ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABI

FOR

M.C.A REGULAR THREE YEAR POST GRADUATE PROGRAM

(for the batches admitted from 2019-2020)

&

M.C.A LATERAL ENTRY PROGRAM

(for the batches admitted from 2020-2021)

CHOICE BASED CREDIT SYSTEM

SREE VIDYANIKETHAN ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUA, Ananthapuramu, Approved by AICTE, Programs Accredited by NBA, Accredited by NAAC with 'A' grade)

SREE SAINATH NAGAR, A. Rangampet -517102:: NEAR TIRUPATI (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 processes for the benefit of students and making the College a Centre of Excellence for Engineering and Technological studies.

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

V I S I O N

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

M I S S I O N

- 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)

After few years of completion of the Program, the graduates of MCA would be:

PEO1: Enrolled or completed higher education/research studies in the core and allied areas of computer science.

PEO2: Successful entrepreneurs and professionally excelled in diverse application skills in the core or allied area of computer science of societal importance.

PEO3: Professionals in industry, academia and organizations with ability to adapt to evolving technologies in the core and 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. (Computational Knowledge)

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

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.

(Design /Development of Solutions)

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.
(Conduct Investigations of Complex Computing Problems)

PO5. Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.(Modern Tool Usage)

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

PO7. Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.(Life-long Learning)

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.(Project management and finance)

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.

(Communication Efficacy)

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.(Societal and Environmental Concern)

PO11. Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.(Individual and Team Work)

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. (Innovation and Entrepreneurship

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of Program, MCA graduates will be able to:

PSO1: Design, implement and test applications for complex computing problems for desired specifications through modern tool usage, appropriate technologies and programming skills.

PSO2: Use managerial and domain Skills of Information Management to model an application's data requirements using domain specific modeling tools, Transaction & Query processing, Indexing & Searching techniques, and extract information for interpreting the datasets for Decision Making.

PSO3: Apply suitable techniques and algorithms to Integrate Operating System, Services, Network devices, Security mechanisms and Infrastructure to meet the requirements for the deployment of an application and to communicate on computer networks.

SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)

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

ACADEMIC REGULATIONS
(SVEC-19)

CHOICE BASED CREDIT SYSTEM (CBCS)

Master of Computer Applications (M.C.A) Regular Three Year
Post Graduate Degree Program
(For the batches admitted from the academic year 2019–20)
&
M.C.A (LATERAL ENTRY Scheme)
(For the batches admitted from the academic year 2020-2021)

For pursuing three year Post Graduate Degree Program in Master of Computer Applications (M.C.A) offered by Sree Vidyanikethan Engineering College under Autonomous status and hereinafter referred to as SVEC:

1. Applicability: All the rules specified herein, approved by the Academic Council, shall be in force and applicable to the students admitted from the academic year 2019-2020 onwards. Any reference to “College” in these rules and regulations stands for SVEC.

2. Extent: All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation. As and when a doubt arises, the interpretation of the Chairman, Academic Council shall be final and ratified by the 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 Regular Three Year Post Graduate Degree Program MCA :

3.1.1. Eligibility:

Admission to the regular three year Post Graduate Degree Program MCA 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 Andhra Pradesh Integrated Common Entrance Test (AP ICET), 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 Post Graduate Degree Program MCA as per the stipulations of A.P State Council of Higher Education (APSCHE), Government of Andhra Pradesh.

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

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

3.2. Admission into the second year of three year post graduate degree program MCA (Lateral Entry) applicable to students admitted from the academic year 2020-2021 onwards.

3.2.1. Eligibility:

A Candidate Seeking admission into the second year of three year post graduate degree program MCA (Lateral Entry) should:

(i) Hold a BCA degree; (or) B.Sc degree in Computer Science (or) B.Sc degree in Information Technology as one of the Subjects (or) as decided by the competent authority.

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

3.2.2. Admission Procedure:

10% of the sanctioned strength as lateral entry students or as stipulated by APSCHE and shall be filled by the Convener, APICET.

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 J.N.T.University Anantapur, Ananthapuramu. The three academic years will be divided into six semesters with two semesters per year. Each semester shall normally consists of 21 weeks (minimum of 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 as suggested by AICTE are followed. Provision is made for lateral entry admission of students into

Second Year of Post Graduate Degree Program MCA and they will be required to satisfy the conditions of admissions thereto prescribed by the JNTUA, Ananthapuramu and Government of Andhra Pradesh.

4.2. Maximum Duration:

The student shall complete all the passing requirements of the M.C.A Program within a maximum duration of SIX years for the 'regular' admitted and FOUR years for 'lateral entry' admitted; these durations are reckoned from the commencement of the semester to which the student is first admitted to the program.

5. Structure of the Program:

The Post Graduate Degree Program MCA shall consist of:

a) Humanities, Mathematics and Management Courses
b) Professional Core Courses
c) Professional Electives Courses
d) Open Elective Course (MOOC)
e) Seminar
f) Internship
g) Project Work

Course Category	Course Description	Number of Credits
HS– Humanities and Management	Includes courses related to Humanities and Management.	11
BS – Mathematics	Includes courses related to Mathematics Management.	08
PC– Professional Core	Includes core courses related to the program of study.	86
PE– Professional Elective	Includes Elective courses related to the program. The electives can be chosen based on the interest of the student to broaden the skills and knowledge.	16
OE-Open	Includes Open Elective courses aimed at unlimited	03

Elective(MOOC)	participation and open access Via the web to diversify their spectrum of knowledge. The open elective can be chosen with the recommendations of chairman BOS.	
Seminar	A course of study with discussion and report.	02
Internship	A course of study to undertake Internship in an industry related to the program of study.	02
Project Work	A course of study planned to undertake Application / Research oriented project.	12

Contact Periods: Depending on the complexity and volume of the course, the numbers of contact periods per week are assigned.

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

6.1. Theory Courses : One hour Lecture (L) per Week in a Semester = 01 Credit.

6.2. Practical Courses : One Practical hour (P) per Week in a Semester =0.5 Credit.

6.3. Tutorial : One hour Tutorial (T) per Week in a Semester = 01 Credit.

6.4. Open Elective (MOOC): 03 Credits

6.5. Other student activities like NCC, NSS, Sports, Study Tour, Guest Lecture etc. will carry 'NO' Credits.

6.6. For courses like Seminar/ Internship/ Project Work, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

6.7. The Three year curriculum of Post Graduate Degree Program MCA shall have total of 140 credits. However the curriculum for students admitted under lateral entry shall have a total of 91 credits.

7. Choice Based Credit System (CBCS):

7.1. Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

- Student centered learning
- Students to learn courses of their choice

- Interdisciplinary learning

A Student has a choice of registering for courses comprising program core, professional electives, open elective through MOOC course.

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. A regular admitted student shall register for all the courses prescribed in the curriculum in the I Semester of MCA program. The student shall enroll for the courses with the help of the student's Faculty Advisor (Mentor). The enrollment for the courses of the succeeding semester will commence 10 days prior to the last instructional day of the preceding semester and complete the registration process duly authorized by the Chairman, Board of studies of the department.

8.3. For Lateral Entry admitted students into Second year of Three year Post Graduate Degree Program MCA, each student on admission shall register for the courses prescribed in the curriculum in the III Semester of MCA program. The student shall enroll for the courses with the help of the student's Faculty Advisor (Mentor).

For the enrollment of courses in succeeding semesters, a student shall follow the course registration process as applicable for the regular admitted student.

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. Elective courses shall be offered by the department only if a minimum of 20 students register for that course.

9. Open Elective(MOOC):

OPEN ELECTIVE (MOOC) is an online course aimed at unlimited participation and open access via the web.

9.1. A Student is offered an Open Elective (MOOC), in the VI-Semester of MCA, and pursued through Massive Open Online Course (MOOC) platforms. The duration of the MOOC course shell be for a minimum period of 08 weeks.

9.2. The student shall confirm registration by enrolling the course within 10 days prior to the last instructional day of the V-Semester along with other courses.

9.3. The list of courses along with MOOC service providers shall be identified by the Chairman, BOS, and Head of the Department. The identified Open Elective (MOOC) courses are to be approved by the Chairman, Academic Council.

9.4. The HOD shall appoint one faculty member as mentor (one mentor for each course with minimum of 20 students and maximum of 60 students) during the V-Semester for each Open Elective Course (MOOC) identified.

9.5. There shall be only semester-end examination for open elective (MOOC) course. It shall be evaluated by the department through ONLINE for THREE HOUR duration with 50 multiple choice questions for 100 marks. The department shall prepare the Question Bank for Conducting the ONLINE Open Elective (MOOC) Examination.

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 two years either as two breaks of one year each or a single break of two years.

10.2. In case, a student wishes to extend the gap year for one more consecutive year, he shall be permitted with the prior approval of the Principal on the recommendations of the Head of the Department prior to the beginning of the semester in which he has taken break of study.

10.3. The student shall apply for break of study in advance, in any case, not later than the last date of the first assessment period in a semester. The gap year concept is introduced for start-up (or) incubation of an idea, National/International Internships, and Professional Volunteering. The application downloaded from the website and duly filled in by the student shall be submitted to the Principal through the Head of the department. A Committee shall be appointed by the Principal in this regard. Based on recommendations of the committee, Principal shall decide whether to permit the student to avail Gap Year or not.

10.4. 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 in the prescribed format through Head of the Department at the beginning of the re-admitted semester for registering additional/equivalent courses to comply with curriculum in-force.

10.5. The two years period of break of study shall not be counted for the maximum time of graduation (i.e., The maximum period of graduation is 8 years for Regular admitted students and 6 years for Lateral Entry admitted students availing Gap Year).

10.6. If a student has not reported to the college after completion of approved period of break of study, he is deemed to be detained in that semester. Such students are eligible for readmission into the semester when offered next.

11. Examination System: All components in the MCA program 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 10 questions each of 12 marks, taken two from each unit. Each unit will have internal choice and 5 questions shall be answered, one from each unit.
		40	Mid-term Examination of 2 hours duration (Internal evaluation)		Two mid-term examinations each for 40 marks are to be conducted. For a total of 40 marks, 80% of better one of the two and 20% of the other one are added and finalized. Mid-I: After first spell of instruction (I & II Units). Mid-II: After second spell of instruction (III, IV & V Units). The question paper shall be of descriptive type with 5 essay type questions each of 10 marks, out of which 3 are to be answered and evaluated for 30 marks. There will also be 5 short answer questions each of 2 marks, all are to be answered and evaluated for 10 marks.
2.	Laboratory	50	Semester-end Lab Examination for 3 hours duration (External evaluation)		The examination shall be conducted by the faculty member handling the laboratory (Examiner-2) and another faculty member (Examiner-1) appointed by the Chief Controller of examinations.
		50	30	Day-to-Day evaluation for Performance in laboratory experiments and Record.	Two laboratory examinations, which include Day-to-Day evaluation and Practical test, each for 50 marks are to be evaluated by the faculty members handling the laboratory. For a total of 50 marks 80% of better one of the two and 20% of the other one are added and finalized.

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
				(Internal evaluation)	Laboratory Examination-I: Shall be conducted just before FIRST mid-term examinations. Laboratory Examination-II: Shall be conducted just before SECOND mid-term examinations.
			20	Practical test (Internal evaluation)	
3.	Seminar	100	Semester-end Examination		Seminar shall be evaluated at semester-end by the Seminar Evaluation Committee (SEC) as given in 11.2.1.
4.	Internship	100	Semester-end Examination		The semester-end evaluation shall be done by the Department Evaluation Committee (DEC) as given in 11.2.2.
5.	Open Elective (MOOC)	100	Semester-end Examination for 3 hours duration		The evaluation shall be done by the department through ONLINE with 50 multiple choice questions.
6.	Project Work	200	100	Internal Evaluation	Continuous evaluation shall be done by the Project Evaluation Committee (PEC) as given in 11.2.3.
			100	Semester-end Evaluation	Project Work Viva-Voce Examination shall be conducted by a Committee at the end of the semester as given in 11.2.3.

11.2. Seminar / Internship /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 by the Seminar Evaluation Committee (SEC), each consisting of concerned supervisor and two senior faculty members. The SEC will be constituted by the Principal on the recommendations of the Head of the Department.

11.2.2. Internship

A student shall undergo Internship in an Industry/ National Laboratories relevant to the program of study. This course is to be registered during IV semester, and taken up during the summer vacation for about FOUR weeks duration. The Internship shall be submitted in a Report form, and a presentation of the same shall be made before a Department Evaluation Committee (DEC). The DEC shall consist of Head of the Department, the concerned supervisor of Internship, and a Senior Faculty Member of the Department. The DEC is constituted by the Principal on the recommendations of the Head of the Department. There shall be no internal

marks for Internship. The Internship report shall be evaluated at the end of the V Semester.

11.2.3. 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 VI Semester. The Internal Evaluation shall be conducted by the Project Evaluation Committee (PEC), consisting of concerned supervisor and two senior faculty members on the basis of TWO project reviews conducted on the topic of the Project Work. The PEC is constituted by the Principal on the recommendations of the Head of the Department.

11.2.3.1. A student shall be allowed to submit the report on the recommendations of the PEC and then attend viva-voce examination of the Project Work. The Project Work Viva-Voce examination may be conducted once in three months for all the eligible candidates.

11.2.3.2. Student can initiate the Project Work only after obtaining the approval of Title of Project Work from PEC within TWO weeks from the commencement of VI Semester. In Project Work Review-I, a student has to present the title, objective, Problem Definition, Scope of Work, Literature Survey, analysis of the problem, implementation tools / methodologies, plan of action (in consultation with his Project Supervisor) and design of the problem to the PEC for approval within NINE weeks from the commencement of VI Semester. The Project Work Review-I will be evaluated by PEC for 100 Marks.

11.2.3.3. In Project Work Review-II, student has to present the implementation, Verification and Validation of Project Work along with the report to the PEC for approval within NINE Weeks after Project Work Review-I. The Project Work Review-II will be evaluated by PEC for 100 Marks.

For a total of 100 marks, 80% of better one of the two and 20% of the other one are added and finalized.

11.2.3.4. If a student wishes to change his supervisor or topic of the project work, he can do so with the approval of the PEC. However, the PEC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work is deemed to be

started from the date of change of Supervisor or change of topic as the case may be.

11.2.3.5. 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 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 for adjudication.

11.2.3.6. If the report of the examiner is favorable, Viva-Voce examination shall be conducted by a Committee consisting of the concerned Supervisor, Head of the Department and the examiner who adjudicated the dissertation. The Committee shall jointly evaluate the student's project work. If the report of the examiner is not favorable, the student should revise and resubmit the project report followed by Viva-Voce examination.

11.2.3.7. The student who fails 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.

11.3. Eligibility to appear for the Semester-End Examination(SEE):

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.

11.3.7. The attendance in Student Development Activities shall be considered for finalization of aggregate attendance.

11.3.8. For the calculation of a student attendance in any semester, the total number of classes conducted shall be counted as scheduled in the class-work time table.

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 the 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. Recounting /Revaluation/Personal Verification/ Challenging Evaluation:
Students shall be permitted to apply for Recounting /Revaluation/Personal Verification/ Challenging Evaluation of the Semester-end examination answer scripts within a stipulated period after payment of the prescribed fee. After completion of the process of Recounting /Revaluation/Personal Verification/ Challenging Evaluation, the 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 for Re-Registration of Theory Courses for improvement of Internal Marks:

12.1. The student should have completed all the course work and obtained examinations results for I to V semesters.

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

12.3. The candidate has to register for the chosen courses and fulfill the academic requirements (i.e. a student has to attend the classes regularly and appear for the mid-examinations and satisfy the attendance requirements to become eligible for appearing at the semester-end examinations).

12.4. 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.

12.5. A student availing the benefit for 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 stands cancelled.

13. Academic Requirements for promotion/ completion of Regular Post Graduate Degree Program MCA:

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion/ completion of regular Post Graduate Degree Program MCA.

For students admitted into Regular Post Graduate Degree Program MCA for the academic year 2019-2020:

13.1. A student shall be deemed to have satisfied the minimum academic requirements for each theory, laboratory course, 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 Internship, he should secure not less than 50% of marks in the semester-end examination.

13.2. A student shall register for all the 140 credits and earn all the 140 credits. Marks obtained in all the 140 credits shall be considered for the calculation of the DIVISION based on CGPA.

13.3. A student who fails to earn 140 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 admitted into Post Graduate Degree Program MCA (Lateral Entry) from the academic year 2020-2021:

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 Internship, he should secure not less than 50% of marks in the Semester-End Examination.

13.5. A student shall register for all the 91 credits and earn all the 91 credits. Marks obtained in all the 91 credits shall be considered for the calculation of the DIVISION based on CGPA.

13.6. A student who fails to earn 91 credits as indicated in the course structure within four academic years from the year of their admission shall forfeit his seat in Post Graduate Degree Program MCA 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 and a lateral entry student within four 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 Internship, 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 the semester-end regular examinations in a particular Semester.

15.3. Cumulative Grade Point Average (CGPA):

The CGPA shall be calculated for a candidate who passed all the courses in the semester-end examinations (including regular and supplementary) till that semester. The CGPA will be displayed in the grade sheet of the regular semester-end examinations and also in the consolidated grade sheet issued at the end of 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 the SGPA and CGPA, provided if he passed all the courses registered in the regular semester-end examinations.

17. Consolidated Grade Sheet: After successful completion of the entire Program of study, a Consolidated Grade Sheet indicating 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, Ananthapuramu on the recommendations of the Chairman, Academic Council, 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:

18.1.1. Registered and successfully completed all the components prescribed in the Program of study to which he is admitted.

18.1.2. Successfully acquired all the required credits as specified in the curriculum of post graduate degree program MCA within the stipulated time.

18.1.3. Obtained CGPA greater than or equal to 5.0 (Minimum requirement for declaring as passed).

18.1.4. Has NO DUES to the College, Hostel, and Library etc. and to any other amenities provided by the College.

18.1.5. 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 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.

19.4 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.

ANNEXURE-I

GUIDELINES FOR DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

Rule No.	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including labs and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for four consecutive semesters from class work and all Semester-end examinations, if his involvement is established. Otherwise, The candidate is debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out	Expulsion from the examination hall and cancellation of performance in that course and all the other

	the question paper during the examination or answer book or additional sheet, during or after the examination.	courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course only.
6.	Refuses to obey the orders of the Chief Controller of Examinations/Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the Controller of Examinations or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the Controller of Examinations, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. If the candidate physically assaults the invigilator/Controller of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.

Note: Whenever the performance of a student is cancelled in any course(s) due to Malpractice, he has to register for Semester-end Examinations in that course(s) consequently and has to fulfill all the norms required for the award of Degree.

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

(Affiliated to JNTUA, Ananthapuramu; Approved by AICTE)

SREE SAINATH NAGAR, TIRUPATI – 517 102

Master of Computer Applications (MCA)

SVEC-19: REGULATIONS

COURSE STRUCTURE

S. No	Course Code	Course Title	Contact hours per Week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total
MCA I- Semester										
1.	19MC1HS01	Financial and Management Accounting	4	-	-	4	4	40	60	100
2.	19MC10101	Computer Organization	4	-	-	4	4	40	60	100
3.	19MC10102	Mathematical Foundations of Computer Science	3	1	-	4	4	40	60	100
4.	19MC10103	Operating Systems	4	-	-	4	4	40	60	100
5.	19MC10104	Programming in C	4	-	-	4	4	40	60	100
6.	19MC1HS31	Communicative English Lab	-	-	3	3	1.5	50	50	100
7.	19MC10131	PC Software Lab	-	-	3	3	1.5	50	50	100
8.	19MC10132	Programming in C Lab	-	-	3	3	1.5	50	50	100
TOTAL			19	1	9	29	24.5	350	450	800

S. No	Course Code	Course Title	Contact hours per Week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total
MCA II- Semester										
1.	19MC2BS01	Probability and Statistics	3	1	-	4	4	40	60	100
2.	19MC20101	Database Management Systems	4	-	-	4	4	40	60	100
3.	19MC20102	Data Structures	3	1	-	4	4	40	60	100
4.	19MC20103	Object Oriented Programming through JAVA	3	1	-	4	4	40	60	100
5.	19MC20104	Software Engineering	4	-	-	4	4	40	60	100
6.	19MC20131	Database Management Systems Lab	-	-	3	3	1.5	50	50	100
7.	19MC20132	Data Structures Lab	-	-	3	3	1.5	50	50	100
8.	19MC20133	Object Oriented Programming through JAVA Lab	-	-	3	3	1.5	50	50	100
TOTAL			17	3	9	29	24.5	350	450	800

S. No	Course Code	Course Title	Contact hours per Week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total
MCA III- Semester										
1.	19MC3HS01	Organizational Behavior and Human Resource Management	4	-	-	4	4	40	60	100
2.	19MC3BS01	Operations Research	4	-	-	4	4	40	60	100
3.	19MC30101	Computer Networks	4	-	-	4	4	40	60	100
4.	19MC30102	Data Warehousing and Data Mining	4	-	-	4	4	40	60	100
5.	19MC30103	Python Programming	3	1	-	4	4	40	60	100
6.	19MC30131	Computer Networks Lab	-	-	3	3	1.5	50	50	100
7.	19MC30132	Data Warehousing and Data Mining Lab	-	-	3	3	1.5	50	50	100
8.	19MC30133	Python Programming Lab	-	-	3	3	1.5	50	50	100
TOTAL			19	1	9	29	24.5	350	450	800

S. No	Course Code	Course Title	Contact hours per Week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total
MCA IV- Semester										
1.	19MC40101	Object Oriented Analysis and Design	3	1	-	4	4	40	60	100
2.	19MC40102	LINUX Programming	3	1	-	4	4	40	60	100
3.	19MC40103	Web Programming	3	1	-	4	4	40	60	100
4.	Professional Elective – I		4	-	-	4	4	40	60	100
	19MC40104	Block Chain Technologies								
	19MC40105	Multimedia Application Development								
	19MC40106	Information Security								
	19MC40107	Software Project Management								
5.	Professional Elective – II		4	-	-	4	4	40	60	100
	19MC40108	Information Retrieval Systems								
	19MC40109	Artificial Intelligence								
	19MC40110	Cyber Security								
	19MC40111	Service Oriented Architecture								
6.	19MC4HS31	Soft Skills Lab	-	-	3	3	1.5	50	50	100
7.	19MC40131	Object Oriented Analysis and Design Lab	-	-	3	3	1.5	50	50	100
8.	19MC40132	LINUX and Web Programming Lab	-	-	3	3	1.5	50	50	100
		TOTAL	17	3	9	29	24.5	350	450	800

S. No	Course Code	Course Title	Contact hours per Week				C	Scheme of Examinations Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total
MCA V- Semester										
1.	19MC50101	Cloud Computing	4	-	-	4	4	40	60	100
2.	19MC50102	Data Analytics	4	-	-	4	4	40	60	100
3.	19MC50103	Mobile Application Development	4	-	-	4	4	40	60	100
4.	Professional Elective – III		4	-	-	4	4	40	60	100
	19MC50104	Data Visualization								
	19MC50105	.Net Technologies								
	19MC50106	Social Networks								
	19MC50107	Software Testing								
5.	Professional Elective – IV		4	-	-	4	4	40	60	100
	19MC50108	M-Commerce								
	19MC50109	Machine Learning								
	19MC50110	Internet of Things								
	19MC50111	Software Security								
6.	19MC50131	Cloud Computing Lab	-	-	3	3	1.5	50	50	100
7.	19MC50132	Data Analytics Lab	-	-	3	3	1.5	50	50	100
8.	19MC50133	Internship	-	-	-	-	2	-	100	100
TOTAL			20	-	6	26	25	300	500	800

S. No	Course Code	Course Title	Contact hours per Week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total
MCA VI- Semester										
1.	19MC6MOOC	Open Elective (MOOC)	-	-	-	-	3	-	100	100
2.	19MC60131	Seminar	-	-	-	-	2	-	100	100
3.	19MC60132	Project Work	-	-	-	-	12	100	100	200
TOTAL			-	-	-	-	17	100	300	400

TOTAL No. OF CREDITS : 140
TOTAL MARKS : 4400

MCA I-SEMESTER
(19MC1HS01) FINANCIAL AND MANAGEMENT ACCOUNTING (Theory)

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

PRE-REQUISITE: --

COURSE DESCRIPTION:

Accounting concepts, Principles of accountancy, Types of accounts, Journal, Ledger and Trial Balance; Trading account, Profit and Loss account, Balance sheet; Ratio analysis of investments; Analysis and determination of Break-Even-Points; Methods of capital budgeting.

