, Benchmarking a Hadoop Cluster.

Administering Hadoop: HDFS, Monitoring, Maintenance.

UNIT -V: R PROGRAMMING ON HADOOP (12 Periods)

Introduction to R: R Data Structures, Help functions in R, Vectors, Scalars, Declarations, Common Vector operations, Using all and any, Vectorised operations: NA and NULL values, Filtering, Vectorised if-then else.

Matrices, Arrays And Lists: Creating matrices, Matrix operations, Applying Functions to Matrix Rows and Columns, Adding and deleting rows and columns, Vector/Matrix Distinction , lists, Creating lists, General list operations, Accessing list components and values – applying functions to lists.

CASE STUDY: Analyze one of the social network data to draw insights for the societal benefit.

Total Periods: 55

TEXT BOOKS:

1. Tom White, "*Hadoop: The Definitive Guide,*" Oreilly and Yahoo press, 3rd Edition, 2012.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, and Marcia Kaufman, "*Big Data for Dummies,*" John Wiley & Sons, Inc., 2013.

REFERENCE BOOK:

1. Norman Matloff, "The Art of R Programming", William Pollock, 2011.
2. Frank J. Ohlhorst, "*Big Data Analytics: Turning Big Data into Big Money*," Wiley Publication, December 2012.

MCA IV-Semester
(16MC40102) LINUX PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on *"Computer Networks".*

COURSE DESCRIPTION: LINUX operating system features; Architecture of LINUX operating system; LINUX environment; Shell Script; Signals and Sockets.

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

CO1. Demonstrate Knowledge on LINUX operating system and utilities.

CO2. Analyze the Bourne shell, LINUX files, processes and signals to solve problems in Linux operating system.

CO3. Design and develop the programs by using LINUX system tools like vi editor, File, Text, Network and Backup utilities.

CO4. Solve Advanced C and Shell Script Programming problems in Linux Environment. Select and apply appropriate techniques like semaphores, Messages and Shared Memory to develop inter Process communication in Linux.

CO5. Communicate effectively with Linux operating system through different application programs.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO LINUX FILE SYSTEM (11 Periods)

Linux Utilities- Introduction to Linux file system, vi editor, File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, sed – scripts, operation, addresses, commands, applications, awk – execution, fields and records, scripts, operation, patterns, actions, functions, using system commands in awk.

UNIT-II: SHELL PROGRAMMING (11 Periods)

Working With The Bourne Shell: shell, shell responsibilities, pipes and input Redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shell script examples.

UNIT-III: LINUX FILE APIS (11 Periods)

Linux Files: File types, file systems, File attributes, i-nodes, application program interface to files, kernel support files, relationship of C stream pointers and file descriptors, directory files, hard and symbolic links.

Linux File APIs: General file APIs, file and record locking, directory file APIs, device file APIs, general file class, regfile class for regular class, dirfile class for directory files, FIFO file class , device file class, symbolic link file class, file listing program.

UNIT-IV: LINUX PROCESSES AND SIGNALS (11 Periods)

Linux Processes: LINUX kernel support for processes, process APIs, process attributes, change process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process

Signals: LINUX kernel support for signals, signal, signal mask, sigaction, the SIGCHLD Signal and the waitpid API, the sigsetjmp and siglongjmp APIs, kill, alarm, Interval timers, POSIX. 1b timers, timer class.

UNIT- V: INTERPROCESS COMMUNICATION AND SOCKETS

(11 Periods)

Interprocess Communications: IPC methods, the UNIX System V IPC methods, UNIX System V messages, Messages Example, UNIX system V semaphores, Semaphore Example, UNIX System V shared memory, Shared memory Example.

Sockets: Introduction to Sockets, Socket Addresses, Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs.

Total Periods: 55

TEXT BOOKS:

1. T. Chan, "*UNIX system programming using C++*," PHI, 2008.
2. Sumitabha Das, "*UNIX Concepts and Applications*," TMH, 4th Edition, 2008.

REFERENCE BOOKS:

1. W.R. Stevens, "*UNIX Network Programming*," Pearson Education, 2008
2. Graham Glass, King Ables, "*UNIX for programmers and users,*" Pearson Education, 3rd Edition, 2003.
3. Kernighan and Pike, "*UNIX programming environment*," Pearson Education, 2006.

MCA IV-Semester

(16MC40103) **WEB PROGRAMMING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

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

COURSE DESCRIPTION:

Concepts of HTML; Java Script and XML; Developing Web Applications using Servlets, JSP and PHP; Adopting Tomcat Server and XAMP Server for deploying Web Applications.

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

CO1. Demonstrate Knowledge on

- Client side scripting
- AJAX programming and Application Servers
- HTML, DHTML**,** Java Script and XML

CO2. Analyze 2-tier, 3-tier and MVC architectures for web application development.

CO3. Design and develop web Applications using Dynamic HTML with Java Script, XML technology.

CO4. Investigate and solve complex problems using Server-side technologies like servlets, JDBC technologies and adapt Tomcat Server and XAMPP Server for deployment.

CO5. Use JSP and PHP to implement E-Commerce applications that has potential insights.

DETAILED SYLLABUS:

UNIT- I: HTML, JAVA SCRIPT AND AJAX (10 periods)

Introduction to HTML, structure of HTML, Lists, Tables, images, forms, Frames, Cascading Style sheets, Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script, Introduction to AJAX.

UNIT- II: XML TECHNOLOGY (11 periods)

Introduction to XML, XML Basics, DTD, Advanced XML: XML Namespaces, XML CDATA, XML Encoding, XML on the Server, XML Application, XMLHttpRequest Object, XML Technologies: XHTML, Java API for XML Processing, DOM, SAX, XSLT, Xpath.

UNIT-III: SERVLETS (11 periods)

Introduction to Servlets, features of Java Servlets, Exploring the Servlet API, Servlet Life Cycle, Configuring Servlet in web.xml, Working with ServletConfig and ServletContext Objects, Creating a Simple Servlet, the HttpServletRequest and HttpServletResponse Interfaces, Session Tracking, Introduction to JDBC, JDBC Drivers, JDBC APIs and Multitier Applications Using JDBC from a Servlet.

UNIT-IV: JSP (12 periods)

Introduction to JSP, Describing the JSP Life Cycle, Creating Simple JSP Pages, Working with JSP Basic Tags and Implicit Objects, Using JavaBeans and Action Tags in JSP, Using the JSP Standard Tag Library [JSTL], Describing JSTL Core Tags, Describing the JSTL SQL Tags.

UNIT-V: PHP (11 periods)

Introduction to PHP, Working with Variables and Constants, Controlling Program Flow, Working with Functions and Arrays, Working with Files and Directories, Working with Forms and Database, Exploring Cookies and Sessions.

Case Study: On-Line examination conduction using 3-Tier Architecture.

Total Periods: 55

TEXT BOOK:

1. Kogent Learning Solutions Inc., "*Web Technologies Black Book,"* Dreamtech Press, 2011.

REFERENCE BOOKS:

1. H. M. Deitel, P.J. Deitel, and T. R. Nieto, "*Internet and World Wide Web – How to program,"* Pearson Education, 2006.
2. Steven Holzner, "*The Complete Reference PHP*," Tata McGraw-Hill Education Pvt. Ltd., 2007.
3. Uttam K Roy, "*Web Technologies*," Oxford University Press, 2010.

MCA – IV Semester

(16MC40104) SERVICE ORIENTED ARCHITECTURE

(Professional Elective–I)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Web Services; Principles of SOA; Service Layers; Simple Object Access Protocol (SOAP); Web Services Description Language (WSDL).

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on:

- Principles, services and policies of service orientation.
- Fundamentals of web services.
- XML, WSDL related to SOA

CO2. Analyze complex business process critically in identifying appropriate service model logic.

CO3. Design service oriented architecture suitable for different environments.

CO4. Use XML, SOAP and service interface design tools for building service oriented architecture.

DETAILED SYLLABUS:

UNIT - I: SOA AND WEB SERVICES FUNDAMENTALS (12 Periods)

Introducing SOA: Fundamental SOA, Common Characteristics of Contemporary SOA, Common misperceptions about SOA, Common Tangible benefits of SOA, Common pitfalls of adopting SOA.

The Evolution of SOA: An SOA Timeline, The continuing evolution of SOA, The roots of SOA, Orchestration.

Web Services and Primitive SOA: The Web Services framework, Services, Service descriptions, messaging, Security.

UNIT - II: SOA AND WS-* EXTENSIONS (10 Periods)

WS-* and Contemporary SOA (Part I): Message Exchange Patterns, Service Activity, Coordination, Atomic transactions, Business Activities, Orchestration.

WS-* and Contemporary SOA (Part-II): Addressing, Reliable messaging, Correlation, Policies, Metadata exchange, Security.

UNIT - III: PRINCIPLES, SERVICE LAYERS AND PLANNING (11 Periods)

Principles of Service-Orientation: Anatomy of SOA, Common principles of Service Orientation, Inter relationship of Service Orientation Principles, Service Orientation and Object Orientation, Native web service Support for service orientation principles.

Service Layers: Service-Orientation and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

SOA Delivery Strategies: SOA delivery lifecycle phases, The Top-down strategy, the bottom-up strategy, the agile strategy.

UNIT - IV: BUILDING SOA AND SERVICE MODELING (10 Periods)

Service Oriented Analysis: Introduction to service oriented analysis, Comparison of service oriented Architecture and Service Oriented Environment, Benefits of a Business Centric SOA and Deriving Business Services.

Service Modeling: Service Modeling, Service Modeling guidelines, Classifying Service model logic, Contrasting Service modeling approaches.

UNIT - V: BUILDING SOA AND SERVICE DESIGN (12 periods)

Service-Oriented Design: WSDL related XML Schema language basics, WSDL language basics, SOAP language basics, Service interface design tools.

SOA Composition Guidelines: Steps to composing SOA, Considerations for choosing service layers, Considerations for positioning for choosing SOA extensions.

Service Design: Service Design overview, Entity-centric business Service Design, Application Service Design, Task-centric business Service Design, Service Design guidelines.

