

**SRI CHANDRASEKHARANEDRA SARASWATHI VISWA MAHA VIDYALAYA  
(Deemed to be University), KANCHIPURAM**

**FACULTY OF SCIENCE  
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS**

**DEGREE OF MASTER OF COMPUTER APPLICATION (M.C.A)**

**REGULATIONS: MCA-R2020**

**M.C.A. Degree (4 –Semester / Regular) Full-Time Programme (w.e.f. 2020 – 2021)**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**DEPARTMENT VISION**

- Empower every student to be innovative, creative and productive in the field of Computer Science by imparting quality education, developing skills and inculcating human values.

**DEPARTMENT MISSION**

- To provide an education of the highest quality for both Under Graduate and Post Graduate students.
- To provide continuous help to students, to develop and enhance their overall personality skills and excel themselves in the challenging environment.
- To enable the students to be knowledgeable and creative by developing state-of-the-art curriculum and through innovative teaching methodologies.
- Providing training programs that bridges the gap between academia and industry to produce competitive software professionals.
- To inculcate values and ethics in the students enabling them to become socially committed professionals.
- To enhance the research quality and productivity, by providing required facilities and industry collaboration.

**1. PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1: To prepare graduates to be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms.

PEO2: To provide students various computing skills like the analysis, design and development of innovative software products to meet the industry needs.

PEO3: To motivate the students to pursue lifelong learning to fulfill their goals.

PEO4: To prepare graduates to contribute to society, as broadly educated, expressive, ethical and responsible citizens with proven expertise.

**2. PROGRAM SPECIFIC OBJECTIVES (PSO)**

PSO1: Enable the students to select the suitable data models, appropriate architecture and platform to implement a system with good performance.

PSO2: Enable the students to design and integrate various system based components to provide user interactive solutions for various challenges.

### 3. PROGRAMME OUTCOMES (PO)

On completion of MCA programme, the students are expected to

**PO1 : Engineering Knowledge :**

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

**PO2 : Problem Analysis :**

Identify, formulate, analyze and interpret data by applying critical thinking to solve complex problems in relevant domain disciplines.

**PO3 : Design and development solutions :**

Design and evaluate solutions for computing systems to meet the industry requirement as per needs and specification which undergoes various phases of software development.

**PO4 : Conduct of investigations of complex problems :**

Use research based knowledge and apply research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

**PO5 : Modern Tool usage:**

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

**PO6 : Professional Ethics:**

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

**PO7 : Life Long learning:**

Recognize the need of independent learning for the continual development as a computing professional in the context of technological change.

**PO8 : Project management and finance :**

Master fundamental project management skills, concepts and techniques, set attainable objectives and ensure positive results, meeting scope, time and budget constraints.

**PO9 : Communication Efficiency :**

Communicate technical information effectively, both orally and in writing.

**PO10: Societal and Environmental concern :**

Recognize the social, cultural, and ethical issues involved in the use of computer technology and give them due consideration in developing software systems.

**PO11: Individual and Team Work:**

Work collaboratively as a member or leader in multidisciplinary teams.

**PO12: Innovation and Entrepreneurship :**

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

### 4. MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OBJECTIVES

| Programme Educational Objectives | Programme Outcomes |   |   |   |   |   |   |   |   |    |    |    | PSO |   |
|----------------------------------|--------------------|---|---|---|---|---|---|---|---|----|----|----|-----|---|
|                                  | 1                  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1   | 2 |
| 1                                | √                  | √ | √ |   |   |   |   |   | √ |    |    | √  | 3   | 2 |
| 2                                |                    | √ | √ | √ | √ |   |   |   |   |    | √  | √  | 4   | 2 |
| 3                                | √                  |   |   | √ |   | √ | √ | √ |   |    | √  |    | 3   | 3 |
| 4                                |                    |   |   |   |   | √ | √ |   | √ | √  |    | √  | 2   | 3 |

## **5. ELIGIBILITY FOR ADMISSION**

Candidates for the admission to the first year course leading to the degree of Master of Computer Application (M.C.A) will be required to possess:

- Passed BCA / Bachelor Degree in Computer Science Engineering or equivalent Degree.  
(OR)
- Passed B.Sc./B.Com./B.A. with Mathematics at 10 + 2 Level or at Graduation Level (with additional bridge courses as per the norms of the University).
- Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in qualifying Examination.
- Notwithstanding the above, actual Admissions will also be based on the rules and regulations of the UGC / AICTE / Competent authorities.

## **6. ENTRANCE EXAMINATION**

MCA entrance examination shall consist of 30 objective type and five descriptive type questions to be solved in 2 hours. Selection is based on both merit and entrance examination.

## **7. DURATION OF THE COURSE**

- a. Bridge courses is organized before the commencement of the first semester.
- b. Nurturing and evaluation process of bridge courses is left the Department of Computer Science and Applications.

The Course duration shall be for TWO years consisting of FOUR semesters. In order to be eligible for the award of the degree the candidate shall successfully complete the course in a maximum period of FOUR years from the date of enrolment for the first semester of the course.

## **8. MODE OF STUDY**

Candidates admitted under this Full-time Programme should be available in the Institution during the entire duration of working hours (From Morning to Evening on Full-Time basis) for the curricular, co-curricular and extra-curricular activities. The candidates should not attend any other Full-time programme(s) / course(s) or take up any Full-Time job / Part-Time job in any Institution or company during the period of full time programme. Violation of the above rules will result in cancellation of admission to the M.C.A. programme.

## **9. CURRICULUM STRUCTURE OF A SEMESTER**

| SEM          | Core Theory Course (CTC) | Core Practical Course (CPC) | Core Theory with Practical Course (CTPC) | Allied Theory Course (ATC) | Elective Theory Course (ETC) | Elective Theory with Practical Course (ETPC) | Employability Skill Development Course (ESDC) | TOTAL COURSES | TOTAL CREDITS |
|--------------|--------------------------|-----------------------------|--|----------------------------|------------------------------|--|---|---------------|---------------|
| I            | 2                        | 2                           | 2  | 1                          | -                            |  | 1   | 8             | 27            |
| II           | 3                        | 2                           | 1  | -                          | 1                            |  | 1   | 8             | 27            |
| III          | 2                        | 2                           | 1  | -                          | 1                            | 1  | 2   | 9             | 28            |
| IV           |                          |                             |  |                            | -                            |  | 2   | 2             | 13            |
| <b>TOTAL</b> | <b>7</b>                 | <b>6</b>                    | <b>4</b>                                 | <b>1</b>                   | <b>2</b>                     | <b>1</b>                                     | <b>6</b>                                      | <b>27</b>     | <b>95</b>     |

- Core Theory Course-(CTC) means the Theory Courses which is core to MCA programme.
- Core Practical Course-(CPC) means the Practical Courses which is core to MCA programme.
- Core Theory with Practical Course-(CTPC)” means Laboratory based Core Theory Course
- Allied Theory Course-(ATC) means the Theory course which is allied/ancillary to MCA programme.
- Elective Theory Course-(ETC) means the Theory course which is as Elective to MCA programme.
- Elective Theory with Practical Course-(ETPC) means the Laboratory based Elective Theory Course
- Employability Skill Development Course (ESDC) means a course that will be offered by the department to bridge the gap between the curriculum and the requirements of the industry.
- Internship” (IS) or Fellowship means a period of time that the student would be deputed to undergo in-house training in reputed Industries or R & D organizations.
- Online Course (OLC) – Online courses conducted by premier institutions like IITs, IISc, etc. through online platform (NPTEL / GIAN / CCNA / CISCO / ORACLE / SPOKEN TUTORIAL / MOOCS / COURSERA, etc.) suggested by the concerned Department can be undertaken by the students.
- New courses may be introduced by the department / institution at any time depending upon the requirement after getting approval from the concerned Board of Studies, Academic Council and Governing Body.

## **10. EXAMINATIONS**

The University follows the ‘Choice Based Credit System (CBCS)’ for all its programmes. Each course is normally assigned one credit per lecture per week and one credit for two periods of tutorials or part thereof for laboratory or practical per week.

Structure of the Course and Evaluation Pattern

|                  |    |
|------------------|----|
| Internal Marks : | 40 |
| External Marks : | 60 |

The duration of University examination for both theory and practical subjects shall be 3 hours. The maximum marks for each theory and practical course is 100. Continuous Internal Assessment (CIA) will be for 40 marks. The university theory examination will be conducted for 100 marks, which will be then converted to 60 in order to add with continuous internal assessment to make 100 marks for the course. The university Practical examination will be conducted for 60 marks.

### **10.1. INTERNAL EXAMINATIONS**

#### **Procedures for Awarding Marks for Internal Assessment**

The break-up of assessment and examination marks for theory subjects is as follows.

|   |   |           |
|---|---|-----------|
| First Assessment (Test)   | : | 15 Marks  |
| Second Assessment (Test)  | : | 15 Marks  |
| Others (Assignment, Quiz/<br>Objective type test, Seminar<br>& Attendance | : | 10 Marks  |
|   |   | -----     |
| Internal Assessment   | : | 40 Marks  |
| University Examination :  |   | 60 Marks  |
|   |   | -----     |
| Total   | : | 100 Marks |

The break-up of the assessment and examination marks for practical is as follows.

|                        |   |           |
|------------------------|---|-----------|
| Observation            | : | 10 Marks  |
| Model Examinations     | : | 20 Marks  |
| Record book            | : | 10 Marks  |
| -----                  |   |           |
| Internal Assessment    | : | 40 Marks  |
| University Examination | : | 60 Marks  |
| -----                  |   |           |
| Total                  | : | 100 Marks |
| -----                  |   |           |

The break-up of assessment (**Internal Assessment Only**) for the subject Soft Skill Development is as follows:

|                          |   |           |
|--------------------------|---|-----------|
| Assignment               | : | 10 Marks  |
| First Internal Test      | : | 30 Marks  |
| Second Internal Test     | : | 30 Marks  |
| Seminar                  | : | 10 Marks  |
| Quiz/Objective type test | : | 10 Marks  |
| Attendance               | : | 10 Marks  |
| -----                    |   |           |
| Total                    | : | 100 Marks |
| -----                    |   |           |

#### 10.2 SUBSTITUTE ASSESSMENT

A student who has missed one or more of assessment tests of a course other than the examinations for genuine reasons as accepted by the Head of the Department may take a substitute assessment for any one of the missed assessment. A student who wishes to have a substitute assessment for missed assessment must apply to the Head of the Department within two **weeks** from the date of the missed assessment.

#### 10.4 EXTERNAL EXAMINATIONS

- The end semester examinations will ordinarily be conducted during November / December in the odd semesters and during April / May in the even semesters. For all the theory courses question papers will be set by external examiners and valued by external and/or internal examiners.
- All practical examinations including the mini project will be conducted by External & internal examiners appointed by the University.
- The final year project work report will be evaluated by the External examiner and viva voce will be conducted by the Board consists of HOD, Internal Examiner (Guide), and External Examiner.

#### 10.5 PROJECT WORK – FINAL SEMESTER

There shall be three assessments (10 marks each and 10 marks for documentation) for the project work during the IV semester by a Review Committee. The student shall make presentation on the progress made before the committee. The Head of the Department shall constitute the review committee for the project work. There shall be a minimum of three members in the review committee. The guide will be an additional member of the Review Committee and he/she should be present during the presentation of his/her student. The candidate is expected to submit the project report on or before the last working day of the semester.

- The Project work can be either carried out in any Industry/University.
- A Coordinator will be appointed by the HOD to coordinate the Project Work.

- Internal guides from the department will be assigned by the Head of the Department to the students.
- As soon as a student gets the project work, he/she has to send the contact details of the organization and the external guide to the department along with the Project title.
- Periodically the students should submit project Task Report to their internal guide.
- The Project work should be an independent one; if the project is a part of a bigger project, the student's work should have a few independent modules.
- If more than one student is working on parts of the same project (big enough to share) the report of each student should be different and not two copies of the same report.

## **10.6 EVALUATION SCHEME**

An External Examiner will evaluate the Project document for 30 marks conduct the *viva voce* along with the review committee for 30 marks. If a student fails in final semester project then the student has to perform the set of activities required for it. The student has to appear for the review fixed by the department and should also appear for the semester exam *viva voce*.

## **10.7 INTERNSHIP**

- Internship scheme is designed specifically for students in the IV semester to take up their major projects in reputed organizations.
- Students can go for internship during the IV semester and complete the Project Work in well reputed companies / organizations offering Placement to the students / R & D organizations/ Premier Institutions both in India and Abroad, as part of their internship.
- This is possible only if the companies / organizations offering Placement to the students / R & D organizations / Premier Institutions allows Internship program with Project and the internship/placement coordinator of the Department concerned are notified well in advance.

### **10.7.1. Eligibility:**

- Final year MCA Students who are selected for Internship, with/without stipend by reputed companies / organizations are eligible.

### **10.7.2. Application to the Internship Scheme:**

- Students eligible / selected for Internship scheme should apply for the scheme to their HOD within the date mentioned by the HOD / Project Coordinator, during the III semester.

### **10.7.3. Guidelines to be followed:**

- Students doing the internship should attend the Project Reviews in the scheduled dates. After completion of the internship cum project, the final summative evaluation will be conducted with a view to assign the final score.

### **10.7.4. Terms and conditions for internship:**

- The internship should be carried out at a single organization.
- It should be completed within one semester.
- All arrangements should be specified in the internship agreement.
- During long leave period and closure of Industries/R&D organization/Premier Institutions for any reason, during the internship period, the students concerned should continue the work only in the college.
- Students should adhere to the rules and regulations of the college and Industries / R&D organization / Premier Institutions during the Internship cum Project period.

#### **10.7.5. Termination of the Internship**

- In the event of prolonged absence of student during the internship (or)
- If the student has to discontinue the internship due to unforeseen circumstances during that period (or)
- If the performance of the work done by the student in the Industries / R&D organization / Premier Institutions is not satisfactory during the Project Review (or)
- If the student violates the college rules & regulations during the Internship/Project period, Then the Internship cum Project will be terminated for these students, after due intimation to the company. In such a situation, the IV Semester Project will be in jeopardy, i.e. these students have to repeat their IV Semester project in the next academic year.

#### **10.8. REQUIREMENTS FOR THE COMPLETION OF THE SEMESTER**

The candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for the completion of the semester.

1. He/ She secures not less than 80% of overall attendance in that semester taking into account the total no of periods in all courses put together attended by the candidate as against the total no of periods in all courses offered during that semester. Condonation of attendance up to 10% is permitted on medical grounds. Relaxation in attendance is permitted up to 10% for the student who represents the university in sports and games. The above two relaxation cannot be taken concurrently.
2. He / She earn a progress certificate from the head of the institution for having satisfactorily completed all the courses pertaining to that semester as judged by Internal Assessment.
3. His / Her conduct has been satisfactory throughout the semester. Candidates who do not complete the semester will not be permitted to write the end semester Examination and are not permitted to go to the next semester. They are required to repeat the incomplete semester in the next academic year.