COURSE OUTCOMES:

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

CO1: Demonstrate the concepts of Financial Accounting in preparation of Financial Statements.

CO2: Analyze and interpret the financial data using Ratio Analysis, Break-Even Analysis and Capital Budgeting Techniques for the decision-making of an Organization.

DETAILED SYLLABUS:

UNIT I - ACCOUNTING (11 periods)

Meaning and Definition, Objectives, Functions; Principles of accountancy: Concepts and Conventions, Double entry system of accounting, Types 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 - RATIO ANALYSIS (11 periods)

Capital Structure Ratios, Liquidity Ratios, Activity Ratios, Profitability Ratios (Simple Problems).

UNIT IV - BREAK-EVEN-ANALYSIS (11periods)

Concept of Break Even Point (BEP), Determination of BEP, Profit/Volume (P/V) ratio, Margin of safety (Simple Problems).

UNIT V - CAPITAL BUDGETING (11periods)

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

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Tyagi, C.L. and Madhu Tyagi, "Financial and Management Accounting," Atlantic Publishers and Distributors, New Delhi, 2016.

2. Madhu Vij, "Financial and Management Accounting," Anmol Publishers, New Delhi, 11th Edition, 2018.

REFERENCE BOOKS:

1. Pauline Weetman, "Financial and Management Accounting – An Introduction," Financial Times Prentice Hall, New Delhi, 4th Edition, 2014.

2. Jain, S.P. and Narang, K.L., "Financial Accounting," Kalyani Publishers, Ludhiana, 2nd Edition, 2016.

CO-PO Mapping Table

Course Outcomes	Program Outcomes					Program Outcomes		
	PO2	PO3	PO4	PO8	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	1	-	3	-	-
CO2	2	3	2	2	1	3	-	-
Average	2.5	2.5	2	1.5	1	3	-	-
Level of Correlation of the course	3	3	2	2	1	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA I- SEMESTER
(19MC10101) COMPUTER ORGANIZATION (Theory)

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

PRE-REQUISITE: --

COURSE DESCRIPTION:

Digital logic circuits and its components; Types of data in circuits; Design of control unit; Organizations of Central Processing Unit(CPU), instruction formats, addressing modes, types of instructions; Design of basic computer; Types of peripheral devices, modes of transfers, interrupts, memory and mappings.

COURSE OUTCOMES:

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

CO1: Design control unit using logic circuits and analyze central processing unit, instruction formats, addressing modes, types of instructions, modes of transfer for effective utilization of a system.

CO2: Apply Boolean algebra and map simplification techniques to design logic circuits and basic computer using memory mappings, techniques of I/O and instruction sets.

DETAILED SYLLABUS:

UNIT I - DIGITAL LOGIC CIRCUITS AND DIGITAL COMPONENTS (11 Periods)

Digital Logic Circuits: Digital Computers, Logic Gates, Boolean Algebra, Map simplification, Combinational Circuits, Flip-Flops, Sequential Circuits.

Digital Components: Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counters.

UNIT II - DATA REPRESENTATION (10 Periods)

Data Representation: Data Types, Complements, Fixed-Point Representation, Floating-Point Representation, Binary Codes, Error Detection Codes.

UNIT III - MICRO PROGRAMMED CONTROL AND CENTRAL PROCESSING UNIT (12 Periods)

Micro programmed Control: Control Memory, Address Sequencing, Micro-program Example, Design of Control Unit.

Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data transfer and manipulation, Program control, Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer (CISC).

UNIT IV - BASIC COMPUTER ORGANIZATION AND DESIGN (11 Periods)

Basic Computer Organization and Design: 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 - INPUT-OUTPUT ORGANIZATION AND MEMORY ORGANIZATION (11 Periods)

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. M. Morris Mano, "Computer System Architecture," Pearson Education, 3rd Edition, 2017.

REFERENCE BOOKS:

1. T. Rajaraman and V. Radhakrishnan, "Computer Organization and Architecture," Prentice Hall India Learning Private Limited, 2007.
2. William Stallings, "Computer Organization and Architecture," Pearson Education, 10th Edition, 2016.

ADDITIONAL LEARNING RESOURCES:

1. http://nptel.ac.in/courses/106106092
2. https://swayam.gov.in/course/3724-computer-architecture-and-organization.

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	-	3	-	-
CO2	3	2	3	3	3	-	-
Average	3	2.5	3	3	3	-	-
Level of correlation of the course	3	3	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA I- SEMESTER

(19MC10102) MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES:--

COURSE DESCRIPTION:

Mathematical logic and predicates; Functions and Relations; Algebraic Structures; Mathematical Reasoning; Recurrence Relations; Graphs and Trees.

COURSE OUTCOMES:

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

CO1: Identify the types of functions, formulate truth tables and solve normal forms using the knowledge of mathematical logic.

CO2: Analyze computer algorithms using the knowledge of graph theory and solve recurrence relations using discrete mathematics.

DETAILED SYLLABUS:

UNIT I - MATHEMATICAL LOGIC AND PREDICATES (10 Periods)

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

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

UNIT II - RELATIONS AND FUNCTIONS (8 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 (9 Periods)

Algebraic structures: Algebraic system problems 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 (9 Periods)

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

UNIT V - GRAPHS AND TREES (9 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: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Trembly J.P. and Manohar.P, "Discrete Mathematical Structures with applications to computer science," Tata McGraw Hill, New Delhi, 2017.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications," Tata McGraw Hill, New Delhi, 7th edition, 2017.

REFERENCE BOOKS:

1. J.L. Mott, A. Kandel, T.P Baker, "Discrete Mathematics for Computer Scientists and Mathematicians," Prentice Hall India, 2nd Edition 2015.
2. D. S. Chandrasekharaiah, "Mathematical Foundations of computer science (Discrete Structures)," Prism Books Pvt. Ltd, India, 2006.

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-
CO2	2	3	3	2	3	-	-
Average	2.5	3	2.5	2	3	-	-
Level of correlation of the course	3	3	3	2	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA I- SEMESTER
(19MC10103) OPERATING SYSTEMS (Theory)

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

PRE-REQUISITES:--

COURSE DESCRIPTION:

Operating Systems; Design and Implementation of Operating System Structure; Evaluation of Multithreading and CPU Scheduling Algorithms; Deadlocks and Synchronization Methods; Memory Management Techniques; Protection and Security.

COURSE OUTCOMES:

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

CO1: Identify and analyze Inter Process Communication (IPC), Process Synchronization, Memory Management, Process Scheduling, System protection and Security mechanisms and algorithms to solve problems of resource utilization.

CO2: Select and apply Deadlock handling mechanisms, Synchronization tools, Process Scheduling and Page Replacement algorithms to interpret and resolve optimal resource allocation problems.

DETAILED SYLLABUS:

UNIT I – SYSTEM STRUCTURES AND PROCESSES (10 periods)

System Structures: Operating System concepts, Role of Operating System, Operating System services, user operating system interface, Operating System Operations, Computing Environments, Operating system structure, System calls, types of system calls, System programs, Virtual machines.

Processes: Process concept, Process scheduling, Operations on processes, Inter process communication (IPC), Examples of IPC systems.

UNIT II- MULTITHREADED PROGRAMMING AND PROCESS SCHEDULING (12 periods)

Multithreaded Programming: Multithreaded models, Thread libraries, Threading Issues, Operating System Examples.

Process Scheduling: Basic Concepts, Type of Scheduler, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling.

UNIT III - PROCESS SYNCHRONIZATION AND DEADLOCKS (11 periods)

Process Synchronization: Concepts, 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: Concepts, Swapping, Contiguous memory allocation, Paging, Structure of page table, Segmentation.

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

UNIT V - SYSTEM 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

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts," John Wiley and Sons. Inc, 8th Edition, 2009.

REFERENCE BOOKS:

1. Achyut S. Godbole, "Operating Systems," Tata McGraw-Hill, 3rd Edition, 2017.
2. William Stallings, "Operating Systems: Internals and Design Principles," Pearson Education, 9th Edition, 2018.

ADDITIONAL LEARNING RESOURCES:

1. https://www.javatpoint.com/os-tutorial
2. https://www.os-book.com/OS10/slide-dir/index.html

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	3
CO2	3	3	2	2	3	-	-	3
Average	3	3	2	2	2.5	-	-	3
Level of correlation of the course	3	3	2	2	3	-	-	3

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA I- SEMESTER
(19MC10104) PROGRAMMING IN C (Theory)

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

PRE-REQUISITES: --

COURSE DESCRIPTION:

Problem Solving; Analysis and Efficiency of Algorithms; Problem solving approaches; Elements of C and Data types; Program design; Operators and Expressions; Data Input and Output ; Control Statements; Functions ; Arrays ; Strings ; Pointers; Structures and Unions and File handling Techniques; Preprocessor directives; Command line argument and its usage.

COURSE OUTCOMES:

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

CO1: Design algorithms using problem-solving approaches, C language Tokens, Input/output Formatting styles, Control statements, Dynamic memory allocation functions, parameter passing mechanism, command line arguments and functions to solve problems.

CO2: Select and apply control statements, 'C' language constructs, functions, pre- processor directives, sequential and random access of text/binary files for persistent data storage to solve computational problems.

DETAILED SYLLABUS:

UNIT I - PROBLEM SOLVING AND C LANGUAGE (11 Periods)

Problem Solving: Problem solving, Top-Down Design, Implementation of Algorithms, Program Verification, Efficiency of Algorithms, Analysis of Algorithms.

C Language: Identifiers, Types, Variables, Constants, Keywords, Expressions, Precedence and Associativity, Evaluating Expressions, Type Conversion, Structure of a C Program, Prepare and Run a C Program.

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 and Strings: Array concept, types of Arrays: One Dimensional, Two Dimensional and Multi-Dimensional Arrays; Strings, String Representation and initialization, Array Of Strings, String Manipulation Functions.

UNIT III -POINTERS AND FUNCTIONS (11 Periods)

Pointers: Pointers declaration and initialization, Arithmetic operations on Pointers, Array of Pointers, Pointer to an Arrays, Dynamic Memory Management Functions: malloc, calloc and realloc and free.

Functions: Declaring Functions, System Defined and User Defined Function; Local and Global Variables, 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: Structures: Structure declaration and initialization, Anonymous structure, Accessing Operators, Nested Structure, Array of structure, Array within a structure, Pointer to Structure, Passing Structures through Functions; Union: Declaration, Initialization and its usage; Typedef, Enumerated types and Bit field, Application of structure with pointers: Static and Dynamic linked list representation.

UNIT V- FILES AND PREPROCESSOR DIRECTIVES (11 Periods)

Files, types of files: Unformatted Data, Binary and Text file; Operations on File: open, close, read, write, seek, tell, 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

Topics for self-study are provided in the lesson plan.

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, 2006.

REFERENCE BOOKS:

1. Ajay Mittal, “Programming in C – A practical approach,” Pearson Education in south Asia, 2010.
2. Byron Gottfried, “Programming in C,” Schaum Outline Series, Tata MC Grawhill, 3rd Edition, 2017.
3. M.T. Somashekara, “Problem Solving with C,” PHI Learning Private Limited, New Delhi, 2009.

ADDITIONAL LEARNING RESOURCES

1. https://nptel.ac.in/courses/106104074/
2. https://swayam.gov.in/course/1388-introduction-to-programming-in-c

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	-	-
CO2	3	3	2	2	3	3	-	-
Average	3	3	2.5	2.5	3	3	-	-
Level of correlation of the course	3	3	3	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA I- SEMESTER
(19MC1HS31) COMMUNICATIVE ENGLISH LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITE: --

COURSE DESCRIPTION:

Just a Minute, Elocution/Impromptu; Phonetics; Vocabulary Building; Grammar; Giving Directions; Role Plays; Public Speaking; Letter Writing; Describing Objects; Reading Comprehension; Information Transfer; Listening Comprehension

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge of Phonetics by examining and applying sounds of English in Phonetic Transcription.

CO2: Analyze sentence structures by applying and demonstrating the skills of Vocabulary and Grammar.

CO3: Apply appropriate listening and reading skills by analyzing the context and demonstrate in Listening Comprehension and Reading Comprehension.

CO4: Function effectively as an individual and as a member in diverse teams examining and applying speaking skills in Just A Minute and Role Play.

CO5: Communicate effectively applying appropriate writing and speaking techniques by examining and demonstrating knowledge through Describing Objects, Information Transfer and Letter Writing.

*First ten exercises are mandatory among the following:

LIST OF EXERCISES:

1. Just a Minute, Elocution/Impromptu
   Steps to be followed, Useful tips, Do's & Don'ts, Preparation, Examples.

2. Phonetics
   Sounds of English, Consonants, Vowels, Speech Organs, Phonetic Transcription, Word Accent, Basics of Intonation.

3. Vocabulary Building
   Prefixes & Suffixes, Synonyms & Antonyms, Phrasal verbs, Idioms, One word substitutes, Words often confused.

4. Grammar
   Tenses, Nouns, Word order and error correction.

5. Giving Directions
   Useful phrases, Sample conversations, Exercises.

6. Role Plays
   Useful tips, Do's & Don'ts, Exercises, Role Plays for practice.

7. Public Speaking
   Stage presence, Voice control, Body Language, Rehearsals, Audience, Delivery, Do's & Don'ts, Project Submission.

8. Letter Writing
   Introduction, Objective, Formats, Types, Exercises.

9. Describing Objects
   Jargon, Useful Phrases,Do's & Don'ts, Exercises.

10. Reading Comprehension
   Introduction, Types of listening, Practice, Benefits of listening, Exercises.

11. Information Transfer
Tables, Pie-Charts, Venn Diagrams, Graphs, Flow Charts, Steps to be followed, Exercises.

12. Listening Comprehension
Introduction, Types of reading, Inferring, Critical analysis, Exercises.

TEXT BOOK:
1. Communicative English Lab Manual, SVEC, 2019.

REFERENCE BOOKS:
1. D. Sudha Rani, "A Manual for English Language Laboratories," Pearson, Noida, 2010.
2. Nira Kumar, "English Language Laboratories," PHI Learning Pvt. Ltd., New Delhi, 2011.

SUGGESTED SOFTWARES:
1. SoftX
2. Speech Solutions
3. English Pronunciation Dictionary by Daniel Jones
4. Learning to Speak English 8.1, The Learning Company – 4 CDs.
5. Mastering English: Grammar, Punctuation and Composition.
6. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
7. Dorling Kindersley Series of Grammar.
8. Language in Use 1, 2 and 3
9. Cambridge Advanced Learner's Dictionary - 3rd Edition
10. Centronix – Phonetics
11. Let's Talk English, Regional Institute of English South India.

ADDITIONAL LEARNING RESOURCES:
1. https://goo.gl/IjE45p: Amazon India site – with thousands of different product descriptions.
2. https://goo.gl/3ozeO6: 15 ways to calm your nerves before giving a presentation.
3. https://goo.gl/p20ttk: useful site for more language about introducing yourself.
4. https://goo.glsvMHZ1: information and advice about describing line graphs
5. https://goo.gl/NqFJuc: an informative presentation about using line graphs

CO-PO-PSO Mapping Table:

	PO1	PO2	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	3	-
CO2	2	3	-	-	-	-	3	-
CO3	3	-	3	-	-	-	3	-
CO4	-	-		3	-	-	-	-
CO5	-	-			3	-	-	-
Average	2.67	3	3	3	3	-	3	-
Level of correlation of the course	3	3	3	3	3	-	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA I-SEMESTER
(19MC10131) PC SOFTWARE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITE: --

COURSE DESCRIPTION:

Peripherals of a computer; Disassembling and Assembling the Personal Computer(PC); Linux file system, File handling utilities and Text processing utilities; Productivity tools including Word, Excel, Power Point, Access and publisher.

COURSE OUTCOMES:

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

CO1: Identify and analyze functional parts of PC, functionalities of Operating System and Information Management.

CO2: Apply Troubleshooting techniques for Assembling and Disassembling of PC and create professional word documents, Excel Spreadsheets and power point presentations for effective management of data.

CO3: Work independently and in a team to solve problems with effective communication.

LIST OF EXERCISES:

PC Hardware

1. a) Identification of peripherals of a computer, components in a CPU and its functions. Construct block diagram of CPU along with the configuration of each peripheral.
   b) Demonstration of disassembling and assembling the PC.
2. Demonstrate Operating System, Components of OS, Installation of Microsoft Windows XP Operating System.
3. Implement Basic MS-DOS Internal and External commands.
4. a) Introduction to Linux file system, perform File handling utilities and Text processing Utilities.
   b) Implement Shell Script to generate Fibonacci series.

MS Word and LaTeX

5. Implement Mail merge using MS-Word.
6. a) Design a visiting card using MS-Word.
   b) Create a project Certificate using LaTeX with the features like Formatting Fonts,

Text Effects, Borders and Colors.

MS Excel

7. The ABC Company shows the sales of different products for 5 years.
   Create Column Chart, Pie Chart and Bar chart for the following data:

YEAR	PRODUCT-1	PRODUCT-2	PRODUCT-3	PRODUCT-4
2014	1000	800	900	1000
2015	800	80	500	900
2016	1200	190	800	400
2017	400	200	300	1000
2018	1800	400	400	1200

MS Power Point

8. Design a power point presentation on Department of MCA which includes Animations, Design, Sound effects and Images.

MS Access

9. Create Employee and Department tables with the following fields:

   Employee table: enumber, ename, salary, deptno.

   Department table: deptno, dname, location.

   a) Create one-to-many relationship between above two tables.

   b) Create a table, form and generate a report with the following fields:

   Book_No, Book_Name, Author, Publisher and Price.

10. Design Form and generate Reports for the above employee table and implement the queries as per the given criteria:

    a) Retrieve employee details whose salary is above 30,000.

    b) Retrieve employee details whose deptno is 20.

11. Mini Project:

    Create a Web page with the given features: Home page, About us, Department, Contact page using Microsoft Publisher.

REFERENCE BOOKS:

1. ITL Education Solutions Limited, “Introduction to Information Technology,” Pearson Education India, 2nd Edition, 2012.

2. John Walkenbach, Herb Tyson, Michael R. Groh, Faithe Wempen, Lisa A. Bucki, "Microsoft Office 2010 Bible," John Wiley and Sons, 2010.

3. Peter Norton, "Introduction to Computers," Tata McGraw-Hill, New Delhi, 7th Edition, 2012.

4. Vikas Gupta, "Comdex Information Technology Course Tool Kit," WILEY Dreamtech, New Delhi, 10th Edition, 2009.

5. Sumitabha Das, "UNIX Concepts and Applications," Tata McGraw Hill, 4th Edition, 2017.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106106144/2
2. https://support.office.com/
3. https://www.latex-project.org/
4. https://www.pcworld.com/

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	3	-	-
CO2	3	3	3	2	2	-	-	3	-	-
CO3	-	-	-	-	-	3	3	3	-	-
Average	3	3	3	2	2	3	3	3	-	-
Level of correlation of the course	3	3	3	2	2	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA I - SEMESTER
(19MC10132) PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES: A Course on Programming in C

COURSE DESCRIPTION:
Program Design and Problem Solving using the C Programming Language; Control Structures; Functions; Arrays; Strings; Pointers; File I/O and the usage of Preprocessor Directives.

COURSE OUTCOMES:

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

CO1: Analyze and implement algorithms using C language Tokens, Input/output formatting styles and Programming components to solve problems.
CO2: Design and develop programs using Control Structures, Loops, Functions, Parameter Passing Mechanism, Command Line Arguments, File Handling to solve complex problems.

CO3: Work independently and in a team to solve problems with effective Communication.

LIST OF EXERCISES:

1. a) Design a flow chart and algorithm to add two numbers and find the largest number among two numbers.
   b) Design a flow chart and algorithm for printing prime numbers for a given range of 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.

3. Write a C language programs to implement non-recursive and recursive functions for the following task:
   a) Calculating Factorial of a given number
   b) GCD of a given numbers

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 whether a given string is a palindrome or not.