Total Periods: 55

TEXT BOOK:

1. Thomas Erl, **"***Service-Oriented Architecture - Concepts, Technology, and Design,"* Pearson, 2011.

REFERENCE BOOKS:

1. Eric Newcomer, *"Understanding SOA with Web Services,"* Pearson Education, 2nd Edition, 2005.
2. Shankar Kambhampaty, *"Service Oriented Architecture for Enterprise and Cloud Applications,"* Wiley-India, 2nd Edition, 2010.

MCA IV - Semester

(16MC40105) INTERNET OF THINGS

(Professional Elective – I)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE: A Course on **"**Computer Networks".

COURSE DESCRIPTION: Internet of Things(IoT) Components; Communication models; Prototyping; Hardware; Design models; Development platforms; Analytics for IoT.

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

CO1. Demonstrate knowledge on Protocols, Functional blocks and communication models of Internet of things.

CO2. Identify appropriate sensors and communication modes used in IoT based systems.

CO3. Design appropriate solutions for IoT applications using Raspberry Pi and Arduino kits.

CO4. Appropriately synthesize the models and applications for usage in Home automation and cities.

CO5. Apply evolutionary techniques to perform analytics on the data integrated from IoT based systems.

CO6. Use Professional engineering principles to design and develop applications using IoT.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION AND DOMAIN APPLICATIONS

(10 periods)

Introduction to Internet of Things: Definition of Internet of Things, Characteristics, Things, Protocols, Logical Design, Functional Blocks, Communication models, APIs, Enabling Technologies, Levels and Deployment templates, Introduction to M2M, Difference between IoT and M2M, Software Defined Networking, Network Function Virtualization.

UNIT- II: DEVICES AND END POINTS (12 periods)

IoT Device, Examples - Arduino, Raspberry PI; Programming Raspberry PI with Python, Other IoT devices, Domain Specific IoTs.

UNIT-III: SENSORS AND CONNECTIVITY (12 periods)

Sensors-Types of Sensor Nodes; Internet Communications, IP Addresses, MAC Address, TCP and UDP ports, Application Layer Protocols, Need for IoT Systems Management, SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG.

UNIT-IV: DESIGN METHODOLOGY AND CASE STUDIES (10 periods)

Design Methodology: Purpose and Requirements specifications, Process Specifications, Domain Model specifications, Information Model specifications, Service specification, IoT Level Specifications, Functional View specifications, Operational View specifications, Device and Component integration, Application development, Cloud Storage Models and Communications APIs, WAMP, Xively Cloud for IoT.

Case Studies: Weather Monitoring System.

UNIT-V: DATA ANALYTICS FOR IOT (11 periods)

Analytics, Apache Hadoop, Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm.

Tools: Chef and Case studies.

Total Periods: 55

TEXT BOOK:

1. Arshdeep Bahga, Vijay Madisetti, "*Internet of Things – A hands-on approach*," University Press, 2015.

REFERENCE BOOKS:

1. Adrian McEwen and Hakim Cassimally, "*Designing the Internet of Things*," Wiley Publishing, 2013.
2. CharlesBell, "*Beginning Sensor Networks with Arduino and Raspberry Pi*," Apress, 2013.
3. Marco Schwartz, "*Internet of Things with the Arduino Yun*," Packt Publishing, 2014.
4. Matt Richardson, Shawn Wallace, "*Getting Started with Raspberry Pi*," Maker Media, Inc, 2012.

MCA – IV Semester

(16MC40106) COMPUTER FORENSICS

(Professional Elective-I)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on "Computer Networks".

COURSE DESCRIPTION: Computer forensics technologies and cybercrime; Evidence collection and data seizure; Initial Response and Forensic Duplication; Open source tools for Forensic Process; Forensic Data Analysis and Validation; Processing crimes and incident scenes; Mobile Device Forensics; Network Forensics; E-mail Investigation; Report writing.

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

CO1. Demonstrate knowledge on:

- Process Fundamentals and Technologies
- Evidence Capture and Computer Forensic Analysis
- Law Enforcement crime and incident scenes

CO2. Analyze and validate digital evidence found in digital storage device.

CO3. Design and develop solutions for a forensic process based on type of communication standards, electronic device capabilities and specifications.

CO4. Investigate and contribute in groups for the development of new forensics tools- Forensic Card Reader, Cell Seizure and MOBILedit.

CO5. Apply forensic tools- Forensic SIM, WinHex and techniques to acquire and verify the evidence.

CO6. Commit to ethics and follow Law of Enforcement standards for digital Forensics and crime investigations.

DETAILED SYLLABUS:

UNIT – I: OVERVIEW OF COMPUTER FORENSICS TECHNOLOGY AND CYBERCRIME (10 periods)

Computer Forensics Fundamentals: Introduction to computer Forensics, Use of computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technologies: Types of Military Computer Forensic Technology, Types of Law Enforcement - Computer Forensic Technology, Types of Business Computer Forensic Technology.

Introduction to Cybercrime: Cybercrime, Cybercrime and Information Security, Cybercriminals, Classification of Cybercrimes, Cyber Detectives.

UNIT – II: COMPUTER FORENSICS EVIDENCE AND CAPTURE (10 periods)

Data Recovery: Data back-up and Recovery, Role of Back-up in Recovery, Data-Recovery solution.

Evidence Collection and Data Seizure: Importance of Collecting Evidence, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination- The Chain of Custody.

UNIT – III: INITIAL RESPONSE, FORENSIC DUPLICATION AND FORENSIC TOOLS (12 periods)

Initial Response and Volatile Data Collection from Windows system, Initial Response and Volatile Data Collection from UNIX system.

Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic Duplicate/Qualified Forensic Duplicate of a Hard Drive, Live Data Collection for Systems (Windows and UNIX).

Forensic Tools: Forensic Card Reader, Cell Seizure, MOBILedit, Forensic SIM, WinHex.

UNIT - IV: COMPUTER FORENSIC ANALYSIS (11 periods)

Data Analysis and Validation: Determining the data to collect and analyze, Validating forensic data, Addressing data, hiding techniques, performing remote acquisitions.

Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime, Preparing for a search, Seizing Digital Evidence at the Scene, Storing Digital Evidence.

UNIT – V: FORENSICS AREAS AND REPORT WRITING

(12 periods)

Cell Phone and Mobile Device Forensics: Understanding Mobile Device Forensics, Acquisition Procedures for Cell Phones and Mobile Devices.

Network Forensics: Overview, Performing Live Acquisitions, Developing Standard Procedure for Network Forensics, Investigating Routers, Network Tools.

E-Mail Investigation: Exploring the role of E-Mail in investigations, Investigating E-Mail Crimes and Violations.

Report Writing: Understanding the importance of Reports, Guidelines for Writing Reports, Generating Report Findings with Forensics Software Tools.

Case Study: Perform the Forensic process on a File system or on an external storage device to ensure the integrity or loss of data using any open source Forensic Tool.

Total periods: 55

TEXT BOOKS:

1. John R. Vacca, *"Computer Forensics, Computer Crime Scene Investigation"*, Firewall Media, 2009.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, *"Guide to Computer Forensics and Investigations"*, Cengage Learning, 4th Edition, 2009.

REFERENCE BOOKS:

1. Chris Prosise, Kevin Mandia, *"Incident Response and Computer Forensics"*, McGraw-Hill Osborne Media, 2nd Edition, July 2003.
2. Nina Godbole, Sunit Belapure, "*Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*", Wiley India Pvt Ltd, 2011.
3. EoghanCasey,"*Handbook Computer Crime Investigation's Forensic Tools and Technology"*, Academic Press, 2001.
4. Peter Stephenson, Keith Gilbert, "*Investigating Computer Related Crime*", CRC Press, 2nd Edition, 2004.

MCA – IV Semester

(16MC40107) **E-COMMERCE**

(Professional Elective–I)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Database Management Systems", "Computer Networks" and "Web Programming".

COURSE DESCRIPTION:

Electronic Commerce; E-Commerce applications and web; Process models; Electronic payment systems; EDI; Interorganizational E-Commerce; Digital document types; Online marketing process; M-Commerce; Commerce catalogues; Multimedia.

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

CO1. Demonstrate knowledge on
- E-Commerce applications.
- Mercantile Process Models
- Electronic Payment Systems
- Electronic Data Interchange (EDI)

CO2. Analyze the impact of E-commerce on business models and strategies in the new economy.

CO3. Design and develop an electronic payment system.

CO4. Solve complex security problems in the development of Electronic commerce application using SSL and S-HTTP.

CO5. Apply corporate digital library technique to make the information useful to diverse people at different stages in the work process.

CO6. Follow ethics to adapt security standards - digital signature standards in resolving the issues of E-Commerce.

DETAILED SYLLABUS:

UNIT-I: ELECTRONIC COMMERCE (11 Periods)

Electronic Commerce: Electronic Commerce Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce Organisation Applications.

Electronic commerce and World Wide Web: Architectural Framework for E-Commerce, WWW as the Architecture, Technology behind the Web, Security and the Web.

UNIT-II: CONSUMER ORIENTED ELECTRONIC COMMERCE (12 Periods)

Consumer Oriented Electronic commerce: Mercantile Process models, Mercantile Models from Consumer's Perspective, Mercantile Models from Merchant's Perceptive.

Electronic payment systems: Types of Electronic Payment Systems: Digital Token-Based, Smart Cards, Credit Cards, and Risks in Electronic Payment systems, Designing Electronic payment System.

UNIT-III: INTERORGANIZATIONAL COMMERCE AND ELECTRONIC DATA INTERCHANGE (EDI) (11 Periods)

Interorganizational Commerce and Electronic Data Interchange (EDI): EDI, EDI Applications in Business, EDI: Legal, Security and Privacy Issues, EDI and Electronic Commerce.

Intraorganizational Electronic Commerce: Macro forces and internal commerce, Work-Flow Automation and Coordination, Supply Chain Management.

UNIT-IV: CORPORATE DIGITAL LIBRARY (11 Periods)

Corporate Digital Library: Document Library, digital Document types, corporate Data Warehouses.

Advertising and Marketing: Information based marketing, advertising on Internet, on-line marketing process, market research.

M-Commerce: Characteristics of M-Commerce, advantages and disadvantages of M-Commerce.

UNIT-V: CONSUMER SEARCH AND RESOURCE DISCOVERY

(10 Periods)

Consumer Search and Resource Discovery: Information search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia and Digital Video: Key Multimedia concepts, Digital Video and electronic Commerce, Desktop video conferencing.