#### **10.9. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER**

- I. Candidates shall register for the First Semester Examination after the admission in the P.G. course.
- II. Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.
- III. Candidates shall be eligible to go to subsequent semester, only if they earn sufficient attendance as prescribed thereof by the University from time to time.

#### **10.10 PASSING AND DECLARATION OF EXAMINATION RESULTS: PASSING MINIMUM**

1. A candidate shall be declared to have passed in each Paper / Practical / Mini Project and Viva-voce, if he / she secures not less than 50% of marks in the continuous internal assessment (CIA) and the University examinations (External) put together, provided a minimum of 45% of marks is secured in the University examination.
2. If a candidate fails to secure a pass in a particular course, it is mandatory that he / she shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. He / She should continue to register and reappear for the examination till he/she secures a pass. However, the internal assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts.

Assessments of all the courses on absolute marks basis will be considered and passed by the Results – Passing - Board in accordance with the rules of the University. Thereafter, the Controller of Examinations shall convert the marks of each course to the corresponding letter grade as given below, compute the grade point average and the cumulative grade point average, and prepare the grade cards

|                    |   |           |
|--------------------|---|-----------|
| 90 to 100          | : | Grade “S” |
| 80 to 89           | : | Grade “A” |
| 70 to 79           | : | Grade “B” |
| 60 to 69           | : | Grade “C” |
| 56 to 59           | : | Grade “D” |
| 50 to 55           | : | Grade “E” |
| Less than 50 marks | : | Grade “F” |

A Student who obtains less than 50 marks out of 100 in the examination OR is absent for the examination will be awarded the “F” grade. A Student who earns a grade of S, A, B, C, D or E in a course is declared to have successfully completed that course and earned the respective credits for that course. Such a course cannot be repeated by the student. A Student who obtains a letter grade “F” in a course has to reappear for the examinations in that course.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

**S – 10; A – 09; B – 08; C – 07; D – 06; E – 05; F - 00**

After the results are declared, grade cards will be issued to the student. The grade cards will contain the list of courses registered during the year/ semester, the grades scored and the grade point average (GPA) for the year/ semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the course for the year/semester, divided by the sum of the number of credits for all courses taken in that year/semester. CGPA is similarly calculated by considering all the courses taken from the time of admission.

After successful completion of the course, the degree will be awarded with the following classification based on CGPA.

- For the first class with distinction, the student must earn 95 credits within TWO years from the time of admission, pass all the courses in the first attempt and obtained a minimum CGPA of 8.25.
- For the first class, the student must earn 95 credits within THREE years from the time of admission, obtain a minimum CGPA of 6.5.
- For second class, the student must earn 95 credits within FOUR years from the time of admission.

#### **11. ELIGIBILITY FOR THE AWARD OF THE DEGREE**

A Student shall be declared to be eligible for the award of the Degree provided if,

- The student has successfully completed the course requirements and has passed all the prescribed examinations in all the **four semesters** within a maximum period of **FOUR years** reckoned from the commencement of the first semester to which the candidate was admitted.
- No disciplinary action is pending against him / her.

## 12. PATTERN OF UNIVERSITY EXAMINATION QUESTION PAPER (THEORY)

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**Time 3 hours**

**Max Marks: 100**

**Part – A (10 \* 2 = 20 Marks)**

(2 Question from each unit)

**Part – B (5 \* 16 = 80 Marks)**

(1 Set from each Unit (Either or Pattern))

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Marks secured by the candidate will be converted to 60 to make the aggregate 100, while adding with Continuous Internal Assessment of 40 marks.

## 13.1 PATTERN OF QUESTION PAPER (PRACTICAL)

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**Time: 3 Hours**

**Max: 100 Marks**

Program exercise (may contain subdivisions) to be solved within 3 hours. The External Examiner will set a question paper on the spot with the help of the question bank or list of exercises.

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## 13. STUDENT MENTOR

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student Mentor for those students throughout their period of study. Such student Mentor shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Head of the Department.

## 14. CLASS COMMITTEE

A class committee consists of teachers of the class concerned, student representatives and a Senior Advisor, ie faculty member who does not handle any subject for the class. It is like the 'Quality Circle' (more commonly used in industries), with the overall goal of improving the teaching-learning process. The functions of the class committee include:

- i. Solving the problems experienced by students in the classroom and in the laboratories in consultation with Head of the Department / Dean.
- ii. Clarifying the Regulations of the degree programme and the details of rules therein.
- iii. Informing the student representatives, the academic schedule including the mode and dates of assessments and the syllabus coverage for each assessment.
- iv. Informing the student representatives, the details of Regulations regarding weightage used for each assessment.
- v. Analyzing the performance of the students of the class after each periodic test and finding ways and means of improving the performance of the students.
- vi. Identifying the slow learners and helping them to come up by guidance and/or by providing additional coaching.

The class committee is normally constituted by the Head of the Department. The class committee shall be constituted within a week from the date of commencement of a semester. At least 4 student-representatives from the respective class (typically 2 boys and 2 girls) shall be included in the class committee. The Chairperson of the class committee normally Class In-charge

may invite the Head of the Department, Senior Advisor, course teachers and students to the meeting of the class committee. The chairperson of the class committee is required to prepare the minutes of every meeting, submit the same to the Head of the Department and then to the DEAN within three working days of the meeting and arrange to circulate the same among concerned students and teachers.

The first meeting of the class committee shall be held within fifteen days from the date of commencement of the semester. The nature and weightage of continuous assessments shall be informed in the first meeting, and the same shall be communicated to the students. Two or three subsequent meetings in a semester may be held at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express their opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

**15. DISCIPLINE**

Every student is required to observe disciplined and decorous behavior both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the University.

**16. REVISION OF REGULATION AND CURRICULUM**

The University may from time to time revise, amend or change the regulations, scheme of examinations and syllabi as found necessary.

**17. AUTHORITY OF BOARD OF STUDIES**

The Board of Studies has the full authority to change the syllabus any time according to IT trend and industry needs.

## MCA CURRICULUM

| BRIDGE COURSE                    |  |              |          |           |           |               |    |       |          |
|----------------------------------|--|--------------|----------|-----------|-----------|---------------|----|-------|----------|
| Course Code                      | Course Title                             | Total Hours  |          |           | Credit    | Maximum Marks |    |       | Category |
|                                  |  | L            | T        | P         |           | CIA           | EA | Total |          |
| MCABC1                           | Principles of IT & Computer Architecture | 10           | 0        | 0         |           |               |    |       | BTC      |
| MCABC2                           | Programming in C & C++                   | 10           | 0        | 0         |           |               |    |       | BTC      |
| MCABC3                           | Programming in C & C++ Lab.              | 0            | 0        | 20        |           |               |    |       | BTC      |
| SEMESTER – I                     |  |              |          |           |           |               |    |       |          |
| Course Code                      | Course Title                             | Hours / Week |          |           | Credit    | Maximum Marks |    |       | Category |
|                                  |  | L            | T        | P         |           | CIA           | EA | Total |          |
| <b>Theory</b>                    |  |              |          |           |           |               |    |       |          |
| MCA2011                          | Probability and Statistics               | 3            | 1        | 0         | 4         | 40            | 60 | 100   | ATC      |
| MCA2012                          | Data Structures and algorithms           | 3            | 1        | 2         | 4         | 40            | 60 | 100   | CTPC     |
| MCA2013                          | JAVA Programming                         | 3            | 2        | 0         | 4         | 40            | 60 | 100   | CTC      |
| MCA2014                          | Database Technologies                    | 3            | 2        | 0         | 4         | 40            | 60 | 100   | CTC      |
| MCA2015                          | Operating Systems                        | 3            |          | 2         | 4         | 40            | 60 | 100   | CTPC     |
| <b>Practical</b>                 |  |              |          |           |           |               |    |       |          |
| MCA2016                          | JAVA Programming Lab.                    | 0            | 0        | 6         | 3         | 40            | 60 | 100   | CPC      |
| MCA2017                          | RDBMS Lab.                               | 0            | 0        | 6         | 3         | 40            | 60 | 100   | CPC      |
| <b>Employability Enhancement</b> |  |              |          |           |           |               |    |       |          |
| MCA2018                          | Skill Communication – I                  | 2            |          |           | 1         | 100           |    | 100   | ESDC     |
| <b>Total</b>                     |  | <b>17</b>    | <b>6</b> | <b>16</b> | <b>27</b> |               |    |       |          |
| SEMESTER – II                    |  |              |          |           |           |               |    |       |          |
| Course Code                      | Course Title                             | Hours / Week |          |           | Credit    | Maximum Marks |    |       | Category |
|                                  |  | L            | T        | P         |           | CIA           | EA | Total |          |
| <b>Theory</b>                    |  |              |          |           |           |               |    |       |          |
| MCA2021                          | Python Programming                       | 3            | 2        | 0         | 4         | 40            | 60 | 100   | ATC      |
| MCA2022                          | Machine Learning                         | 3            | 2        | 0         | 4         | 40            | 60 | 100   | CTC      |
| MCA2023                          | Dot net technologies                     | 3            | 2        | 0         | 4         | 40            | 60 | 100   | CTC      |
| MCA2024                          | Software Design & Testing                | 3            |          | 2         | 4         | 40            | 60 | 100   | CTPC     |
| MCA2025                          | <b><u>ELECTIVE – I</u></b>               |              |          |           |           |               |    |       |          |
|                                  | A. Data Communication and Networks       |              |          |           |           |               |    |       |          |
|                                  | B. NOSQL Databases                       |              |          |           |           |               |    |       |          |
|                                  | C. OOAD with UML                         |              |          |           |           |               |    |       |          |
|                                  | D. Artificial Intelligence               |              |          |           |           |               |    |       |          |
|                                  | E. Mobile computing                      | 3            | 2        | 0         | 4         | 40            | 60 | 100   | ETC      |
| <b>Practical</b>                 |  |              |          |           |           |               |    |       |          |
| MCA2026                          | Machine Learning Lab. Using Python       | 0            | 0        | 6         | 3         | 40            | 60 | 100   | CPC      |
| MCA2027                          | Dot net technologies Lab.                | 0            | 0        | 6         | 3         | 40            | 60 | 100   | CPC      |
| <b>Employability Enhancement</b> |  |              |          |           |           |               |    |       |          |
| MCA2028                          | Skill Communication – II                 | 2            |          |           | 1         | 100           |    | 100   | ESDC     |
| <b>Total</b>                     |  | <b>17</b>    | <b>8</b> | <b>14</b> | <b>27</b> |               |    |       |          |

| SEMESTER – III                   |  |              |          |           |           |               |    |       |          |
|----------------------------------|--|--------------|----------|-----------|-----------|---------------|----|-------|----------|
| Course Code                      | Course Title   | Hours / Week |          |           | Credit    | Maximum Marks |    |       | Category |
|                                  |  | L            | T        | P         |           | CIA           | EA | Total |          |
| <b>Theory</b>                    |  |              |          |           |           |               |    |       |          |
| MCA2031                          | Mobile Application Development                       | 3            | 2        | 0         | 4         | 40            | 60 | 100   | CTC      |
| MCA2032                          | Web Technology                                       | 3            | 2        | 0         | 4         | 40            | 60 | 100   | CTC      |
| MCA2033                          | Cloud Computing                                      | 3            |          | 2         | 4         | 40            | 60 | 100   | CTPC     |
| MCA2034                          | <b>Elective – II</b>                                 |              |          |           |           |               |    |       |          |
|                                  | A. Big Data Analytics                                |              |          |           |           |               |    |       |          |
|                                  | B. Agile Software Engineering                        |              |          |           |           |               |    |       |          |
|                                  | C. Computer Graphics and Multimedia                  |              |          |           |           |               |    |       |          |
|                                  | D. Data Analytics with R                             |              |          |           |           |               |    |       |          |
|                                  | E. Internet of Things (IoT)                          |              |          |           |           |               |    |       |          |
|                                  | F. Ethical Hacking                                   | 3            | 0        | 2         | 4         | 40            | 60 | 100   | ETPC     |
| MCA2035                          | <b>Elective – III</b>                                |              |          |           |           |               |    |       |          |
|                                  | A. Block chain Technology                            |              |          |           |           |               |    |       |          |
|                                  | B. Digital Marketing                                 |              |          |           |           |               |    |       |          |
|                                  | C. Digital Image Processing                          |              |          |           |           |               |    |       |          |
|                                  | D. Automata Theory                                   |              |          |           |           |               |    |       |          |
|                                  | E. Software Project Management and Quality Assurance |              |          |           |           |               |    |       |          |
|                                  | F. Research Methodologies                            | 3            | 1        | 0         | 3         | 40            | 60 | 100   | ETC      |
| <b>Practical</b>                 |  |              |          |           |           |               |    |       |          |
| MCA2036                          | Mobile Application Development Lab                   | 0            | 0        | 5         | 3         | 40            | 60 | 100   | CPC      |
| MCA2037                          | Web Technology Lab                                   | 0            | 0        | 5         | 3         | 40            | 60 | 100   | CPC      |
| <b>Employability Enhancement</b> |  |              |          |           |           |               |    |       |          |
| MCA2038                          | Mini Project   |              |          | 4         | 2         | 40            | 60 | 100   | ESDC     |
| MCA2039                          | Online Course –I                                     |              |          | 2         | 1         | 100           |    | 100   |          |
| <b>Total</b>                     |  | <b>15</b>    | <b>5</b> | <b>20</b> | <b>28</b> |               |    |       |          |
| SEMESTER – IV                    |  |              |          |           |           |               |    |       |          |
| Course Code                      | Course Title   | Hours / Week |          |           | Credit    | Maximum Marks |    |       | Category |
|                                  |  | L            | T        | P         |           | CIA           | EA | Total |          |
| <b>Employability Enhancement</b> |  |              |          |           |           |               |    |       |          |
| MCA2041                          | Project Work   |              |          | 24        | 12        | 40            | 60 | 100   | ESDC     |
| MCA2042                          | Online Course- II                                    |              |          |           | 1         | 100           |    | 100   |          |
| <b>Total</b>                     |  | <b>0</b>     | <b>0</b> | <b>24</b> | <b>13</b> |               |    |       |          |

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|---------|----------------------------|---|---|---|---|
| MCA2011 | PROBABILITY AND STATISTICS | L | T | P | C |
|         |                            | 3 | 1 | 0 | 4 |

### COURSE OBJECTIVES

- Statistical knowledge helps to collect data and employ it for correct analysis
- To understand about descriptive, analytical, inductive, inferential, applied for final analysis and interpretation
- To make students with consequently requisite quantitative skills
- To make students to solve some practical engineering problems

### COURSE OUTCOMES

- CO1: Understand Baye's theorem and also summarize discrete and continuous probability distributions
- CO2: Analyze statistical data using measures of central tendency and dispersion.
- CO3: Compute and interpret the results of Bivariate Regression and Correlation Analysis, for forecasting and also apply the appropriate Chi-Squared test for independence and goodness of fit
- CO 4: Perform hypotheses tests of means, proportions and variances using both one-and two-sample data sets.
- CO 5: Design experiments by choosing the experimental units, treatments, factors, randomization and blocking.