5. a) Write a C program to Insert a Substring into a given main String at a given Position.
   b) Write a C program to delete 'n' characters from a given position in a given string.

6. a) Write a C program to generate Electricity Bill for different categories of users based on different slabs in each category. (Using Nested if else Statement).
   b) Write a c program to evaluate the following expression using loops:
   $1+x^2/2!+x^4/4!+...$upto 5 terms.

7. 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 student name

8. a) Write a program to read in an array of names and sort them.
Note: Use functions and pointers.

   b) Write a program to read and display values of an integer array.
Note: Allocate space dynamically for the array using the malloc ().

9. a) Write a C program to copy contents of one file to another file.
   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.

10. 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
Note: The contents of the first file followed by those of the second are put in the third file).

Mini Project-1:
Create a list of Employees with the following fields and calculate minimum and maximum salaries of an employee: Emp_Id, Name: First name, Middle name, Last name, Address: Area, City, State, Age, Salary, Designation.

Mini Project-2: Estimation of Tax for an Employee, given the following conditions:
If income is less than 1,50,000 then no tax.
If taxable income is in the range 1,50,001 – 3,00,000 then charge 10% tax.
If taxable income is in the range 3,00,001 – 5,00,000 then charge 20% tax.
If taxable income is above 5,00,001 then charge 30% tax.

REFERENCE BOOKS:

1. Byron Gottfried, "Programming in C," SchaumOutline Series, Tata MC Grawhill, 3rd Edition, 2017.
2. M.T. Somashekara, "Problem Solving with C," PHI Learning Private Limited, New Delhi, 2009.

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	-	-	3	-	-
CO2	3	3	3	2	3	-	-	3	-	-
CO3	-	-	-	-	-	3	3	3	-	-
Average	3	3	2.5	2.5	2.5	3	3	3	-	-
Level of correlation of the course	3	3	3	3	3	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II – SEMESTER
(19MC2BS01) PROBABILITY AND STATISTICS (Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: --

COURSE DESCRIPTION:

Concepts of Probability; Probability distributions; Random variables; Sampling, Correlation and regression analysis; Statistical quality control; Testing of hypothesis.

COURSE OUTCOMES:

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

CO1: Analyze the correlation and regression, estimation and sampling distributions to identify and solve the problems for testing of hypothesis.

CO2: Apply the methods of probability and its distributions to solve the problems on random variables and formulate statistical quality control charts.

DETAILED SYLLABUS:

UNIT I- PROBABILITY AND RANDOM VARIABLES (9 Periods)

Probability: Random experiment, event, sample space, probability, Addition and Multiplication theorems of probability, conditional probability, Bayes' 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 and Mathematical expectation of a random variable.

UNIT II- PROBABILITY DISTRIBUTIONS AND STATISTICAL QUALITY CONTROL (10 Periods)

Probability Distributions: 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 (8 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 standard deviation, 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 of single proportion, Difference of two Proportions, Single mean, Difference of two Means.

UNIT V - TEST OF SIGNIFICANCE FOR SMALL SAMPLES (8 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: 45

Topics for self-study are provided in the lesson plan.

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, "Probability and Statistics," RIDGE Publications, 2nd Edition, 2006.

2. S.C. Gupta and V.K. Kapoor, "Fundamentals of Applied Statistics," S. Chand and Sons, New Delhi, 2010.

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	-	-
CO2	3	3	3	3	3	3	-	-
Average	3	3	3	3	3	3	-	-
Level of correlation of the course	3	3	3	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II-SEMESTER
(19MC20101) DATABASE MANAGEMENT SYSTEMS (Theory)

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

PRE-REQUISITES:
A course on Operating Systems.

COURSE DESCRIPTION:

Databases; Database Architecture and Database Design; 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:

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

CO1: Identify and analyze the problems arise due to redundancy, Data normalization techniques, Transaction processing approaches, Concurrency control and Recovery mechanisms for an optimal database application system.

CO2: Select and apply integrity constraints over relations, relational models, storage and indexing, hashing techniques for the construction of relational database systems.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION TO DATABASES, DATABASE ARCHITECTURE AND DATABASE DESIGN (11 Periods)

Databases and Database Users: Concepts, Characteristics of the Database approach, Actors on the Scene, Workers behind the scene, Advantages of the using the DBMS Approach.

Database System Concepts and Architecture: Data Models, Schemas and Instances, Three Schema architecture and Data Independence, Database Languages and Interfaces, Database system environment, Centralized and Client/Server Architectures for DBMS, Classification of Database Management Systems.

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: Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational.

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 CHECK constraints on tuples.

UNIT III - SQL, SCHEMA REFINEMENT AND NORMAL FORMS (12 Periods)

SQL: Form of Basic SQL Query, Examples of queries in SQL: Insert, Delete and Update statements; Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, NULL values, Comparison using Null values, Logical connectives: AND, OR , NOT; Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Views, Destroying /altering Tables and Views, Triggers and Active Databases.

Schema Refinement and Normal Forms: 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: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock Based Concurrency Control, Performance of Locking.

Concurrency Control: 2Phase Locking (2PL), Serializability and Recoverability, Lock Management, Lock Conversions.

Crash recovery: ARIES, the Log, Other Recovery related Structures, 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: 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

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, “Data base Management Systems,” Tata McGraw-Hill, 3rd Edition, 2013.
2. Ramez Elmasri, 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, 2011.
2. C.J.Date, “Introduction to Database Systems,” Pearson Education, 8th Edition, 2006.

ADDITIONAL LEARNING RESOURCES:

1. http://www.nptelvideos.in/2012/11/database-management-system.html
2. http://www.oracle.com/technetwork/tutorials/index.html
3. https://www.tutorialcup.com/dbms
4. https://www.javatpoint.com/oracle-tutorial

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	3	-
CO2	2	2	3	2	3	-	3	-
Average	2.5	2.5	3	2	2.5	-	3	-
Level of correlation of the course	3	3	3	2	3	-	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II-SEMESTER
(19MC20102) DATA STRUCTURES (Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITE:

A course on Programming in C.

COURSE DESCRIPTION:

Pseudo code; Abstract Data Type (ADT); Implementation of Stack; Queues; Linked Lists; Graphs; Tree ADT's and its Application; Sorting and Searching techniques; Binary Search Tree ADT, AVL- Height balanced trees and its Applications; Graphs; Shortest Path algorithms.

COURSE OUTCOMES:

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

CO1: Analyze abstract data types to implement stacks, queues, linked lists, trees and graphs to solve computational problems.

CO2: Select and apply sorting, searching, tree and graph traversal techniques for designing algorithms.

DETAILED SYLLABUS:

UNIT I - BASIC CONCEPTS AND STACKS (9 Periods)

Basic Concepts: Algorithm, Pseudo code, Abstract Data Type, Model for an Abstract Data Type, Abstract Data Type Implementations.

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

UNIT II - QUEUES AND GENERAL LINEAR LISTS (10 Periods)

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

General Linear Lists: 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 (8 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 (10 Periods)

Trees: Tree Concepts, Binary Trees, General Trees, Binary Tree Traversals.

Binary Search Trees: Concepts, BST Operations, Binary Search Tree Abstract Data Type, Binary Search Tree Applications, Threaded Trees.

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

UNIT V - GRAPHS (8 Periods)

Graphs: Concepts of graph, Operations, Graph Storage Structures, Graph Algorithms, Graph Abstract Data Type.

Application of Graph Structures: Dijkstra's Algorithm, Topological Sorting,

Minimum Spanning Tree: Kruskal's, Prim's Algorithm, Euler's and Hamiltonian Circuits.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Richard F.Gilberg and Behrouz A. Forouzan, "Data Structure: A Pseudo code Approach with C," Thomson India Edition, 2nd Edition, 2007.
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," Pearson Education, 2nd Edition, 2002.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran "Fundamentals of Computer Algorithms," Galgotia publications Pvt. ltd., New Delhi, 2010.
3. Jean-Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications," McGraw-Hill education, 2nd Edition, 2017.

ADDITIONAL LEARNING RESOURCES:

1. https://www.coursera.org › Browse › Computer Science › Algorithms
2. https://nptel.ac.in/courses/106102064
3. https://nptel.ac.in/courses/106103069
4. https://nptel.ac.in/courses/106102064/24
5. https://swayam.gov.in/course/235-data-structure

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	-	3	3	-
CO2	3	2	3	3	3	3	-
Average	3	2.5	3	3	3	3	-
Level of correlation of the course	3	3	3	3	3	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II-SEMESTER
(19MC20103) OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PREREQUISITES:

A course on Programming in C.

COURSE DESCRIPTION:

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; GUI applications by using AWT and Swings.

COURSE OUTCOMES:

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

CO1: Analyze Object Oriented Programming Principles and apply Exception Handling mechanisms and Multithreading for application development.

CO2: Design and develop complex user interface applications using AWT, Applets, Swings, Java Collection API and Java standard class libraries to solve complex problems.

DETAILED SYLLABUS:

UNIT I - JAVA PROGRAMMING (9 Periods)

Java Programming: Java Buzzwords, Object-Oriented Programming, Beginner Program, Data Type, Variables, Operators, Control Statements, Arrays; Classes: Class and Objects, Methods, Constructors, this Keyword, Garbage Collection, finalize Method; Overloading Methods, Access Control, static Keyword, final Keyword, Nested and Inner Classes, String Class.

UNIT II - INHERITANCE AND POLYMORPHISM (9 Periods)

Inheritance and Polymorphism: Inheritance, super, Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Final with Inheritance, Object Class.

Packages and Interfaces: Packages, Access Protection, Importing Packages; Interfaces: Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT III - UTILITY CLASSES AND INPUT/OUTPUT (9 Periods)

Utility Classes: Java Collections, Java Collection Frame Work, Collection Interfaces: Set, List, Queue, Map; Collection Classes: Hash Set, LinkedHashSet, SortedSet, Linked List, Stack, Array List, Vector, Hash table; Iteration over Collections: Iterator Interface, Comparator 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 (9 Periods)

Exception Handling: Exception Handling, Exception Types, Uncaught Exceptions, try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, User defined Exceptions, Exception Subclasses, Chained Exceptions.

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

UNIT V - EVENT HANDLING AND GUI PROGRAMMING WITH JAVA (9 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, Working with Frame Windows, Graphics and Color, AWT Controls: Labels, Buttons, Check Boxes, Lists, Scroll Bars, Text Field, Text Area, Layout Managers; Applets: Applet, Applet Architecture, Applet Skeleton, Applet Display Methods, Passing Parameters to Applets.

Swings: 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: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Herbert Schildt, "The Complete Reference Java," Tata McGraw-Hill, 10th Edition, 2017.

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 India, 10th Edition, 2016.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106105191
2. https://javabeginnerstutorial.com/core-java-tutorial
3. https://www.javatpoint.com/java-tutorial

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	-	-
CO2	3	3	2	3	3	3	-	-
Average	3	3	2.5	3	2.5	3	-	-
Level of correlation of the course	3	3	3	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II- SEMESTER
(19MC20104) SOFTWARE ENGINEERING (Theory)

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

PRE-REQUISITES: --

COURSE DESCRIPTION:

Nature of Software, Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice; Process Models, Agile Development, Understanding Requirements, Requirements Modeling; Design Concepts, Architectural And Component-Level Design; User Interface Design and Testing Strategies; Product Metrics, Risk Management And Quality Management.

COURSE OUTCOMES:

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

CO1: Identify and analyze software requirements, cost estimations, risk and quality management using the principles of software engineering, process models, design models, testing strategies, risk and management strategies to develop an application software.

CO2: Design software applications by applying design principles, user interface design rules, architectural design process, component-level design, agile development and metrics to develop a quality software product.

DETAILED SYLLABUS:

UNIT I - SOFTWARE AND SOFTWARE ENGINEERING, PROCESS MODELS AND AGILE DEVELOPMENT (11 Periods)

Software and Software Engineering: Nature of Software, Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice, Software Myths. Process Models: Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

Agile Development: Agility, Agility and Cost of Change, Agile Process, Extreme Programming, Other Agile Process Models.

UNIT II - UNDERSTANDING REQUIREMENTS AND REQUIREMENTS MODELING

(11 Periods)

Understanding Requirements: Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Developing Use Cases, Building the requirements model, Negotiating Requirements, Validating Requirements.

Requirements Modeling (Scenarios, Information and Analysis Classes): Requirements Analysis, Scenario-Based Modeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

Requirements Modeling (Flow, Behavior, Patterns and WEBAPPS): Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

UNIT III- DESIGN CONCEPTS, ARCHITECTURAL AND COMPONENT-LEVEL DESIGN

(11 Periods)

Design Concepts: Design with Context of Software Engineering, Design Process, Design Concepts, Design Model.

Architectural Design: Software Architecture, Architecture Genres, Architecture Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

Component-Level Design: Component, Designing Class-Based Components, Conducting Component-level Design, Component Level Design for WebApps, Designing Traditional Components, Component-Based Development.

UNIT IV- USER INTERFACE DESIGN AND TESTING STRATEGIES (11 Periods)

User Interface Design: Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation.

Testing Strategies: Strategic approach to software testing, test strategies for conventional software, Black-box and White-box testing, Validation testing, System testing, the art of debugging.

UNIT V - PRODUCT METRICS, RISK MANAGEMENT AND QUALITY MANAGEMENT

(11 Periods)

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

Metrics for Process and Products: Software measurement, metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Roger S. Pressman, "Software engineering A practitioner's Approach," Tata Mc-Graw Hill International Education, 7th Edition, 2016.
2. Ian Sommerville, "Software Engineering," Pearson, 9th Edition, 2011.

REFERENCE BOOKS:

1. Rajib Mall, "Fundamentals of Software Engineering," PHI, 5th Edition, 2018.
2. Hans Van Vliet, "Software Engineering: Principles and Practices," Willey Publications, 3rd Edition, 2010.

ADDITIONAL LEARNING RESOURCES:

https://nptel.ac.in/courses/106101061

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	-	-
CO2	3	2	3	2	1	3	-	-
Average	3	2.5	2.5	2	1.5	3	-	-
Level of correlation of the course	3	3	3	2	2	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II-SEMESTER
(19MC20131) DATABASE MANAGEMENT SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

A course on Database Management Systems

COURSE DESCRIPTION:

Creation of Data Definition commands; Implementation of Data Manipulation Commands; Table level and Column level Constraints; Construction of ER diagrams; Implementation of GROUP BY, HAVING, ORDER By clause; Creation and dropping of Views; Implementation of Nested Queries, Joins, Cursors, Functions, Procedures and Triggers.

COURSE OUTCOMES:

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

CO1: Design and implement ER-diagrams, Relational schemas, table and column level constraints, Cursors, Triggers, Functions and procedures to develop Relational Database applications.

CO2: Select and apply Nested Queries, Joins, Views, Group functions in updating and managing the databases to solve relational database problems using SQL and PL/SQL languages.

CO3: Work independently and in team to solve problems with effective Communication.

LIST OF EXERCISES:

1. Creation of DDL Commands

Consider the following relation schemas:

Client_master(Client_no, Name, Address1, Address2, City, State, Pincode, Bal_due)

Product_master(Product_no, Description, Unit_measure, Qty_on_hand, Record_lvl, Sell_price, Cost_price)

Salesman_master(Salesman_id, Name, Address1, Address2, City, State, Pincode, Sal_amt, Target_amt, Remarks)

Create the above tables, insert suitable tuples and perform the following DDL operations (CREATE, ALTER, DROP, RENAME, TRUNCATE) in Oracle SQL.

2. Creation of DML Commands

Using the table client master and product master answer the following Questionnaires.

i. Change the selling price of '1.44 floppy drive to Rs.1150.00

ii. Delete the record with client 0001 from the client master table.

iii. Change the city of client_no'0005' to Bombay.

iv. Change the bal_due of client_no '0001, to 1000.

v. Find the products whose selling price is more than 1500 and also find the new selling price as original selling price *15.

vi. Find out the clients who stay in a city whose second letter is a.

vii. Find out the name of all clients having 'a' as the second letter in their names.

viii. List the products in sorted order of their description.

ix. Count the total number of orders

x. Calculate the average price of all the products.

xi. Calculate the minimum price of products.

xii. Determine the maximum and minimum prices . Rename the tittle as 'max_price' and min_price respectively.

xiii. Count the number of products having price greater than or equal to 1500.

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) for the below tables.

Create table Salesman_master with the following columns and constraints-

Column name	Data type	Size	Attributes
Salesman_no	Varchar2	6	Primary key/first letter must start with 's'
Sal_name	Varchar2	20	Not null
Address	Varchar2	20	Not null
City	Varchar2	20	
State	Varchar2	20	
Pincode	Number	6	
Sal_amt	Number	8,2	Not null, cannot be 0
Tgt_to_get	Number	6,2	Not null, cannot be 0
Ytd_sales	Number	6,2	Not null, cannot be 0
Remarks	Varchar2	30	

Create table sales_order with following columns and constraints

Column name	Data type	Size	Attributes
S_order_no	Varchar2	6	Primary/first letter must be 0

S_order_date	Date	6	Primary key reference client_no of client_master table
Client_no	Varchar2	25	
Dely_add	Varchar2	6	
Salesman_no	Varchar2	6	Foreign key references salesman_no of salesman_master table
Dely_type	Char	1	Delivery part(P)/full(F), default F
Billed_yn	Char	1	
Dely_date	Date		Can not be lessthan s_order_date
Order_status	Varchar2	10	Values (‘In Process’; ’Fulfilled’; Back Order’; Canceled

Create table sales_order_details with following columns and constraints

Column name	Data type	Size	Attributes
S_order_no	Varchar2	6	Primary key/foreign key references s_order_no of sales_order
Product_no	Varchar2	6	Primary key/foreign key references product_no of product_master
Qty_order	Number	8	
Qty_disp	Number	8	
Product_rate	Number	10,2	

4. Construction of ER diagram

a) 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.

For the above problem create the following:

i. Analyze the date required

ii. Normalize the attributes

iii. Create the logical data model (ER diagram)

b) Construct an ER diagram for a Bank Database by considering the following set of requirements that is used to keep track of Customer.

i. Each bank has a unique name.

ii. Each branch has a number, name, address (number, street, city), and set of phones.

iii. Customer includes their name, set of address (P.O. Box, city, zip code, country), set of phones, and social security number.

iv. Accounts have numbers, types (e.g. saving, checking) and balance. Other branches might use the same designation for accounts. So to name an account uniquely, we need to give both the branch number to which this account belongs to and the account number.

v. Not all bank customers must own accounts and a customer may have at most 5 accounts in the bank.

vi. An account must have only one customer.

vii. A customer may have many accounts in different branches.

5. Group functions: Implement queries using Aggregate functions, GROUP BY, HAVING, ORDER By clause and Creation, dropping of Views for the above tables using SQL.

6. Subqueries: Implement queries using SUBQUERIES for the above tables using SQL.

7. Joins: Implement queries using JOINS and OUTER JOINS for the above tables using SQL.

PL/SQL PROGRAMS:

8. PL/SQL CURSOR program

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

Note: 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.

9. Triggers

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

10. Procedures and Functions

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

b) 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.

Mini Project 1: Consider the following schema for a Library Database:

BOOK(Book_id, Title, Publisher_Name, Pub_Year)

BOOK_AUTHORS(Book_id, Author_Name)

PUBLISHER(Name, Address, Phone)

BOOK_COPIES(Book_id, Branch_id, No-of_Copies)

BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date)

LIBRARY_BRANCH(Branch_id, Branch_Name, Address)

Implement the following SQL queries to:

a) Retrieve details of all books in the library–id, title, name of publisher, authors, number of copies in each branch, etc.
b) Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
c) Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
d) Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
e) Create a view of all books and its number of copies that are currently available in the Library.

Mini Project 2: Consider the schema for College Database:

STUDENT(USN, SName, Address, Phone, Gender)

SEMSEC(SSID, Sem, Sec)

CLASS(USN, SSID)

SUBJECT(Subcode, Title, Sem, Credits)

IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)]

Implement the following SQL queries to:

a) List all the student details studying in fourth semester 'C' section.
b) Compute the total number of male and female students in each semester and in each section.
c) Create a view of Test1 marks of student USN '1BI15CS101' in all subjects.
d) Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
e) Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students.

REFERENCE BOOKS:

1. Ivan Bayross, "SQL, PL/SQL The Programming Language of ORACLE," BPB Publications, 2010.
2. Dr. P. S. Deshpande, "SQL & PL/SQL for Oracle 10g Black Book," Dreamtech Press, 2011.
3. J. J. Patrick, "SQL Fundamentals," Pearson Education, 3rd Edition, 2008.
4. Rick F. Vander Lans, "Introduction to SQL," Addison-Wesley Professional, 4th Edition, 2006.

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	-	-	-	3	-
CO2	3	3	3	2	3	-	-	-	3	-
CO3	-	-	-	-	-	3	3	-	3	-
Average	3	3	2.5	2.5	2.5	3	3	-	3	-
Level of correlation of the course	3	3	3	3	3	3	3	-	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II-SEMESTER
(19MC20132) DATA STRUCTURES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITE:

Courses on Programming in C Lab and Data Structures.

COURSE DESCRIPTION:

Logical and physical representation of data, Abstract data types of Linear and Non-linear Data structures; Singly and Doubly Linked lists; Queues, Stacks and their applications; Binary tree, Binary Search Tree and AVL trees; Usage of graphs, Sorting and Searching techniques.

COURSE OUTCOMES:

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

CO1: Analyze and implement algorithms to perform the operations of stacks, queues, linked lists, trees and graphs using problem solving approaches to solve computational problems.

CO2: Develop programs using sorting and searching techniques, trees and graph traversal techniques to solve memory utilization problems.

CO3: Work independently and in a team to solve problems with effective Communication.

LIST OF EXERCISES:

1. Write a C program to implement Stack and Queues using pointers.
2. Write a C program to perform the following expression using Stack operations
   a) Convert infix expression into postfix expression
   b) Evaluate postfix expression
3. Write a C program to implement the following:
   a) Singly linked list
   b) Doubly Linked List
4. Write a C program to implement Towers of Hanoi using Stack.