Total Periods: 55

TEXT BOOK:

1. Ravi Kalakota and Andrew B. Whinston, "*Frontiers of electronic commerce*," Pearson Education, 2008.

REFERENCE BOOKS:

1. Marilyn Greenstein and Todd M Feinman, "*Electronic Commerce*," Tata McGraw-Hill, 2000.
2. Brenda Kienan, "*Managing E-Commerce Business*," PHI, 2001.

MCA IV-Semester

(16MC40108) SOFTWARE PROJECT MANAGEMENT

(Professional Elective – II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Software Models and process improvement ; Principles of software management system and life cycle phases; Workflows and checkpoints of the process; scheduling and work break down structure ; Process automation ; Software metrics ; Future generation software economics.

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

CO1. Demonstrate knowledge on

- Software Economics
- Engineering and Production stages
- Artifacts of the process
- Check points of the process
- Process Automation and Tailoring of the process

CO2. Analyze the resources required for a project and to produce a work plan and resource schedule.

CO3. Design and develop project plans to address real-world management Challenges.

CO4. Synthesize the development of project by assessing quality of project using metrics.

CO5. Apply process methods to manage the software projects at each stage of software development life cycle.

CO6. Commit to ethics to adapt conventional and modern software project management principles for developing the software projects.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO CONVENTIONAL SOFTWARE MANAGEMENT AND IMPROVING SOFTWARE ECONOMICS (11 Periods)

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 through software environments, Achieving required quality, peer inspections: A Pragmatic view.

UNIT- II: PRINCIPLES, LIFE CYCLE PHASES AND ARTIFACTS OF THE PROCESS (12 Periods)

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 phase, Elaboration phase, construction phase, transition phase.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, pragmatic artifacts.

UNIT –III: SOFTWARE ARCHITECTURE, WORKFLOWS AND CHECKPOINTS OF THE PROCESS (12 Periods)

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 process, Iteration planning process, Pragmatic planning.

UNIT-IV: PROJECT ORGANIZATIONS AND RESPONSIBILITIES, PROCESS AUTOMATION (10 Periods)

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, Evolution of Organizations.

Process Automation: Tools: Automation Building blocks, The Project Environment: Roundtrip Engineering, Change management, Infrastructures, Stakeholder Environments.

UNIT-V: PROJECT CONTROL AND PROCESS INSTRUMENTATION, TAILORING THE PROCESS AND FUTURE SPM (10 Periods)

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 discriminants.

Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions.

Total Periods: 55

TEXT BOOK:

1. Walker Royce, "*Software Project Management*," Pearson Education, 6th Edition, 2007.

REFERENCE BOOKS:

1. Bob Hughes and Mike Cotterell, "*Software Project Management*," Tata McGraw-Hill, 4th Edition, 2006.
2. Joel Henry, "*Software Project Management"*, Pearson Education, 2004.
3. Pankaj Jalote, "*Software Project Management in practice*," Pearson Education, 2002.

IV-Semester

(16MC40109) INFORMATION RETRIEVAL SYSTEMS

(Professional Elective-II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

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

COURSE DESCRIPTION: Functional overview; Information Retrieval System capabilities; automatic Indexing; stemming algorithms; automatic term clustering; user search techniques; Information visualization technologies; software text search algorithms; Information system evaluation.

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

CO1. Demonstrate knowledge on

- Theoretical and practical aspects of information retrieval Systems.
- Automatic indexing
- Hardware/ Software text search algorithms and Information visualization

CO2. Analyze the functionality of several searches and browse algorithms.

CO3. Design and develop the probabilistic retrieval methods, algorithms and ranking principles.

CO4. Apply porter stemming and successor stemming algorithms to extract meaningful and relevant patterns.

CO5. Use various search engines effectively by applying optimum searching techniques.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION AND INFORMATION RETRIEVAL SYSTEM CAPABILITIES (12 Periods)

Introduction to IRS: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.

Information Retrieval System Capabilities: **Search Capabilities**- Boolean logic, Proximity, contiguous word phrases, fuzzy searches, Term masking, **Browse Capabilities**-Ranking, Zoning, Highlighting, **Miscellaneous Capabilities**- vocabulary Browse, canned query.

UNIT – II: CATALOGING AND INDEXING AND DATA STRUCTURE (10 Periods)

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.

Data Structure: Introduction to data structure, Stemming Algorithms: Introduction to stemming process, Porter stemming algorithm, Successor stemmers, Inverted file Structure, N-Gram Data Structures PAT Data Structure.

UNIT -III: AUTOMATIC INDEXING (10 Periods)

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing-probabilistic weighting, Vector weighting, Natural Language, Concept Indexing, Hypertext Linkages.

Document and Term Clustering: Introduction to clustering, Thesaurus Generation, Automatic term clustering- complete term relation method, clustering using existing clusters, one pass assignments**.**

UNIT – IV: USER SEARCH TECHNIQUES AND INFORMATION VISUALIZATION (11 Periods)

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the Internet and Hypertext.

Information Visualization: Introduction, Cognition and Perception, Information Visualization Technologies.

UNIT – V: TEXT SEARCH ALGORITHMS AND INFORMATION SYSTEM EVALUATION (12 Periods)

Text Search Algorithms: Introduction to text search techniques, Software Text Search Algorithms, Hardware Text Search Systems

Information System Evaluation: Introduction to information system evaluation, Measures Used in System Evaluations, Measurement Example – TREC Results.

Total periods: 55

TEXT BOOK:

1. Gerald J. Kowalski and Mark T. Maybury, "*Information Storage and Retrieval Systems,"* Springer International Edition, 2nd Edition, 2009.

REFERENCE BOOKS:

1. Ricardo Baeza – Yates, Berthier Ribeiro-Neto, "*Modern Information Retrieval,"* Pearson Education, 2004.
2. Robert R. Korfhage, "*Information Storage and Retrieval*," John Wiley and Sons, 1997.

MCA IV-Semester

(16MC40110) **WIRELESS NETWORKS**

(Professional Elective – II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on *"Computer Networks".*

COURSE DESCRIPTION: Concepts of Medium access alternatives; Generations of Wireless WANS; Adhoc and Wireless Sensor Networks; Wireless MANS and PANS.

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

CO1. Demonstrate Knowledge on
- Wireless WANS
- Wireless LANS
- Adhoc and Sensor Networks and
- Wireless MANS and PANS

CO2. Analyze the sensor and Adhoc network models and its classifications.

CO3. Design and develop Network applications for Wireless devices like smart phones and tablets.

CO4. Solve complex connectivity problems - Security, Quality of service and routing optimization at in wireless Networks.

CO5. Select and apply the latest wireless network protocols - LTE, Wi-Fi and Bluetooth in developing and operating wireless networks.

CO6. Provide innovative privacy and security measures for accessing of Wireless Network devices adapting standards-IEEE 802.11, IEEE 802.11b and IEEE 802.11.

DETAILED SYLLABUS:

UNIT- I : MULTIPLE RADIO ACCESS (11 Periods)

Medium Access Alternatives: Fixed-Assignment for Voice Oriented Networks, Random Access for Data Oriented Networks, Handoff and Roaming Support, Security and Privacy.

UNIT - II : WIRELESS WANS (11 Periods)

First Generation Analog, Second Generation TDMA – GSM, Short Messaging Service in GSM, Second Generation CDMA – IS-95, GPRS - Third Generation Systems (WCDMA/CDMA 2000).

UNIT- III: WIRELESS LANS (11 Periods)

Introduction to wireless LANs - IEEE 802.11 WLAN – Architecture and Services, Physical Layer- MAC sublayer- MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, WiMax standard.

UNIT- IV: ADHOC AND SENSOR NETWORKS (11 Periods)

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

UNIT- V: WIRELESS MANS AND PANS (11 Periods)

Wireless MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards.

Total Periods: 55

TEXT BOOKS:

1. William Stallings, "*Wireless Communications and networks*," Pearson Education, 2nd Edition, 2007.
2. Dharma Prakash Agrawal and Qing-An Zeng, *"Introduction to Wireless and Mobile Systems*," Thomson India Edition, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Vijay. K. Garg, *"Wireless Communication and Networking*," Morgan Kaufmann Publishers, 2007.
2. Kaveth Pahlavan, Prashant Krishnamurthy, "*Principles of Wireless Networks*," Pearson Education Asia, 2002.
3. Gary. S. Rogers and John Edwards, "*An Introduction to Wireless Technology*," Pearson Education, 2007.

MCA – IV Semester

(16MC40111) **BUSINESS INTELLIGENCE**

(Professional Elective – II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

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

COURSE DESCRIPTION: Decision support and business intelligence**;** Framework of computerized decision support and business intelligence; DSS classifications; DSS components; Mathematical models for decision support; BPM methodologies; BPM technologies; BPM applications; Artificial intelligence; Fuzzy logic; Fuzzy inference systems; Natural Language Processing and Artificial Intelligence.

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

CO1. Demonstrate knowledge on:

- Big data technologies, Data Mining (DM), Knowledge Management, Expert Systems, Natural Language Processing and Artificial Intelligence, banking, finance and insurance.
- Data mining techniques.
- Frameworks of computerized decision support system and Business Intelligence.

CO2. Analyze the scenarios like customer choices and preferences for an organization using predictive analytics.

CO3. Design and develop a DSS with the dimensions like Communications-driven and group, Data-driven, Document-driven, Knowledge-driven, Model-driven.

CO4. Develop solutions for the problems in data warehouse by analyzing a BI maturity model to identify critical attributes and mapping operational data to data warehouse.

CO5. Apply modern techniques like variable identification, predictive analytics of Mathematical models for identification and environmental analysis of the problem.

DETAILED SYLLABUS:

UNIT – I: DECISION SUPPORT AND BUSINESS INTELLIGENCE (12 Periods)

Decision support systems and Business Intelligence: Introduction, Changing business environments and computerized decision support, Managerial Decision making, Computerized support for decision making, An early framework for computerized decision support, the concept of decision support systems, A framework for business intelligence.

Computerized Decision Support: Introduction and definitions, Models, Phases of decision-making process, Decision-making Phases.

UNIT–II: DECISION SUPPORT SYSTEMS CONCEPTS, METHODOLOGIES, AND TECHNOLOGIES (10 Periods)

Decision support system configurations, Decision support system description, Decision support system characteristics and capabilities, Decision support system classifications, components of Decision support system.