### SYLLABUS

#### **UNIT – I: Probability and Random Variable:**

Sample Spaces and Events – Probability – Axioms of Probability – Some Elementary Theorems – Conditional Probability – Baye's Theorem - Random Variable: Discrete Random Variable - Continuous Random Variable - Distribution Function - Mathematical Expectation - Binomial Distribution - Poisson Distribution - Normal Distribution (only simple problems).

12

#### **UNIT – II: Descriptive statistics:**

Statistical Averages - Arithmetic Mean - Properties of Arithmetic Mean - Merits and Demerits of Arithmetic Mean - Median - Merits and Demerits of Median - Mode - Merits and Demerits of Mode - Dispersion: Range - Quartile Deviations - Mean Deviation - Standard Deviation - Coefficient of Variance - Skewness: Karl Pearson Coefficient of Skewness

12

#### **UNIT – III: Multivariate Analysis:**

Correlation: Bivariate Data - Correlation between Two Variables - Covariance between Two Variables - Karl Pearson's Coefficient of Correlation - Rank Correlation. Regression Analysis: Simple Linear Regression - Regression Equations. Attributes - Coefficient of Association -  $\chi^2$  test for Goodness of Fit - Test for Independence

12

#### **UNIT – IV: Inference Concerning Means and Variances:**

Test of Hypothesis – Null Hypothesis – Hypothesis Concerning One Mean – Relation between Tests and Confidence Intervals – Inference Concerning Two Means - Hypothesis Concerning One Variance – Hypothesis Concerning Two Variances

12

**UNIT – V : Analysis of Variance:**

Some General Principles – Completely Randomized Designs – Randomized – Block Designs – Some Further Experimental Design.

**12**

**TOTAL : 60**

**REFERENCES:**

1. Erwin Miller and John E.Freund, “Probability and Statistics for Engineers”, 7<sup>th</sup> Edition, Pearson Education, India, 2017. (Unit I, IV,V)
2. James T. McClave and Terry Sincich, “Statistics”, 12<sup>th</sup> Edition, Pearson Education, India, 2013. (Unit II, III)
3. Gupta S.C and Kapoor V.K, “Fundamentals of Mathematical Statistics”, 11<sup>th</sup> Edition, Sultan Chand & Sons, India, 2007.

|                |                                       |          |          |          |          |
|----------------|---------------------------------------|----------|----------|----------|----------|
| <b>MCA2012</b> | <b>DATA STRUCTURES AND ALGORITHMS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                                       | <b>3</b> | <b>1</b> | <b>2</b> | <b>4</b> |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To understand and apply linear data structures-List, Stack and Queue.
- To understand non linear data structures- trees and graphs and applications.
- To learn different algorithms analysis techniques.
- To apply data structures and algorithms in real time applications
- To be Able to analyze the efficiency of algorithm

### **COURSE OUTCOMES**

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

- CO1 : Describe, explain and use abstract data types including stacks, queues and lists  
CO2 : Design and Implement Tree data structures  
CO3 : Able to understand and implement nonlinear data structures - graphs.  
CO4 : Able to understand various algorithm design and implementation.

### **SYLLABUS**

#### **UNIT –I INTRODUCTION**

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

**12**

#### **UNIT – II LINEAR DATA STRUCTURES:**

Lists-Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

**12**

#### **UNIT –III NON-LINEAR DATA STRUCTURES**

Binary Tree – expression trees – Binary tree traversals – Applications of trees – Binary search tree - Balanced Trees - AVL Tree .

#### **GRAPHS**

Representation of graph - Graph Traversals - Depth-first and breadth-first traversal - Applications of graphs – shortest-path algorithms - Dijkstra's algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms.

**12**

#### **UNIT – IV SORTING AND HASHING**

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

**12**

## **UNIT – V ALGORITHM DESIGN AND ANALYSIS**

Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. - Divide and Conquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Warshall’s Algorithm for Finding Transitive Closure. Backtracking – N-Queen's Problem - P & NP problems –NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem.

**12**

**TOTAL: 60**

### **REFERENCES:**

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms” Pearson Education, 2015.
2. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, 2007.
3. E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms/C++”, Second Edition, University Press, 2007.
4. Gilles Brassard, “Fundamentals of Algorithms”, Pearson Education 2015.
5. Harsh Bhasin, “Algorithms Design and Analysis”, Oxford University Press 2015.
6. John R.Hubbard, “Data Structures with Java”, Pearson Education, 2015.
7. M. A. Weiss, “Data Structures and Algorithm Analysis in Java”, Pearson Education Asia, 2013.
8. Peter Drake, “Data Structures and Algorithms in Java”, Pearson Education 2014.
9. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Third Edition, PHI Learning Private Ltd, 2012.
10. Tanaenbaum A.S., Langram Y. Augestein M.J, “Data Structures using C” Pearson Education , 2004.
11. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983

|                |                         |          |          |          |          |
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| <b>MCA2013</b> | <b>JAVA PROGRAMMING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                         | <b>3</b> | <b>2</b> | <b>0</b> | <b>4</b> |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- Understand fundamentals of object-oriented programming in Java.
- To impart the knowledge on the concept of Java Programming skills.

### **COURSE OUTCOMES**

- CO1 : Implement the basic programming concept in java.  
CO2 : Understand the object oriented features of Java  
CO3 : To ensure the Execution of I/O packages and Multiple Thread,  
CO4 : Implement various data structure concept like queue, dequeue and linked list  
CO5 : To develop web applications using GUI.

### **SYLLABUS**

#### **UNIT – I JAVA BASICS:**

The History and Evolution of Java - Overview of Java – Program Structure -Data Types, Variables, Arrays, Operators -Control Statements- Classes - Objects – Methods -Constructors- this keyword – finalize() method -- Method Overloading - Constructor Overloading.

**12**

#### **UNIT – II INHERITANCE, PACKAGES AND INTERFACE:**

Inheritance: Member Access and Inheritance – Multilevel Hierarchy - Method Overriding – Dynamic Method Dispatch - Keywords: Abstract – Super - Final – Static - Packages: Defining a Package - Access Protection - Importing Packages. Interfaces: Defining an Interface - Implementing Interfaces.

**12**

#### **UNIT – III EXCEPTION HANDLING, MULTITHREADING AND I/O PACKAGES:**

Exception handling: Exception Types – Try and Catch statement – Throw – Throws – Finally. Multithreading: The Java Thread Model – Creating Threads and Multiple Thread Creation - Thread Priorities – Synchronization – Deadlock - I/O Packages: Byte Streams -Character Streams – String Handling.

**12**

#### **UNIT – IV COLLECTIONS FRAMEWORK:**

Collection Interfaces: Set - Sorted Set – List – Queue - Dequeue – Collection Classes: Array List - Linked List- Hash Set – Priority Queue – Comparators.

**12**

#### **UNIT – V APPLETS AND EVENT HANDLING :**

The Applet Class – Applet Architecture – Simple Applet and display methods – The HTML , Applet Tag – Applet context and show document – The Delegation Event Model – Event Classes – key event class – Event Listener interface – Adapter Classes – Inner classes – AWT – Working with Windows, Graphics and Text – Using AWT Controls – Layout Managers.

**12**

**TOTAL: 60**

## REFERENCES

1. HerberSchildt “Java : A Beginner’s Guide “,7<sup>th</sup> Edition, Oracle Press ,Tata McGraw Hill, Education,2017
2. Cay S.Horstmann, “ Core java volume 1- Fundamentals”, 10<sup>th</sup> Edition Prentice Hall,2016.
3. RajkumarBuyya, ThamaraiSelvi S. and Xingchen Chu, “Object Oriented Programming with Java Essentials and Applications”, Tata McGraw Hill Publishing Company, New Delhi, 2011.
4. HerberSchildt “The Complete Reference – Java 2“, 11<sup>th</sup> Edition, Oracle press,Tata McGraw Hill,Education ,2019.
5. Somasundaram. K, ”Programming in Java2”,10<sup>th</sup> Edition, Jaico Publishing House, Mumbai, 2010.

|                |                              |          |          |          |          |
|----------------|------------------------------|----------|----------|----------|----------|
| <b>MCA2014</b> | <b>DATABASE TECHNOLOGIES</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                              | <b>3</b> | <b>2</b> | <b>0</b> | <b>4</b> |

**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVES**

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram
- To make a study of SQL and relational database design.

**COURSE OUTCOMES**

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

- CO1 : Design a database using ER diagrams and map ER into Relations and Normalize the relations.
- CO2 : Understand the basic concepts of the database and data models.
- CO3 : Design multiple tables, and using group functions, sub queries
- CO4 : Write simple and advanced PL/SQL code blocks,
- CO5 : Write stored procedures, functions, packages, and triggers, and implement complex business rules with oracle 11g

**SYLLABUS**

**UNIT – I Data Models and Relational Model:** Introduction – Database System Applications – Purpose of Database Systems – View of Data – Database Languages – Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture – Database Users and Administrators – Relational Model – Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations - Relational Algebra.

**12**

**UNIT – II SQL and Database Design:** Overview – SQL Data Definition – Basic Structure – Operations – Aggregate Functions – Nested Sub Queries – Modification of the Database – Intermediate SQL: Joins – Views - Integrity Constraints – SQL Data Types and Schemas – Authorization – Database Design and E-R Model: E-R Model - Constraints – ER Diagrams – Reduction to Relational Schema – ER design Issues.

**12**

**UNIT – III Normalization and Tables :** Relational Database Design: Features of Good Relational Designs - Atomic Domains and First Normal Form - Functional Dependency Theory – Decomposition using Functional Dependencies: 2NF, 3NF, BCNF – Decomposition using Multivalued Dependencies - 4NF, 5NF, Tables : DDL, DML, TCL comments- SQL queries – Views.

**12**

**UNIT – IV INTRODUCTION TO PL/SQL**

Introduction to PL/SQL – Data Types in PL/SQL, Column %Type, %row , Commenting - Control Structures - Exception Handling - Cursors : Implicit, Explicit Cursor, Procedures: Create, Drop Procedure, Functions: Create, Drop Function- Triggers: Creating Trigger, Enable and Disable Triggers

**12**

**UNIT – V MongoDB:** Getting and Starting MongoDB - Introduction to the MongoDB Shell - Data Types - Using the MongoDB Shell – Creating, Updating, Deleting Documents - Querying – Introduction to the Aggregation Framework.

**12**

**TOTAL: 60**

## **REFERENCES**

1. Abraham Silberschatz, Henry F. Korth and Sudharshan S., “Database System Concepts”, 7<sup>th</sup> Edition, Tata McGraw Hill, New York, 2019. (Unit I, II, IV)
2. Ramez Elmasri, Shamkant B Navathe, “Fundamentals of Database Systems”, 7<sup>th</sup> Edition, Pearson, 2016. (Unit III)
3. Kristina Chodorow, “MongoDB: The Definitive Guide”, 3<sup>rd</sup> Edition, O’Reilly Media Inc., 2019. (Unit V)

|         |                   |   |   |   |   |
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| MCA2015 | OPERATING SYSTEMS | L | T | P | C |
|         |                   | 3 |   | 2 | 4 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To learn the fundamentals of Operating System
- To know about Process, Thread and CPU Scheduling
- To understand the Process Synchronization and Deadlocks
- To learn about Memory Management and Virtual Memory
- To know about File System Interface and Implementation

### COURSE OUTCOMES

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

- CO 1: Able to learn the fundamentals of Operating System  
CO 2: Able to know about Process, Thread and CPU Scheduling  
CO 3: Able to understand the Process Synchronization and Deadlocks  
CO 4: Able to learn about Memory Management and Virtual Memory  
CO 5: Able to know about File System Interface and Implementation

### SYLLABUS

#### **UNIT – I: Operating System Overview and System Structures**

Introduction - Mainframe systems – Desktop Systems – Multiprocessor Systems Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection – System Components – Operating System Services – System Calls – System Programs.

12

#### **UNIT – II: Process, Thread and CPU Scheduling**

Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Interprocess Communication. Threads : Overview – Threading issues. CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling.

12

#### **UNIT – III: Process Synchronization and Deadlocks**

The Critical Section Problem – Synchronization Hardware– Semaphores – Classic problems of Synchronization – Critical regions – Monitors. System Model – Deadlock Characterization – Methods for handling Deadlocks-Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks

12

#### **UNIT – IV: Memory Management and Virtual Memory**

Overview of Memory Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging. Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing

12

#### **UNIT – V: File System Interface and Implementation**

File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection. File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management – Efficiency and Performance – Recovery – Log Structured File System - NFS

12

21

**REFERENCES**

1. Abraham Silberschatz, Peter Baer Galvin and GregGagne, “Operating System Concepts”, 0th Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2018.
2. Andrew S. Tanenbaum, Herbert Bos, “Modern Operating Systems”, 4th Edition, Pearson education, 2014
3. Achyut S.Godbole, Atul Kahate, —Operating Systems, 4<sup>th</sup> Edition, McGraw Hill Education, 2016.
4. Pramod Chandra P. Bhatt – “An Introduction to Operating Systems, Concepts and Practice”, 5th Edition, PHI Learning Pvt. Ltd., 2019

|                |                             |          |          |          |          |
|----------------|-----------------------------|----------|----------|----------|----------|
| <b>MCA2016</b> | <b>JAVA PROGRAMMING LAB</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                             | <b>0</b> | <b>0</b> | <b>6</b> | <b>3</b> |

**(For Students admitted from 2020 onwards)**

### **COURSE OBJECTIVES**

- To Develop programs using Core JAVA
- To implement the Thread Concepts
- To develop an web application using Applet.

### **COURSE OUTCOMES**

- CO1: Implement the basic java programming concept and OOPs concept like Encapsulation , Polymorphism ,and inheritance.
- CO2: Applying an interface, exception and user define packages.
- CO3: implement the Inter thread concept using an Applet.
- CO4: Develop a web application Using an Applet and Events.

### **LIST OF EXERCISES**

1. Develop Java applications using classes and objects.
2. Develop Java applications to implement overloading.
3. Write a Java program to implement inheritance
4. Develop Java applications to implement overriding.
5. Write a Java program to illustrate exception handling.
6. Develop Java applications using interfaces.
7. Develop Java applications using packages.
8. Write a Java program to demonstrate the concept of inter thread communication.
9. Java program for applet using drawstring(), drawRect() and drawOval().
10. Develop a Java program to create a banner using applet.
11. Develop an applet program to perform an Arithmetic operation using AWT controls and Event.
12. Develop a web application using a Layout Manager in AWT.

|         |           |   |   |   |   |
|---------|-----------|---|---|---|---|
| MCA2017 | RDBMS LAB | L | T | P | C |
|         |           | 0 | 0 | 6 | 3 |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To give practical training in design and implementation of relational data bases for the selected set of problems.