5. Write a C program to implement the following sorting algorithms:

   i) Bubble sort ii) Selection sort iii) Quick sort iv) Merge sort

6. Write a C program that use both Recursive and non-recursive functions to perform the following searching operations:

   i) Linear search ii) Binary search

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

8. a) Write a C program to implement Recursive Tree traversal techniques.

   b) Write a C program to implement non-recursive Tree traversal techniques.

9. Write a C program to create AVL-tree and perform operations on it.

10. Write a C Program to implement Prim's Algorithm.

Mini Project-1:

Design, Develop and Implement a Program in C for the following operations on Graph of Cities

a. Create a Graph of N cities using Adjacency Matrix.

b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method.

Mini Project-2:

Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo.

Perform the following operations on Employee data:

a. Create a DLL of N Employees Data by using end insertion.
b. Display the status of DLL and count the number of nodes in it
c. Perform Insertion and Deletion at End of DLL
d. Perform Insertion and Deletion at Front of DLL
e. Demonstrate how this DLL can be used as Double Ended Queue
f. Exit

REFERENCE BOOKS:

1. P. Padmanabham, "C programming and Data Structures," B.S. Publications, 3rd Edition, 2008.
2. M.T. Somashekara, D. S. Guru, K. S. Manjunatha, "Problem Solving with C," PHI Learning, 2nd Edition, 2018.
3. E. Karthikeyan, "A Textbook on C: Fundamentals, Data Structures and Problem Solving," Prentice Hall of India Private Limited, 2008.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106102064
2. https://nptel.ac.in/courses/106103069
3. https://nptel.ac.in/courses/106102064/24
4. https://swayam.gov.in/course/235-data-structure

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	-	-	3	3	-
CO2	3	2	3	2	3	-	-	3	3	-
CO3	-	-	-	-	-	3	3	3	3	-
Average	3	2.5	2.5	2.5	2.5	3	3	3	3	-
Level of correlation of the course	3	3	3	3	3	3	3	3	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA II-SEMESTER
(19MC20133) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

Courses on Programming in C and Object-Oriented Programming through JAVA.

COURSE DESCRIPTION:

Object oriented concepts, recursive and non recursive function; String Tokenizer class; Method Overloading; String Operations; Creation of package and Interfaces; Handling predefined and User Defined Exceptions; Creation of Files and its Operations; Implementation of Multithreading; Creating and testing Applets; Event handling techniques, GUI applications using AWT and Swings.

COURSE OUTCOMES:

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

CO1: Apply object-oriented Programming Principles to solve problems using control Structures, strings, functions, packages, interfaces, types of file streams and I/O operations on files.

CO2: Design and develop applications and graphical user interface components using Applet, AWT, Swings components, multithreading techniques, Inter threaded communication and Process synchronization to solve problems.

CO3: Work independently and in team to solve problems with effective communication.

LIST OF EXERCISES:

1. a)Write a Java program that prints all real solutions to the quadratic equation

   $ax^2 + bx + c = 0$.

   b) Write a Java program to implement nth value of Fibonacci sequence using recursive and non recursive functions.

2. a) Write a Java program that prompts the user for an integer and print out all prime numbers up to the given 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 illustrate method overloading.

4. Write a Java program to implement the matrix ADT using a class:

   a) Addition and Subtraction of matrices. b) Multiplication of matrices.

5. Write a Java program to implement the following:

   a) Create and Access a package b) Interfaces.

6. Write a Java program to implement the following:

   a) Predefined exceptions b) User defined exceptions

7. 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 to display the number of characters, lines and words in a text file.

8. a) Write a Java program to implement multithreading techniques.

   b) Write a Java program to implement producer consumer problem using the concept of inter thread communication.

9. a)Write a java program to develop GUI components in java (AWT) with appropriate Event Handling techniques .

   b)Write a Java program to create user interface to perform integer divisions using Swings.

10. a) Develop an applet in Java to display a message.

    b) Develop an applet to perform factorial of a given value.

Mini Project

1. Use Eclipse IDE to implement calculator using AWT and SWINGS.
2. Application for Temperature Conversion

   a).Write a temperature conversion applet that converts from Fahrenheit to Celsius.

   Use the following formula for the conversion:

   Celsius = ((5/9)*(Ferenheit-32)).

   b).Enhance the temperature conversion applet by adding the Kelvin temperature scale.

   Use the following formula for the conversion between Kelvin and Celsius

   Kelvin = Celsius + 273.15

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. Harvey Dietel and Paul Dietel, “Java How to Program,” Pearson Education, 11th Edition, 2018.

ADDITIONAL LEARNING RESOURCES:

1. https://javabeginnerstutorial.com/core-java-tutorial/

2. https://www.javatpoint.com/java-tutorial

3. URL: http://docs.oracle.com/javase/

4. URL: http://www.ibm.com/developerworks/java/

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	3	-	-
CO2	2	2	3	2	3	-	-	3	-	-
CO3	-	-	-	-	-	3	3	3	-	-
Average	2.5	2.5	3	2.5	3	3	3	3	-	-
Level of correlation of the course	3	3	3	3	3	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC3HS01) ORGANIZATIONAL BEHAVIOR AND HUMAN RESOURCE MANAGEMENT (Theory)

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

PRE-REQUISITE: --

COURSE DESCRIPTION:

Concepts of Management and organization, Functions of Management, organizational and individual behavior, Formal and informal groups, Leadership, Functions and Objectives of HRM, Recruitment, Selection, Training.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge in managing behavior in an organization.

CO2: Develop requisite skills for effective and optimum utilization of Human resource management.

CO3: Develop 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 and Managerial Skill.

UNIT II- ORGANIZATIONAL AND INDIVIDUAL BEHAVIOR (11 periods)

Concept and meaning of Organizational Behavior (OB), Characteristics of OB, Individual Behavior and differences; Personality Theories: Trait Factor Theory and Holistic Theory.

UNIT III- GROUP DYNAMICS (11 periods)

Formal and informal groups–Group Dynamics; Leadership: Leadership Styles and Transformational Leadership Theory; Motivation: Attitude and beliefs, Maslow's Need Hierarchy – Management of Change.

UNIT IV- NATURE AND SCOPE OF HRM (11 periods)

Functions and Objectives of HRM, Nature and importance of HRP, Factors affecting HRP, Job Design and Analysis: Nature, Process of job analysis, Job Design, Factors affecting Job Design.

UNIT V- RECRUITMENT, SELECTION AND TRAINING (11 periods)

Recruitment: Nature, Scope and Importance of recruitment, recruitment process. Selection: Selection process, barriers to effective selection.

Training: Nature of training and development, Designing Training Programmes, Business Process Outsourcing (BPO).

Total Periods: 55

Topics for self-study are provided in the lesson plan.

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', 7th Edition, 2016.

REFERENCE BOOKS:

1. Fred Luthans, "Organizational behavior," McGraw Hill Higher Education, 12th Edition, 2016.
2. Shashi K. Gupta and Rosy Joshi, "Organizational Behavior," Kalyani Publications, 7th Edition, 2015.

CO-PO-PSO Mapping Table:

	PO1	PO2	PO10	PSO1	PSO2	PSO3
CO1	3	-	-	-	3	-
CO2	1	-	-	-	2	-
CO3	-	2	-	-	3	-
CO4	-			-	3	-
Average	-	2	2.5	-	2.75	-
Level of correlation of the course	2	2	3	-	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC3BS01) OPERATIONS RESEARCH (Theory)

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

PRE-REQUISITES:--

COURSE DESCRIPTION:

Optimization techniques and formulation of mathematical models in Linear Programming Problems, Transportation problem, Assignment problem, sequencing problem, Replacement problem, game theory, Inventory models, simulation models; Programme Evaluation and Review Technique/Critical Path Method (PERT/CPM) in project management.

COURSE OUTCOMES:

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

CO1: Understand concepts and optimization techniques of Operations Research (OR), models in OR, basics of PERT/CPM, rules of drawing network diagrams and Replacement policies.

CO2: Formulate and solve Linear Programming Problems (LPP) using graphical method, simplex method and Two-Phase simplex method.

CO3: Apply the optimization techniques to solve Transportation problem, Assignment problem, sequencing problem and Replacement problems.

CO4: Analyze and solve Inventory models, simulation models, PERT/CPM in project management and game theory.

DETAILED SYLLABUS:

UNIT I - OPERATIONS RESEARCH CONCEPTS AND LINEAR PROGRAMMING PROBLEMS (10 Periods)

Operation Research concepts: Concepts of OR, modeling in OR- Phases of OR study.

Linear Programming: Formulation of LPP, Graphical solution of LPP, Simplex method, Artificial variable technique - Two-Phase simplex 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 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, n-jobs through k-machines.

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

Topics for self-study are provided in the lesson plan.

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. J.K. Sharma, "Operations Research Theory and Applications," 4th Edition, Mc Millan India Ltd.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/112/106/112106134/
2. https://www.classcentral.com/course/swayam-introduction-to-operations-research-7902

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-
CO2	3	3	3	3	3	-	-
CO3	3	3	3	3	3	-	-
CO4	3	1	3	3	3	-	-
Average	3	2.5	3	3	3	-	-
Level of correlation of the course	3	2	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC30101) COMPUTER NETWORKS (Theory)

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

PRE-REQUISITES:--

COURSE DESCRIPTION:

Concepts of Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sub layer; The Network Layer; The Transport Layer; The Application Layer.

COURSE OUTCOMES:

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

CO1: Understand the concepts of Networking, reference models, guided and unguided media, importance of multiplexing, framing and routing policy, internetworking for data communication.

CO2: Apply error and flow control mechanisms and implement transport protocols for reliable data communication.

CO3: Analyze design issues of layers, medium access control protocols, techniques for quality of service, elements of transport and application Protocols ensuring the communication procedures.

CO4: Examine the layered and e-mail architectures, networking protocols and e-mail message formats in compliance with communication standards.

DETAILED SYLLABUS:

UNIT I- NETWORK CONCEPTS AND PHYSICAL LAYER (12 Periods)

Network Concepts: 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, 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.

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 (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; File Transfer Protocol (FTP).

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks,” Pearson Education, 5th Edition, 2015.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, "Data Communication and Networking," Tata McGraw-Hill, 4th Edition, 2010.
2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet," Pearson Education, 2nd Edition, 2012.

ADDITIONAL LEARNING RESOURCES:

1. https://www.cisco.com/c/en/us/solutions/small-business/resource-center/networking/networking-basics.html
2. https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf
3. https://www01.ibm.com/servers/resourcelink/svc0302a.nsf/pages/zVMV7R1sc246333/$file/kijl0_v7r1.pdf

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	3
CO2	2	2	3	3	1	-	-	3
CO3	3	3	3	3	2	-	-	3
CO4	-	2	1	-	2	-	-	2
Average	2.67	2.5	2.5	3	1.67	-	-	2.75
Level of correlation of the course	3	3	3	3	2	-	-	3

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC30102) DATA WAREHOUSING AND DATA MINING (Theory)

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

PRE-REQUISITE: --

A Course on Database Management Systems.

COURSE DESCRIPTION:

Data Warehouse Components; Building Data Warehouse; Data mining; Data Preprocessing; Association Rule Mining; Classification and Clustering techniques; Mining different types of data and its Applications.

COURSE OUTCOMES:

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

CO1: Design and develop data warehouse architecture, multidimensional schemas to perform business analysis using OLAP tools.

CO2: Select and apply association rule mining and classification algorithms to identify the frequent patterns and predictions effectively.

CO3: Apply Clustering algorithms on preprocessed datasets to find solutions of real time applications.

CO4: Analyze data preprocessing methods and data mining functionalities to mine text, multimedia, web and spatial data to discover knowledge.

DETAILED SYLLABUS:

UNIT I- DATA WAREHOUSE COMPONENTS (11 periods)

DATA WAREHOUSE COMPONENTS: Data Warehousing, Paradigm Shift, Business Problem Definition, operational and informational Data Stores, Data Warehouse Definition and Characteristics, A Multi-tiered Data Warehouse Architecture. Meta data, data marts, Data Warehouse Administration and Management, Benefits of Data Warehousing, Multidimensional Data Model-From tables and spread sheets to Data Cubes and Star, Snowflake and fact constellation Schemas, Role of Concept hierarchies, Measures, OLAP Operations, From online Analytical processing to Multidimensional Data Mining.

UNIT II- DATA MINING AND DATA PREPROCESSING (11 periods)

DATA MINING: Motivated 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.

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

UNIT III- ASSOCIATION RULE MINING AND CLASSIFICATION (12 periods)

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.

CLASSIFICATION: Classification, issues in classification and prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-based classification, Prediction: Linear Regression, Accuracy and Error measures, evaluating the accuracy of a classifier or predictor, bagging and boosting.

UNIT IV- CLUSTER ANALYSIS (11 periods)

CLUSTERING: 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, Density-Based Method-DBSCAN, Grid-Based Method-STING, Outlier Analysis.

UNIT V- MINING DIFFERENT TYPES OF DATA AND ITS APPLICATIONS

(10 periods)

MINING DIFFERENT TYPES OF DATA: Multimedia Data Mining, Text Mining - Text data analysis and informational retrieval, text mining approaches, Spatial Mining, 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

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, Elsevier, 3rd Edition, 2013.
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 and Sons Inc, 2nd Edition, 2007.

2. William H Inmon, “Building the Data Warehouse,” John Wiley and Sons Inc, 4th Edition, 2005.
3. Arun K Pujari, “Data Mining Techniques,” Universities Press (India) Pvt. Ltd, 2nd Edition, 2001.
4. G. K. Gupta, “Introduction to Data Mining with Case Studies,” Easter Economy Edition, Prentice Hall of India, 2006.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105174/
2. https://www.youtube.com/watch?v=vuc93jbO2Dw.
3. Data Mining - Concepts and Techniques (3rd edition) by Jiawei Han, Micheline Kamber and Jian Pei.
4. Tutorial on Data Mining Algorithms by Ian.
5. Mining of Massive Datasets by Anand Rajaraman and Jeff Ullman.
6. Open source tools for data mining:http://eprints.fri.uni-lj.si/893/1/2008-OpenSource DataMining.pdf

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	1	2	3	2	3	-	2	-
CO2	2	3	2	2	2	-	2	-
CO3	2	2	3	1	3	-	2	-
CO4	3	3	2	2	2	-	2	-
Average	2	2.5	2.5	1.75	2.5	-	2	-
Level of correlation of the course	2	3	3	2	3	-	2	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC30103) PYTHON PROGRAMMING (Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES:

Courses on Programming in C and Object Oriented Programming through JAVA.

COURSE DESCRIPTION:

Data types and Expressions; Control Statements; Strings; Text Files; Lists; Dictionaries; Functions; Objects and their use; Exception Handling; Design with Classes; Graphical user Interface.

COURSE OUTCOMES:

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

CO1: Understand the concepts of computer algorithms, problem solving, data types, control structures, expressions, lists, dictionaries, and tuples.

CO2: Design functions, modules, algorithms to solve recursive and non recursive problems.

CO3: Apply python programming constructs, Objects, strings and text files to implement Object Oriented Programming applications using Jupyter Notebook.

CO4: Implement towers of hanoi, Cigarette Use/ Lung cancer Correlation programs using Dictionaries, list, sets, tuples and functions.

CO5: Develop GUI based applications using tkinter, Python programming and object-oriented programming constructs to solve problems.

DETAILED SYLLABUS:

UNIT I- PYTHON PROGRAMMING CONCEPTS (10 Periods)

Computer science and problem solving, Computer and algorithms a perfect match, Computer software-Syntax, semantics and problem translation, the process of computational problem solving, The Python programming language, python development environment, basics of python, First program in Python-calculating the drake equation.

Data Types and Expressions: Literals, Variables and Identifiers, Operators, Expressions and Data types, program to calculate individual's age in seconds.

UNIT II- CONTROL STRUCTURES, LISTS, DICTIONARIES, TUPLES AND SETS (9 Periods)

Control Structures: Control structures, Boolean expressions, Selection control and Iterative control.

Lists: List structures, Lists in Python, Iterations over lists, Assigning and copying lists, List comprehensions.

Dictionaries, Tuples and Sets: Dictionary types, Implementation of Dictionary, Tuples, Sets, program to add and access elements from the dictionary.

UNIT III- DESIGN FUNCTIONS, MODULES, STRINGS AND TEXT FILES (8 Periods)

Functions: Program routines, Functions.

Recursion: Recursion-Recursive functions, Recursive problem solving, comparing Iteration with Recursion.

Case study 1: Towers of Hanoi using recursion (The Towers of Hanoi problem is based on a legend of unknown origin. According to the legend, there is a Vietnamese temple with a large room containing three pegs and 64 golden disks. Each disk has a hole in it so that it can be slipped onto any of the pegs. In addition, each disk is of different size. The 64 disks are moved by priests from one peg to another with the following conditions:

- Only one disk can be moved at a time.
- At no time can a larger disk be placed on top of a smaller one.)

Text Files: Using text files, String processing, Exception handling.

Module Design: modules, top-down design, Python modules.

Case study 2: Cigarette Use/ Lung cancer Correlation program. (Computing the correlation between Cigarette use/ Lung cancer)

UNIT IV- OBJECTS AND OBJECT ORIENTED PROGRAMMING (9 Periods)

Objects: Software objects, Turtle graphics- Creating a turtle graphics window, default turtle, Fundamental turtle attributes and behavior, Additional turtle attributes, creating multiple turtles.

Case Study: Horse Race Simulation problem (design, implement and test a program that simulates a horse race)

Object Oriented Programming: concepts of object oriented programming, Encapsulation, Inheritance and Polymorphism.

UNIT V- GRAPHICAL USER INTERFACE PROGRAMMING (9 Periods)

Tkinter Overview - tkinter pragmatics, Documentation, Extensions, structure; making widgets; tkinter coding alternatives, configuring widgets, adding buttons and callbacks-lambda, bound method, callable class object, Binding events; adding multiple widgets, Reusable GUI Components with classes, Dialogs, Entry, check buttons, Radio buttons, Scales and Menus.

Case Study: Create a Canvas with options, where user presses the button, it should draw a required shape on the canvas.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus," Wiley India Edition, 2016.
2. Mark Lutz, "Programming Python," O'Reilly Publications, 4th Edition, 2011.

REFERENCE BOOK:

1. Kenneth Lambert and B.L. Juneja, "Fundamentals of Python, Cengage Learning," 3rd Edition, 2012.

ADDITIONAL LEARNING RESOURCES:

1. https://docs.python.org/3/tutorial/
2. https://pythonprogramming.net/introduction-to-python-programming/

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	-	-
CO2	2	3	3	2	2	2	-	-
CO3	2	2	2	2	2	2	-	-
CO4	3	2	2	2	2	2	-	-
CO5	2	1	2	1	2	2	-	-
Average	2.4	2.2	2.4	2	2.2	2	-	-
Level of correlation of the course	2	2	2	2	2	2	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC30131) COMPUTER NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

A course on Computer Networks.

COURSE DESCRIPTION:

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

COURSE OUTCOMES:

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

CO1: Understand guided and unguided media, Network Configurations, Network topologies, and networking devices.

CO2: Apply network simulation tools to simulate routing algorithms, flow control techniques to provide solutions in compliance with networking standards.

CO3: Implement client-server Communication, RMI, TCP/IP sockets, transport layer protocols, Congestion control protocols, error detection and correction mechanisms following Networking Principles and Standards.

CO4: Function effectively as an individual to solve problems with effective Communication.

CO5: Write and present a technical report / document effectively.

LIST OF EXERCISES:

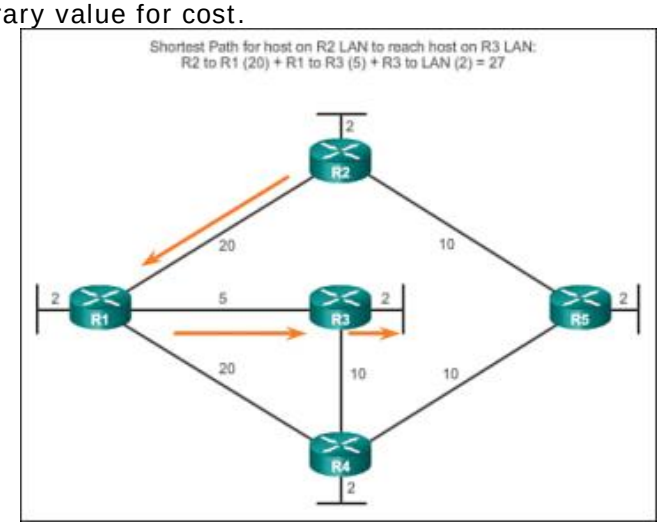
1. a) Study of different types of network cables and implement cross wired cable and straight through cable using clamping tool
   b) Study of network devices and network IP in detail.
   c) Construct a peer to peer topology.
2. a) Study of basic network commands and network configuration commands.
   i) ping ii) nslookup iii) netstat iv) ipconfig
   b) Create and configure a network topology with four PCs, two switches, and two routers.
3. Implement the Data Link layer error detecting method using CRC-CCITT (16-bits).
4. Implement the Data Link layer error detection and correction techniques using Hamming Code.
5. a) Introduction to Simulation tool (NS2/NS3).

b) Create a network with three nodes namely 0, 1 and 2. Establish a TCP connection between node 0 and node 2 such that node 0 will send TCP packets to node 2 via node 1.

6. a) Sliding window protocol supports reliable and efficient transmission between nodes and it also obtains higher throughput than that of stop-n-wait protocol. Simulate sliding window protocol normal operation and timeout operations.

b) Implement the congestion control using Leaky bucket algorithm.

7. Configure the following network to find shortest path between R2 LAN to R3 LAN using Distance Vector/Link State Routing Protocol. Each path is labeled with an arbitrary value for cost.



8. a) 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.

b) In a typical FTP session, the user is sitting in front of one host (the local host) and wants to transfer files to or from a remote host. Implement File Transfer Protocol to move files between local and remote file systems.

9. Implementation of Socket Programming using UDP.

10. a) Implement Remote Procedure Call (RPC) using Remote Command Execution.

b) Develop a code for Remote Method Invocation (RMI).

11. Write a program to simulate Address Resolution Protocol (ARP) and Reverse Address Resolution Protocols (RARP) used in Transport Layer.

12. 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 and David J. Wetherall, "Computer Networks," Pearson Education, 5th Edition, 2015.
2. Behrouz Forouzan, "Introduction to Data Communications and Networking", Tata McGrawHill, 5th Edition, 2015.