Modeling and Analysis: Management support systems modeling, Structure of mathematical models for decision support, Certainty, uncertainty and risk.

UNIT -III: DATA MINING FOR BUSINESS INTELLIGENCE

(11 Periods)

Data mining concepts and applications, Data mining applications, Data mining process, data mining methods, Data mining software tools.

Text and web mining: Text mining concepts and definitions, Natural language processing, Text mining applications, text mining process, Text mining tools, web mining overview.

UNIT – IV: BUSINESS PERFORMANCE MANAGEMENT AND KNOWLEDGE MANAGEMENT (10 Periods)

Business performance management: Business Performance Management (BPM) overview**,** Performance measurement, BPM methodologies, BPM Technologies and Applications, Performance dashboards and scorecards.

Knowledge Management: Introduction to Knowledge Management, Organizational learning and transformation, Knowledge management activities, Approaches to knowledge Management, Information technology in knowledge management.

UNIT – V: INTELLIGENT SYSTEMS (12 Periods)

Concepts and definitions of artificial intelligence, expert systems, Applications of Expert systems, Structure of Expert systems, Knowledge Engineering**,** Machine Learning techniques, case-based reasoning, Genetic algorithms and Developing GA applications, Fuzzy logic and Fuzzy inference systems, Support vector machines.

Total periods: 55

TEXT BOOK:

1. Efraim Turban, E. Aronson, Teng - Peng Liang, and Ramesh Sharda, "*Decision Support and Business Intelligence Systems*," Pearson Education, 9th Edition, 2009.

REFERENCE BOOK:

1. David Loshin, "*Business Intelligence*," Morgan Kaufmann Publishers, 2003.

MCA – IV Semester

(16MC4HS31) SOFT SKILLS LAB

(Professional Elective – II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "English Language Lab".

COURSE DESCRIPTION: Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

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

CO1. Acquire knowledge on:

- Goal Setting
- Creative Thinking
- Leadership Skills and
- Team Work

CO2. Analyse the functional knowledge on

- Body Language
- Interpersonal Skills and
- Stress Management

CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.

CO4. Function effectively as an individual and as a member in diverse teams.

CO5. Communicate effectively in public speaking in formal and informal situations.

LIST OF EXERCISES:

1. Body Language
2. Assertiveness
3. Goal Setting
4. Creative Thinking
5. Interpersonal Skills
6. Team Work
7. Conflict Management
8. Etiquette
9. Report Writing
10. Resume Writing
11. Group Discussions
12. Interviewing Skills

Total Lab Slots: 10

REFERENCE BOOKS:

1. R. C. Sharma & Krishna Mohan, "*Business Correspondence and Report Writing*," Tata McGraw-Hill Publishing Company Limited, Third Edition, New Delhi, 2012.
2. Gopalswamy Ramesh and Mahadevan Ramesh, "*The Ace of Soft Skills*," Pearson, Noida, 2010.
3. Jeff Butterfeild, "*Soft Skills for Everyone*," Cengage learning, Delhi, 2011.
4. Barun K. Mitra, "*Personality Development and Soft Skills*," Oxford University Press, Noida, 2012.

SUGGESTED SOFTWARE:

1. ETNL Language Lab Software Version 4.0
2. GEMS – Globarena E- Mentoring System
3. Speech Solutions.
4. English Pronunciation Dictionary by Daniel Jones.
5. Learning to Speak English 8.1, The Learning Company – 4 CDs.

6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
8. Dorling Kindersley Series of Grammar, Punctuation, Composition etc.
9. Language in Use 1, 2 and 3.
10. Cambridge Advanced Learner's Dictionary - 3rd Edition.
11. Centronix – Phonetics.
12. Let's Talk English, Regional Institute of English South India.
13. Ultimate English Tutor.

MCA IV-SEMESTER
(16MC40131) BIG DATA ANALYTICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A Course on "Big Data Analytics".

COURSE DESCRIPTION: Installation of Hadoop; Perform analytics on Weather sensors application; Analysis of reports in R and HIVE Tool.

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

CO1. Demonstrate knowledge on:

- Map Reduce Framework
- R programming

CO2. Analyze Structured, unstructured and semi-structured types of data to perform data analytics.

CO3. Design and develop Map Reduce programs on Hadoop platform for weather sensor data.

CO4. Solve complex problems in Big Data by adopting appropriate techniques to provide insights to facebook datasets.

CO5. Apply modern tools such as HIVE and R to perform analytics in a user friendly environment.

CO6. Communicate effectively in implementing social network data sets for analysis using R tool with respect to visualization of hidden patterns.

CO7. Asses the Weather sensors applications with respect to local or global climatic conditions.

CO8. Demonstrate knowledge as an individual to manage OLA dataset on R and HIVE to handle diverse data.

LIST OF EXERCISES:

1. Setting up and Installing Hadoop to handle Big data.
2. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux.

   After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
3. Implement the following file management tasks in Hadoop:

   a) Adding files and directories

   b) Retrieving files

   c) Deleting files

   • Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
6. Implement Matrix Multiplication with Hadoop Map Reduce
7. Perform setting up and Installing R studio.
8. Implement R scripts to perform sorting and grouping of data.
9. Implement R scripts to perform joining, projection, and filtering of data.
10. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
11. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.

REFERENCE BOOKS:

1. Tom White, "*Hadoop: The Definitive Guide,*" Oreilly and Yahoo press, 3rd Edition, 2012.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, and Marcia Kaufman, "*Big Data for Dummies*," John Wiley & Sons, Inc., 2013.
3. Frank J. Ohlhorst, "*Big Data Analytics: Turning Big Data into Big Money*", Wiley Publication, December 2012.

MCA IV-Semester

(16MC40132) LINUX AND WEB PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on “Linux Programming” and “Web Programming”.

COURSE DESCRIPTION: HTML, Java Script**,** XML and Shell Script; Web Application Development using Servlets, Java Server Pages, PHP and JDBC; Tomcat Server and XAMP Server for Deploying Web Applications.

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

CO1. Demonstrate Knowledge on:

- Client side scripting
- AJAX programming and Application Servers
- HTML, DHTML**,** Java Script and XML

CO2. Analyze 2-tier, 3-tier and MVC architectures for web application development.

CO3. Design and develop web Applications using Dynamic HTML with Java Script, XML technology.

CO4. Investigate and solve complex problems using Server-side technologies like servlets, JDBC technologies and adapt Tomcat Server and XAMPP Server for deployment.

CO5. Use JSP and PHP to implement E-Commerce applications that has potential insights.

CO6. Communicate effectively in implementing web application programs using HTML, JAVA script and AJAX.

CO7. Develop societal, environmental and health related applications using Servlets, JSP and PHP.

CO8. Work with diverse teams using web technology frame-works towards developing quality software applications.

LIST OF EXERCISES:

1. a. Develop static pages of an online Book Store using HTML (the pages should resemble: www.amazon.com). The website should consist of the following pages.
   i. Home Page
   ii. Registration and User Login
   iii. Books Catalog
   b. Validate the Registration and User Login pages using JavaScript.
2. a. Programs using XML Schema, XSLT/XSL
   b. Program using DOM / SAX.
3. a. Filtering utilities
   b. Networking utilities
4. Write a basic servlet program that must display information like
   a. Request method used by the client and
   b. Current system date
5. a. Write a shell script that copies multiple files to a directory.
   b. 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)
6. a. Write a JSP program for finding total number of visitors in a site to keep track of active users at a given instance of time, and also display the user session starting time.
   b. Write a JSP program that creates a cookie on username which is send from html file and display the cookie value as a response. The cookie must be active based on the maximum active interval time.
7. a. Write a shell script that counts the number of lines and words present in a given file.

b. Write a shell script that displays the list of all files in the given directory.

8. Develop java program for following SQL operations using JDBC.
   i. Create
   ii. Insert
   iii. Update and
   iv. Delete

Consider the following schema:

Employee (EmpName, EmpNo Primary Key, Department, Salary)

9. a. Write a shell script to generate a multiplication table.
   b. Write a shell script to reverse the rows and columns of a matrix.
10. Generate a JSP page that will retrieve the Employee information from the database. The page should display the employee records in a tabular format.
11. Implement in C the following UNIX commands using system calls.
    i) cat ii) ls iii) mv
12. a. Write a PHP program to demonstrate GET and POST method of passing the data between pages.
    b. Write a PHP program to demonstrate Array, Key-pair values.
    c. Write a PHP program to read and write the Data from the Database.
13. **Minor Project:** Design and develop an online library management system using Model View Controller (MVC) architecture.

REFERENCE BOOKS:

1. Kogent Learning Solutions Inc., "*Web Technologies Black Book",* Dreamtech Press, 2011.
2. Steven Holzner, *"The Complete Reference PHP"*, Tata McGraw-Hill Education Pvt. Ltd., 2007.

MCA – V Semester

(16MC50101) CLOUD COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: Courses on "Computer Networks" and "Operating Systems".

COURSE DESCRIPTION: Virtualization, Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security; Cloud Disaster Recovery; Working with Clouds; and Case Studies.

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

CO1. Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and Virtualization.

CO2. Analyze the issues in cloud computing Data, Network and Host security.

CO3. Apply API development skills in web applications for Cloud deployment.

CO4. Use research based knowledge to build cloud applications.

CO5. Use advanced programming languages to access cloud services.

CO6. Build cloud environment suitable for societal requirements.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTAL CLOUD COMPUTING (10 Periods)

Understanding Cloud Computing: Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges.

Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.

UNIT-II: CLOUD COMPUTING MECHANISMS AND ARCHITECTURE (11 Periods)

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.

Fundamental Cloud Architectures: Architecture - Workload Distribution, Resource Pooling, Dynamic Scalability, Elastic Resource Capacity, Service Load Balancing, Cloud Bursting, Elastic Disk Provisioning, Redundant Storage.

UNIT-III: CLOUD COMPUTING ADVANCED ARCHITECTURES (12 Periods)

Advanced Cloud Architectures: Architecture-Hypervisor Clustering, Load Balanced Virtual Server Instances, Non-Disruptive Service Relocation, Zero Downtime, Cloud Balancing, Resource Reservation, Dynamic Failure Detection and Recovery, Bare-Metal Provisioning, Rapid Provisioning, Storage Workload Management.