### **COURSE OUTCOMES**

CO1: Students will be familiar in coding with PL/SQL programs and work with RDBMS

### **LIST OF EXERCISES**

1. Data Definition Language (DDL) commands in RDBMS
2. Data Manipulation Language (DML) and Data Control Language (DCL)
3. Sub-queries and JOINS
4. High level language extensions with cursors
5. High level language extension with Triggers
6. Procedures and Functions
7. Database design using E-R model and Normalization
8. Implementation of Embedded SQL // Practice on some simple PL/SQL Programs
9. PL/SQL program to perform Select, Insert, Update and Delete operations on Student Database.
10. PL/SQL program to perform Select, Insert, Update and Delete operations on Employee Database.
11. Creating, Creating, Updating, Deleting Documents using MangoDB.

|                |                                |          |          |          |          |
|----------------|--------------------------------|----------|----------|----------|----------|
| <b>MCA2018</b> | <b>SKILL COMMUNICATION - I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                                | <b>2</b> |          |          | <b>1</b> |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To inculcate reading habit and develop effective reading skills.
- To improve basics of grammar.
- To help students to spot common errors in English.
- To familiarize students with vocabulary and their application in context.
- To improve aptitude skills, problem solving skills and reasoning ability.

### **COURSE OUTCOMES**

At the end of the course, students will be

- CO1: Able to understand the fundamentals of grammar also helps to apply and analyze in spotting the errors.
- CO2: Able to understand and apply the concept of vocabulary and verbal logic with examples.
- CO3: Able to understand and solve the number problems.
- CO4: Able to understand and solve the problems through analytical and logical reasoning methods.

### **SYLLABUS**

#### **UNIT I - READING SKILLS & GRAMMAR**

Reading Comprehension - Fundamentals of Grammar – Parts of Speech I - Fundamentals of Grammar – Parts of Speech II -Fundamentals of Grammar – Articles, Modifiers & Determiners - Fundamentals of Spotting Errors Grammar – Concord Rule - Fundamentals of Grammar – Tenses-Sentence Correction.

#### **UNIT II - VOCABULARY & VERBAL LOGIC**

Synonyms – Antonyms - Examples – Case study - Sentence Completion - Word Analogy - Examples – Case study - Critical Reasoning - Examples – Case study.

#### **UNIT III - NUMBERS AND MODERN MATHEMATICS**

Numbers I - Numbers II – Logarithm -Simple Equations- Ratio & Proportion - Percentage, Profit & Loss - Venn Diagram- Permutation –Combinations - Probability

#### **UNIT IV - REASONING**

Analytical Reasoning I - Analytical Reasoning II- Logical Reasoning –Blood Relations / Directions - Logical Reasoning – Number series - Logical Reasoning – Coding /Decoding/ Odd man out.

**WEEKLY 2 HOURS**

### **REFERENCES**

1. Thomson A.J. & Martinet A.V, “A Practical English Grammar”, Oxford University Press, 4<sup>th</sup> Edition (For 1 to 2 units), 1986.
2. Wren & Martin, “High School English Grammar and Composition”, Faber &Faber, First Canadian Edition, (For 1 to 2 units), 1991.
3. Agrawal R.S. (2012), “Quantitative Aptitude for Competitive Examination”, S.Chand Publishing, New Delhi (For 3 to 4 units), 2012.
4. Dinesh Khattar (2013), “Quantitative Aptitude for Competitive Examinations”, Pearson Education, 2nd Edition (For 3 to 4), 2013.

## **E-REFERENCES**

1. <https://www.talkenglish.com/grammar/grammar.aspx>
2. <https://www.english-at-home.com/grammar/>
3. <https://www.grammarly.com/blog/definitions-of-key-grammar-concepts/#:~:text=In%20English%20grammar%2C%20the%20eight,preposition%2C%20conjunction%2C%20and%20interjection.>
4. <https://grammar.yourdictionary.com/grammar-rules-and-tips/basic-english-grammar-rules.html>
5. <https://www.hitbullseye.com/Logical-Reasoning.php>
6. <https://www.indiabix.com/logical-reasoning/questions-and-answers/>

|         |                    |   |   |   |   |
|---------|--------------------|---|---|---|---|
| MCA2021 | PYTHON PROGRAMMING | L | T | P | C |
|         |                    | 3 | 2 | 0 | 4 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To make the students to be able to create and run scripts using Python for real time applications.

### COURSE OUTCOMES

- CO1: demonstrate the fundamental concepts of python programming
- CO2: implement data structures concept in python applying
- CO3: develop python programs with modules and regular expression
- CO4: manipulate object oriented programming concepts in python
- CO5: solve real world problems using python programming

### SYLLABUS

**UNIT – I:** Python Basics : Data types – input to python program – Strings basics – Operators in Python – Functions : Basics of functions – Passing variables in a function call – function arguments – Modules in Python – Recursion. 12

**UNIT – II** Control Statements, Arrays and Strings : if - if...else – if... elif...else – While Loop – for Loop – Range function – String : Creating, initializing and accessing elements of a string – Traversing a string – string operations – String functions versus string methods. 12

**UNIT – III** List – Tuples – Dictionaries – Regular Expressions: File Operations : Basic of File operation – Reading and Writing a file – Python exception : Basic concepts of exceptions in Python – user defined exceptions – built-in exceptions. 12

**UNIT – IV**  
Object Oriented Programming: Introduction to OOPS – OOPs concept related specifically related to Python – Inheritance and namespace – Basics of NumPy, SciPy and Pandas. 12

**UNIT – V**  
Python Advances: Graphical User Interface : GUI in Python – Root Window – Fonts and Colors – Containers – Canvas – Frame – Widgets : Button, Label, Message, Text, Scrollbar, Check and Radio Button – Spin and Listbox – Menu – Python’s Database Connectivity. 12

TOTAL: 60

### REFERENCES:

- Anurag Gupta, G.P.Biswas, “Python Programming-Problem solving, Packages and Libraries”, McGraw Hill(India) Pvt. Ltd., 2020
- NageswaraRao R., “Core Python Programming”, 2nd Edition, Dreamtech Press, New Delhi, 2018..
- J. Jose, Introduction to Computing and Problem Solving with Python, Khanna Publications, 2019.

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| MCA2022 | MACHINE LEARNING | L | T | P | C |
|         |                  | 3 | 2 | 0 | 4 |

(For Students admitted from 2020 onwards)

**COURSE OBJECTIVES:**

- To understand the basic concepts of machine learning and probability theory
- To understand decision tree learning and hypothesis.
- To understand the Bayesian models.
- To learn other learning aspects such as reinforcement learning.

**COURSE OUTCOMES**

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

- CO – 1 : Classify the different techniques of machine learning for problem solving problems
- CO – 2: Identify the role of Decision Tree Learning
- CO – 3 : Analyze the working model and features of Bayesian Learning
- CO – 4 : Predict the various approaches in the Analytical and Inductive Learning
- CO – 5 : Outline the concepts of Instance-Based and Reinforcement Learning

**SYLLABUS**

**UNIT – I : Introduction to Learning:** Well Posed Learning Problem - Designing a Learning System - Perspective and Issue in Machine Learning. Concept Learning and General to Specific Ordering: Concept Learning Task - Concept Learning as Search - Find S: Finding a Maximally Specific Hypothesis - Version Spaces and Candidate Elimination – Remakes - Inductive Bias.

**UNIT – II : Decision Tree Learning:** Decision Tree Representation - Appropriate Problems for Decision Tree Learning - Basics Decision Tree Algorithm - Hypothesis Space Search - Inductive Bias - Issues. Evaluating Hypotheses: Motivation - Estimating Hypothesis Accuracy - Basics of Sampling Theory - General Approach for Deriving Confidence Intervals - Difference in Error of Two Hypotheses - Comparing Learning Algorithms

**UNIT – III : Bayesian Learning:** Bayes Theorem and Concept Learning - Maximum Likelihood and Least Squared Error Hypothesis - Maximum Likelihood Hypotheses for Predicting Probabilities - Minimum Description Length Principle - Bayes Optimal Classifier - Gibbs Algorithm - Naive Bayes Classifier - Bayesian Belief Networks - EM Algorithm.

**UNIT – IV : Analytical and Inductive Learning:** Analytical Learning - Explanation based Learning - Inductive Analytical Approaches to Learning – Using Prior Knowledge to, Initialize the Hypothesis, Alter the Search Objective and Augment Search Operators.

**UNIT – V : Instance-Based and Reinforcement Learning:** K - Nearest Neighbor Learning - Locally Weighted Regression - Radial Basis Functions - Case based Reasoning - Reinforcement Learning: Learning Task - Q Learning - Q Function - Algorithm for Learning Q - Convergence - Updating Sequence - Temporal Difference Learning - Non Deterministic Rewards and Actions.

## REFERENCES

1. Tom M. Mitchell, "**Machine Learning**", Indian Edition, McGraw-Hill Education Private Limited, 2018.
2. Ethem Alpaydin, "**Introduction to Machine Learning**", 4<sup>th</sup> Edition, MIT Press, 2020.
3. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley, 2019
3. Aurelien Geron, "**Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow**", 2<sup>nd</sup> Edition, O'Reilly, 2019.

## E- REFERENCES

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| MCA2023 | Dot Net Technologies | L | T | P | C |
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(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To understand the foundations of CLR execution and .NET Framework.
- To develop background knowledge as well as core expertise in VB.Net and C#
- To learn the object oriented concepts
- To be aware of application development in .NET (Window Application and ADO.NET).
- To impart the knowledge on creation of web based applications on .NET (ASP.NET).

### COURSE OUTCOMES

- CO1: List the major elements of the .NET frame work  
CO2: Explain how VB.Net and C# fits into the .NET platform.  
CO3: Analyze the basic structure of a VB.NET and C# application  
CO4: Debug, compile, and run a simple application.  
CO5: Design and develop Console, Window and Web based applications on .NET.

### SYLLABUS

#### UNIT – I

**Introduction to .NET:** .NET Framework Architecture -.NET Framework Class Hierarchy- The System Namespace. **Introducing VB.NET:** New Object Oriented Capabilities- Overriding- Overloading- Shared Members-Exception Handling- File I/O: System.IO Hierarchy- Streaming text in and out of Text Files- Object Serialization and Deserialization.

12

#### UNIT – II

**Introduction to C# :** Language Fundamentals – Arrays –Jagged Arrays- Value and Reference Types–Nullable Types- Indexers and Properties – Delegates - Events - Lambda Expressions— LINQ to Objects : Specific Programming Constructs - LINQ Queries - LINQ Query Operators.

12

#### UNIT – III

**Window Applications :** Windows Forms –Properties – Events - Building Dynamic Forms - Adding controls to forms – Layout and Grouping – Responding to User Inputs – Mouse and Keyboard Events – Designing Menus – Building MDI Applications- Common Dialog Controls – Rich Textbox Control.

12

#### UNIT – IV

**ADO.NET:** ADO.NET Architecture-ADO.NET Managed Providers: SQL Managed Provider-OLEDB Managed Provider - Connected Layer – Data Readers - The Disconnected Layer: dataset– Data columns, Data Rows, Data Tables--Data Adapter - Binding Data Objects to Windows Forms – Accessing Data using ADO.NET.

12

## **UNIT – V**

**ASP.NET:** Introducing ASP.NET web forms- The Role of HTTP, HTML, Server side Scripting and Client Side Scripting – The Life Cycle of an ASP.NET Web Page - Server Controls-Validation Controls- Form Events - Web Form Creation - Data Binding -Building Database applications.

**12**

## **REFERENCES**

1. Evangelos Petroustos , Mastering Visual Basic. NET, BPB Publications Reprinted 2005.
2. Andrew Troelsen, Philip Japikse, “C# 6.0 and the .NET 4.6 Framework”, 7th Edition, Apress, 2015.
3. Herbert Schildt, “The Complete Reference: C# 4.0”, 1st Edition, Tata McGraw Hill, 2012.
4. Michael Otey , Denielle Otey, ADO.NET Complete Reference, Tata McGrawHill, 4th reprint 2005

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| MCA2024 | SOFTWARE DESIGN & TESTING | L | T | P | C |
|         |                           | 3 |   | 2 | 4 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To understand the concepts of software processes, process models and fundamental process activities.
- To understand the fundamental concepts of requirements engineering and requirements specification and documents.
- To know about the idea of design patterns and how these are away of reusing design knowledge and experience.
- To be aware of testing processes, techniques and debugging to solve program defects.
- To learn how to use software metrics, manage risk, apply basic software quality assurance practices to ensure that software designs, development, and maintenance meet or exceed applicable standards.

### COURSE OUTCOMES

- CO1 : The learner will get an understanding of various software process models.
- CO2 : The learner will have an understanding on various concepts of requirements engineering.
- CO3 : The learner will get an understanding of software design concepts and software design models
- CO4 : The learner will be able to test the software by applying various testing techniques.
- CO5 : The learner will have an understanding of developing a project management plans (PMP) and to track project execution through collecting artifacts and metrics

## SYLLABUS

### UNIT-I: INTRODUCTION

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

12

### UNIT-II: SOFTWARE REQUIREMENT ENGINEERING

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

12

### UNIT-III: SOFTWARE DESIGN

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom- Up Design. Software

32

Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs

12

#### **UNIT-IV: SOFTWARE TESTING**

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

12

#### **UNIT-V: SOFTWARE TESTING TOOLS**

Need for automated testing tools – Taxonomy of testing tools – Functional/Regression testing tools – Performance testing tools – Testing management tools – Source code testing tools – How to select a testing tool - Testing an application using winrunner.

12

**TOTAL: 60**

#### **REFERENCES:**

1. Pressman R.S., Software Engineering – A practitioner's approach, ninth Edition, McGraw Hill, International Edition, 2019
2. Kishore S, and Naik R., Software Requirements and Estimation, First Edition, Tata McGraw-Hill, 2017.
3. Ian Sommerville, Software Engineering, Ninth Edition, Addison-Wesley, 2013
4. Boris Beizer, "Software Testing Techniques" , Dream Tech Press, 2009
5. Dale H. Besterfield , "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2011).

#### **E- REFERENCES:**

1. <https://nptel.ac.in/courses/106105182/>
2. <http://www.nptelvideos.in/2012/11/software-engineering.html>

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| <b>MCA2025-A</b> | <b>DATA COMMUNICATION AND NETWORKS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
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**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVES**

- To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.
- To study the detection and correction of errors, link control and link protocols of data link layer.
- To study about the access method and implementation of different networks, types of Routing.
- To study the logic of link mechanisms used in networks and different layers of TCP/IP.

**COURSE OUTCOMES**

At the end of the course, the students will be able toknow :

- CO1 : Describe the building blocks of Computer Networks
- CO2: Describe the various signal and switching Techniques used in transmission
- CO3: Understanding the error checks and deduction methods in layer3.
- CO4: Determine the Logical addressing and various types transmission protocol and services.
- CO5: Illustrate the generation of telecommunication systems in wireless networks.