SOFTWARE/TOOLS TO BE USED:

1. Network simulator tools – NS2/NS3, Packet Tracer
2. Virtual Labs
3. (Computer Networks Lab – http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php)
4. Virtual Labs
5. (Advanced Network Technologies Virtual Lab - http://vlabs.iitkgp.ernet.in/ant/)

ADDITIONAL LEARNING RESOURCES:

1. https://www.itprc.com/packet-tracers/
2. https://www.nsnam.org/docs/tutorial/html/
3. http://www.tcpipguide.com/free/t_OSIReferenceModelLayers.htm

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	3
CO2	3	2	3	2	3	2	-	-	-	-	3
CO3	3	1	3	-	-	-	-	-	-	-	3
CO4	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	3	2	3	2	-	-	-	-	3
Level of correlation of the course	3	2	3	2	3	2	-	-	-	-	3

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC30132) DATA WAREHOUSING AND DATA MINING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

A course on Data Warehousing and Data Mining.

COURSE DESCRIPTION:

Hands-on experience on developing active/passive transformations; Creation of Datasets; Data Preprocessing; Association Rule Mining; Classification and Clustering techniques using Data Warehouse ETL and WEKA tool.

COURSE OUTCOMES:

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

CO1: Design and develop solutions for data acquisition process from one data source to other target data source using ETL tool.

CO2: Select and Apply Classification and Clustering algorithms on preprocessed datasets to infer predictions effectively.

CO3: Apply methods of data mining to assess and provide analytical solutions for societal issues.

CO4: Analyze preprocessing techniques, data mining algorithms and identify frequent itemsets using Apriori algorithm to extract interesting patterns from large databases using WEKA components.

CO5: Function effectively as an individual and as a member in a team to manage and implement data mining applications.

CO6: Write and present a technical report/ document effectively.

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. Create data sets in ARFF and CSV formats and load into the Weka Explorer.

7. Perform data preprocessing steps on weather nominal and student information data sets as follows:

a) Handle missing values for categorical and nominal values.

b) Select relevant attributes.

c) Apply normalization techniques

8. Generate strong Association rules by applying Apriori algorithm on preprocessed dataset with Min_Sup=60% and Min_Conf=80%.

9. i) Implement the Classification using Decision Tree algorithm on 'Weather' dataset. Draw the confusion matrix and report the model with accuracy.
(ii) Implement Bayesian Classification and analyze the results on 'iris' dataset.

10. Implement simple k-Means clustering algorithm on 'iris' dataset.

11. Use Experimenter WEKA component to rank the performance of j48, oneR, ID3, algorithms on 'weather nominal' dataset.

12. Verify ID3 classifier performance using Gain ration and Ranker method using a Knowledge flow WEKA component.

13. 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 and social media 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 and Sons Inc, 3rd Edition, 2013.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies," PHI, New Delhi, 3rd Edition, 2009.

ADDITIONAL LEARNING RESOURCES:

1. Tutorial on Data Mining Algorithms by Ian.
2. Mining of Massive Datasets by Anand Rajaraman and Jeff Ullman.
3. Open source tools for data mining: http://eprints.fri.uni-lj.si/893/1/2008-OpenSourceDataMining.pdf
4. https://www.kaggle.com/datasets

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	2	3	-	-	-	-	2	-
CO2	2	3	2	2	2	-	-	-	-	2	-
CO3	2	2	3	1	3	-	-	-	-	2	-
CO4	2	3	2	2	2	-	-	-	-	2	-
CO5	-	-	-	-	-	-	2	3	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-
Average	1.75	2.5	2.5	1.75	2.5	3	2	3	-	2	-
Level of correlation of the course	2	3	3	2	3	3	2	3	-	2	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA III- SEMESTER
(19MC30133) PYTHON PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

A course on Python Programming.

COURSE DESCRIPTION:

Hands on practice–Scripting using Python Programming constructs; Conditional statements; Loops; Text Files; Lists; Dictionaries; Strings; Functions; GUI.

COURSE OUTCOMES:

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

CO1: Understand python programming constructs, data types, control structures, expressions, objects, lists, dictionaries, tuples, strings and text files to solve computational problems.

CO2: Identify and analyse classes, functions, modules, algorithms to solve problems.

CO3: Design and develop GUI based application using tkinter, Python programming and object-oriented programming constructs for Horse Race Simulation application.

CO4: Select and Apply Python 3.7.5, Anaconda Navigator, Jupyter notebook to solve problems.

CO5: Work independently or in teams to solve problems with effective Communication.

CO6: Write and present a technical report/ document effectively.

LIST OF EXERCISES:

1. a. Write a python script to display a simple message.
   b. Write a python script to perform basic arithmetic operations on two values which are accepted from the user.
2. a. Write a python script to calculate the factorial of a given number.
   b. Write a python script to calculate sum of individual digits of a given number.
   c. Write a python script to display the prime number series up to the given N Value.
3. a. Write a python script to find the largest number among three numbers and display them in ascending order using if-else construct.
   b. Write a python script to create a simple text file, write the contents into the created file and display the same on to the console screen.
4. Write a python script to remove all the occurrences of a given character from a text file, copy the resultant text into another text file. Find the total occurrences

of the eliminated characters and display the count along with the contents of the text file on to the console.

5. a. Write a python script to display Fibonacci sequence of numbers using while loop and for loop constructs.
   b. Write a python script to demonstrate string methods.
6. a. Write a python script to create a list and add n number of user-defined values to the list and display the same on to the console screen.
   b. Write a python script to perform the following operations on Lists:
      (i) Matrix Addition.
      (ii) Matrix Multiplication.
7. a. Write a python script to search a key element in the given list of elements.
   b. Write a python script to arrange the given list of elements in ascending or descending order.
8. a. Write a python script to find GCD of two numbers using recursive and non recursive functions.
   b. Write a python script to convert the following using functions:
      (i) Fahrenheit to Celsius temperature.
      (ii) Celsius to Fahrenheit temperature.
9. a. Write a python script to draw a square using set position method in absolute positioning.
   b. Write a python script to draw a triangle using left, right and Forward methods in relative positioning.
   c. Write a python script using penup and pendown methods to draw “W” character using turtle graphics.
   d. Write a python script to create your own polygon shape and create an interesting design with it.
10. a. Write a GUI Script for creating text label in a window.
    b. Write a Python Script to create a command button. When the button is clicked the event should be handled and the message on the window should change from “Hello” to “Good Bye”.
11. a. Write a python script to demonstrate the Exception Handling.
    b. Write a Python script to demonstrate the Mouse and Key Event handling.
    c. Write a python script to demonstrate menu driven applications
12. Form a group of 3 to 4 members develop a mini project for Horse Race simulation with the help of GUI programming and tkinter package.

REFERENCE BOOKS:

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

2. Mark Lutz, "Programming Python," O'Reilly Publications, 4th Edition, 2011.

SOFTWARE / TOOLS USED:

Jupyter notebook, Tkinter, python 3.7.5, anaconda navigator

ADDITIONAL LEARNING RESOURCES:

1. https://docs.python.org/3/tutorial/
2. https://pythonprogramming.net/introduction-to-python-programming/

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	3	-	-
CO2	2	3	2	3	1	-	-	2	-	-
CO3	1	1	3	2	1	-	-	2	-	-
CO4	2	2	2	2	2	-	-	2	-	-
CO5	1	3	2	2	1	2	2	2	-	-
CO6	-	-	-	-	-	3	-	-	-	-
Average	1.8	2.4	2.4	2.4	1.4	2.5	2	2.2	-	-
Level of correlation of the course	2	2	2	2	1	2	2	2	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV – SEMESTER

(19MC40101) OBJECT ORIENTED ANALYSIS AND DESIGN (Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES:

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:

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

CO1: Analyze the specifications of Class, Things, principles of Object-Oriented development, Use case, Activity, Sequence and State diagrams to develop static and dynamic models using pre conditions and post conditions.

CO2: Design application artifacts to construct the Logical, Behavioral and Architectural models of an application using common modeling techniques of things.

CO3: Use UML tool Rational Rose or Visual Paradigm to design Class, Use Case, Sequence, Collaboration, Activity, State Chart, Component and Deployment Diagrams.

CO4: Function effectively as a member or leader in teams to analyze and design Leave Management System.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION TO UML (9 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.

Case study: Annotated Requirement Specification and Linguistic Analysis of Leave Management System.

UNIT II- STRUCTURAL MODELING (9 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.

Case study: Implementation of class and object diagrams using Rational Rose or Visual Paradigm for Leave Management System.

UNIT III- BASIC BEHAVIORAL MODELING (9 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.

Case study: Implementation of Usecase and Interaction diagrams using Rational Rose or Visual Paradigm for Leave Management System.

UNIT IV- ADVANCED BEHAVIORAL MODELING (9 Periods)

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

Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams – Modeling Reactive Objects.

Case study: Implementation of Activity and State Chart diagrams using Rational Rose or Visual Paradigm for Leave Management System.

UNIT V- ARCHITECTURAL MODELING (9 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.

Patterns and Frameworks, Artifact Diagrams.

Case study: Implementation of Component and Deployment diagrams using Rational Rose or Visual Paradigm for Leave Management System.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

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.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/106105153/
2. https://courses.cs.washington.edu/courses/cse403/11sp/lectures/lecture08-uml1.pdf
3. https://www.uml-diagrams.org/index-examples.html

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	3	-	-
CO2	3	3	2	2	2	-	3	-	-
CO3	3	3	2	2	3	-	3	-	-
CO4	-	2	-	-	-	3	2	-	-
Average	3	2.5	2	2.3	2.3	3	2.75	-	-
Level of correlation of the course	3	3	2	3	2	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV – SEMESTER
(19MC40102) LINUX PROGRAMMING (Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES:

Courses on Operating Systems and Computer Networks.

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

COURSE OUTCOMES:

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

CO1: Demonstrate LINUX operating system concepts and File, Text, Network, process and Backup utilities, awk and Bourne shell.

CO2: Design and develop client/server programs by using Sockets and RPC.

CO3: Use the vi editor to execute commands and implement shell script.

CO4: Analyse LINUX files, processes and signals to design and implement programs in Linux operating system.

CO5: Investigate and select appropriate technique from semaphores, Messages and Shared Memory to solve the problems in Inter Process Communication.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION TO LINUX FILE SYSTEM (9 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 (8 Periods)

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

UNIT III- LINUX FILE APIS (10 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.

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 (9 Periods)

Linux Processes: LINUX kernel support for processes, process APIs, process attributes, and change process attributes, process control - process creation, internal and external commands, process states and zombies, orphan process.

Signals: LINUX kernel support for signals, signal, signal mask, sig action, 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 AND REMOTE PROCEDURE CALLS (9 Periods)

Inter process 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.

Remote Procedure Calls: RPC library functions, programming interface, classes.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

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.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/117/106/117106113/
2. https://www.edx.org/course/linux-basics-the-command-line-interface
3. https://training.linuxfoundation.org/resources/free-courses/introduction-to-linux/

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	3	-	-
CO2	1	2	3	2	1	2	-	-
CO3	2	3	2	2	1	2	-	-
CO4	3	3	3	3	3	3	-	-
CO5	3	2	3	3	2	3	-	-
Average	2.4	2.4	2.8	2.6	1.8	2.6	-	-
Level of correlation of the course	2	2	3	3	2	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV-SEMESTER
(19MC40103) WEB PROGRAMMING (Theory)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES:

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:

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

- CO1: Understand concepts of HTML, DHTML, Java Script, AJAX programming and XML.
- CO2: Design and develop web Applications using Dynamic HTML, XML technology, Servlets, JSP and PHP.
- CO3: Use JSP and PHP technologies to implement E-Commerce applications to infer potential insights. Analyze 2-tier, 3-tier and MVC architectures, Servlets Life cycle and JSP Life cycle, Directory structure of servlets and JSP to design web application.
- CO4: Analyze 2-tier, 3-tier and MVC architectures, Servlets Life cycle and JSP Life cycle, Directory structure of servlets and JSP to design web application.
- CO5: Investigate and Solve real time problems using Server-side technologies, Tomcat Server and XAMPP Server for deployment of web applications.
- CO6: Commit to ethics to adapt JSP Standard Tag Libraries, PHP Standard Recommendation (PSR) and XML standards and extensions to develop web application.

DETAILED SYLLABUS:

UNIT I- HTML, JAVA SCRIPT AND AJAX (08 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 (09 periods)

Introduction to XML, XML Basics, XML standards and extensions- DTD, DOM and SAX APIs, XSL and XSLT; Advanced XML: XML Namespaces, XML CDATA, XML Encoding, XML on the

Server, XML Application, XMLHttpRequest Object, XML Technologies: XHTML, Java API for XML Processing, Xpath.

UNIT III- SERVLETS (09 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 (10 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 (09 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, PHP Standard Recommendation (PSR).

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

Total Periods: 45

Topics for self-study are provided in the lesson plan.

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.

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	-	3
CO2	2	3	3	3	3	-	-	-	3
CO3	2	2	3	3	3	-	-	-	3
C04	1	3	-	-	-	-	-	-	3
C05	-	3	-	3	-	-	-	-	3
CO6	-	-	-	-	-	3	-	-	-
Average	2	2.8	3	3	2.3	3	-	-	3
Level of correlation of the course	2	3	3	3	3	3	-	-	3

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV - SEMESTER
(19MC40104) BLOCKCHAIN TECHNOLOGIES (Theory)
(Professional Elective-I)

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

PRE-REQUISITES:
Courses on Data Structures and Computer Networks.

COURSE DESCRIPTION:

Distributed Systems, Blockchain, Types of blockchains, Decentralization, Bitcoin, Alternative Coins, Smart Contracts, Ethereum 101, Applications of Ethereum, Scalability Challenges in Privacy and Security, Current Landscape.

COURSE OUTCOMES:

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

CO1: Understand the concepts of distributed Systems, decentralization and blockchain technology for the development of an application.

CO2: Select and use the Bitcoins, Smart Contracts and Ethereum 101 for the development of distributed systems and decentralized systems.

CO3: Analyze the issues and challenges of scalability, privacy and security in monetizing the businesses using blockchain technology.

CO4: Develop and deploy the applications using BlockApps, Eris platforms.

CO5: Commit to ethics and cyber regulations to perform encryption, multiparty computation, smart governance using Smart contract security.

DETAILED SYLLABUS:

UNIT I– DISTRIBUTED SYSTEMS AND DECENTRALIZATION (12 Periods)

Distributed Systems: CAP Theorem, Byzantine Generals Problem, Consensus, History of blockchain, Generic Elements, Features, Applications, Tiers, Types of blockchain, CAP Theorem and blockchain, Benefits and limitations of blockchain.

Decentralization: Decentralization using blockchain, Methods of decentralization, Routes to Decentralization, blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications, Platforms for decentralization.

UNIT II – DIGITAL CURRENCY (11 Periods)

Bitcoin: Concepts, Transactions, Blockchain, Bitcoin Payments.

Alternative Coins: Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash.

UNIT III – SMART CONTRACTS AND ALTERNATIVE BLOCKCHAINS (10 Periods)

Smart Contracts: History, Ricardian contracts, Smart Contract Templates, Oracles, Smart Oracles, Deployment of Smart Contracts on Blockchains.

Alternative Blockchains: Kadena; Platforms: BlockApps, Eris

UNIT IV – ETHEREUM 101 (11 Periods)

Ethereum: Ethereum blockchain, Elements of Ethereum blockchain, Precompiled contracts, Accounts, Block, Ether, Messages, Mining, Clients and wallets, Ethereum network, Applications developed on Ethereum, Scalability and Security Issues.

UNIT V – CHALLENGES AND CURRENT LANDSCAPE (11 Periods)

Scalability and Other Challenges: Scalability: Block size increase, Block internal reduction, Invertible Bloom lookup tables, Sharding, State channels, Private blockchain, Proof of Stake. Privacy: Indistinguishability obfuscation, Homomorphic encryption, Zero knowledge proofs,

State channels, Secure multiparty computation, Usage of hardware to provide confidentiality, Coinjoin, Confidential transactions, MimbleWimble; Security: Smart contract security.

Current Landscape: Emerging Trends, Improvement proposals; Blockchain research: Smart contracts, Centralization issues, Limitations in cryptographic functions, Consensus Algorithms, Scalability, Code Obfuscation.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Imran Bashir, “Mastering Blockchain,” Packt Publishing Ltd., 2017.

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, “Blockchain Applications: A Hands-On Approach,” VPT Books, 2017.
2. Josh Thompsons, “Blockchain: The Blockchain For Beginners Guide To Blockchain Technology and Leveraging Blockchain Programming,” Create Space Independent Publishing Platform, 2017.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106105184/
2. https://medium.com/moatcoin/part-6-blockchain-simplified-notes-nptel-892f13875555
3. http://www.hands-on-books-series.com/assets/Bahga-Madisetti-Blockchain-Book-Code.zip

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		-	-	-	-	-	2
CO2	1	2	3	3	-	-	-	-	-	2
CO3	-	2	3		-	-	1	-	-	2
CO4	-	-	3	2	2	-	-	-	-	2
CO5	-	-	-	-	2	3	-	-	-	3
Average	2	2	2.75	2.5	2	3	1	-	-	2.2
Level of correlation of the course	2	2	3	3	2	3	1	-	-	2

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV - SEMESTER
(19MC40105) MULTIMEDIA APPLICATION DEVELOPMENT (Theory)
(Professional Elective-I)

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

PRE-REQUISITES:
A course on Web Programming.

COURSE DESCRIPTION:
Multimedia Concepts; Data Representation; Action script Programming Concepts; Dynamic Action Script and Event Handling Mechanism; Video and audio compression Techniques and Multimedia communication and data transmission.

COURSE OUTCOMES:

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

- CO1: Understand the concepts of Multimedia, hypermedia, validation of forms and action script programming and Event Handling.
- CO2: Design and Develop online media applications using searching of motor vectors and Moving Picture Expert Group (MPEG) techniques for visual design.
- CO3: Demonstrate Bitmap Programming, multimedia software tools, graphic software, scanning and digital photography to create original images.
- CO4: Analyze image data representation graphics, image data types, file formats, color models in images and color models in videos to design graphics and videos.
- CO5: Solve the compression of audio and video problems using audio and video compression techniques.
- CO6: Apply compression standards, Adaptive Differential Pulse Code Modulations (ADPCM), Vocoders and Linear Predictive Coding (LPC) to develop quality applications.

DETAILED SYLLABUS:

UNIT I- MULTIMEDIA AUTHORING AND DATA REPRESENTATIONS (11 Periods)

Multimedia Authoring and Data Representations: 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- ACTION SCRIPT (12 Periods)

Action Script: Core Concepts, Conditionals and Loops, Instance Methods Revisited, Static Variables and Static Methods, Functions, Inheritance, Compiling and Running a program, Data types and Type Checking, Interfaces.

UNIT III- DISPLAY AND INTERACTIVITY (12 Periods)

Display and Interactivity: Events and Event Handling, Exceptions and Error Handling, Dynamic Action Script, Scope, Events and Display Hierarchies, Interactivity. Screen Updates, Programmatic Animation, Drawing with Vectors, Bitmap Programming, Text Display and Input.

UNIT IV- BASIC VIDEO COMPRESSION TECHNIQUES (10 Periods)

Basic Video Compression Techniques: 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, LPC.

UNIT V- MULTIMEDIA COMMUNICATION AND RETRIEVAL (10 Periods)

Multimedia Communication and Retrieval: Computer and Multimedia Networks: 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).

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Ze-Nian Li, and Mark S. Drew, “Fundamentals of Multimedia,” Pearson Education,2008.
2. Colin Moock, SPD O, REILLY, “Essentials ActionScript 3.0,” 2007.

REFERENCE BOOKS:

1. Nigel chapman, and jenny chapman, “Digital Multimedia,” Wiley-Dreamtech, 2005.
2. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and Standards,” Pearson Education, 2001.

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	3	-	-
CO2	2	2	3	2	3	-	3	-	-
CO3	1	3	3	3	3	-	3	-	-
C04	1	3	3	-	-	-	3	-	-
C05	-	-	-	-	-	-	3	-	-
C06	-	-	-	-	-	3	3	-	-
Average	1.75	2.75	3	2.67	3	3	3	-	-
Level of correlation of the course	2	3	3	3	3	3	3	-	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV - SEMESTER
(19MC40106) INFORMATION SECURITY (Theory)
(Professional Elective – I)

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

PRE-REQUISITES:

A course on Computer Networks.

COURSE DESCRIPTION:

Cryptographic algorithms; Classical Encryption Techniques; Public key and Private key encryption; Security models; Hash Algorithms; E-mail, IP and Web Security; ensuring system security and security over the Internet; Intrusion Detection and Trusted systems.

COURSE OUTCOMES:

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

CO1: Understand Network security model and cryptographic techniques for secure communication.
CO2: Apply Cryptographic techniques to provide security for E-Mail and IP based communication
CO3: Analyze Cryptographic algorithms and provide solutions for secure data transmission.
CO4: Demonstrate web and system security techniques to prevent the data from digital attacks.

DETAILED SYLLABUS:

UNIT I- COMPUTER AND NETWORK SECURITY CONCEPTS AND CLASSIC ENCRYPTION TECHNIQUES (10 Periods)

Computer Security Concepts, OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Fundamental Security Design Principles, Attack Surfaces and Attack Trees, A Model for Network Security, Standards.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques– Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Polyalphabetic Ciphers and Transposition Techniques.

UNIT II- CONFIDENTIALITY USING SYMMETRIC AND ASYMMETRIC CIPHERS (12 Periods)

Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, Data Encryption Standard (DES), Strength of DES, Block Cipher Design Principles.

Advanced Encryption Standard and Block Cipher Operation: AES Structure, Multiple Encryption and Triple DES, Electronic Codebook, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode and Counter Mode. Stream Ciphers and RC4,

Placement of Encryption Function, Traffic Confidentiality.

Public-Key Cryptography: Principles of Public-Key Cryptosystems, Public-Key Cryptographic algorithms - The RSA Algorithm, Diffie – Hellman Key Exchange.

Case Study: Implement RSA and Diffie – Hellman Key Exchange algorithms.

UNIT III- CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS AND MUTUAL TRUST (14 Periods)

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining and Secure Hash Algorithm (SHA).