Specialized Cloud Architectures: Architecture - Direct I/O Access, Direct LUN Access, Dynamic Data Normalization, Elastic Network Capacity, Cross-Storage Device Vertical Tiering, Intra-Storage Device Vertical Data Tiering, Load Balanced Virtual Switches, Multipath Resource Access, Persistent Virtual Network Configuration, Redundant Physical Connection for Virtual Servers, Storage Maintenance Window.

UNIT-IV: CLOUD SECURITY AND DISASTER RECOVERY (11 Periods)

Cloud Security: Data security, Network security, Host security, Cloud Security Services and Cloud Security Possible Solutions.

Cloud Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management, Capacity Planning and Cloud Scale.

UNIT-V: CLOUD SERVICE MODELS AND CASE STUDIES (11 Periods)

Cloud Service Models: Software as a Service (SaaS)-Characteristics, Examples and Applications. Platform as a

Service (PaaS)- Characteristics, Examples and Applications. Infrastructure as a Service (IaaS)- Characteristics, Examples and Applications.

Case Studies: SaaS: Salesforce.com, Facebook.com; PaaS: Google App Engine, MS-Azure and IBM Bluemix; IaaS: Amazon EC2, Amazon S3 and Netflix.

Total Periods: 55

TEXT BOOKS:

1. Thomas Erl and RicardoPuttini **"***Cloud Computing- Concepts, Technology & Architecture,"* Pearson Publication, 2013.
2. George Reese "Cloud Application Architectures", O'Reilly Publications, 2009.

REFERENCE BOOKS:

1. Barrie Sosinsky, *"Cloud Computing Bible",* Wiley India Pvt. Ltd, 2011.
2. Rajkumar Buyya, James Broberg and Andrzej Goscinski, *"Cloud computing principles and paradigms*", John Wiley and Sons, 2011.
3. John W. Rittinghouse, James F. Ransome, *"Cloud Computing implementation, Management and Security*", CRC Press, Taylor and Francis group, 2010.

MCA V-Semester

(16MC50102) MOBILE APPLICATION DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Computer Networks", "Web Programming" and "Database Management systems"

COURSE DESCRIPTION:

J2ME concepts; J2ME Architecture and Development Environment; Commands, Items and Event Processing; Low level and High Level Displays; e Applications by using Wireless Tool Kit and Connecting with SQL Data Bases.

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

CO1. Demonstrate knowledge on J2ME and Wireless Technology.

CO2. Analyze the commands, items and event processing in MIDlet Programming.

CO3. Design and develop the applications for Mobile Devices.

CO4. Solve the High level and Low level Display problems in Mobiles Screens and Canvas.

CO5. Select appropriate tool like wireless tool kit-MIDlet programming to develop Mobile Applications.

CO6. Create security alerts in mobiles for betterment of individual and society.

DETAILED SYLLABUS:

UNIT -I: J2ME OVERVIEW (11 periods)

Introduction to J2ME: Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices.

Small Computing Technology: Wireless Technology, Radio Data Networks, Microwave Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants.

J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MIDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MIDlets in a MIDlet Suite, J2ME Wireless Toolkit.

UNIT II: J2ME PRACTICES, PATTERNS, EVENTS AND SCREENS (11 periods)

J2ME Practices and Patterns: The Reality of Working in a J2ME World, Best Practices. **Commands, Items, and Event Processing:** J2ME User Interfaces, Display Class, the Palm OS Emulator, Command Class, Item Class, Exception Handling.

High-Level Display-Screens*:* Screen Class, Alert Class, Form Class, Item Class, List Class, Text Box Class, Ticker Class.

UNIT III: CANVAS AND RECORD MANAGEMENT SYSTEM (11 periods)

Low-Level Display-Canvas: The Canvas, User Interactions, Graphics, Clipping Regions, Animation.

Record Management System : Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener.

UNIT IV: J2ME DATABASE CONCEPTS AND JDBC OBJECTS (11 periods)

J2ME Database Concepts: Data, Databases, database schema, the art of indexing.

JDBC Objects: Database Connection, statement Objects, Result set, Transaction Processing, Metadata, Data Types, Exceptions.

UNIT V: EMBEDDED SQL AND GENERIC CONNECTION FRAMEWORK (11 periods)

JDBC and Embedded SQL: Model Programs, Tables, Indexing, Inserting Data into Tables, Selecting Data from a Table, Metadata, Updating Tables, Deleting Data form a Table, Joining

Tables, Calculating Data, Grouping and Ordering Data, Sub queries, VIEWs.

Generic Connection Framework: The Connection, Hypertext Transfer Protocol, Communication Management Using HTTP Commands, Session Management, Transmit as a Background Process.

Total Periods: *55*

TEXT BOOK:

1. James Keogh,"*J2ME: The Complete Reference*," Tata McGraw-Hill, 2003.

REFERENCE BOOKS:

1. Ray Rischpater, "*Beginning Java ME Platform*, " Apress, 2009.
2. Brian Fling, *"Mobile Design and Development: Practical concepts and techniques for creating mobile sites and web apps*," O'Reilly, 2009.

MCA V-SEMESTER

(16MC50103) SOFTWARE TESTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION:

Software Testing Basics: Goals, Defects, Terminology, Methodology, STLC in SDLC, Verification and Validation; Software Testing Techniques: White box testing, Black Box Testing, Regression testing; Test Management: Test Planning, Design and Specifications; Test Automation: Tool selection and Guidelines.

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

CO1. Demonstrate knowledge on:
- Software Testing Life Cycle.
- Testing Techniques.
- Test Management and Metrics.
- Regression Testing
- Test Automation

CO2. Analyze testing circumstances and their resultants in software development.

CO3. Design and develop the appropriate test cases in accordance to the software development model.

CO4. Use problem solving skills to control and monitor the testing process.

CO5. Apply testing tools for testing the software quality.

CO6. Apply contextual knowledge to perform testing on software related to societal applications.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO SOFTWARE TESTING

(10 periods)

Evolution of Software Testing, Software Testing—Myths and Facts, Goals of software testing, Psychology for software testing, Software testing definitions, Model for software testing, Effective software testing vs. exhaustive software testing, Effective testing is hard, Software testing as a process.

Terminology and Methodology: Software testing terminology, Software Testing Life Cycle (STLC), Software testing methodology.

UNIT-II: TESTING TECHNIQUES (12 periods)

White Box Testing

Need of white-box testing, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, Data flow testing, Mutation testing.

Black Box Testing

Boundary Value Analysis (BVA), Equivalence class testing, State table-based testing, Decision table-based testing, Cause-effect graphing based testing, Error guessing.

UNIT-III: SOFTWARE TEST MANAGEMENT AND METRICS

(11 periods)

Test Management: Test organization, Structure of testing group, Test planning, detailed test design, Test specifications.

Software Metrics: Definition of software metrics, Classification of software metrics, Size metrics.

Efficient Test Suit Management: Minimizing Test Suite and its Benefits, Test Suit Minimization problem, Test suite Prioritization, Types of Test case prioritization, Prioritization Techniques.

UNIT-IV: REGRESSION AND AUTOMATION (10 periods)

Static Testing: Inspections, Walkthroughs, Technical reviews.

Regression Testing: Progressive vs. regressive testing, Regression testing produces quality software, Regression

testability, Objectives of regression testing, Regression testing types, Defining regression test problem, Regression testing techniques.

Automation and Testing Tools: Need for automation, Categorization of testing tools, Selection of testing tools, Costs incurred in testing tools, Guidelines for automated testing, Overview of some commercial testing tools.

UNIT -V: TESTING FOR SPECIALIZED ENVIRONMENTS AND FUNCTIONAL TEST TOOL (12 Periods)

Testing for specialized Environment: Object-oriented Testing software and web-based software, challenges in testing for web-based software, testing of web-based systems.

Functional Test Tool: Overview of Functional test tool (UFT/ RFT/Selenium), Test Recording, Test Running, Synchronization of test cases, creating checkpoints, testing with parameterization.

Total Periods: 55

TEXT BOOK:

1. Naresh Chauhan, "Software Testing: Principles and Practices," Oxford University Press, 2nd Edition, 2016.

REFERENCE BOOKS:

1. Boris Beizer, "Software Testing Techniques," Dream Tech Press, 2nd Edition, 2004.
2. Dr. K. V. K. K. Prasad, "Software Testing Tools," Dreamtech, 2004.

MCA V – Semester

(16MC50104) SOFTWARE QUALITY ASSURANCE

(Professional Elective – III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on "Software Engineering".

COURSE DESCRIPTION: Software Quality; Software Quality Assurance; Project Life Cycle components; Software Quality Infrastructure; Development Methodologies; Procedures and Work Instructions; Standards, Certificates and assessments.

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

CO1. Demonstrate knowledge on quality, architecture, metrics of software development.

CO2. Analyze software quality plan for a software project to include sections on change management, configuration management, defect elimination, validation and verification and measurement.

CO3. Design software quality plans for a software project and asses their capability to adopt quality standards.

CO4. Assess the quality of software product using software quality metrics.

CO5. Adapt Procedures and work instructions, Templates, Checklists and 3S development for software quality infrastructure.

CO6. Commit to ethics to apply ISO and IEEE standards in preparing the quality plan and documents.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO SOFTWARE QUALITY AND ARCHITECTURE (10 Periods)

Need for Software quality, Quality challenges, Software quality assurance (SQA) - Definition and objectives; Software quality factors, McCall's quality model, SQA system - an SQA architecture, Software Project life cycle Components; Pre project quality components - Development and quality plans.

UNIT II: SQA COMPONENTS AND PROJECT LIFE CYCLE (11 Periods)

Software Development methodologies, Quality assurance activities in the development process, Verification and Validation, Reviews, Software Testing, Software Testing implementations, Quality of software maintenance - Pre Maintenance of software quality components, Quality assurance tools; CASE tools for software quality, Software maintenance quality, Project Management.

UNIT III: SOFTWARE QUALITY INFRASTRUCTURE (11 Periods)

Procedures and work instructions , Templates , Checklists, 3S development , Staff training and certification, Corrective and preventive actions, Configuration management - Software change control, Configuration management audit; Documentation control - Storage and retrieval.