**SYLLABUS**

**UNIT – I DATA COMMUNICATION**

Introduction: Networks – Components- Data Representation-Data Flow-Physical structures-Network Types-Switching-The Internet-Internet Standards and Administration-TCP/IP Protocol Suite-Addressing-Multiplexing and De Multiplexing-The OSI Model. **12**

**UNIT – II PHYSICAL LAYER**

Data and signals-Digital Signals-Transmission Impairment-Digital to Digital conversion-Analog to Digital Conversion-Multiplexing-Spread spectrum-Transmission media-Guided media-Unguided media-Circuit Switching-Packet Switching. **12**

**UNIT – III DATA LINK LAYER**

Introduction-Link Layer Addressing-Error Detection and Correction-Cyclic codes-DLC Services-Data Link Layer protocols-HDLC-Point to point Protocol-Media Access control (MAC)-Channelization-Standard Ethernet-ATM-IEEE 802.11 Project-Bluetooth-Wi MAX-Virtual LANS. **12**

**UNIT – IV NETWORK AND TRANSPORT LAYER**

Introduction to Network Layer-Packet Switching-IPV4 Addresses-Internet Protocol-ICMPv4-Mobile IP-Routing Algorithms-Unicast and Multicast Routing- Transport Layer-Introduction-Transport layer Protocols-User Datagram Protocols-Transmission control Protocols-Services. **12**

**UNIT – V WIRELESS COMMUNICATION**

Introduction - Spread Spectrum: Transmission - Multiplexing. Medium Access Control: Motivational for a Specialized MAC - Space Division Multiple Access (SDMA) - Frequency Division Multiple

Access (FDMA) - Time Division Multiple Access (TDMA) - Code Division Multiple Access (CDMA). Mobile Telecommunication Systems: GSM Architecture, Services and Protocols.

**12**

**TOTAL: 60**

**REFERENCES:**

1. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw Hill publishing Company, New Delhi ,2018..
2. William Stallings. "Data and computer Communication", 8th Edition, Pearson Education,2013/PHI.
3. Andrew Tannenbaum.S." Computer Networks", Pearson Education, 4th Edition,2013/PHI.
4. Schiller Jochen, "Mobile Communications", 2<sup>nd</sup> Edition, Pearson Education, New Delhi, 2012.

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| MCA2025-B | NOSQL DATABASES | L | T | P | C |
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(For Students admitted on 2019)

**COURSE OBJECTIVE:**

To impart knowledge on

- To understand the principles behind the NoSQL databases.
- To explore knowledge on variety of NoSQL databases.
- To apply architectures and common features of NoSQL databases (key-value stores, document databases, graph databases).
- To analyze the various NoSQL databases.
- To design applications using NoSQL databases.

**COURSE OUTCOME:**

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

- Design four types of NoSQL Databases (Document-oriented, Key-Value Pairs, and Graph).
- Understand the detailed architecture, define objects, load data, query data and performance tune Key-Value Pair NoSQL databases.
- Understand the detailed architecture, define objects, load data, query data and performance tune Documentoriented, Graph NoSQL databases.
- Evaluate NoSQL database development tools and programming languages.

**SYLLABUS**

**UNIT - I :** **INTRODUCTION TO NOSQL** Overview, and History of NoSQL Databases – Definition of various Types of NoSQL Databases – The Value of Relational Databases – Attack of the Clusters, The Emergence of NoSQL, Key Points.

**UNIT – II:** **REPLICATION AND SHARING** Distribution Models – Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication – New NoSQL stores, MongoDB, Cassandra, OrientDB use and deployment, Application, Challenges NoSQL approach – Key-Value and Document Data Models, Aggregate-Oriented Databases.

**UNIT - III:** **PostgreSQL and DynamoDB** : PostgreSQL - Relations, CRUD, and Joins - Advanced Queries, Code, and Rules - Full Text and Multidimensions . DynamoDB The “Big Easy” of NoSQL Building a Streaming Data - Pipeline Building an “Internet of Things” - System Around DynamoDB

**UNIT - IV :** **CASSANDRA and ELASTIC SEARCH** : Cassandra: Features – CQL Data Types – CQLSH – Keyspaces – CRUD Operations – Collections – Using a Counter – Time to Live – Alter Commands – Import and Export – Querying System Tables. ELASTIC SEARCH : Create Index – Adding data in Kibana - Index API – Query DSL.

**UNIT - V :** **ORIENTDB** : Basic Concepts – Data Types – Database Commands – Record Commands – Cluster and Class Commands – Property, Vertex, and Edge Commands – Hooks – Caching – Logging.

**Reference Books:**

1. Shashank Tiwari, “Professional NOSQL”, WROX Press, 2011.
2. Sadalage, P. & Fowler, M., “NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence”, 1st Ed., Pearson Education, 2012.

3. Redmond, E. & Wilson, J., “Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement”, 1st Ed., 2012.
4. Dan MC Creary and Ann Kelly, “Making Sense of NoSQL: A guide for Managers and the Rest of Us”, Dreamtech Press, 2013.
5. Adam Fowler, “Nosql for Dummies”, Wiley,2015

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| <b>MCA2025-C</b> | <b>OOAD with UML</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
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(For Students admitted from 2019 onwards)

**COURSE OBJECTIVES**

- To provide a brief, hands-on overview of object-oriented analysis in software process
- To discuss Case studies based project specifications to develop object-oriented models and identify implementation strategies.
- To demonstrate and apply basic object oriented techniques to create and modify object oriented analysis and design models.
- To understand and apply testing techniques for object oriented software

**COURSE OUTCOMES**

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

- CO1 : Understand the basic concepts to identify state & behavior of real world objects
- CO2 : Able to learn the various object oriented methodologies and choose the appropriate one for solving the problem with the help of various case studies
- CO3 : Understand the concept of analysis, design & testing to develop a document for the project
- CO4 : Able to implement analysis, design & testing phases in developing a software project
- CO5 : Able to understand the testing strategies and know about automated testing.

**SYLLABUS**

**UNIT – I Object oriented concepts and principles** – Object oriented concepts – Identifying the elements of an object model – Management of object oriented software projects –Object oriented Analysis- Domain analysis – OOA Process – Object relationship model – Object behavior model.

**12**

**Unit – II Object oriented Design-** design for object oriented systems – the system design process – object design process – design patterns – Object oriented programming.

**12**

**Unit – III Object oriented Testing** – Testing OOA and OOD models – Testing strategies – Test case design for OO software – Testing methods – Interclass test case design

**12**

**Unit – IV Technical Metrics for Object oriented system** – Object oriented metrics – Metrics for OOD – Class oriented metrics - System concept for Object modeling - Abstraction, Inheritance, Polymorphism, Encapsulation, Message Sending, Association, Aggregation.

**12**

**Unit – V Use-Case Modeling** – Actors, Use Cases, Use Case Relationships. The Process of Requirements Use-Case - Identify Business Actors, Identify Business Requirements Use Cases, Construct Use Case Model Diagram Class Diagrams and Object Diagrams-Package Diagrams-Sequence and Collaboration diagrams, State chart diagram.

**12**

**TOTAL: 60**

**REFERENCES**

1. Roger Pressman, | Software Engineering, 6th Edition, TMH, 2010.
2. Bahram, —Object Oriented Systems Development, 7th Edition, TMH, 1999.
3. Stephan R. Schach, —Object oriented software engineering|, 5th Edition, TMH, 2002.
4. Timothy C. Lethbridge, Robert Laganriere, |Object-Oriented Software Engineering.
5. <http://www.freetechbooks.com/object-oriented-analysis-and-design-course-notes-t577.html>  
[www.engin.umich.edu/CIS/course.des/cis200/.../tutorial/one.doc](http://www.engin.umich.edu/CIS/course.des/cis200/.../tutorial/one.doc)

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| _MCA2025-D | ARTIFICIAL INTELLIGENCE | L | T | P | C |
|            |                         | 3 | 2 | 0 | 4 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To understand the fundamentals of computational intelligence
- To understand the various characteristics of Intelligent agents
- To learn about the different search strategies in AI

### COURSE OUTCOMES

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

- CO1 : Implement computational intelligence through applications
- CO2 : Use appropriate search algorithms for any AI problem
- CO3 : Understand knowledge representation methods and apply approximate reasoning
- CO4 : Represent a problem using first order and predicate logic
- CO5 : Apply reinforcement learning techniques for finding a solution to a problem

### SYLLABUS

#### **UNIT: I Artificial Intelligence and Intelligent Agents**

Introduction: Approaches to AI: Thinking Humanly, Thinking Rationally, Acting Humanly, Acting Rationally. Foundations of AI – Applications of AI. Intelligent agents: Agents and environments – Rational agents – Rationality – Nature of environments: Specifying the PEAS description of the task environment, Properties of task environment. Structure of agents – Agent programs – Basic types of Agent programs: Simple reflex agents, Model-based reflex agents, Goal-based agents, Utility-based agents. Learning Agents.

12

#### **UNIT: II Problem-solving and Search**

Problem-solving agents: Well-defined problems and solutions, Formulating problems. Searching for solutions - Uninformed search strategies: Breadth-first search, Depth-first search, Bidirectional search. Informed search strategies: Greedy best-first search, Recursive best-first search. Online search agents. Adversarial search: Games - Optimal Decisions in Games – Alpha-Beta Pruning.

12

#### **UNIT: III Knowledge, Reasoning and Planning**

Knowledge-based agents - Propositional logic - Agents based on propositional logic - propositional inference. First order (Predicate) logic – Inference in First order logic. Expert System. Knowledge representation: Categories and objects – Reasoning systems for categories.

Classical Planning – Algorithms for planning as State-Space Search. Planning and acting in the real world.

12

#### **UNIT: IV Learning**

Learning from Examples: Forms of Learning – Supervised Learning – Learning Decision Trees – Artificial Neural Networks.

Knowledge in Learning: A Logical Formulation of Learning – Explanation-Based Learning – Inductive Logic Programming. Learning with hidden variables – Unsupervised learning – Clustering. Reinforcement learning – Passive Reinforcement Learning – Active Reinforcement Learning.

38

**UNIT: V AI Applications**

Text Classification - Information Retrieval – Information Extraction - Machine Translation – Speech Recognition – Object Recognition – Robotics

12

**TOTAL : 60****REFERENCES**

1. Stuart J. Russell and Peter Norvig , “Artificial Intelligence A Modern Approach”, Third Edition, Pearson Education, Inc., 2010
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill Publishing Company Limited, 2009.
3. David Poole, Alan Mackworth, “Artificial Intelligence: Foundations of Computational agents”, Cambridge University, 2011.
4. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2013.
5. Nils J.Nilsson,“The Quest for Artificial Intelligence: A History of Ideas and achievements”, Cambridge University Press, 2010

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| MCA2025-E | MOBILE COMPUTING | L | T | P | C |
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(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To understand the basic concepts of mobile computing
- To be familiar with the network protocol stack
- To learn the basics of mobile telecommunication system
- To be exposed to Ad-Hoc networks
- To gain knowledge about different mobile platforms and application development

### COURSE OUTCOMES

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

- CO1 : Explain the basics of mobile telecommunication system
- CO2 : Choose the required functionality at each layer for given application
- CO3 : Identify solution for each functionality at each layer
- CO4 : Use simulator tools and design Ad hoc networks
- CO5 : Develop a mobile application

### SYLLABUS

#### UNIT – I WIRELESS COMMUNICATION FUNDAMENTALS:

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum –MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

12

#### UNIT – II TELECOMMUNICATIONS SYSTEMS:

GSM-System Architecture-Protocols-Connection Establishment-Frequency Allocation-Routing-Handover-Security-GPRS.

12

#### UNIT – III WIRELESS NETWORKS:

Wireless LAN-IEEE 802.11 Standards-Architecture-Services HIPERLAN-AdHoc Network-Bluetooth.

12

#### UNIT – IV MOBILE NETWORK LAYER:

Mobile IP – Dynamic Host Configuration Protocol - Routing –DSDV – DSR – Alternative Metrics-Wireless Application Protocol –WAP.

12

UNIT – V MOBILE Ad hoc NETWORKS (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

12  
TOTAL : 60

## **REFERENCES**

1. Jochen Schiller, "Mobile Communications", PHI/Pearson Education, Second Edition, 2003.
2. William Stallings, "Wireless Communications and Networks", PHI/Pearson Education, 2002.
3. Reza, Bfar, Mobile Computing Principles Designing and Developing Mobile Applications with UML and XML, Cambridge University Press, 2005
4. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.
5. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.

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| <b>MCA2026</b> | <b>MACHINE LEARNING USING PYTHON LAB</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
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**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVES**

- To make use of Data Sets in implementing the Machine Learning Algorithms

**COURSE OUTCOMES:**

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

- CO 1 : Understand the implementation procedures for the machine learning algorithms
- CO 2 : Apply appropriate data sets to the machine learning algorithms
- CO 3 : Identify and apply machine learning algorithms to solve real world problems

**LIST OF EXERCISES:**

1. Explore the concept of control statement and functions in simple python programs.
2. Perform various operations in tuple and list
3. Perform various operations in list and dictionary
4. Show the performance of class, objects and constructor in python
5. Design a python program to implement different types of inheritance.
6. Develop a python code to interact with Databases
7. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
8. Write a program to demonstrate the working of the decision tree based ID3 algorithm
9. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets
10. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
11. Write a program to implement k-Nearest Neighbor algorithm to classify the data set
12. Write a program to implement linear regression using statistics on the training data to estimate the coefficients required by the model to make predictions on new data.

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| <b>MCA2027</b> | <b>DOT NET TECHNOLOGIES LAB.</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
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**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVES**

- To Introduce to .Net IDE Component Framework.
- To learn Programming concepts in .Net Framework.
- To update and enhance skills in writing Windows applications.
- To study about the data connectivity using ADO.NET.
- To impart knowledge to create website using ASP.Net Controls.

**COURSE OUTCOMES**

- CO1: Write various Console applications using VB.Net and C# Language in the .NET Framework.  
CO2: Debug and run a window application.  
CO3: Create data binding applications using ADO.Net connectivity.  
CO4: Perform Database operations for Windows Form and web applications.  
CO5: Design user interactive web pages using ASP.Net.

**LIST OF EXERCISES**

1. Console Application to implement the concept of Class and Interface using VB.Net
2. Console Application to Exception Handling using VB.Net
3. Console Application for Serialization and DeSerialization using Vb.Net
4. Console Application to implement Jagged Array using C#
5. Console Application to implement Properties and Indexers using C#
6. Designing Window Application using Basic Controls.
7. Designing Notepad using Menu option.
8. Window application to connect with database and manipulate the records in the database using ADO.NET.
9. Web Application to perform validation using validation controls.
10. Web application to Connect with the database using ADO.NET and manipulate the records.

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| MCA2028 | SKILL COMMUNICATION – II | L | T | P | C |
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(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To make them prepare and give professional presentations
- To introduce students to the nuances of vocabulary
- To enable students the art of writing resumes and give interviews
- To improve the ability of the students to solve aptitude problems in arithmetic and menstruation

### COURSE OUTCOMES

At the end of the course, students will be

- CO1: Able to understand and develop the presentation skills.
- CO2: Able to understand, apply and develop the reading and interview skills.
- CO3: Able to understand and solve the number problems.
- CO4: Able to understand and solve the aptitude problems in arithmetic and menstruation.

### SYLLABUS

#### UNIT I: PRESENTATION SKILLS

Extempore - Company Profile/Area of Interest/Recent Developments.