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC and MACs Based on Block Ciphers: DAA and CMAC.

Digital Signatures: Digital Signatures, NIST Digital Signature Algorithm.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates and Public-Key Infrastructure.

User Authentication: Remote User – Authentication Principles, Kerberos, Federated Identity Management, Personal Identity Verification.

Case Study: To check the integrity of files in a system using any open source security algorithm.

UNIT IV- ELECTRONIC MAIL SECURITY AND IP SECURITY (09 Periods)

Electronic Mail Security: Email Threats and Comprehensive Email Security, S/MIME and Pretty Good Privacy (PGP).

IP Security: IP Security Overview, IP Security Policy, Authentication Header (AH), Encapsulating Security Payload (ESP), Combining Security Associations and Internet Key Exchange.

UNIT V- WEB SECURITY AND SYSTEM SECURITY (10 Periods)

Transport-Level 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: A study on Challenges to mitigate security risks associated with Online and Mobile Payments

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. William Stallings, “Cryptography and Network Security (Principles and Practice),” Pearson Education, 7th Edition, 2020.
2. 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. Bernard L. Menezes, Ravinder Kumar, “Cryptography, Network Security and Cyber Laws,” Cengage Learning, 2019.
3. Behrouz A. Forouzan, “Cryptography and Network Security,” Tata McGraw-Hill, 2007.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106105031/ lecture by Dr. Debdeep Mukhopadhyay, IIT Kharagpur
2. https://www.udemy.com/introduction-to-cryptography-online-course-rahsoft-crypto-certificate/ by Dr. Sourabh Prakash Head of Rahsoft Cyber Security and Cryprography Department
3. https://www.coursera.org/learn/asymmetric-cryptography offered by university of Colorado
4. https://www.khanacademy.org/computing/computer-science/cryptography-Journey into Cryptography.

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	3
CO2	3	3	3	3	2	-	-	3
CO3	3	3	3	3	1	-	-	3
CO4	3	3	3	2	-	-	-	3
Average	3	3	3	2	1.5	-	-	3
Level of correlation of the course	3	3	3	2	2	-	-	3

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV-SEMESTER
(19MC40107) SOFTWARE PROJECT MANAGEMENT (Theory)
(Professional Elective – I)

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

PRE-REQUISITES:

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:

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

CO1: Understand the conventional software management, project organization roles and responsibilities, software economics for conventional, modern and future software project development.

CO2: Apply Life cycle phases, Planning guidelines, Cost and schedule estimation process, seven-core metrics to assess the quality of project.

CO3: Analyze the checkpoints of the process, software architecture and Work Breakdown Structure to identify the artifacts of software project deliverables.

CO4: Analyze the process workflows, tailoring the process and process automation tools to manage and deploy successful software projects.

CO5: Commit to ethics to adapt conventional and modern software project management principles at each stage of software development life cycle.

DETAILED SYLLABUS:

UNIT I- CONVENTIONAL SOFTWARE MANAGEMENT AND IMPROVING SOFTWARE ECONOMICS (10 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 (11 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 (12 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.

Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

Total Periods: 55

Topics for self-study are provided in the lesson plan.

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.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105218/
2. https://www.udemy.com/course/software-project-management-the-complete-course/
3. https://freevideolectures.com/course/4071/nptel-software-project-management

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	3	3	2	3	-	-	2	-
CO2	2	3	3	2	2	-	-	2	-
CO3	3	3	2	2	2	-	-	2	-
CO4	2	3	2	3	2	-	-	2	-
CO5	-	-	-	-	-	3	-	3	-
Average	2	3	2.5	2.25	2.25	3	-	2.2	-
Level of correlation of the course	2	3	3	2	2	3	-	2	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV-SEMESTER
(19MC40108) INFORMATION RETRIEVAL SYSTEMS (Theory)
(Professional Elective-II)

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

PRE-REQUISITES:

Courses on Database Management Systems and 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:

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

CO1: Understand IRS functionality, search and browse capabilities, cataloging and Indexing process, data structures, Document and Term Clustering.

CO2: Select and apply stemming algorithms, Automatic Term Clustering and Information visualization technologies, Text search algorithms in the Internet or Web search engine to interpret meaningful and relevant patterns.

CO3: Analyze the information retrieval system capabilities, Automatic indexing, user search techniques, Information system evaluation measures to present the relevant search results to the user.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION AND INFORMATION RETRIEVAL SYSTEM CAPABILITIES (12 Periods)

Introduction to IRS: 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

Topics for self-study are provided in the lesson plan.

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.

ADDITIONAL LEARNING RESOURCES:

1. https://www.udemy.com/course/information-retrieval-and-mining-massive-data-sets/
2. https://dl.acm.org/doi/book/10.5555/567292
3. https://www.youtube.com/watch?v=FkRxmlNiC0c
4. https://www.coursera.org/lecture/text-retrieval/lesson-3-1-evaluation-of-tr-systems-YSvkh

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	1	3	2	3	3	-	2	-
CO2	2	3	3	2	2	-	2	-
CO3	2	2	3	2	3	-	2	-
Average	1.6	2.6	2.6	2.3	2.6	-	2	-
Level of correlation of the course	2	3	3	3	3	-	2	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV - SEMESTER
(19MC40109) ARTIFICIAL INTELLIGENCE (Theory)
(Professional Elective - II)

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

PRE-REQUISITES:

Courses on Mathematical Foundations of Computer Science and Data Structures.

COURSE DESCRIPTION:

AI Problems; Problem Characteristics Search Algorithms; Inference in Propositional Logic; axioms of probability; baye's rule; decision theory; computational learning theories; Basic Probability Notations; Forms of Learning; fuzzy logic.

COURSE OUTCOMES:

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

CO1: Understand the concepts of Artificial Intelligence, Problem characteristics, problem solving agents, production system and knowledge representation to solve AI problems.

CO2: Formulate Logical Agents, First-Order Logic and Inference in First-Order Logic to compute intelligent systems.

CO3: Apply knowledge representation using probabilistic and statistical reasoning, propositional theorems, reasoning theories and models to recommend advisory consultative situation.

CO4: Analyse artificial Intelligent Techniques, searching algorithms, strategies, problems, Propositional and first order Logic to infer solutions for Grammar Induction and implementation methodology problem.

CO5: Use statistical methods, distributions, genetic algorithms, learning and evolutionary strategies to optimize particle swarns problems.

DETAILED SYLLABUS:

UNIT I - ARTIFICIAL INTELLIGENCE (11 Periods)

AI Problems, Underlying Assumption, Levels of the Model, Criteria of Success, Some General References.

Problems, Problem Spaces, and Search: Define the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics.

Use Case: Solve Water Jug problem using state space and production rules.

UNIT II - SEARCHING AND PROBLEM SOLVING (12 Periods)

Solving Problems by Searching: issues, problem solving agents, searching for solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions,

Beyond classical search: Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, searching with nondeterministic actions, searching with partial observations.

UNIT III - KNOWLEDGE AND REASONING (11 Periods)

Logical Agents: Knowledge Based Agents, Wumpus World, Logic, Propositional Logic, Propositional theorem Proving, Effective Propositional model checking, Agents Based on Propositional Logic.

First-Order Logic: Representation Revisited, Syntax and Semantic of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT IV - KNOWLEDGE REPRESENTATION AND REASONING (12 Periods)

Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, Internet Shopping World.

Uncertainty Knowledge and reasoning: Acting under Uncertainty, Basic Probability Notation, the Axioms of Probability, Inference Using Full Joint distributions, Independence, Bayes' Rule and its use.

Probabilistic reasoning: Representing knowledge in uncertain domain, hidden Markov model.

Statistical Reasoning: certainty factors and rule-based systems, Dampster-shafer theory, fuzzy logic.

Case Study: Sales advisory-consultative situation in buying a complex technical product.

UNIT V - LEARNING AND EVOLUTIONARY COMPUTATION CONCEPTS

(11 Periods)

Forms of Learning, Learning Decision Trees, Ensemble Learning, Computational Learning Theory. History of Evolutionary Computation, Evolutionary Computation Overview, Genetic algorithms, Evolutionary Programming and strategies, Implementation issues, Genetic algorithm implementation, Particle Swarm Optimization Implementation.

Case Study: Grammar Induction and implementation methodology using genetic algorithms.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Elaine Rich, Kevin Knight and Shivashankar B Nair, "Artificial Intelligence," Tata McGraw Hill, 3rd Edition, 2007.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence A Modern Approach," Pearson Education, 2nd Edition, 2011.

REFERENCE BOOKS:

1. Russell C.Eberhart and Yuhui Shi, "Computational Intelligence: Concepts to Implementations," Elsevier, 2007.
2. George F. Luther, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving," Pearson Education, 5th Edition, 2001.

ADDITIONAL LEARNING RESOURCES:

1. https://ai.google/education/
2. https://nptel.ac.in/courses/106/105/106105078/
3. https://www.slideshare.net/ravislides99/problems-problem-spaces-and-search-112060118
4. https://www.researchgate.net/publication/262250593_Genetic_algorithms_Concepts_issues_and_a_case_study_of_grammar_induction
5. https://cseweb.ucsd.edu/classes/sp07/cse150/lectures-pdf/l.newsearch.pdf
6. https://towardsdatascience.com/basic-probability-theory-and-statistics-3105ab637213

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	3	-
CO2	2	2	2	2	2	-	2	-
CO3	3	2	3	3	2	-	3	-
CO4	2	3	2	3	2	-	2	-
CO5	2	3	2	3	2	-	2	-
Average	2.4	2.6	2.4	2.6	2	-	2.4	-
Level of correlation of the course	3	3	3	3	2	-	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV-SEMESTER
(19MC40110) CYBER SECURITY (Theory)
(Professional Elective-II)

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

PRE-REQUISITES:

A course on Computer Networks.

COURSE DESCRIPTION:

Computer Security and threats, Browser Attacks, Security in the design of Operating Systems, Wireless Network Security, Intrusion Detection and Prevention Systems, Privacy Impacts of Emerging Technologies, Managing the incidents.

COURSE OUTCOMES:

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

CO1: Understand the concepts of Threats, Harm, Vulnerabilities, Security in Operating Systems, Security Counter measures, Internet of things, Data Mining, Big Data and privacy concepts for providing Cyber Security.

CO2: Identify incidents of Economics, Electronic Voting and Cyber Warfare and privacy impacts of emerging techniques to identify the critical issues.

CO3: Apply security counter measures, intrusion detection and prevention techniques to provide Network Security.

CO4: Commit ethics of cyber regulations, responsibilities, and norms to manage incidents using privacy principles, policies, Cyber Welfare and International Laws to adapt in cyberspace.

DETAILED SYLLABUS:

UNIT I– CYBER SECURITY (9 periods)

Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control and Cryptography, Web User Side, Browser Attacks, Web attacks Targeting Users, Obtaining User or Website Data, Email Attacks.

UNIT II – SECURITY IN OPERATING SYSTEM AND NETWORKS (11 periods)

Security in Operating Systems, Security in the Design of Operating Systems, Rootkit, Network security attack, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service.

UNIT III – DEFENCES: SECURITY COUNTER MEASURES (11 periods)

Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management, Databases, Security Requirements of Databases, Reliability and Integrity, Database Disclosure, Data Mining and Big Data.

UNIT IV – PRIVACY IN CYBERSPACE (12 periods)

Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed.

UNIT V – MANAGEMENT AND INCIDENTS (11 periods)

Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster, Emerging Technologies, The Internet of Things, Economics, Electronic Voting, Cyber Warfare, Cyberspace and the Law, International Laws, Cyber crime, Cyber Warfare and Home Land Security.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, “Security in Computing,” 5th Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. George K.Kostopoulous, “Cyber Space and Cyber Security,” CRC Press, 2013.
2. MarttiLehto, PekkaNeittaanmäki, “Cyber Security: Analytics, Technology and Automation”, Springer International Publishing Switzerland, 2015.

ADDITIONAL LEARNING RESOURCES:

1. https://www.edx.org/course/cyber,security,basics,a,hands,on,approach.
2. https://www.cyberaces.org/courses/
3. https://www.futurelearn.com/courses/introduction,to,cyber,security
4. https://swayam.gov.in/nd2_cec20_cs09/preview

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	3
CO2	-	3	-	-	2	-	-	-	3
CO3	1	-	2	-	3	-	-	-	2
CO4	-	-	-	-	-	3	-	-	-
Average	2	3	2	2	2.5	3	-	-	2.67
Level of correlation of the course	2	3	2	2	3	3	-	-	3

3- High mapping 2-Medium Mapping 1-Low Mapping

MCA IV - SEMESTER
(19MC40111) SERVICE ORIENTED ARCHITECTURE (Theory)
(Professional Elective-II)

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

PRE-REQUISITES:

Courses on Software Engineering, Computer Networks and Web Programming.

COURSE DESCRIPTION:

XML document structure; Web Services; Principles of SOA; Service Layers; Simple Object Access Protocol (SOAP); Web Services Description Language (WSDL) and Building SOA-Based Applications.

COURSE OUTCOMES:

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

CO1: Understand the concepts of XML, Characteristics of SOA, Benefits of SOA, Principles of Service orientation and Service layers.

CO2: Design and develop modern softwares using XML parsers, WSDL and SOAP Web services.

CO3: Analyze XML Transformation, XSL Formatting, Service Oriented Analysis and Design, Service Modeling and guidelines to build XML and SOA based applications.

CO4: Commit to SOA standards to design service oriented web applications for an individual and society.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION TO XML (11 periods)

XML document structure, well formed and valid documents, Namespaces, DTD, XML Schema, X-Files.

UNIT II- BUILDING XML- BASED APPLICATIONS (11 periods)

Parsing XML: using DOM, SAX, XML Transformation and XSL, XSL Formatting, Modeling databases in XML.

UNIT III- SERVICE ORIENTED ARCHITECTURE (11 periods)

Characteristics of SOA, Comparing SOA with Client/Server and Distributed architectures, Benefits of SOA , Principles of Service orientation and Service layers.

UNIT IV- WEB SERVICES (11 periods)

Service descriptions, WSDL, Messaging with SOAP, Service discovery, UDDI, Message Exchange Patterns, Orchestration, Choreography and WS Transactions.

UNIT V- BUILDING SOA-BASED APPLICATIONS (11 periods)

Service Oriented Analysis and Design, Service Modeling, Design standards and guidelines, Composition, WS-BPEL, WS-Coordination, WS-Policy, WS-Security and SOA support in J2EE.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology and Design," Pearson Education, 2013. ISBN 978-81-317-1490-4.
2. Ron Schmelzer et al. "XML and Web Services," Pearson Education, 2002.

REFERENCE BOOKS:

1. Frank P. Coyle, "XML, Web Services and the Data Revolution," Pearson Education, 2002.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services," Pearson Education, 2005
3. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide," Prentice Hall, 2004.
4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web Services Architecture," Morgan Kaufmann Publishers, 2003.

CO-PO-PSO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	3
CO2	1	3	3	3	3	-	-	-	-	3
CO3	1	3	3	-	-	-	-	-	-	3
CO4	-	-	-	-	-	3	3	-	-	-
Average	1.6	3	3	3	3	3	3	-	-	3
Level of correlation of the course	2	3	3	3	3	3	3	-	-	3

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV - SEMESTER
(19MC4HS31) SOFT SKILLS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:--

COURSE DESCRIPTION:

Body Language; Assertiveness; Etiquette; Goal Setting; Thinking Skills; Interpersonal Skills; Team Building; Conflict Management; Technical Report Writing; Résumé Writing; Group Discussions; Interview Skills.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge of career skills by examining and applying the styles and strategies of Goal Setting, Thinking Skills, and Etiquettes.

CO2: Analyze the limitations and possibilities of favorable situations by applying the skills of Body Language and demonstrate through Assertiveness and Interpersonal Skills.

CO3: Apply appropriate soft skills by analyzing the problem situations that arise in professional career through demonstrating remedies in Conflict Management.

CO4: Function effectively as an individual and as a member in diverse teams examining and applying soft skills in Interviews, Group Discussion and Team Building.

CO5: Communicate effectively applying appropriate writing and speaking techniques by examining and demonstrating knowledge through Technical Report Writing and Résumé Writing.

*****First ten exercises are mandatory among the following:

LIST OF EXERCISES:

1. Body Language

Types of Body Language – Parts of Body – Facial Expressions– Eye Contact Insights – Good Posture

2. Assertiveness

Communications Styles – Benefits – Being Unassertive –Role Playing

3. Goal Setting

Seven Steps of Goal Setting – Self Motivation– Personal Goal Setting –Setting Career Goals

4. Thinking Skills

Positive Thinking – Creative Thinking – Lateral Thinking – Logical Thinking – Intitutive Thinking

5. Team Building

Learning Activities – Management Essentials – Team Building Scenarios

6. Conflict Management

Ways of Resolving Conflict – Personality Types and Conflict – Conflict Resolution Process – Team Conflict

7. Technical Report Writing

Objectives –Formats – Writing Styles

8. Résumé Writing

Structure and Presentation – Planning – Defining Career Objectives – Projecting One's Strengths and Skills – Cover Letter – Formats and Styles

9. Group Discussions

Types of GD –Dos and Don'ts – Dynamics of GD – Intervention – Summarization Techniques

10. Interview Skills

Planning – Opening Strategies – Answering Strategies – Tele Conferencing – Video Conferencing

11. Interpersonal Skills

Starting a Conversation – Responding to a Conversation – Conversation Examples – Body Language – Role Play

12. Etiquette

Basic Social Etiquette – Telephone Etiquette – Dinning Etiquette – Conference Etiquette

TEXT BOOK:

1. Soft Skills Lab Manual, SVEC

REFERENCE BOOK:

1. R. C. Sharma & Krishna Mohan, Business Correspondence and Report Writing, Tata McGraw-Hill Publishing Company Limited, 3rd edition, New Delhi, 2012.

SUGGESTED SOFTWARES:

1. KVAN SOLUTIONS
2. Learning to Speak English 8.1, The Learning Company – 4 CDs.
3. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
4. Language in Use 1, 2 & 3.
5. Cambridge Advanced Learner's Dictionary - 3rd Edition.
6. Let's Talk English, Regional Institute of English South India.

ADDITIONAL LEARNING RESOURCES

1. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
2. http://job-search-search.com/interviewing/behavioral_interviews
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. https://goo.gl/FEMGXS

CO-PO-PSO Mapping Table:

	PO1	PO2	PO5	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	3	-
CO2	3	4	1	-	-	-	3	-
CO3	2	2	3	-	-	-	3	-
CO4	2	2	2	3	2	-	-	-
CO5	1	1	2	-	3	-	-	-
Average	2.2	2.2	1.8	3	2.2	-	3	-
Level of correlation of the course	2	2	2	3	2	-	3	-

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV- SEMESTER
(19MC40131) OBJECT ORIENTED ANALYSIS AND DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:
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:

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

CO1: Analyze Library Management System, ATM Application, Online Bookshop, Railway Reservation System using design principles to annotate requirement specifications and Linguistic Analysis to design static and behavioral models.

CO2: Design and construct the Logical, Behavioral and Architectural model of an application using UML Tools (Visual Paradigm/ Rational Rose) for an Application Software.

CO3: Identify societal and environmental issues within local and global contexts relevant to analyze and design models for real time applications.

CO4: Work independently and in a team to solve problems with effective communication about various logical and behavioral objects of an Application.

CO5: Write and present a technical report/ document effectively.

LIST OF EXERCISES:

Design of Applications

- Library Management System
- Pharmaceutical Management Systems
- Stock Broker
- 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. Rational Software Development Training Manual.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/106105153/
2. https://courses.cs.washington.edu/courses/cse403/11sp/lectures/lecture08-uml1.pdf
3. https://www.uml-diagrams.org/index-examples.html

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	2	-	-
CO2	3	3	2	1	3	-	-	-	2	-	-
CO3	1	2	3	-	-	-	3	-	2	-	-
CO4	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-
Average	2.3	2.6	2.6	1.5	2.5	3	3	3	2	-	-
Level of correlation of the course	3	3	3	2	3	3	3	3	2	-	-

1. 3- High mapping 2-Medium Mapping 1- Low Mapping

MCA IV-SEMESTER
(16MC40132) LINUX AND WEB PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

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:

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

CO1: Demonstrate LINUX operating system concepts and File, Text, Network, process and Backup utilities, awk, Bourne shell, HTML, DHTML, Java Script, AJAX programming and XML.

CO2: Design and develop client/server programs by using Sockets, RPC and web Applications using Dynamic HTML, XML technology, Servlets, JSP and PHP

CO3: Use the vi editor to execute commands and implement shell script and JSP and PHP technologies to implement E-Commerce applications.

CO4: Implement LINUX file APIs, process APIs and signal APIs in Linux operating system and directory structure of servlets and JSP to design web application.

CO5: Investigate and solve real time problems using Server-side technologies, Tomcat Server and XAMPP Server for deployment of web applications.

CO6: Commit to ethics to adapt JSP Standard Tag Libraries, PHP Standard Recommendation (PSR) and XML standards and extensions to develop web application.

CO7: Work independently or in a team to solve the problems with effective Communication.

CO8: Write and present a technical report/ document effectively.

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).

c. Write a shell script that deletes all lines containing specified word in one or more files supplied as arguments to it.

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.
   c. Write an awk script to count the number of lines in a file that do not contain vowels.
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 ecommerce application (retail) 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.

Software / Tools used:

Notepad++, Wamp Server, Eclipse IDE, Geany / sublime text shell ide, java

ADDITIONAL LEARNING RESOURCES:

1. www.shellscript.sh
2. https://www.livefirelabs.com/unix_tip_trick_shell_script/unix_shell_scripting/unix-shell-scripting-tutorial.htm

CO-PO-PSO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	-	-	-	-	3
CO2	2	2	3	3	1	-	-	-	-	3
CO3	2	2	2	2	1	-	-	-	-	3
CO4	1	3	2	2	2	2	2	-	-	3
Average	2	2.5	2.25	2.5	1.5	2	2	-	-	3
Level of correlation of the course	2	2	2	3	2	2	2	-	-	3

3- High mapping 2-Medium Mapping 1- Low Mapping

MCA V - SEMESTER
(19MC50101)CLOUD COMPUTING (Theory)

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 Mechanisms; Cloud Service Models.