UNIT IV: SOFTWARE QUALITY MANAGEMENT AND METRICS (11 Periods)

Project progress control - Computerized tools, Software quality metrics - Objectives of quality measurement, Process metrics, Product metrics, Implementation, Limitations of software metrics; Cost of software quality - Classical quality cost model, extended model, Application of Cost model.

UNIT V: STANDARDS, CERTIFICATIONS AND ASSESSMENTS (12 Periods)

Quality management standards- ISO 9001 and ISO 9000-3, capability Maturity Models, CMM and CMMI assessment methodologies , Bootstrap methodology, SPICE Project; SQA

project process standards- IEEE standard 1012 and 1028; Organization of Quality Assurance - Department management responsibilities, Project management responsibilities; SQA units and other actors in SQA systems.

Total Periods: 55

TEXT BOOK:

1. Daniel Galin, "*Software Quality Assurance: From Theory to Implementation"*, Pearson Publication, 2004.

REFERENCES:

1. Alan C. Gillies, "*Software Quality: Theory and Management*", International Thomson Computer Press, 1997.
2. Mordechai Ben, Menachem "*Software Quality: Producing Practical Consistent Software*", International Thompson Computer Press, 1997.

MCA – V Semester

(16MC50105) **SEMANTIC WEB**

(Professional Elective – III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Web Programming" and "Computer Networks".

COURSE DESCRIPTION: Semantic web fundamentals; Semantic web technology; Ontology web language; Swoogle; Semantic web services.

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

CO1. Demonstrate knowledge on:

- Semantic web search
- RDF and SWOOGLE
- Semantic web services
- RDFS and OWL

CO2. Analyze layers of web architecture for describing web content.

CO3. Design semantic web search engine for capturing information on the current web

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO SEMANTIC WEB

(10 periods)

The world of the semantic web: WWW, Internet usage, Meta data, Search Engine for traditional web and Semantic Web, Web Page Markup Problem, "Common Vocabulary"- Problem, Query-Building Problem.

UNIT-II: SEMANTIC WEB TECHNOLOGY

(11 periods)

Resource Description Framework (RDF), Rules of RDF, Aggregation-Distributed information, core elements of RDFS,

Ontology and Taxonomy, Inference based on RDF schema, RDF relationship with DL, XML, and RDF tools.

UNIT-III: WEB ONTOLOGY LANGUAGE –OWL (11 periods)

Web Ontology Language (OWL), Define Classes: Localize Global Properties, Set Operators and Enumeration, Define properties; Ontology Matching and Distributed Information , OWL ontology Header, Camera Ontology in OWL, Three Faces of OWL, Validating OWL ontology.

UNIT-IV: SWOOGLE (12 periods)

Swoogle Architecture, FOAF, Semantic markup, Issues, prototype system, Design of Semantic web search engine, Discovery and indexation strategy, usage of prototype system, Prototype Search Engine Performance.

UNIT-V: SEMANTIC WEB SERVICES (11 periods)

Need for Semantic Web Services Semantic web services and applications, OWL-S: Upper ontology, Building blocks, Validating OWL-S document semantics, WSDL-S, OWL-S to UDDI mapping, Matchmaking Engines, Design of the search engine and implementations.

Total Periods: 55

TEXT BOOK:

1. Liyang Yu, *"Introduction to the Semantic Web and Semantic web services,"* Chapman and Hall/CRC, Taylor & Francis group, 2007.

REFERENCE BOOKS:

1. Johan Hjelm, *"Creating the Semantic Web with RDF,"* Wiley, 2001.
2. Grigoris Antoniou and Frank van Harmelen, *"A Semantic Web Primer",* MIT Press, 2004.

MCA – V Semester

(16MC50106) INFORMATION SECURITY

(Professional Elective – III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: cryptographic algorithms; Classical Encryption Techniques; Public key and Private key encryption; security models; Hash Algorithms; E-mail and IP Security; analysis of security principles in internet and system security; Intrusion Detection.

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

CO1. Demonstrate knowledge on

- Symmetric and Asymmetric Encryption Algorithms
- Key distribution and message Authentication
- Hash algorithms and digital signature techniques
- IP security and Web Security
- Intrusion Detection and Firewall configurations

CO2. Analyze appropriate Symmetric, Asymmetric Encryption algorithms and Hash Algorithms to provide Confidentiality and Authentication.

CO3. Design solutions to problems related to Public-Key Encryption, Digital signatures, Secure Hash Functions.

CO4. Identify efficient ciphers such as Gauss Cipher, Vigenere cipher, Rail Fence Cipher and cryptographic algorithms such as RSA, Diffie-Hellman cryptographic algorithms, Digital Signature standard for Hashing techniques to provide novel solutions for real-time application protocols like PGP, S/MIME, SSL, TLS and SET.

CO5. Use the Cryptographic Techniques - Vigenere cipher, Rail Fence Cipher to provide confidentiality, security Algorithms

and hashing techniques to enhance level of protection in area of digital communication.

CO6. Commit to ethics in authentication and access control methods to implement policies and mechanisms on business operations using Digital Signature Standards.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO SECURITY, CLASSIC ENCRYPTION TECHNIQUES (11 Periods)

Introduction: Introduction to Security - Security Trends, The OSI Security Architecture, Security Attacks, Security Services and Mechanisms. A model for Network security, Internet Standards and the Internet Society.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques – Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers and One – Time pad. Transposition Techniques.

Block Ciphers and the Data Encryption Standard: Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Multiple Encryption and Triple DES.

UNIT-II: CONFIDENTIALITY USING CONVENTIONAL ENCRYPTION TECHNIQUES (11 Periods)

Advanced Encryption Standard: The AES Cipher, Block Cipher Modes of Operation, Stream Ciphers and RC4, Placement of Encryption Function, Traffic Confidentiality, Key Distribution.

Public-Key Cryptography: Principles of Public-Key Cryptosystems, Public-Key Cryptography algorithms - The RSA Public-Key Encryption Algorithm, Diffie – Hellman Key Exchange, Key Management.

UNIT-III: MESSAGE AUTHENTICATION, HASH FUNCTIONS AND DIGITAL SIGNATURE STANDARD (12 Periods)

Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes.

Hash Functions: Hash Functions, Secure Hash Algorithm – SHA-512 Logic and Round Function, HMAC.

Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standard.

Authentication Applications: Kerberos, X.509 Authentication Service.

UNIT-IV: ELECTRONIC MAIL SECURITY AND IP SECURITY (9 Periods)

Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME.

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

UNIT-V: WEB SECURITY AND SYSTEM SECURITY (12 Periods)

Web Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

System Security: Intruders, Intrusion Detection systems, Viruses and Related Threats, Virus Countermeasures, Firewall Design Principles, Trusted Systems.

Case Study: To check the integrity of files in a system using any open source security algorithm.

Total Periods: 55

TEXT BOOK:

1. William Stallings, "*Cryptography and Network Security*", Pearson Education, 4th Edition, 2009.

REFERENCE BOOKS:

1. William Stallings, "*Network Security Essentials (Applications and Standards)*", Pearson Education, 3rd Edition, 2009.
2. Behrouz A. Forouzan, "*Cryptography and Network Security*", Tata McGraw-Hill, 2007.
3. Charlie Kaufman, Radia Perlman and Mike Speciner, "*Network Security - Private Communication in a Public World*", Pearson Education, 2nd Edition, 2005.
4. Michael E. Whitman, Herbert J. Mattord, "*Principles of Information Security*", Cengage Learning, 2008.

MCA V-SEMESTER

(16MC50107) ENTERPRISE RESOURCE PLANNING

(Professional Elective – III)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Database Management Systems and Management Information Systems."

COURSE DESCRIPTION: Concepts of ERP; Strategies of ERP Technology; Business models; ERP market.

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

CO1. Demonstrate knowledge on systematically planning mechanisms in an enterprise and identify all components in an ERP system and the relationships among the component.

CO2. Analyze ERP Technology Implementations and Modules to develop custom ERP Applications.

CO3. Design and develop an ERP system along with customization using appropriate modeling methods-Entity Relationship Modeling (ERM) and Event-Driven Process Chains (EPC).

CO4. Solve Complex ERP Risks and SAP Business Applications problems.

CO5. Select appropriate tool like SAP AG's ERP used in implementation of ERP system.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO ERP (11 Periods)

Introduction, Business Functions and Business Processes, Integrated Management Information, The Role of enterprise, Business Modeling, Integrated Data Model, Definition of ERP, Common ERP Myths, History of ERP, Reasons for the growth of ERP Market, The advantages of ERP, Risks of ERP: Process

Risks, Technological Risks, Implementation issues, Benefits of ERP.

UNIT – II: ERP AND TECHNOLOGY (11 Periods)

Business Process Re-engineering (BPR): Introduction, BPR-Different Phases, Product Life Cycle Management: Introduction, Product Design and Development, Product Data Management (PDM), Product Life Cycle Phases, Product Life Cycle Management (PLM), Supply chain Management (SCM): Evolution of SCM, Advantages of Supply chain Management, Customer Relationship Management (CRM):Function of CRM, Components of CRM, Uses of CRM, Features and Functions of CRM .

UNIT-III: ERP IMPLEMENTATION (11 Periods)

ERP Implementation Challenges, ERP Implementation (Transition) Strategies: Big bang, Phased, Parallel, Process Line, Hybrid, ERP Implementation Life Cycle: Objective of ERP Implementation, Different phases in ERP Implementation, Pre-implementation tasks: Importance of Preparation, before you Leap, Requirement Definition, Process Definition, ERP Post implementation Activities.

UNIT – IV: THE BUSINESS MODULES (11 Periods)

Finance (Fi), Manufacturing (Production), Human Resources (HR), Plant Maintenance (PM), Material Management (MM), Quality Management (QM), Marketing, Sales, Distribution and Services (SD).

UNIT-V: THE ERP MARKET (11 Periods)

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, SAP-AG: Company Profile, SAP Business Applications and Solutions, Oracle Corporation: Company Profile, Oracle Application Lines, PeopleSoft, JD Edwards.