#### UNIT II: ANALYTICAL READING & INTERVIEW SKILLS

Reading Comprehension & Critical Reasoning - CV Writing - Self Profiling –Mock Interview - One Word Substitution – Homonyms – Idioms - Phrasal Verbs - Odd Word.

#### UNIT III: ARITHMETIC

Averages - Mixtures & Solutions - Time & Work - Pipes & Cisterns - Time, Speed & Distance.

#### UNIT IV: MODERN MATHEMATICS & MENSRUATION

Data Sufficiency - Data Interpretation - Cubes - Menstruation – Clocks – Calendars.

**WEEKLY 2 HOURS**

### REFERENCES

1. Dinesh Khattar, “Quantitative Aptitude for Competitive Examinations”, Pearson Education, 2<sup>nd</sup> Edition (For 1 to 2 Units), 2013.
2. Agrawal, R.S., “Quantitative Aptitude for Competitive Examination”, S.Chand Publishing, (For 1 to 2 Units), 2012.
3. ArunSharma “Logical Reasoning”, Tata McGraw Hill, 2012.
4. Edgar Thorpe, “Test of Reasoning”, Tata McGraw Hill, 4<sup>th</sup> Edition, 2007.
5. Agarwal R.S., “Verbal & Non Verbal Reasoning”, S.Chand Publishing, New Delhi.

### E-REFERENCES

1. <https://www.skillsyouneed.com/presentation-skills.html>
2. <https://edwardlowe.org/how-to-develop-powerful-presentation-skills/>
3. <https://www.skillsyouneed.com/ips/interview-skills.html>
4. <https://hbr.org/1964/01/strategies-of-effective-interviewing>
5. <https://www.hitbullseye.com/Arithmetic-Reasoning-Concepts.php>
6. <https://www.onlinemathlearning.com/math-problem-solving-strategies.html>.
7. <https://www.examsbook.com/very-important-arithmetical-reasoning-questions-and-answers>
8. <https://www.indiabix.com/verbal-reasoning/arithmetic-reasoning/>

|                |                                       |          |          |          |          |
|----------------|---------------------------------------|----------|----------|----------|----------|
| <b>MCA2031</b> | <b>MOBILE APPLICATION DEVELOPMENT</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                                       | <b>3</b> | <b>0</b> | <b>2</b> | <b>3</b> |

**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVES**

- To understand mobile application development trends and Android platform.
- To analyze the need of simple applications, Location map based services.
- To enable the learner for aspiring careers in Android Mobile application development areas.

**COURSE OUTCOMES**

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

- CO1 : Understanding the concepts of android platform.
- CO2 : Exploring the building application framework for the android platform.
- CO3 : Applying android User Interface objects to designing android applications.
- CO4 : Applying methods to handling the data for an android application.
- CO5 : Exploring ADB tool deployment and publishing of mobile apps.

**SYLLABUS**

**UNIT – I ANDROID FUNDAMENTALS, FRAGMENTS and INTENTS**

Introduction to Android - Obtaining the Required Tools, Creating Android Application, Anatomy of an Android Application. Using the Android Emulator, Activities, Fragments, and Intents: Understanding Activities, Linking Activities Using Intents, Fragments, Calling Built-In Applications Using Intents, Displaying Notifications.

**12**

**UNIT – II USER INTERFACE**

Understanding the Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically, Listening for UI Notifications, Designing User Interface with Views:

Using Basic Views, Using Picker Views, Using List Views to Display Long Lists, Displaying pictures and menus with views , using image views to display pictures, using menus with views.

**12**

**UNIT – III DATA PERSISTENCE**

Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases. Sharing Data in Android, Using a Content Provider, Creating Content Providers, Using the Content Provider.

**12**

**UNIT – IV MESSAGING, NETWORKING and SERVICES**

SMS Messaging: Sending and Receiving – Sending email and networking – Downloading binary and text data files – Access Web services – Local and remote services, Asynchronous threading, communication and binding services.

**12**

**UNIT –V LOCATION ACCESS and PUBLISHING ANDROID APPLICATIONS**

Location based services: Display map, zoom control, view and change, Marking, Geocoding, Get location - Publish Android applications and Deployment.

**12**

**TOTAL: 60**

## **REFERENCES**

1. John Horton, “Android Programming for Beginners”, 1st Edition, Packt Publishing, India, 2015.
2. Paul Deitel, Harvey Deitel and Alexander Wald, “Android 6 for Programmers an App-Driven Approach”, 3rd Edition, Pearson Education India, New Delhi, 2015.
3. Wei-Meng Lee, Beginning Android Application development, Wiley Publishing, 2012.
4. Reto Meier (2012), “Professional Android 4 Application Development”, Wrox Publications (John Wiley, New York.
5. ZigurdMednieks, Laird Dornin, Blake Meike G, Masumi Nakamura (2011), “Programming Android: Java Programming for the New Generation of Mobile Devices”, OReilly Media, USA

## **E-REFERENCES**

1. <http://developer.android.com>
2. <http://www.abhiandroid.com>
3. <http://www.vogella.com>

|         |                |   |   |   |   |
|---------|----------------|---|---|---|---|
| MCA2032 | WEB TECHNOLOGY | L | T | P | C |
|         |                | 3 | 2 | 0 | 4 |

(For Students admitted from 2020 onwards)

**COURSE OBJECTIVES:**

- This course will introduce students to the World Wide Web and scripting languages. By the end of this course, students should possess a firm grounding in some of the existing web technologies as well as commercial web applications. The emphasis is on the contemporary use of mark-up and scripting to create effective and attractive web sites.

**COURSE OUTCOMES:**

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

- CO1 :The students should be able to create HTML5 documents, and establish adequate formatting for presentation purpose, manipulation of images, tables, links and realize the power of Cascading Style Sheets (CSS) to control the look and feel of their HTML documents in an organized and efficient
- CO2: The learner will have an in-depth knowledge-on writing client-side JavaScript and to integrate JavaScript into web pages.
- CO3 : The learner will gain a good practical knowledge on writing successful HTML/PHP code utilizing MySQL database.
- CO4 : The learner will get exposed to handle and design rich client presentation using Angular JS.
- CO5 : The learner will have an in-depth knowledge on structural framework for dynamic web apps

**SYLLABUS**

**UNIT –I: HTML5 and CSS**

Introduction to Web development – Websites – Languages – Tools - Structure of HTML – Contents: Text, Links, Images, Lists, Tables, Global Attributes, Form - Definition, Elements, Submission-Cascading Style Sheets - Applying Styles – References: Keywords, Id Attribute, Class Attribute, Other Attributes, Pseudo-Classes – Properties: Text, Colors, Sizes, Background, Borders, Shadows, Gradients, Filters, Transformations, Transitions, Animations.

12

**UNIT – II JavaScript**

Introduction to JavaScript – Variables, Conditionals and Loops, Control Transfer Instructions – Functions: scope, anonymous, standard function – Objects – methods, constructor, inheritance - keywords, constructors - Standard objects: String Objects, Array Objects, Date Objects, Math Object, Window Object, Document Object, Element Objects, Creating Element Objects – Events – Debugging – error event, exception – APIs

12

**UNIT – III PHP**

Introduction to PHP – Expressions and Control flow – PHP functions and objects – Array – Form handling – Cookies, Sessions and Authentication.

**UNIT – IV PHP and MySQL**

Introduction to MySQL – Making a Connection – Handling Errors - Creating Tables – Insert, Update and Delete Records with PHP - Retrieving data using Select.

12

**UNIT – V AngularJS**

Angular JS: Basics of AngularJS – MVC – Filters and Modules – Directives – Working with Forms – Creating and Using Services.

12

47

**REFERENCES:**

1. J.D. Gauchat, HTML5 for Masterminds, Third Edition, 2017
2. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, Oreilly, Third Edition, 2014.
3. Basarat Ali Syed, Beginning Node.js, Apress publications, 2014.
4. Ravi Kant Soni, AngularJS for java developers, Apress publications, 2017,
5. Deitel&Deitel, Goldberg, Internet and World Wide Web – How to Program, Fifth Edition, Pearson Education Asia, 2012
6. Tom Butler & Kevin Yank, PHP & MySQL – Novice to Ninja, Sixth edition, SitePoint, 2012
7. A. Ravichandran, Internet and Web Technology, Khanna Book Publishing Company, first Edition, 2013.
8. Steceb Holzner PHP: The Complete Reference, Tata McGraw Hill, 2007
9. Pawel Kozlowski and Peter Bacon Darwin, Mastering Web Application Development with Angular JS, Packt Publishing, 2013.

**E- REFERENCES**

1. <https://nptel.ac.in/courses/106105084/>

|                |                        |          |          |          |          |
|----------------|------------------------|----------|----------|----------|----------|
| <b>MCA2033</b> | <b>CLOUD COMPUTING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                        | <b>3</b> |          | <b>2</b> | <b>4</b> |

**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVES:**

- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies like Virtualization.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To study the various security issues in cloud computing.

**COURSE OUTCOMES**

CO1: Articulate the main concepts, key technologies, strengths and limitations of cloud computing.

CO2: Learn the key and enabling technologies that help in the development of cloud.

CO3: Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.

CO4: Explain the core issues of cloud computing such as resource management and security.

**SYLLABUS**

**UNIT – I**

Introduction and Architecture: Technologies for Network-Based System: CPU and GPU – Software Environment for Cloud Computing: Service-Oriented Architecture (SOA) - Cloud Types : IaaS – PaaS - SaaS – Public - Private and Hybrid clouds – Characteristics of Cloud Computing - NIST Cloud Computing Reference Architecture.

**12**

**UNIT – II**

Virtualization : Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU – Memory - I/O Devices - Virtual Clusters and Resource management.

**12**

**UNIT – III**

Cloud Infrastructure : Architectural Design of Compute and Storage Clouds - Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

**12**

**UNIT – IV**

Programming Model : Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, OpenStack, CloudSim

**12**

**UNIT – V**

Cloud Security : Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

**12**

**TOTAL : 60**

**REFERENCES:**

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. Cloud Computing Bible, Barrie Sosinsky, Wiley India Pvt. Ltd, 2013.
3. John W.Rittinghouse and James F.Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.
4. Roger Jennings, Cloud Computing with Windows Azure Platform, Wiley India Pvt. Ltd, 2009.

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|------------------|---------------------------|----------|----------|----------|----------|
| <b>MCA2034-A</b> | <b>BIG DATA ANALYTICS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                  |                           | <b>3</b> | <b>0</b> | <b>2</b> | <b>4</b> |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To understand the concept of document-oriented database management systems.
- Understand the Big Data Platform and its Use cases
- Understand Map Reduce Jobs
- Provide hands on Hadoop Eco System
- Apply analytics on Structured, Unstructured Data.

### **COURSE OUTCOMES**

The students will be able to:

- CO1 : Identify Big Data and its Business Implications.
- CO2 : List the components of Hadoop and Hadoop Eco-System
- CO3 : Access and Process Data on Distributed File System
- CO4 : Manage Job Execution in Hadoop Environment
- CO5 : Develop Big Data Solutions using MangoDB and Hive

### **SYLLABUS**

#### **UNIT – I : BIG DATA**

Characteristics of Data - Evolution of Big Data - Definition of Big Data - Challenges with Big Data - Need for Big Data - Big Data Analytics : Sudden Hype Around Big Data Analytics - Classification of Analytics - Top Challenges Facing Big Data - Importance of Big Data Analytics - Technologies to Meet the Challenges Posed by Big Data - Data Science - Data Scientist - Few Top Analytics Tools.

**12**

#### **UNIT – II : HADOOP**

Need for Hadoop - RDBMS versus Hadoop – Hadoop Overview - Use Case of Hadoop - Hadoop Distributors - HDFS - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN- Interacting with Hadoop Ecosystem. Hadoop I/O: Data Integrity – Data Integrity in HDFS - LocalFileSystem - ChecksumFileSystem. Compression - Codecs - Compression and Input Splits - Using Compression in MapReduce. Serialization – The Writable Interface - Writable Classes - Implementing a Custom Writable.

**12**

#### **UNIT – III MAPREDUCE**

Anatomy of a MapReduce Job Run - Classic MapReduce (MapReduce 1) - YARN (MapReduce 2). Failures: Failures in Classic MapReduce - Failures in YARN. Job Scheduling - The Fair Scheduler - The Capacity Scheduler. Shuffle and Sort - The Map Side - The Reduce Side - Configuration Tuning. Task Execution - The Task Execution Environment - Speculative Execution - Output Committers - Task JVM Reuse - Skipping Bad Records.

**12**

#### **UNIT – IV MONGODB**

MongoDB - Need for MongoDB - Terms Used in RDBMS and MongoDB - Data Types in MongoDB - MongoDB Query Language. Cassandra: Apache Cassandra – An Introduction - Features of Cassandra - CQL Data Types - CQLSH - Keyspaces – CRUD (Create, Read, Update and Delete) Operations - Collections - Using a Counter - Time to Live (TTL) - Alter Commands - Import and Export.

**12**

## **UNIT – V      HIVE**

Hive Architecture - Hive Query Language (HQL) - RCFile Implementation - SerDe - User-Defined Function (UDF). Pig: Introduction - The Anatomy of Pig - Pig on Hadoop - Pig Philosophy - Use Case for Pig: ETL Processing - Running Pig - Execution Modes of Pig - HDFS Commands - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions (UDF) - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig - Uses of Pig - Pig at Yahoo! - Pig versus Hive.

**12**

**TOTAL:60**

## **REFERENCES**

1. Seema Acharya, Subhasini Chellappan, "Big Data and Analytics" Wiley 2015.
2. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reily Media, 2012.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
4. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press, 2013
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge DataStreams with Advanced Analytics", John Wiley & sons, 2012.

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|-------------------|-----------------------------------|----------|----------|----------|----------|
| <b>MCA2034 -B</b> | <b>AGILE SOFTWARE ENGINEERING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                   |                                   | <b>3</b> | <b>0</b> | <b>2</b> | <b>4</b> |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To understand the fundamentals and motivation of agile manifesto.
- To learn the need and importance of teamwork and stakeholders in a learning environment.
- To study time related issues in software projects.
- To understand about measures.
- To focus about quality aspects and delivery process with respect to cyclicity.

### **COURSE OUTCOMES**

At the end of the course, the student will be

- CO1: Able to understand and explain the perspectives on software engineering and agile manifesto.
- CO2: Able to remember, understand, apply and evaluate the importance of teamwork with respect to their stakeholders.
- CO3: Able to remember, understand, examine and discuss the need and significance of time related problems in software projects.
- CO4: Able to remember, analyze and discuss about consequence of measures.
- CO5: Able to remember, understand, apply and discuss about quality and delivery process.

### **SYLLABUS**

#### **UNIT I: INTRODUCTION TO AGILE SOFTWARE DEVELOPMENT**

Objectives – Three perspectives on software engineering – Agile manifesto – Application of agile software development – Agile software development in learning environment.

**12**

#### **UNIT II: TEAMWORK AND CUSTOMERS & USERS**

Objectives – A role scheme in agile teams – Dilemmas in team work – Teamwork in learning environment – the customer – User – Customers and users in learning environment.