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

CO1: Demonstrate the concepts of Cloud Computing, Cloud-Enabling Technology, and Cloud Architectures.

CO2: Apply virtualization and develop virtual environments for the deployment of cloud applications.

CO3: Design applications using cloud service models salesforce.com(SaaS), Google App Engine(PaaS), Amazon (IaaS) and deploy in cloud

CO4: Identify and analyze the Cloud-Enabling Technologies and architectures for developing the applications to solve e-commerce problems.

CO5: Adhere to ethics and adapt cloud security mechanisms and Cloud-Based Security Groups for providing security to societal applications.

DETAILED SYLLABUS:

UNIT I– FUNDAMENTAL CLOUD COMPUTING (10 Periods)

Understanding Cloud Computing: Origins and Influences, 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: 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: 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: 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 (11 periods)

Fundamental Cloud Security: Threat Agents, Cloud Security Threats, Additional Considerations, Case Study Example.

Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-On, Cloud-Based Security Groups, Hardened Virtual Server Images.

UNIT V – CLOUD SERVICE MODELS (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 Study: SaaS: Salesforce.com, Facebook.com; PaaS: Google App Engine, MS-Azure and IBM Bluemix; IaaS: Amazon EC2, Amazon S3 and Netflix.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini “Cloud Computing- Concepts, Technology & Architecture,” Pearson Publication, 2014.
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.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://www.coursera.org/browse/information-technology/cloud-computing
3. https://www.edx.org/learn/cloud-computing
4. https://www.udemy.com/course/introduction-to-cloud-computing/
5. https://www.eduonix.com/courses/Software-Development/Learn-Cloud-Computing-from-Scratch-for-Beginners#courseContentNav

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	1	3	-	3	-	-	-	-	-	-	-	2	-	3
CO3	-	-	3	2	2	-	-	-	-	-	-	-	-	-	3
CO4	-	3	2	2	3	-	-	-	-	-	-	-	-	1	3
CO5	-	-	-	-	2	3	-	-	-	1	-	-	-	-	3
Average	3	2	2.6	2	2.5	3	-	-	-	1	-	-	2	1	3
Course Correlation Level	3	2	3	2	3	3	-	-	-	1	-	-	2	1	3

Correlation Level: 3- High 2-Medium 1- Low

MCA V- SEMESTER
(19MC50102) DATA ANALYTICS (Theory)

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

PRE-REQUISITES:

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 and HIVE on Hadoop.

COURSE OUTCOMES:

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

CO1: Demonstrate the concepts of Big Data Analytics, Life Cycle, techniques, Integrated Development Environment (IDE) and trends to use MapReduce framework, HDFS, Apache Hive and R Studio.

CO2: Apply Hadoop, HiveQL Indexes and Eclipse IDE tools to perform analytics on Hadoop platform to infer insights of Big Data applications.

CO3: Implement Hadoop features, Hadoop Distributed File system, Hadoop I/O and administering Hadoop to develop applications in Hadoop Environment.

CO4: Analyze Map Reduce framework, varieties of data formats, Methods, Dimensions, and practices to manage Weather sensors data and preprocess data for map reduce applications.

CO5: Apply Data Structures, functions, Matrices, Arrays and Lists to implement R programming on Hadoop.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION TO DATA ANALYTICS (11 periods)

Big Data Analytics: Concepts of Big Data Analytics, State of the practice in analytics; Data Analysis Life Cycle: Life cycle, discovery, data preparation, model planning, model building, communicating result, operationalization, Big Data Analytics Examples, Big Data Analytics Solutions.

Meet Hadoop: Data Storage and Analysis, Comparison with Other Systems, 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 AND APACHE HIVE

(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, HDFS.

Apache Hive Concepts: Hive QL queries, Hive QL views- reduce query complexity.

Hive QL Indexes- create, show, drop, Aggregate functions, Bucketing and Partitioning.

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: Applications on Big Data Using Hadoop and its supporting Tools.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Tom White, “Hadoop: The Definitive Guide,” Oreilly and Yahoo press, 3rd Edition, 2012.
2. EMC Education services, “Data Science and Big Data analytics,” John wiley publications, 2015.

REFERENCE BOOKS:

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.

ADDITIONAL LEARNING RESOURCES:

1. https://www.ngdata.com/big-data-analysis-resources/
2. https://www.analyticsvidhya.com/resources-big-data/
3. https://hadoop.apache.org/docs/r3.1.3/
4. https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	2	3	3	2	3	-	-	-	-	-	-	-	1	3	2
CO3	3	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	-	-	1	3	2
CO5	3	2	3	-	3	-	-	-	-	-	-	-	2	3	-
Average	2.6	2.5	2.6	2.25	2.6	-	-	-	-	-	-	-	1.8	3	2.5
Course Correlation Level	3	3	3	2	3	-	-	-	-	-	-	-	2	3	3

Correlation level: 3- High 2-Medium 1- Low

MCA V-SEMESTER
(19MC50103) MOBILE APPLICATION DEVELOPMENT (Theory)

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; Mobile Applications using Wireless Tool Kit and Connecting with SQL Database.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge on Wireless Technology (WT), J2ME-architecture, Commands, Items, Event Processing and Record Management System.

CO2: Design and develop mobile applications using Java and MIDlet programming.

CO3: Apply wireless toolkit and SQL to design database and develop mobile applications.

CO4: Analyze JDBC and HTTP connections to implement client/server applications in mobile.

CO5: Analyze and solve the High level and Low level Display problems at the time of designing Mobiles Screen.

CO6: Practice MIDP 2.0 Security in mobiles for the safe and betterment of an individual and society.

DETAILED SYLLABUS:

UNIT I: J2ME OVERVIEW (11 periods)

J2ME Concepts: 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, MIDP 2.0 Security Enhancements.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

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.

ADDITIONAL LEARNING RESOURCE:

1. https://ieeexplore.ieee.org/document/1265679: MIDP 2.0 Security Enhancements
2. https://www.geeksforgeeks.org/j2se-vs-j2me-vs-j2ee-whats-the-difference/

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO2	-	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO4	2	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	-	2	-	3	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	3	-	-	-	3	-	-	-	-	-
Average	2.6	2.8	3	3	3	3	-	-	-	3	-	-	2.8	2.6	2.6
Course Correlation Level	3	3	3	3	3	3	-	-	-	3	-	-	3	3	3

Correlation Level: 3-High 2-Medium 1-Low

MCA V - SEMESTER
(19MC50104)DATA VISUALIZATION (Theory)
(Professional Elective - III)

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

PRE-REQUISITES:

Courses on Probability and Statistics, Database Management System and Data Warehousing and Data Mining.

COURSE DESCRIPTION:

Data Foundation; Human Perception and Visualization; Visualization Techniques; Designing Comparing and Evaluating Visualization Techniques; Visualization Systems and Research Directions.

COURSE OUTCOMES:

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

CO1: Demonstrate the concepts of visualization, data vs information visualization, data pre-processing, visualization process and human perception, text and issues to perform basic visualizations.

CO2: Analyze visualization tools such as prefuse and weave to perform visualizations based on data and analysis types and pre attentive theories for information processing.

CO3: Apply visualization techniques such as 1-D, 2-D, 3-D, point, line, region, document and text visualization to analyze spatial and multivariate data.

CO4: Design and implement visualizations, trees, graphs and networks for comparing and evaluating visualization techniques using user, data and visualization characteristics.

CO5: Adhere to ethics and adapt cyber regulations in pre-processing and analysing the data.

DETAILED SYLLABUS:

UNIT I – INTRODUCTION AND FOUNDATION (12 Periods)

Visualization in everyday life, importance of visualization, relationship between visualization and other fields-visualization and computer graphics, scientific data visualization vs information visualization; visualization process-computer graphics pipeline, visualization pipeline, knowledge discovery pipeline, role of perception; pseudocode conventions, scatter plot.

Data Foundations: Types of data-(), structure within and between records, other forms of structure, Data pre-processing-metadata and statistics, missing values and data cleaning, normalization, segmentation, sampling and sub setting, dimension reduction, aggregation and summarization, smoothing and filtering.

UNIT II – HUMAN PERCEPTION AND VISUALIZATION (12 Periods)

Human perception and information processing: Perception, perceptual processing-preattentive processing theories.

Visualization foundations: Visualization process in detail, semiology of graphical symbols-symbols and visualizations, features of graphics; the eight visual variables.

Visualization techniques for spatial data: One-dimensional data, Two-dimensional data, Three-dimensional data, visualization technique for geo-spatial data: visualization of point data, visualization of line data, visualization of area data.

Case Study: Visualize the “quakes” data using Google Maps API and attributes of depth, magnitude, and stations for each data point in the map with suitable glyph visualization.

UNIT III – VISUALIZATION TECHNIQUES (10 Periods)

Visualization techniques for multivariate data: Point based techniques, line based techniques, region based techniques, combination of techniques; Visualization techniques for trees, graphs and networks-displaying hierarchical structures, displaying arbitrary graphs or networks and issues.

Case Study: Display a data set using a choice of three or more of the glyph types. Test on a data set with a modest number of records (less than 300) and dimensions (less than 10). Identify the most effective glyphs.

Text and Document Visualization: Levels of text representations, vector space model, Extended text visualizations.

Case Study: A common task when dealing with data is dividing into categories, such as low, medium, and high. Write a program that reads in a document and divides the words into three classes: simple, optimal and complex.

UNIT IV - DESIGNING, COMPARING AND EVALUATING VISUALIZATIONS (11 Periods)

Designing effective visualizations: Steps in designing visualizations, problems in designing effective visualizations.

Comparing and evaluating visualization techniques: User tasks, user characteristics, data characteristics, visualization characteristics, structures for evaluating visualizations, benchmarking procedures, an example of visualization benchmarking

UNIT V- VISUALIZATION SYSTEMS, RESEARCH DIRECTIONS (10 Periods)

Visualization Systems: Systems based on data types, systems based on analysis types, Text analysis and visualization, Tool kits-Prefuse, visualization tool kit, weave.

Research Directions in visualizations: Issues of data, issues of cognition, perception and Reasoning, issues of system design, issues of evaluation, issues of hardware, issues of application.

Case Study: For at least three different types of data (e.g., spatial, multivariate, relational), discuss the impact on typical visualization techniques if the data is dynamic rather than static.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Matthew Ward, Georges Grinstein, Daniel Kaim, "Interactive Data Visualization foundations, Techniques and Applications," CRC Press, Taylor & Francis Group, 2nd Edition, 2010.

REFERENCE BOOK:

1. Chun-houh Chen, Wolfgang Karl Hardle, Antony Unwin, "Hand Book of Data Visualization," Springer, ISBN: 9783540330370, 2008.

ADDITIONAL LEARNING RESOURCES:

1. https://indico.cern.ch/event/681081/contributions/2790760/attachments/1729504/2794629/Principles-of-Visualization-Course-Pt1-Full.pdf
2. https://indico.cern.ch/event/681081/contributions/2790760/attachments/1729504/2794629/Principles-of-Visualization-Course-Pt1-Full.pdf

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	3	-	-	-	-	-	-	-	2	2	3
CO2	-	3	2	-	2	-	-	-	-	-	-	-	1	3	3
CO3	3	2	-	-	3	-	-	-	-	-	-	-	1	3	3
CO4	-	-	3	2		-	-	-	-	-	-	-	3	3	3
CO5	2	3	-	-	2	-	-	-	-	-	-	-	2	3	3
Average	2.67	2.67	2	2	2.5	-	-	-	-	-	-	-	1.8	2.8	3
Course Correlation Level	3	3	2	2	3	-	-	-	-	-	-	-	2	3	3

Correlation level: 3- High 2-Medium 1- Low

MCA V-SEMESTER
(19MC50105).NET TECHNOLOGIES (Theory)
(Professional Elective-III)

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

PRE-REQUISITES:

A course on Object Oriented Programming through JAVA.

COURSE DESCRIPTION:

Introduction to .NET and Building blocks to the .NET Platform; Concepts of C# Programming; Implementation of interfaces, creating custom delegates and Events; Applications on ADO.NET; Design and development of ASP.NET Web Forms.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge on .NET Framework, Microsoft Visual C# and Visual Studio.

CO2: Design and develop web applications using ADO.NET and ASP.NET.

CO3: Apply Microsoft Visual Studio tool to develop web applications.

CO4: Analyze principles of C#, mechanisms of ASP.NET, web controls, sessions and cookies techniques to design Client/Server applications.

CO5: Analyze object oriented programming principles to solve Exception Handling and Multithreading problems to implement C# Programming.

CO6: Adhere to ethics and adapt Key security standards of .NET to design secure web applications for an individual and society.

DETAILED SYLLABUS:

UNIT I- INTRODUCING C# AND.NET PLATFORM (11 Periods)

Benefits of the .NET platform, Building blocks of the .NET platform, Overview of .NET assemblies, Common type system, Common language specification, Common language runtime, Platform-independent nature of .NET, Introduction to Visual Studio; the role of the .NET framework, Building .NET application using visual studio, Anatomy of a simple C# program, System. Console class, System data types and corresponding c# keywords. Working with string data, C# iteration constructs Decision constructs and the Relational/equality operators.

UNIT II- CORE C# PROGRAMMING, OOP WITH C# AND EXCEPTION HANDLING (10 Periods)

C# arrays, C# class type, Constructors, The role of the this keyword, The static keyword, Pillars of OOP, C# access modifiers, C# encapsulation services, automatic properties, mechanics of inheritance, polymorphic support.

Role of .NET Exception Handling, example, System level exceptions, Application level exceptions, processing multiple exceptions.

UNIT III- INTERFACES, GENERICS, DELEGATES AND EVENTS (12 Periods)

Interface types, custom interfaces, Implementing an interface, Implementing an interfaces using visual studio, Role of generic type parameters, Creating custom generic methods, Creating custom generic structures and classes, .NET delegate type, Delegate example, Generic delegate, and C #events, operator overloading.

UNIT IV- ADO.NET (12 Periods)

High level definition of ADO.NET, ADO.NET data provider, ADO.NET namespaces, Connected layer of ADO.NET, Data Readers , Database transactions, Disconnected layer of ADO.NET, Role of the dataset, Working with Data Columns, Data Rows, Data Table , Binding Data Table objects to windows forms GUIs, Data Adapters.

UNIT V- ASP.NET WEB PAGES AND WEB CONTROLS (10 Periods)

ASP.NET, ASP.NET web forms, Role of http, Web applications and web servers, Role of client side scripting, posting back to the web server. ASP.NET API, Building a single file ASP.NET web page, building an ASP.NET webpage using Code Files, ASP.NET web sites vs. ASP.NET Web applications, ASP.NET web site directory structure, the life cycle of an ASP.NET web page, Role of the web.config file, nature of web controls, Major categories of ASP.NET web control, The Role of validation controls, Maintaining session data and Cookies.

Key Security Concepts in .NET: Type safety and security, Principle, Authentication and Authorization.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework,” 6th Edition, Apress, 2013.

REFERENCE BOOKS:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, “Professional C# 4 and .NET 4,” Wrox Publications, 2010, ISBN:978-0-470-50225-9.
2. Mathew Mac Donald “The Complete Reference ASP.NET,” TATA McGraw Hill,2010.

ADDITIONAL LEARNING RESOURCES:

1. https://docs.microsoft.com/en-us/dotnet/standard/security/key-security-concepts

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO2	2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	-	3	-	3	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	3	-	-	-	3	-	-	-	-	-
Average	2.75	3	3	3	3	3	-	-	-	3	-	-	2.6	2.8	2.8
Course Correlation Level	3	3	3	3	3	3	-	-	-	3	-	-	3	3	3

Correlation level: 3- High 2-Medium 1- Low

MCA V - Semester
(19MC50106) SOCIAL NETWORKS (Theory)
(Professional Elective-III)

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

PRE-REQUISITES:

A Course on Computer Networks.

COURSE DESCRIPTION:

Social Networks, Visualizing Online Social Networks, Modeling and aggregating social network data, Aggregating and reasoning with social network data, Framework, Algorithms and Systems for Expert Location in Social Networks, Text Mining in Social Networks.

COURSE OUTCOMES:

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

CO1: Demonstrate the concepts of semantic web, current web, social web to analyze the applications of social networks

CO2: Identify and analyze web based social networks, human behavior for social communities, the role of ontology in modeling, aggregating and representing the social relationships using social network data.

CO3: Analyze tools of Web Ontology Language (OWL), Resource Description Frame work (RDF) and SPARQL (Query Language for RDF) to design social networks.

CO4: Design Node-Edge diagrams, Node-Link diagrams, Trust models based on subjective logic for Visualizing social networks using matrix-based representations.

CO5: Adhere to ethics and adapt XML, URI and Unicode standards, responsibilities, and norms to managing the social network data.

DETAILED SYLLABUS:

UNIT I–WEB-BASED NETWORKS (11 periods)

Semantic Web Concepts: Limitations of current Web, Development of Semantic Web, Emergence of the Social Web; Social Network analysis: Development of Social Network Analysis, Key concepts and measures in network analysis; Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based network, Applications of Social Network Analysis.

UNIT II – MODELING, AGGREGATING AND KNOWLEDGE REPRESENTATION

(11 periods)

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation, Ontology languages for the Semantic Web: Resource Description Framework, Web Ontology Language, Modeling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced representations.

UNIT III – EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

(11 periods)

Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities, social network infrastructures and communities, Decentralized online social networks, Multi-Relational characterization of dynamic social network communities.

UNIT IV – PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES (11 periods)

Understanding and predicting human behavior for social communities, User data management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, Trust models based on subjective logic, Trust network analysis, Trust transitivity analysis, Combining trust and reputation, Trust derivation based on trust comparisons, Attack spectrum and counter measures.

UNIT V – VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

(11 periods)

Graph theory, Centrality, Clustering, Node-Edge Diagrams, Matrix representation, Visualizing online social networks, Visualizing social networks with matrix-based representations, Matrix and Node-Link Diagrams, Hybrid representations, Applications, Cover networks, Community welfare, Collaboration networks, Co-Citation networks.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st Edition, 2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, 1st Edition, 2010.

REFERENCE BOOKS:

1. GuandongXu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st Edition, 2011.
2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.

ADDITIONAL LEARNING RESOURCES:

1. https://www.uky.edu/celt/instructional-resources/teaching-technology/social-networking-tools
2. https://nptel.ac.in/courses/106/106/106106169/
3. https://www.edx.org/learn/social-media-marketing
4. http://www.iitrpr.ac.in/social-media

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	2	3
CO2	-	3	2		1	-	-	-	-	-	-	-	1	2	3
CO3	-	3	-	1	2	-	-	-	-	-	-	-	1	2	2
CO4	1	2	3	-	-	-	-	-	-	-	-	-	2	1	3
CO5	-	-	-	-	-	3	-	-	-	-	-	-	2	2	3
Average	2	2.5	2.5	1	1.5	3	-	-	-	-	-	-	1.6	1.8	2.8
Course Correlation Level	2	3	3	1	2	3	-	-	-	-	-	-	2	2	3

Correlation level: 3- High 2-Medium 1-Low

MCA V-SEMESTER
(19MC50107) SOFTWARE TESTING (Theory)
(Professional Elective – III)

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

PRE-REQUISITES: A course on “Software Engineering”.

COURSE DESCRIPTION:

Software Testing basics: Goals, Defects, Terminology, Methodology, Software Testing Life Cycle (STLC) in Software Development Life Cycle (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:

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

CO1: Demonstrate Knowledge on software testing concepts, Terminology and Methodology, Test Management to perform Software testing.

CO2: Analyze White Box Testing and Black Box Testing techniques to perform testing on Software System.

CO3: Apply testing tools such as Unified Functional Testing (UFT)/ Rational Functional Tester (RFT)/Selenium to control and monitor the functional testing for Airline Reservation System.

CO4: Analyze Testing Techniques, Categorization of testing tools, Selection of testing tools, Static testing and Test Automation strategies for quality of software.

CO5: Analyze Test suite Prioritizations, Types of Test case prioritization, Prioritization Techniques, Software metrics and Regression testing techniques for effective Software testing.

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 Suite Management: Minimizing Test Suite and benefits, Test Suite Minimization problem, Test suite Prioritization, Types of Test case prioritization, Prioritization Techniques.

UNIT IV - REGRESSION AND AUTOMATION (11 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, Define 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, commercial testing tools.

UNIT V- TESTING FOR SPECIALIZED ENVIRONMENTS AND FUNCTIONAL TEST TOOL (11 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. Software Quality Assurance (Case study): Usage of open source test tool(Unified Functional Testing (UFT)/ Rational Functional Tester (RFT)/Selenium) for Functional/Regression testing, Test Recording, Test Running, Synchronization of test cases, creating checkpoints, testing with parameterization.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Naresh Chauhan, "Software Testing: Principles and Practices," Oxford University Press, 2nd Edition, 2016.
2. Ron Patton, "Software Testing", Pearson Education, 2nd Edition, 2007.

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.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105150/
2. https://www.toolsqa.com/software-testing-tutorial/
3. https://www.softwaretestinghelp.com/manual-testing-tutorial-1/
4. https://www.softwaretestinghelp.com/selenium-tutorial-1/

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	1	2	-	-	-	-	-	-	-	3	-	-
CO3	2	2	-	-	3	-	-	-	-	-	-	-	3	-	-
CO4	3	3	-	1	2	-	-	-	-	-	-	-	3	-	-
CO5	3	3	-	1	2								3		
Average	2.8	2.6	-	1	2.3	-	-	-	-	-	-	-	3	-	-
Course Correlation Level	3	3	-	1	2	-	-	-	-	-	-	-	3	-	-

Correlation Level: 3-High 2-Medium 1-Low

MCA V - SEMESTER
(19MC50108) M-COMMERCE (Theory)
(Professional Elective-IV)

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

PRE-REQUISITES:

Courses on Database Management Systems and Computer Networks.

COURSE DESCRIPTION:

Electronic Commerce; E-Commerce applications and web; Process models; Electronic payment systems; Mobile Commerce; Wireless/wired Commerce; Framework for the study of Mobile Commerce; NTT Docomo's I–Mode; Classification framework for Mobile Location Based Services; Mobile Data Technologies and Small Business Adoption And Diffusion; M–Commerce business models.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge on E-Commerce, electronic payment systems, architectures/ Frameworks/ Mercantile models used for E-Commerce applications.