Total Periods: 55

TEXT BOOK:

1. Alexis Leon, "*ERP (Demystified Hrs),"* Tata McGraw-Hill, 2nd Edition, 2008.

REFERENCE BOOK:

1. Ashim Singla, "*Enterprise Resource Planning Systems*," Cengage Learning, 2008.

MCA – V Semester

(16MC50108) MANAGEMENT INFORMATION SYSTEMS

(Professional Elective – IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Database Management System" and "Organizational Behavior and Human Resource Management".

COURSE DESCRIPTION: Methodologies of systems approach to organization; types of information systems; Management issues; Strategic and project planning for MIS; Designing an information system; Implementation of a system; Evaluation and maintenance; Weaknesses in system development; Soft spots in planning.

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

CO1. Demonstrate knowledge on:

- Meaning and role of MIS
- Types of information systems
- System design processes
- Decision making processes
- Techniques used in developing an information system.

CO2. Analyze the techniques of operations research, management science, mathematical tools, scientific approaches for decision rules.

CO3. Design and develop programmed decision system for Manufacturing Subsystem Inventory System Distribution Logistics System.

CO4. Solve complex problems in strategic and project planning, conceptual and detailed system design by using the techniques like breakdown structure, the network approach to defining task relationships and the integration of performance/cost/time for planning and control.

CO5. Apply tools like spreadsheets, system flowcharts to evaluate solutions for real-world business problems.

CO6. Aware of the ethical, social, and security issues of an information system.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO MIS (11 Periods)

The meaning and role of MIS: MIS, Systems approach, the systems view of business, MIS organization within the company.

Management, Organizational theory and the systems approach: Development of organizational theory, Management and organizational behavior, Management, Information, and the Systems approach.

UNIT-II: DECISION MAKING AND PROJECT PLANNING FOR MIS (11 Periods)

Information systems for decision making: Evolution of an information system, **Basic information systems-** Finance information system, Production / Operations System, Marketing information system, Personnel information system, other information systems.

IS Management Issues: Decision making and MIS, MIS as a technique for making programmed decisions, decision-assisting information systems.

Strategic and project planning for MIS: General business planning, appropriate MIS response, MIS planning: General, detail.

UNIT-III: CONCEPTUAL AND DETAILED SYSTEM DESIGN (13 Periods)

Conceptual system design: Problems, set system objectives, establish system constraints, determine information needs, determine information sources, develop alternative conceptual designs and select one, document the system concept, prepare the conceptual design report.

Detailed system design: Inform and involve the organization, aim of detailed design, project management of MIS detailed

design, identify dominant and trade-off criteria, define the subsystems, sketch the detailed operating subsystems and information flows, determine the degree of automation of each operation, Inputs, outputs and processing, Early system Testing, Software, Hardware and Tools, Propose an organization to operate the system, document the detailed design, revisit the manager-user.

UNIT-IV: IMPLEMENTATION, EVALUATION AND MAINTENANCE OF THE MIS (11 Periods)

Implementation, evaluation and maintenance of the MIS: Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files, test the system, cutover, document the system, evaluate the MIS, control and maintain the system.

UNIT-V: PITFALLS IN MIS DEVELOPMENT (9 Periods)

Pitfalls in MIS development: Fundamental weaknesses, soft spots in planning, design problems, implementation: the TAR PIT.

Case Study on International Medical Instruments to develop a management information system for the company.

Total Periods: 55

TEXT BOOK:

1. R. G. Murdick, J. E. Ross and J. R. Claggett, "*Information systems for Modern Management*," PHI, 3rd Edition, 2004.

REFERENCE BOOKS:

1. Laudon & Laudon and V. M. Prasad, "*Management Information Systems*," Pearson Education, 9th Edition, 2005.
2. Robert Schultheis and Mary Sumner, "*Management information Systems*," Prentice-Hall of India, 4th Edition, 2004.

MCA – V Semester

(16MC50109) **BIOINFORMATICS**

(Professional Elective – IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION: Bioinformatics; Biology and Information; DNA and RNA; biological databases; Sequence alignment and dynamic programming; database mining tools; usages of Bioinformatics.

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

CO1. Demonstrate knowledge on

- Biological database.
- Bioinformatics.
- DNA and RNA.
- Modern molecular biology

CO2. Analyze DNA and RNA Structure, Public Databases-NCBI and global and local sequence alignments on biological DBMS.

CO3. Design and implement

- Data retrieval.
- Data annotation.
- Database Connectivity

CO4. Investigate on sequence alignment function and retrieve structure and Evolutionary information using dynamic programming.

CO5. Select and apply techniques and data mining tools on biological data to perform Sequence similarity search using tools like BLAST and FASTA.

DETAILED SYLLABUS:

UNIT- I: BIOLOGY AND INFORMATION (11 periods)

Bioinformatics - Maturing Science, Genes to Proteins, Bioinformatics in the public domain; Computers in Biology and Medicine- Computational Tools- Limitations of Computational Tools; Virtual Doctor- Mapping the human Brain; Biological Macromolecules as Information Carriers.

UNIT- II: DNA and RNA (10 periods)

DNA and RNA Structure, DNA Cloning and Sequencing, Genes, Taxonomy and Evolution

Automated Procedure: DNA Sequencing, Method of Genome Sequencing Access from Databases-ENTREZ.

UNIT-III: BIOLOGICAL DATABASES (11 periods)

Biological Databases Organization: Database content and Management, Data submission, Growth of Public Databases, Data Retrieval, Data Annotation and Database Connectivity.

Public Databases: National Center for Biotechnology Information (NCBI).

UNIT-IV: SEQUENCE ALIGNMENT AND DYNAMIC PROGRAMMING (12 periods)

Alignment of Pairs of Sequence:

Introduction to sequence alignment, Definition of Sequence alignment, Sequence alignment Reveal function, Structure and Evolutionary information.

Dynamic Programming: Principal methods of Pair wise sequence alignment- Dot matrix method, Finding sequence Repeats, Finding Repeats of a Single sequence symbols, Dynamic programming methods for sequence alignment.

UNIT-V: DATABASE MINING TOOLS (11 periods)

Database Mining Tools: Sequence similarity search tools- BLAST and FASTA; Overview of Database sequence searching, Pattern Recognition tools, Multiple Alignment and Phylogenetic Tree Analysis.

Total Periods: 55

TEXT BOOKS:

1. Hooman H. Rashidi and Lukas K. Buehler, "*Bioinformatics Basics, Applications in Biological Science and Medicine*", CRC Press, Taylor & Francis Group, 2nd Edition, 2005.
2. David W.Mount "*Bioinformatics: Sequence and Genome Analysis*", Cold Spring Harbor Laboratory (CSHL) press, 2nd Edition, 2005.

REFERENCE BOOK:

1. C S V Murthy," *Bioinformatics*", Himalaya Publishing House, 2003.

MCA – V Semester

(16MC50110) **ETHICAL HACKING**

(Professional Elective – IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on "Computer networks".

COURSE DESCRIPTION: Network and Computer Attacks; Foot Printing and Social Engineering; Port Scanning; Enumeration; Desktop and Server Operating System vulnerabilities; Hacking Web Servers; Cryptography; Network Protection System; Hacking Wireless Network.

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

CO1. Demonstrate Knowledge on:

- Network and Computer attacks
- OS Vulnerabilities
- Hacking web servers, Hacking wireless network

CO2. Analyze system and network vulnerabilities.

CO3. Design security solutions for risks that arise from hacking.

CO4. Use appropriate ethical hacking technique to solve security problems.

CO5. Apply Contextual Knowledge to assess safety and legal issues in ethical hacking.

CO6. Inculcate use of ethical hacking practices while maintaining professional ethics.

DETAILED SYLLABUS:

UNIT-I: ETHICAL HACKING OVERVIEW, NETWORK AND COMPUTER ATTACKS (11 periods)

Ethical Hacking Overview: Ethical hacking, Certification programs for network security personnel, Hacker Vs Cracker.

Network and Computer Attacks: Malicious software, Protection against malware, Intruder attacks on networks and computers, addressing physical security.

UNIT-II: FOOTPRINTING AND SOCIAL ENGINEERING, PORT SCANNING (10 periods)

Footprinting and Social Engineering: Using web tools for footprinting, Conducting competitive intelligence, Using domain name system zone transfers, Introduction to social engineering.

Case Study: Social Engineering.

Port Scanning: Port scanning, Using port scanning tools, Conducting ping sweeps, Understanding scripting.

UNIT-III: ENUMERATION, OS VULNERABILITIES (11 periods)

Enumeration: Enumeration, Enumerating windows operating systems, Netware operating system and Unix operating system.

Desktop and Server OS Vulnerabilities: Windows OS vulnerabilities, Tools for identifying vulnerabilities in windows, Best practices for hardening windows systems, Linux OS vulnerabilities.

UNIT-IV: HACKING WEB SERVERS, HACKING WIRELESS NETWORK (12 periods)

Hacking Web Servers: Understanding web applications, Web application vulnerabilities, Tools for web attackers and Security testers.

Hacking Wireless Network: Understanding wireless technology, Wireless network standards, Authentication, War driving, Wireless hacking.

UNIT-V: CRYPTOGRAPHY, NETWORK PROTECTION SYSTEM (11 periods)

Cryptography: Understanding cryptography basics, Substitution and Transposition ciphers, DES, Cryptography attacks.

Network Protection System: Understanding routers, Firewalls, Intrusion detection and prevention systems, Honeypots.

Total Periods: 55

TEXT BOOK:

1. Michael T. Simpson, Kent Backman and James E. Corley, "*Hands-On Ethical Hacking and Network Defense***,**" Cengage Learning, 2013.

REFERENCE BOOKS:

1. Kimberly graves, *"CEH Official Certified Ethical Hacker Review Guide,"* Wiley Publications, 2007.
2. Michael Gregg, *"Certified ethical hacker (CEH) Cert guide,"* Pearson Education, 2014.

MCA V-Semester

(16MC50111) MULTIMEDIA AND RICH INTERNET APPLICATION DEVELOPMENT

(Professional Elective – IV)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Web Programming".

COURSE DESCRIPTION: Concepts of Multimedia; Multimedia authoring tools; Data representations; Fundamental concepts in Video and digital audio; Basic video compression techniques; Multimedia communication and retrieval; Development of rich internet applications with adobe flash.

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

CO1. Demonstrate Knowledge on multimedia, video compression techniques and adobe flash.

CO2. Analyze a variety of creative techniques like sequential, hierarchical search and MPEG in the visual design of online media.