**12**

#### **UNIT III: TIME**

Objectives – Time related problems in software projects – Tightness of software development methods – Sustainable pace – Time management of agile projects – Time in learning environments.

**12**

#### **UNIT IV: MEASURES**

Objectives – Why are measures needed – Who decides what is measured – What should be measured – When are measures taken – How are measures taken – Who takes the measures – How are measures used - Monitoring a large scale project by measures – Measures in learning environments.

**12**

#### **UNIT V: QUALITY AND DELIVERY & CYCLICALITY**

Objectives – The agile approach to quality assurance – Test driven development – Measured TDD – Quality in learning environment – Delivery and Cyclicity in learning environments.

**12**

**TOTAL: 60**

## **REFERENCES**

1. Orit Hazzan, Yael Dubinsky, "Agile Software Engineering", Springer International Edition, 2011.
2. Jim Highsmith, "Agile Software Development Ecosystems", Addison-Wesley Professional, 1<sup>st</sup> Edition, 2002.
3. Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison-Wesley, 2<sup>nd</sup> Edition, 2007.

## **E-REFERENCES**

1. [https://www.tutorialspoint.com/sdlc/sdlc\\_agile\\_model.htm](https://www.tutorialspoint.com/sdlc/sdlc_agile_model.htm)
2. <https://www.infoworld.com/article/3237508/what-is-agile-methodology-modern-software-development-explained.html>
3. <https://www.agilealliance.org/agile101/>
4. <https://www.w3schools.in/sdlc-tutorial/agile-model/>

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|-----------|----------------------------------|---|---|---|---|
| MCA2034-C | COMPUTER GRAPHICS AND MULTIMEDIA | L | T | P | C |
|           |                                  | 3 | 2 | 0 | 4 |

(For Students admitted from 2020 onwards)

**COURSE OBJECTIVES:**

- To become familiar with various software programs used in the creation and implementation of multi- media
- To appreciate the importance of technical ability and creativity within design practice.
- To gain knowledge about graphics hardware devices and software used.
- To understand the two-dimensional graphics and their transformations.
- To understand the three-dimensional graphics and their transformations.

**COURSE OUTCOMES:**

At the end of the course, the students should be able to:

- CO1 : Design two dimensional graphics.
- CO2 : Apply two dimensional transformations.
- CO3 : Design three dimensional graphics.
- CO4 : Apply three dimensional transformations.
- CO5 : Understood Different types of Multimedia File Format.

**SYLLABUS**

**UNIT -I ILLUMINATION AND COLOR MODELS**

Light sources – basic illumination models – Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function-circle and ellipse generating algorithms- Intuitive color concepts – RGB color model – YIQ color model – CMY color model – HSV color model – HLS color model.

12

**UNIT- II TWO-DIMENSIONAL GRAPHICS**

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation.

12

**UNIT- III THREE-DIMENSIONAL GRAPHICS**

Three dimensional concepts-three dimensional object representations –Spline representations – TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, and composite transformations.

12

**UNIT- IV MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING**

Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation

12

**UNIT- V HYPERMEDIA**

Multimedia authoring and user interface – Hypermedia messaging -Mobile messaging –Hypermedia message component – Creating hypermedia message – Integrated multimedia message standards.

12

**TOTAL: 60**

**REFERENCES:**

1. Donald Hearn and Pauline Baker M, —Computer Graphics”, Prentice Hall, New Delhi, 2007 [UNIT I – III ].
2. Andleigh,P. K and Kiran Thakrar, —Multimedia Systems and Designl, PHI, 2003.[ UNIT IV,V ].
3. Judith Jeffcoate, —Multimedia in practice: Technology and Applicationsl, PHI, 1998.
4. Foley, Vandam, Feiner and Hughes, —Computer Graphics: Principles and Practicel, 2nd Edition, Pearson Education, 2003.
5. Jeffrey McConnell, —Computer Graphics: Theory into Practicel, Jones and Bartlett Publishers,2006.

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|------------------|------------------------------|----------|----------|----------|----------|
| <b>MCA2034-D</b> | <b>DATA ANALYTICS WITH R</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                  |                              | <b>3</b> | <b>2</b> | <b>0</b> | <b>4</b> |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To learn how to use the R programming language and software environment for data Manipulations and managing, exploratory data analysis and data visualizations.

### **COURSE OUTCOMES**

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

- CO1 : Explain the nature, source and uses of data
- CO2 : Apply statistical techniques for data analytics using R Tool
- CO3 : Analyze the correlation between various parameters of a data set using suitable techniques through statistical study
- CO4 : Apply non-parametric tests for data analytics
- CO5 : Identify suitable technique for various stages of data analytics

### **SYLLABUS**

#### **UNIT – I**

Introduction to Big Data Analytics - Big Data Overview - State of the Practice in Analytics-Key Roles for the New Big Data Ecosystem -Examples of Big Data Analytics - Data Analytics Life cycle - Data Analytics Lifecycle – R Language: Advantages of R Over Other Programming Languages-Handling Packages in R

**12**

#### **UNIT – II**

Getting Started with R-Working with Directory- Data Types in R-Few Commands for Data Exploration-Challenges of Analytical Data Processing- Expression, Variables and Functions-Missing Values Treatment in R - Using the 'as Operator to Change the Structure of Data - Vectors -Matrices - Factors -List -Few Common Analytical Tasks- Aggregating and Group Processing of a Variable-Simple Analysis Using R- Methods for Reading Data-Comparison of R GUIs for Data Input- Using R with Databases and Business Intelligence

**12**

#### **UNIT – III**

Exploring Data in R-Data Frames-R Functions for Understanding Data in Data frames-Load Data Frames-Exploring Data-Data Summary-Finding the Missing Values - Invalid Values and Outliers - Descriptive Statistics-Spotting Problems in Data with Visualization -Linear Regression Using R - Model Fitting - Linear Regression-Assumptions of Linear Regression-Validating Linear Assumption- Logistic Regression-Introduction to Generalized Linear Models-Logistic Regression- Binary Logistic Regression-Diagnosing Logistic Regression -Multinomial Logistic Regression Models

**12**

#### **UNIT – IV**

Decision Tree- Decision Tree Representation in R-Appropriate Problems for Decision Tree Learning-Basic Decision Tree Learning Algorithm-Measuring Features- Hypothesis Space Search in Decision Tree Learning-Inductive Bias in Decision Tree Learning - Issues in Decision Tree Learning- Time Series Data - Reading Time Series Data - Plotting Time Series Data - Decomposing Time Series Data-Forecasts using Exponential Smoothing-ARIMA Models.

**12**

## **UNIT – V**

Clustering - Basic Concepts in Clustering- Hierarchical Clustering -k-means Algorithm-CURE Algorithm -Clustering in Non-Euclidean Space –Clustering for Streams and parallelism - Association Rules – Frequent item set – Data structure overview – Mining algorithm interface – Auxiliary function.

**12**

**TOTAL: 60**

### **REFERENCES:**

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services 2015 (Unit 1 – Big Data)
2. SeemaAcharya, “Data Analytics using R”, McGraw Hill Education 2018, 1st Edition (Unit II,III,IV&V -R language)
3. Bharti Motwani, Data Analytics with R, Wiley India Pvt. Ltd., Reprint, 2020.
4. Jeeva Jose, Data Analysis using R programming, Khanna Publishing, New Delhi, 2019.
5. V.K.Jain, “Data Science and Analytics”, Khanna Publishing, 2018.

### **E-REFERENCES:**

1. <https://analytics.google.com/analytics/academy/course/6>
2. <https://www.youtube.com/watch?v=D2YcHRiIzCk>
3. <https://online-learning.harvard.edu/subject/data-anaysis>.
4. <https://analytics.google.com/analytics/academy/>

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|-----------|--------------------------|---|---|---|---|
| MCA2034-E | INTERNET OF THINGS (IoT) | L | T | P | C |
|           |                          | 3 | 2 | 0 | 4 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To understand the fundamentals of Internet of Things
- To learn about the basics of IoT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario

### COURSE OUTCOMES

Upon completion of the course, the student should be able to:

- CO1 : Analyze various protocols for IoT
- CO2 : Develop web services to access/control IoT devices.
- CO3 : Design a portable IoT using Raspberry Pi.
- CO4 : Deploy an IoT application and connect to the cloud.
- CO5 : Analyze applications of IoT in real time scenario

### SYLLABUS

#### UNIT – I INTRODUCTION TO IoT

Internet of Things - Physical Design- Logical Design – IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

12

#### UNIT – II IoT ARCHITECTURE

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.

12

#### UNIT – III IoT PROTOCOLS

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP– Security.

12

#### UNIT – IV BUILDING IoT WITH RASPBERRY PI & ARDUINO

Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

12

#### UNIT – VCASE STUDIES AND REAL-WORLD APPLICATIONS

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

12

**TOTAL : 60**

**REFERENCES:**

1. ArshdeepBahga, Vijay Madiseti, "Internet of Things – A hands-on approach", Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Jan Ho" ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Jeeva Jose, Internet of Things, Khanna Publishing House, 2019.
5. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
6. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key Applications and Protocols", Wiley, 2012

|           |                 |   |   |   |   |
|-----------|-----------------|---|---|---|---|
| MCA2034-F | ETHICAL HACKING | L | T | P | C |
|           |                 | 3 | 2 | 0 | 4 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To learn various hacking techniques and attacks.
- To know how to protect Windows and Networks
- To know how to protect data assets against attacks from the Internet.
- To assess and measure threats to information assets.
- To evaluate where information networks are most vulnerable.

### COURSE OUTCOMES

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

CO1 : Defend hacking attacks and protect data assets.

CO2 : Defend a computer against a variety of different types of security attacks using a number of hands-on techniques.

CO3 : Practice and use safe techniques on the World Wide Web.

### SYLLABUS

#### **UNIT: I Introduction to Ethical Hacking and Methodology**

Introduction to Ethical Hacking: Planning and performing attacks - Five stages of Ethical Hacking – Ways to conduct Ethical Hacking - Types of hacking – Hacker types Hacking Methodology: Setting the stage for testing - Seeing what others see - Scanning systems - Determining what's running on open ports - Assessing vulnerabilities - Penetrating the system.

12

#### **UNIT: II Reconnaissance and Social Engineering**

Reconnaissance: HTTrack - Google Directives – Harvester - Whois – Netcraft –Host - Fierce and other tools to extract information from DNS - Extracting Information From E-mail Servers – MetaGooFil – ThreatAgent

Social Engineering: Implications of Social Engineering - Performing Social Engineering attacks – Social Engineering countermeasures.

12

#### **UNIT: III Windows Hacking and Security**

Security architecture of Windows – Windows User Account Architecture and Attack – Windows vulnerabilities – Detecting null sessions - Cracking BIOS and Windows Password – Changing Windows Visuals – Editing the OS – Registry - Other system files – Checking share permissions.

12

#### **UNIT: IV Network Hacking**

Network infrastructure vulnerabilities - Scanning, poking and prodding the network - IP address – DNS – Nslookup – Port scanning and surfing - Sockets – PING – Netstat – Getting information about a domain – FTP Port and using FTP Client – FTP Commands –Detecting common Router, Switch and Firewall weaknesses – Discovering wireless network attacks and taking countermeasures.

12

#### **UNIT: V Web Hacking and Cracking Passwords**

Web Hacking: Get, Post and Head methods – Hacking from Web Browser – Post Dial Up Screen hacking – Web security testing tools – Web Vulnerabilities – Minimizing Web security risks Cracking Passwords: Password vulnerabilities – Cracking passwords – Password cracking countermeasures

12

**TOTAL: 60**

## **REFERENCES**

1. Ankit Fadia, Ethical Hacking, second edition, Macmillan India Ltd, 2006
2. Kevin Beaver, Hacking for Dummies, 5th edition, Wiley, 2016
3. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.
4. Kenneth C.Brancik “Insider Computer Fraud” Auerbach Publications Taylor & Francis Group– 2008.
5. Jeff Simon, Hacking Practical Guide for Beginners, 2016
6. Patrick Engebretson, The Basics of Hacking and Penetration Testing, 2nd edition, Syngress, 2013

|                  |                              |          |          |          |          |
|------------------|------------------------------|----------|----------|----------|----------|
| <b>MCA2035-A</b> | <b>BLOCKCHAIN TECHNOLOGY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                  |                              | <b>3</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVE**

- To know about the Basics in Block chain Technology and its Applications with different Platforms.

**COURSE OUTCOMES**

On completion of the course, the students will be able to Bloom’s Category (Highest Level)

- CO1: Describe the Basics of Blockchain Technology concepts and its applications.
- CO2: How various security services are provided with the help of symmetric and asymmetric cryptography.
- CO3: Summarize the Blockchain scalability and challenges in other domains.
- CO4: Providing the details about the Bitcoin clients and programming APIs.
- CO5: Explain the technical concepts related to Bitcoin Cryptocurrencies in detail.

**SYLLABUS**

**UNIT – I**

Blockchain: Growth - Distributed System - History - Types of Blockchain - Consensus - Decentralization: Methods - Routes - Ecosystems - Smart Contracts - Platforms for Decentralization.

**12**

**UNIT – II**

Symmetric Cryptography: Introduction - Cryptographic Primitives - Public Key Cryptography: Asymmetric Cryptography - Private and Public Keys: Hash Functions.

**12**

**UNIT – III**

Blockchain Outside of Currencies: IOT - Government - Health - Finance - Scalability and other Challenges.

**12**

**UNIT – IV**

Bitcoin: Introduction - How Bitcoin Works: Bitcoin Transactions - Constructing a Transaction - Bitcoin Mining - Mining Transactions in Blocks - Spending the Transaction - Bitcoin Client: Bitcoin Core - Using JSON- RPC API - Alternative Clients, Libraries and Toolkits.

**12**

**UNIT – V**

Keys, Addresses and Wallets: Introduction - Bitcoin Addresses - Implementing Keys and Addresses in Python -Wallets: Random Wallets - Seeded Wallets - Mnemonics Code Words - Hierarchical Deterministic Wallets-Transaction: Life Cycle - Structure - Inputs and Outputs - Chaining and orphan transactions – Script- Standard Transactions.

**12**

**TOTAL :60**

**REFERENCES:**

1. Imran Bashir, “Mastering Blockchain”, 2nd Edition, Packt Publication, Mumbai, 2018.(Unit 1, 2 and 3).
2. Andreas M. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, 1st Edition, O’Reilly Media Inc, USA, 2015. (Unit 4 and 5).
3. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Leveraging Blockchain Programming’, 1st Edition, Create Space Independent Publishing Platform, 2017.