CO2: Identify and analyze wireless technologies, mobile data technologies used for developing M-Commerce applications.

CO3: Analyze M-Commerce applications, framework of M-Commerce, technologies of wireless business to design business models.

CO4: Apply marketing business model, advertising business model and MMS, SMS for mobile commerce applications in marketing and advertising to Customers.

CO5: Adhere to ethics and adapt cyber regulations to design electronic payment systems, mobile business services of E-commerce and M-commerce applications.

DETAILED SYLLABUS:

UNIT I– ELECTRONIC COMMERCE (11 periods)

Electronic Commerce: Electronic Commerce Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce Organization 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; Risks and Electronic Payment systems, Designing Electronic payment System.

UNIT III – MOBILE COMMERCE (10 periods)

Mobile Commerce: Infrastructure of M–Commerce, Types of Mobile Commerce Services, Technologies of Wireless Business, Benefits and Limitations, Support, Mobile Marketing and Advertisement, Non–Internet applications in M–Commerce, Wireless/Wired Commerce comparisons.

UNIT IV – MOBILE COMMERCE TECHNOLOGY (10 periods)

A framework for the study of Mobile Commerce, NTT Docomo's I– Mode, Wireless devices for Mobile Commerce, Classification framework for Mobile Location Based Services, Wireless personal and Local Area Networks, the impact of technology advances on strategy formulation in mobile communications networks.

UNIT V – MOBILE COMMERCE THEORY AND APPLICATIONS (12 periods)

The Ecology of Mobile Commerce, the Wireless Application Protocol, Mobile Business Services, Mobile Portal, factors influencing the adoption of Mobile Gaming Services, Mobile Data Technologies and Small Business Adoption and Diffusion, M–Commerce in the automotive industry, Location–Based services, Criteria for adoption and solution deployment, the role of Mobile advertising in building a brand, M–Commerce business models.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Ravi Kalakota, B. Andrew Whinston, "Frontiers of Electronic Commerce," Pearson Education, 2003.
2. E. Brian Mennecke, J. Troy Strader, "Mobile Commerce: Technology, Theory and Applications," Idea Group Inc., IRM press, 2003.

REFERENCE BOOKS:

1. P. J. Louis, “M-Commerce Crash Course,” McGraw- Hill Companies, 2001.
2. Paul May, “Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business,” Cambridge University Press, 2001.

ADDITIONAL LEARNING RESOURCES:

1. https://www.edx.org/learn/ecommerce
2. https://www.coursera.org/learn/digital-business-models
3. https://www.udemy.com/topic/e-commerce/
4. https://www.oxfordhomestudy.com/courses/online-management-courses/e-commerce-online-course

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	3	-	1	2	-	-	-	-	-	-	-	2	-	3
CO3	-	2	1	-	3	-	-	-	-	-	-	-	-	-	3
CO4	-	-	-	3	2	-	-	-	-	-	-	1	-	1	3
CO5	-	-	1	-	-	3	-	-	-	1	-	-	-	-	3
Average	3	2.3	1	2	2.3	3	-	-	-	1	-	1	2	1	3
Course Correlation Level	3	2	1	2	2	3	-	-	-	1	-	1	2	1	3

Correlation Level: 3- High 2-Medium 1- Low

MCA V- SEMESTER
(19MC50109) MACHINE LEARNING (Theory)
(Professional Elective-IV)

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

PRE-REQUISITES:

Courses on “Data Warehousing and Data Mining” and “Probability and Statistics”.

COURSE DESCRIPTION:

Learning problems; designing a learning system; Issues in machine learning; decision tree learning; artificial neural networks; evaluation hypotheses; estimation hypothesis accuracy; Bayesian learning and computational learning theory; learning sets of rules and analytical learning; combining inductive and analytical learning; reinforcement learning and Dynamic Programming.

COURSE OUTCOMES:

CO1: Demonstrate knowledge on Machine learning concepts, learning problems, decision tree learning, artificial neural networks and Bayesian learning, computational learning theory and probabilities.

CO2: Select and apply decision tree learning algorithms, artificial neural networks algorithms and probabilities to evaluate Learning problems of an application.

CO3: Analyze learning sets of rules, analytical learning of domain theories, inductive-analytical approaches to infer insights of learning.

CO4: Apply reinforcement learning, Bayesian learning and computational learning approaches to classify and assess cues in real time applications.

CO5: Demonstrate knowledge on reinforcement learning and Analytical Learning to know the consequences of actions and process information in specific environment.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION TO MACHINE LEARNING (10 Periods)

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning; Concept learning and the general to specific ordering, concept learning task, concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and candidate elimination algorithm, Remarks on version spaces and candidate elimination, inductive bias.

UNIT II - DECISION TREE LEARNING, ARTIFICIAL NEURAL NETWORKS AND EVALUATION HYPOTHESES (12 Periods)

Decision Tree Learning: Decision tree representation, problems for decision tree learning, basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

Artificial Neural Networks: Neural network representation, problems for neural network learning, perceptions, multilayer networks and the back propagation algorithm, remarks on the back propagation algorithm.

Evaluation Hypotheses: Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT III - BAYESIAN LEARNING AND COMPUTATIONAL LEARNING THEORY (12 Periods)

Bayesian Learning: Bayes theorem, concept learning, maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, gibs algorithm, Naive Bayes classifier, example learning to classify text, Bayesian belief networks- the EM algorithm.

Computational learning theory: Probability learning, approximately correct hypothesis, sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, mistake bound model of learning.

UNIT IV - LEARNING SETS OF RULES AND ANALYTICAL LEARNING (11 Periods)

Learning Sets of Rules: Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules; Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution.

Analytical Learning: Learning with perfect domain theories- Prolog-EBG; Remarks on Explanation-based Learning, Explanation-based Learning of Search Control Knowledge.

UNIT V - COMBINING INDUCTIVE AND ANALYTICAL LEARNING, REINFORCEMENT LEARNING (10 Periods)

Combining Inductive and Analytical Learning: Motivation, inductive-analytical approaches to Learning, Prior Knowledge to initialize the Hypothesis, Prior Knowledge to alter the Search Objective, Prior Knowledge to Augment Search Operators.

Reinforcement Learning: Learning Task, Q-Learning, Non-Deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to Dynamic Programming.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Tom M. Mitchell, “Machine Learning,” Mc Graw Hill, Indian Edition, 2017.
2. Stephen Marsland, “Machine Learning: An Algorithmic Perspective,” Taylor & Francis (CRC), 2nd Edition, 2015.

REFERENCE BOOKS:

1. William W Hsieh, “Machine Learning Methods in the Environmental Sciences, Neural Networks,” Cambridge University Press, 2009.
2. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern classification,” John Wiley & Sons Inc., 2001.
3. Chris Bishop, “Neural Networks for Pattern Recognition,” Oxford University Press, 1995.
4. Peter Flach, “Machine Learning,” Cambridge University Press, 2012.

ADDITIONAL LEARNING RESOURCES:

1. http://ww.cs.cmu.edu/~tom/mlbook-chapter-slides.html

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	1	3	2	3	-	-	-	-	-	-	-	-	3	-
CO3	2	3	2	1	2	-	-	-	-	-	-	-	-	3	-
CO4	2	2	2	1	3	-	-	-	-	-	-	-	-	3	-
CO5	3	2	1	-	-									3	
Average	2.4	2	2	1.3	2.6	-	-	-	-	-	-	-	-	3	-
Course Correlation Level	2	2	2	2	3	-	-	-	-	-	-	-	-	3	-

Correlation Level: 3-High 2-Medium 1-Low

MCA V - SEMESTER
(19MC50110) INTERNET OF THINGS (Theory)
(Professional Elective – IV)

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

PRE-REQUISITES:

A Course on Computer Networks.

COURSE DESCRIPTION:

Internet of Things (IoT) Components; IoT Architecture; Communication models; Prototyping; Hardware; Design models; Development platforms; Analytics for IoT; Security challenges for IoT.

COURSE OUTCOMES:

After Successful completion of this course students will be able to:

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

CO2: Analyze sensors and System Management protocols used in IoT based systems.

CO3: Apply evolutionary techniques to perform analysis on the data integrated based on IoT systems.

CO4: Analyze Security Challenges, Deployment templates and design methodology to design solutions for IoT applications using tools such as Raspberry Pi and Arduino.

CO5: Synthesize the models and IoT applications for usage in Home automation and Weather monitoring systems using IoT deployment templates.

DETAILED SYLLABUS:

UNIT I- IoT CONCEPTS, DOMAIN APPLICATIONS, IoT AND M2M (10 periods)

Introduction to Internet of Things: Definition and Characteristics of IoT, Things in IoT, IoT Protocols, Functional Blocks, Communication models, Communication APIs, IoT Enabling Technologies, IoT Levels & Deployment templates.

IoT and M2M: Concepts of M2M, difference between IoT and M2M, Software Defined Networking, Network Function Virtualization.

UNIT II- IoT ARCHITECTURE, DEVICES AND END POINTS (11 periods)

IoT Architecture: Four-Layer Architecture, Seven-Layer Architecture, FOG Computing and Open Stack Cloud Architecture

IoT Physical Devices and Endpoints: IoT Device, Exemplary Device - Raspberry Pi, about the board, Linux on Raspberry Pi, Raspberry Pi interfaces, Arduino interfaces, Programming Raspberry Pi with Python, Other IOT devices, Domain Specific IoTs.

UNIT III- SENSORS AND CONNECTIVITY, IoT SYSTEM MANAGEMENT (11 periods)

Sensors-Types of Sensor Nodes; Internet Communications, IP Addresses, MAC Address, TCP and UDP ports, Application Layer Protocols.

IoT SYSTEM MANAGEMENT: Need for IoT Systems Management, Simple Network Management Protocol (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 Communication APIs, WAMP – AutoBahn for IoT, Xively Cloud for IoT.

Case Study: IoT System for Weather Monitoring

UNIT V- DATA ANALYTICS AND SECURITY CHALLENGES FOR IoT (13 periods)

Data Analytics for IoT: Analytics, Apache Hadoop, Hadoop MapReduce for Batch Data Analysis, Apache Oozie.

Tools for IoT: Chef and Chef Case studies.

Security Challenges for IoT: Botnets, Mirai, Spam Emails, Ransom ware, Medical IoT Devices, Man in the Middle Attack, Remote Vehicle Access, IP Spoofing, Targeting Cameras in IoT Ecosystem.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. ArshdeepBahga, Vijay Madisetti, Internet of Things – A hands-on approach, University Press, 2015.

REFERENCE BOOKS:

1. Mayur Ramgir, Internet of Things – Architecture, Implementation and Seurity, Pearson, 2020.
2. Adrian McEwen and Hakim Cassimally, Designing the Internet of Things, Wiley Publishing, 2013.

3. CharlesBell, Beginning Sensor Networks with Arduino and Raspberry Pi, Apress, 2013.
4. Marco Schwartz, Internet of Things with the Arduino Yun, Packt Publishing, 2014.
5. Matt Richardson, Shawn Wallace, Getting Started with Raspberry Pi, Maker Media, Inc, 2012.

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	3	-	-	3	-	-	-	-	-	-	-	-	3
CO3	3	2	2	3	2	-	-	-	-	-	-	-	-	-	3
CO4	1	2	3	1	1	-	-	-	-	2	-	-	-	-	2
CO5	3	2	2	2	2	-	-	-	-	2	-	-			3
Average	2.6	2.4	2.6	2	1.7	3	-	-	-	2	-	-	-	-	2.8
Course Correlation Level	3	2	3	2	2	3	-	-	-	2	-	-	-	-	3

Correlation Level: 3-High 2-Medium 1-Low

MCA V - SEMESTER
(19MC50111) SOFTWARE SECURITY (Theory)
(Professional Elective-IV)

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

PRE-REQUISITES:

Courses on Software Engineering and Computer Networks.

COURSE DESCRIPTION:

Importance of Software Security - Security a Software Issue, Secure Software; Requirements Engineering for Secure Software; Security Principles in SDLC - Secure Software Architecture and Design, Secure Coding and Testing; Security and Complexity - System Assembly Challenges; Governance and Managing for more Secure Software.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge on software security, security issues of a software, properties of secure software, Security practices for Software Architecture, Design, Secure Coding and Testing to manage secure software development.

CO2: Analyze the requirements engineering for secure software using SQUARE process model to build security in requirements phase of project development

CO3: Analyze the challenges of security failures in functional and attacker perspectives to overcome the technical complexity in project management.

CO4: Apply software security framework to design roadmap for secured project management.

CO5: Adhere to ethics and adapt cyber regulations using Governance and security standards for developing secure software, security guidelines and maturity of practice.

DETAILED SYLLABUS:

UNIT I– IMPORTANCE OF SECURITY IN SOFTWARE (11 Periods)

Security a Software Issue: Software Assurance and Software Security, Threats to software security, Sources of software insecurity, Benefits of detecting software security defects early, managing secure software development.

Secure Software: Properties of Secure Software, Influencing the security properties of software, Asserting and specifying the desired security properties.

UNIT II – REQUIREMENTS ENGINEERING (11 Periods)

Requirements Engineering for Secure Software: Misuse and abuse cases, the SQUARE process Model, SQUARE sample outputs, Requirements elicitation, Requirements prioritization. IEEE Standard 1074-2006, Developing Software Project Life Cycle Processes

UNIT III – SECURITY PRINCIPLES IN SDLC (12 Periods)

Secure Software Architecture and Design: Software Security practices for Architecture and Design - architectural risk analysis, Software security knowledge for Architecture and Design - Security principles, Security guidelines and Attack patterns.

Secure Coding and Testing: Code analysis, Coding Practices, Software Security testing, Security testing considerations throughput of the SDLC.

UNIT IV – SECURITY AND COMPLEXITY (11 Periods)

System Assembly Challenges: Security failures, functional and attacker perspectives for security analysis in web services and identity management, system complexity drivers and security, Deep technical problem complexity.

UNIT V – GOVERNANCE AND MANAGING (10 Periods)

Governance and Managing for more Secure Software: Governance and security, adopting an enterprise software security framework, Defining adequate security, Risk Management framework for software security, Security and Project Management, Maturity of Practice.

Total Periods: 55

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, and Nancy R. Mead, "Security Engineering: A Guide for Project Managers," Pearson Education, 2009.

REFERENCE BOOKS:

1. Gary McGraw, "Software Security: Building Security In," Addison-Wesley, 2006.
2. Mark Dowd, John McDonald and Justin Schuh, "The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities," Addison-Wesley, 1st Edition, 2006.
3. John Viega and Gary McGraw, "Building Secure Software: How to Avoid Security Problems the Right Way," Addison-Wesley, 2001.
4. G. Hoglund and G. McGraw, "Exploiting Software: How to Break Code," Addison-Wesley, 2004.

ADDITIONAL LEARNING RESOURCES:

1. https://swayam.gov.in/nd2_nou20_cs01/preview
2. https://www.coursera.org/learn/software-security
3. http://www.sei.cmu.edu/publications/books/cert/software-security-engineering.html
4. http://www.informit.com/store/product.aspx?isbn=032150917X
5. http://www.cert.org/podcast/show/20080527allen.html

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	2	-	-	-	-	-	-	-	-	1	-	2
CO2	-	3	1	-	2	-	-	-	-	-	-	-	1	1	3
CO3	-	3	-	2	-	-	-	1	-	-	-	-	1	-	3
CO4	-	-	1	3	2	-	-	-	-	-	-	-	1	1	3
CO5	-	-	-	-	-	3	-	-	-	-	-	-	-	-	3
Average	3	3	1	2.3	2	3	-	1	-	-	-	-	1	1	2.8
Course Correlation Level	3	3	1	3	2	3	-	1	-	-	-	-	1	1	3

Correlation Level: 3- High 2-Medium 1- Low

MCA V SEMESTER
(19MC50131) CLOUD COMPUTING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

Courses on Cloud Computing, Computer Networks, Operating Systems and Object Oriented Programming through JAVA.

COURSE DESCRIPTION:

Practice on installation and configuration of IaaS and PaaS for developing the applications in cloud; Designing web applications in SaaS using JAVA and APEX Programming.

COURSE OUTCOMES:

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

CO1: Demonstrate the web applications of IaaS, PaaS, and SaaS in cloud environment.

CO2: Identify and analyse the applications to install and configure the PaaS, SaaS and IaaS environments to develop applications and deploy in cloud environment.

CO3: Design and develop Cloud applications using service models of Amazon Web Services (IaaS), Google App Engine (PaaS) and Salesforce.com(SaaS).

CO4: Apply Java and Apex programming languages for the development of web applications in SaaS and PaaS environments.

CO5: Work independently or in teams to solve problems with effective communication.

LIST OF EXERCISES:

1. Create a word document of your class time table and store locally and on the cloud with doc, and pdf format.
2. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula DA=10% OF BASIC HRA=30% OF BASIC PF=10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF

BASIC IF BASIC<=1500 =11% OF BASIC IF BASIC>1500 AND BASIC<=2500 =12% OF BASIC IF BASIC>2500 NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX.

3. Prepare a presentation on cloud computing introduction, models, services, and Architectures. Presentation should contain content, images of minimum 15 slides.
4. Create resume using google and zoho cloud programs in PaaS.
5. Write a Google app engine program to generate 'n' even numbers and deploy it to Google Cloud.
6. Write a Google app engine program to multiply two matrices.
7. Installation and configuration of JustCloud.
8. Create an EC2 instance and invoke Ubuntu operating system with a set of configuration on amazon web services under IaaS.
9. Create S3 bucket and store a file in the bucket using AWS.
10. Configure web server on Amazon Linux instance with ElasticIP.

Mini Project

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.

SOFTWARE/TOOLS USED:

1. Google App Engine
2. Amazon Web Services
3. Salesforce.com

ADDITIONAL LEARNING RESOURCES:

1. https://mkyong.com/tutorials/google-app-engine-tutorial/
2. https://aws.amazon.com

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	2	-	-	-	-	-	-	-	1	3	3
CO2	-	2	2	1	3	2	-	-	-	-	-	-	3	3	3
CO3	-	-	3	2	2	2	-	-	-	-	-	-	3	3	3
CO4	-	-	2	-	3	1	-	-	-	-	-	-	2	3	3
CO5	-	1	-	-	-	-	-	-	3	-	3	-	1	1	-
Average	3	1.6	2.5	1.5	2.5	1.6	-	-	3	-	3	-	2	2.6	3
Course Correlation Level	3	2	3	2	3	2	-	-	3	-	3	-	2	3	3

Correlation Level: 3-High 2-Medium 1-Low

MCA V- SEMESTER
(19MC50132) DATA ANALYTICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	1.5

PRE-REQUISITES:

Courses on Computer Networks, Object Oriented Programming through Java and Data Analytics.

COURSE DESCRIPTION:

Installation of Hadoop; Perform analytics on Weather sensors application; Analysis of reports in R and HIVE Tool.

COURSE OUTCOMES:

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

CO1: Demonstrate concepts of Hive, Big Data Analytics, techniques, Integrated Development Environment (IDE) and use MapReduce framework, HDFS and Apache Hive.

CO2: Analyze OLA dataset on Hadoop and R studio to handle diverse data to implement Mapper and Reducer functions in Mapreduce Framework and R programming to manage heterogeneous data to perform data analytics.

CO3: Develop Map Reduce programs on Hadoop platform for weather sensor data by adapting appropriate techniques to provide insights for societal applications.

CO4: Apply modern tools such as HIVE CQL and Cassandra to create, access and store NOSQL and SQL data to perform analytics in a user friendly environment.

CO5: Work independently or in teams to solve problems with effective communication.

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

4. 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.
5. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
6. 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.
7. Implement Matrix Multiplication with Hadoop Map Reduce.
8. Perform setting up and Installing R studio.
9. Implement R scripts to perform sorting and grouping of data.
10. Implement R scripts to perform joining, projection, and filtering of data.
11. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
12. 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.

ADDITIONAL LEARNING RESOURCES:

1. https://www.ngdata.com/big-data-analysis-resources/
2. https://www.analyticsvidhya.com/resources-big-data/
3. https://hadoop.apache.org/docs/r3.1.3/
4. https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf

SOFTWARE/TOOLS USED:

Hadoop, Cassandra, R Studio, Apache HIVE, Ubuntu, VMware

CO-PO-PSO Mapping Table

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	2	3	3	2	3	-	-	-	-	-	-	-	1	3	2
CO3	3	3	3	3	2	-	-	-	-	2	-	-	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	-	-	1	3	2
CO5	3	2	3	-	3	-	-	-	3	-	3	-	2	3	-
Average	2.6	2.5	2.6	2.25	2.6	-	-	-	3	2	2	-	1.6	3	2.5
Course Correlation Level	3	3	3	2	3	-	-	-	3	2	2	-	2	3	3

Correlation level: 3- High 2-Medium 1- Low

MCA V-SEMESTER
(19MC50133) INTERNSHIP

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

PREREQUISITES: -

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand responsibilities relevant to professional computing practices and ethics; Familiarize with latest tools and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

COURSE OUTCOMES:

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

CO1: Analyze latest tools, and technologies that are used in industry to solve complex computing problems following relevant standards, codes, policies and regulations.

CO2: Analyze safety, health, societal, environmental, legal, economical and managerial factors considered in industry in solving complex computing problem relevant to professional computing practices.

CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical forms on computing practices.

MCA VI-SEMESTER
(19MC60131) SEMINAR

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

PREREQUISITES: --

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:

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

CO1: Identify promising new directions of various cutting edge technologies for understanding of a new field in the area of computer science to summarize and review.

CO2: Analytical ability exercised to investigate and solve complex computing problems faced during the seminar.

CO3: Ability to apply techniques to complex computing activities with an understanding of limitations as applied in the seminar.

CO4: Perform individually or in a team besides communicating effectively in written, oral presentation and graphical forms of various cutting edge technologies.

MCA VI-SEMESTER
(19MC60132) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PREREQUISITES: -

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:

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

CO1: Design and Develop software systems or processes to solve complex computing and allied problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.

CO2: Consider society, health, safety, environment, legal, economics and project management in solving complex computing and allied problems.

CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical forms on Software systems or processes.