CO3. Design and development of Multimedia Animations using Adobe Flash and Flex3

CO4. Create highly interactive, rich internet applications using multimedia technologies and authoring tools.

CO5. Evaluate the role and importance of critical experimentation and innovation in the multimedia development process as a professional practice.

DETAILED SYLLABUS:

UNIT- I: MULTIMEDIA AUTHORING AND DATA REPRESENTATIONS (10 periods)

Multimedia and hypermedia, World Wide Web, overview of multimedia software tools. Graphics and image data

representation graphics/image data types, file formats, Color in image and video: color science, color models in images, color models in video.

UNIT- II: FUNDAMENTAL CONCEPTS IN VIDEO AND DIGITAL AUDIO (11 periods)

Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio. Multimedia Data Compression: Lossless compression algorithms, Lossy compression algorithms, Image compression standards.

UNIT-III: BASIC VIDEO COMPRESSION TECHNIQUES (11 periods)

Introduction to video compression, video compression based on motion compensation, search for motion vectors, MPEG video coding I- MPEG-1 and 2, Basic Audio Compression Techniques: ADPCM in Speech Coding, G.726 ADPCM, Vocoders.

UNIT-IV: MULTIMEDIA COMMUNICATION AND RETRIEVAL (12 periods)

Basics of Computer and Multimedia Networks, Multiplexing Technologies, LAN and WAN, Access Networks. Multimedia Network Communications and Applications: Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-On- Demand (MOD).

UNIT-V: RICH INTERNET APPLICATIONS (RIAS) WITH ADOBE FLASH (11 periods)

Adobe Flash Introduction, Flash Movie Development, Learning Flash with Hands-on Examples, Publish your flash movie, creating special effects with Flash, Creating a website splash screen, action script. Rich Internet Applications (RIAs) with Flex3 Introduction, Flex Platform Overview, Creating a Simple user Interface.

Total Periods: 55

TEXT BOOKS:

1. Ze-Nian Li, and Mark S. Drew, "*Fundamentals of Multimedia*", Pearson Education, 2008.
2. Paul J Deitel and Harvey M Deitel, "*AJAX Rich Internet Applications, and Web Development for Programmers*", Deitel Developer Series, Pearson Education, 2009.

REFERENCE BOOKS:

1. Nigel Chapman, and jenny chapman, "*Digital Multimedia"*, Wiley-*Dreamtech, 2005*
2. Russel Chun, "*Flash CS3 Professional Advanced*", Pearson Education, 2007.

MCA – V Semester

(16MC50131) CLOUD COMPUTING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "Cloud Computing".

COURSE DESCRIPTION: Hands-on experience on creating virtual machines on Windows and Linux platforms; Development of service based web applications and their deployment and Mobile app development.

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

CO1. Demonstrate hands-on experience on Virtualization models and Cloud Environment.

CO2. Analyze the given experiment and relate to existing architectures.

CO3. Apply API development skills in web applications for cloud deployment.

CO4. Demonstrate independent problem solving skills in developing dynamic web applications.

CO5. Use advanced programming languages to access cloud services.

CO6. Demonstrate communication skills, both oral and written for preparing and presenting reports.

CO7. Build suitable cloud environment for societal requirements.

CO8. Work effectively as an individual and as a member in team for mini-project implementation.

LIST OF EXERCISES:

1. Create VM's with given set of configuration on Hyper-V Ubuntu 14LTs files with 2GB RAM and 200GB Hard Disk through Infrastructure Services (IaaS).

2. Create Virtualization on VMware Windows 7 OS with 4GB RAM and 500GB Hard Disk" through Infrastructure as a Service (IaaS).
3. Develop a simple web application for student details and operative using Salesforce.com in Cloud Platform under Software as Service (SaaS).
4. Develop a simple web application for personal Homepage, Attributes, Controllers, GUI, Visual Page, Forms, and Templates under Software as Service (SaaS).
5. Develop a web application for performing calculator operations be selecting relevant serviced. Deploy this application on Salesforce.com Cloud Platform under Software as Service (SaaS).
6. Develop a web application on IBM Bluemix Cloud Platform for executing application using Eclipse under Platform as a Service.
7. Create virtual machine instance with given set of configuration on Amazon web Services (AWS) under Infrastructure as a Service (IaaS).
8. Create virtual machine instance with set of configuration on Amazon S3 (Simple Storage Service) in Amazon Web Service (AWS) under Infrastructure as a Service (IaaS).
9. Develop a web application on IBM Bluemix Cloud Platform for implementing IoT application.
10. Develop a calculator web based application on MS-Azure Platform i.e. Platform as a Service (PaaS).
11. Develop a student home page web based application on MS-Azure Platform i.e. Platform as a Service (PaaS) Cloud.
12. Develop a mobile app on Google App Engine for uploading a resume into a website, collaborated with Drop box. The resume should be encrypted. (PaaS)
13. Develop a service call to run on Drop box resumes for picking the resumes of given skill set. (PaaS)

i. 6+ years of Exp in Java Development.

ii. 10 years of experience in Automation Testing.

iii. 15+ years of Managerial experience with technical background.

iv. 5-7 years of on-site experience in .NET support and programming.

REFERENCE BOOKS:

1. Barrie Sosinsky, *"Cloud Computing Bible*,**"** Wiley India Pvt Ltd, 2011.
2. Rajkumar Buyya, James Broberg and Andrzej Goscinski, **"***Cloud computing principles and paradigms,"* John Wiley and Sons, 2011.
3. Thomas Erl and RicardoPuttini *"Cloud Computing-Concepts, Technology & Architecture*,**"** Pearson, 2013.
4. John W. Rittinghouse, James F. Ransome, *"Cloud Computing implementation, Management and Security,***"** CRC Press, Taylor & Francis group, 2010.

MCA – V Semester

(16MC50132) **MINI PROJECT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	-	2

PREREQUISITES: All the courses of the program from I to IV semesters.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Implementation of the project work; Preparation of mini project reports and presentation.

COURSE OUTCOMES: Completion of the project work enables a successful student to demonstrate:

CO1. Knowledge on the project topic.

CO2. Analytical ability exercised in the project work.

CO3. Design skills applied on the project topic.

CO4. Ability to investigate and solve complex computing problems faced during the project work.

CO5. Ability to apply tools and techniques to complex computing activities with an understanding of limitations in the project work.

CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.

CO7. Understanding of the impact of the professional computing practices to provide solutions in environmental context and need for sustainable development experienced during the project work.

CO8. Ability to apply ethics and norms of the professional computing practice applied in the project work.

CO9. Ability to function effectively in a team is experienced during the mini project.

CO10. Ability to present views cogently and precisely on the project work.

CO11. Project management skills as applied in the project work.

CO12. Ability to engage in life-long leaning as experience during the project work.

MCA – V Semester

(16MC50133) **COMPREHENSIVE ASSESSMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables a successful student to demonstrate:

CO1. Knowledge in the courses of the program.

CO2. Analytical ability in the courses of the program.

CO3. Design skills in the courses of the program.

CO4. Ability to investigate and solve complex computing problems in the courses of the program.

CO5. Ability to apply tools and techniques to complex computing activities with an understanding of limitations in the courses of the program.

CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.

CO7. Understanding of the impact of the professional computing solutions in environmental context and need for sustainable development in the courses of the program.

CO8. Ability to apply ethics and norms of the professional computing practices in the courses of the program.

CO9. Ability to function effectively as an individual in the courses of the program.

CO10. Ability to present views cogently and precisely in the courses of the program.

CO11. Ability to engage in life-long leaning in the courses of the program.

MCA – VI Semester
(16MC60131) **SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES: Completion of the seminar work enables a successful student to demonstrate:

CO1. Knowledge on the seminar topic.

CO2. Analytical ability exercised during the seminar work.

CO3. Ability to investigate and solve complex computing problems faced during the seminar work.

CO4. Ability to apply techniques to complex computing activities with an understanding of limitations as applied in the seminar work.

CO5. Ability to function effectively as an individual as experienced during the seminar work.

CO6. Ability to present views cogently and precisely on the seminar topic.

CO7. Ability to engage in life-long leaning as experience during the seminar work.

MCA – VI Semester

(16MC60132) **PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: Completion of the project work enables a successful student to demonstrate:

CO1. Knowledge on the project topic.

CO2. Analytical ability exercised in the project work.

CO3. Design skills applied on the project topic.

CO4. Ability to investigate and solve complex computing problems faced during the project work.

CO5. Ability to apply tools and techniques to complex computing activities with an understanding of limitations in the project work.

CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.

CO7. Understanding of the impact of the professional computing practices to provide solutions in environmental context and need for sustainable development experienced during the project work.

CO8. Ability to apply ethics and norms of the professional computing practice applied in the project work.

CO9. Ability to function effectively as an individual as experienced during the project work.

CO10. Ability to present views cogently and precisely on the project work.

CO11. Project management skills as applied in the project work.

CO12. Ability to engage in life-long leaning as experience during the project work.

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

Sree Sainath Nagar, A.Rangampet, Near Tirupati - 517 102. A.P.

Salient Features of Prohibition of Ragging in Educational Institutions Act 26 of 1997

- Ragging within or outside the College is prohibited.
- Ragging means doing an act which causes or is likely to cause insult or annoyance or fear or apprehension or threat or intimidation or outrage of modesty or injury to a student

Nature of Ragging	Punishment
Teasing, Embarrassing and humiliating	Imprisonment up to 6 months or fine up to Rs. 1,000/- or Both
Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 year or fine up to Rs. 2,000/- or Both
Wrongfully restraining or confining or causing hurt	Imprisonment up to 2 years or fine up to Rs. 5,000/- or Both
Causing grievous hurt, Kidnapping or rape or committing unnatural offence	Imprisonment up to 5 years or fine up to Rs. 10,000/-
Causing death or abetting suicide	Imprisonment up to 10 years or fine up to Rs. 50,000/-

Note:

1. A student convicted of any of the above offences, will be expelled from the College.
2. A student imprisoned for more than six months for any of the above offences will not be admitted in any other College.
3. A student against whom there is prima facie evidence of ragging in any form will be suspended from the College immediately.
4. The full text of Act 26 of 1997 **and** UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009 **(Dated 17th June, 2009) are placed in the College library for reference.**