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|------------------|--------------------------|----------|----------|----------|----------|
| <b>MCA2035-B</b> | <b>DIGITAL MARKETING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                  |                          | <b>3</b> | <b>1</b> | <b>0</b> | <b>3</b> |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To learn how to take a systematic approach to develop a Digital Marketing strategy
- To designing an online marketing strategy integrated with overall marketing objectives
- To learn to use email marketing as an effective marketing channel
- To learn global strategy in digital marketing
- To learn all the essentials of mobile marketing

### **COURSE OUTCOMES**

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

- CO1 : List the advantages of digital marketing over traditional marketing.
- CO2 : Summarize how they can use digital marketing is used to increase sales and grow their business
- CO3 : Work with a digital marketing tool kit
- CO4 : Become familiar with the elements of the digital marketing plan
- CO5 : Reach the online target market and develop basic digital marketing objectives collect, process, and analyze consumer data to make informed marketing decisions develop marketing strategies based on product, price, place and promotion objectives

### **SYLLABUS**

#### **UNIT – I**

Origin and development of Digital Marketing – Digital marketing strategy – Digital advertising market in India – digital marketing plan – skill required in digital marketing – careers in digital marketing. Display Advertising : Digital metrics – targeting in digital marketing – geographic and language tagging – Programmatic advertising – Ad Exchange – Challenges faced by digital display advertising **12**

#### **UNIT – II**

Search Engine Advertising : Understanding Ad placement – Understanding Ad ranks – Google Ads account – Best practice for creating effective Ads – Enhance Ad campaign - performance report – E-commerce. Social Media Marketing : Introduction – Listen – strategy – implementation – measure – improve – social entertainment – Gamification. **12**

#### **UNIT – III**

Facebook marketing : Organic marketing – Paid marketing – Facebook insights – other marketing tools – marketing with 3D Posts. LinkedIn : LikedIn strategy – LinkedIn website Demographics – Content strategy – LinkedIn Native videos – LinedIn Analytics – LinedIn sales navigator – Ad Campaign **12**

#### **UNIT – IV**

Twitter Marketing : Building a content strategy – tTwitter usage – Twitter Ads – Twitter Analytics – Twitter Tools and Tips for Marketers. Emerging platforms – Instagram – Snapchat – Pinterest .Mobile Marketing : Mobile advertising – Tool Kits – Mobile marketing features – Mobile Analytics. **12**

## **UNIT –V**

Search Engine Optimization : SEO phases – On-page optimization – Off page optimization – social media reach – Google search engine – Localsearch SEO - Google my business – SEO visual search – SEO – UX and UI. Video Marketing : Types of marketing videos – You Tube marketing – Video Analytics.

**12**

**TOTAL: 60**

## **REFERENCES**

1. Seema Gupta, Digital Marketing, McGraw Hill Education(India) Pvt. Ltd., 2020.
2. Calvin Jones : The best digital marketing campaigns in the world, Mastering The Art of Customer Engagement
3. Jan Zimmerman – Social media marketing all in one for dummies
4. Chaffey Et Al E marketing Excellence: Planning and Optimizing your digital marketing, 4Ed
5. Alan Charlesworth Digital Marketing: A Practical Approach

|           |                          |   |   |   |   |
|-----------|--------------------------|---|---|---|---|
| MCA2035-C | DIGITAL IMAGE PROCESSING | L | T | P | C |
|           |                          | 3 | 1 | 0 | 3 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in spatial and frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods.

### COURSE OUTCOMES

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

CO1 : Review and Introduction: Introduction to the DIP areas and applications.

CO2 : Image Digitization: Transformation, Sharpening

CO3 : Image Restoration: Noise models, filtering and implementation.

CO4 : Image Compression : Lossless compression, Lossy Compression

CO5 : Image segmentation and representation: Edge detection, Boundary representation

### SYLLABUS

#### UNIT – I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS

Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

12

#### UNIT II IMAGE ENHANCEMENT TECHNIQUES

Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters– Frequency domain filters: Smoothing – Sharpening filters – Homomorphic filtering.

12

#### UNIT III IMAGE RESTORATION

Model of Image Degradation/restoration process – Noise models – Inverse filtering -Least mean square filtering – Constrained least mean square filtering – Blind image restoration – Pseudo inverse – Singular value decomposition.

12

#### UNIT IV IMAGE COMPRESSION

Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding- DPCM.

Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization.

12

#### UNIT V IMAGE SEGMENTATION AND REPRESENTATION

Edge detection – Thresholding - Region Based segmentation – Boundary representation: chain codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors –Simple descriptors- Texture.

12

**TOTAL: 60**

## REFERENCES

1. Rafael C Gonzalez, Richard E Woods, Digital Image Processing - Pearson Education 2003 2<sup>nd</sup> Edition.
2. William K Pratt, Digital Image Processing John Willey(2001).
3. Image Processing Analysis and Machine Vision – MillmanSonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Larniy(1999).
4. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital ImageProcessing.
5. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India,2000.

|           |                 |   |   |   |   |
|-----------|-----------------|---|---|---|---|
| MCA2035-D | AUTOMATA THEORY | L | T | P | C |
|           |                 | 3 | 1 | 0 | 3 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To study the basic concepts in theory of computation
- To be familiar with DFA and NFA
- To study Regular expression and context free grammar
- To get the knowledge of Push down automata and Turing machine.

### COURSE OUTCOMES

After completing the course, the student will be able to:

- CO1 : Construct DFA and NFA for the given Language and vice versa
- CO2 : Understand the connections between RE and CFG and the Formal languages
- CO3 : Model Pushdown Automata for the given languages
- CO4 : Understand the use of Turing machine as language acceptor and Transducers.

### SYLLABUS

#### UNIT-I

Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite-Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite-Automata (NFA) – Finite Automata with Epsilon transitions.

12

#### UNIT-II

Regular Expression – FA(Finite Automata) and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

12

#### UNIT-III

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata.

12

#### UNIT- IV

Normal forms for CFG – Pumping Lemma for CFL – Pumping Lemma for linear languages, Closure Properties and Decision algorithms for CFL – Closure of context free languages, Some decidable properties of CFL

12

#### UNIT- V

Problems that computer cannot solve- Definition of Turing machine- Turing machine as a language Acceptor, Turing machine as Transducers, Programming techniques for Turing machines-Extension to the basic Turing machine- Restricted Turing machines-Turing machines and computers.

12

**TOTAL: 60**

## REFERENCES

1. J. E. Hopcroft, R. Motwani, and J. D. Ullman, Introduction to Automata Theory, languages, and computation (2nd ed.), Addison-Wesley, 2001, Press, 2006.
2. H.R. Lewis and C.H. Papadimitriou, “Elements of the theory of Computation”, Second Edition, Pearson Education, 2003.
3. Thomas A. Sudkamp,” An Introduction to the Theory of Computer Science, Languages and Machines”, Third Edition, Pearson Education, 2007.
4. Raymond Greenlaw an H.James Hoover, “ Fundamentals of Theory of Computation, Principles and Practice”, Morgan Kaufmann Publishers, 1998.
5. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Brokecole, 1997.
6. Peter Linz, An Introduction to Formal Languages and Automata, Sixth Edition, Jone & Bartlett Learning, 2016

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|-----------|--|---|---|---|---|
| MCA2035-E | SOFTWARE PROJECT MANAGEMENT AND<br>QUALITY ASSURANCE | L | T | P | C |
|           |  | 3 | 1 | 0 | 3 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To Develop A Good Understanding of Issues, Techniques and Tools for Software Project Management to Gain Knowledge of the Software Management Process
- To Understand the Concepts Software Quality Assurance
- To Gain Knowledge of The Software Quality Metrics
- To Understand The Software Quality standards.

### COURSE OUTCOMES

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

- CO1 : Student can understand the concepts of Software Project Management  
CO2 : The students get enhanced skills in Software Management Process development.  
CO3 : Good understanding in Concepts Software Quality Assurance  
CO4 : The students can have the ability to find the proper Software Quality Metrics  
CO5 : Proper Software Quality standards will be used.

### SYLLABUS

**UNIT: I SOFTWARE MANAGEMENT:** Conventional Software Management – Evolution of Software Economics – Improving Software Economics – Conventional versus Modern Software Project Management

12

**UNIT: II SOFTWARE MANAGEMENT PROCESS:** Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Workflows of the Process – Checkpoints of the Process - Iterative Process Planning.

12

**UNIT: III SOFTWARE QUALITY ASSURANCE:** The Software Quality Challenge – Definition and Objectives - Software Quality Factors –Development and Quality Plans.

12

**UNIT: IV SOFTWARE QUALITY METRICS:** Classification of Software Quality metrics – Process metrics – Product metrics – Implementation of Software Quality metrics - Cost of Software Quality.

12

**UNIT: V SOFTWARE QUALITY ASSURANCE STANDARDIZATION:** Quality management standards - ISO-9000 – Series – Capability Maturity Model (CMM) - SPICE – SQA project process standards –IEEE Software Engineering standards.

12

**TOTAL: 60**

### REFERENCES

1. Walker Royce “Software Project Management – A Unified Framework “, Pearson Education, 2004
2. Watts Humphery, “Managing Software Process “, Addison - Wesley, 1998.
3. Daniel Galin, “Software Quality Assurance- from Theory to Implementation “PEARSON Education Led 2004.
4. Roger S.Pressman, “*Software Engineering - A Practitioner’s Approach*”, 7th Edition McGraw Hill, 2010.(Revised).
5. Humphery Watts, “*Managing the Software Process*”, Addison Wesley, 1989.(Revised).
6. Wheelwright and Clark: “*Revolutionizing product development*”, The FreePress, 1993

|           |                        |   |   |   |   |
|-----------|------------------------|---|---|---|---|
| MCA2035-F | RESEARCH METHODOLOGIES | L | T | P | C |
|           |                        | 3 | 1 | 0 | 3 |

(For Students admitted from 2020 onwards)

### COURSE OBJECTIVES

- To familiarize the fundamental perceptions and methods adopted in research and to provide knowledge in intellectual property and patenting laws.

### COURSE OUTCOMES

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

- CO1: Interpret the research problem and suggest suitable tool for the given problem
- CO2: Identity the suitable measures for the given problem
- CO3: Apply the algorithmic research and simulation for the given case study
- CO4: Utilize the interpretation and write the report for the given problem
- CO5: Explain the intellectual property and patent law for the given case study

### SYLLABUS

#### UNIT: I

**Research Methodology:** Overview of Research Methodology: Introduction – Mathematical Tool for Analysis - Types of Research - Research Process - Data Collection and Presentation: Introduction – Primary Data – Secondary Data – Data Presentation.

12

#### UNIT: II

**Measures:** Review of Basic Statistical Measures: Introduction- Measures of Central Tendency – Measures of Variation – Measures of Skewness - Attitude Measurement and Scales: Introduction – Measurement – Fundamental of Data Collections Methods – Types of Scale – Scales for Stimuli – Probability Distributions: Introduction – Approaches to Probability – Probability Distributions.

12

#### UNIT: III

**Algorithmic Research and Simulation:** Algorithmic Research: Introduction - Algorithmic Research Problems - Types of Algorithmic Research Problems – Types of Solution Procedure / Algorithm – Steps of Development of Algorithm - Steps of Algorithmic Research – Design of Experiments and Comparison of Algorithms – Meta Heuristics for Combinatorial Problem. Simulation: Introduction – Need for Simulation - Types of Simulation – Simulation Languages - Simulation of a Season Ticket Issuing Counter of a Transport Corporation – A Case Study.

12

#### UNIT: IV

**Report Writing and Presentation, SPSS:** Report Writing and Presentation: Introduction - Types of Report – Guidelines for Reviewing Draft – Report Format - Typing Instructions – Oral Presentation. SPSS: Introduction – Sample Session for Data Creation – Reports - Descriptive Statistics – Tables - Compare Means – Non Parametric Test – Graphs.

12

#### UNIT: V

**Intellectual Property and Patent Law:** Introduction to Intellectual Property Law: Intellectual Property Law Basics - Types of Intellectual Property - Agencies Responsible for Intellectual Property Registration - International Organizations, Agencies, and Treaties - The Increasing Importance of Intellectual Property Rights. Foundations of Patent Law: Introduction - Rights under Federal Law - U.S. Patent and Trademark Office – Patentability - Design Patents - Plant Patents - Double Patenting

12

**TOTAL: 60**

## **REFERENCES**

1. Panneerselvam R., “Research Methodology”, 2nd Edition, PHI Learning Private Limited, New Delhi, 2014. (Unit I, II,III, IV)
2. Deborah E. Bouchoux, “Intellectual property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, 4th Edition, Delmar Cengage Learning, New York, 2013. (Unit V)
3. Kothari C.R., GauravGarg, “Research Methodology: Methods and Techniques”, 3rd Edition, New Age International Publishers, New Delhi, 2016

|         |                                    |   |   |   |   |
|---------|------------------------------------|---|---|---|---|
| MCA2036 | MOBILE APPLICATION DEVELOPMENT LAB | L | T | P | C |
|         |                                    | 0 | 0 | 5 | 3 |

(For Students admitted from 2020 onwards)

### **COURSE OBJECTIVES**

- To learn creating android applications with any simple database.

### **COURSE OUTCOMES**

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

- CO1 : Build a native application using GUI components and Mobile application development framework
- CO2 : Develop an application using basic graphical primitives and databases
- CO3 : Develop an application basic graphical primitives and content provider.
- CO4 : Construct an application using multi threading.
- CO5 : Model new applications to hand held devices

### **TOOLS:**

Develop Applications using any of the following tools:

- Eclipse
- Android studio.

### **LIST OF EXERCISES**

1. To design a simple android application for Change the Font color and size for Textbox.
2. To design a simple android application for adding of two number.
3. To Design a Simple android application for Calculator.
4. To illustrate the alert dialog box,
5. To Design a simple android application for calculating the simple interest.
6. To Design an android application for cafeapp.
7. To illustrate the notification.
8. To illustrate the layout manager.
9. To design an android application for database application.
10. A simple android application for the internal storage.

### **REFERENCES**

1. OnurCinar Android Apps with Eclipse, Apress-2012.
2. <http://developer.android.com/tools/studio/index.html>.

|                |                           |          |          |          |          |
|----------------|---------------------------|----------|----------|----------|----------|
| <b>MCA2037</b> | <b>WEB TECHNOLOGY LAB</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                           | <b>0</b> | <b>0</b> | <b>5</b> | <b>3</b> |

**(For Students admitted from 2020 onwards)**

### **COURSE OBJECTIVES**

- To develop the most important technologies that are being used today by web developers to build a wide variety of web applications.
- To understand and practice web development techniques on client-side
- Web applications using technologies such as HTML, Javascript, Angular JS and PHP.

### **COURSE OUTCOMES**

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

- CO1: Develop web applications using scripting languages.
- CO2: Design a Web application using various PHP techniques.
- CO3: Develop an application using HTML5, AngularJS & PHP and store data by connecting using MySQL.

### **LIST OF EXERCISES**

1. Write a HTML Code to design the class time table using table tags and to apply the styles.
2. Write a HTML Code to design a login form and validate it using JavaScript
3. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems: a. Parameter: A string Output: The position in the string of the left-most vowel b. Parameter: A number Output: The number with its digits in the reverse order
4. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
5. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
6. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.
7. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
8. Write a PHP program to display a digital clock which displays the current time of the server.
9. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix. c. Multiplication of two matrices. d. Addition of two matrices.
10. Write a PHP program to demonstrate the PHP Regular and expressions.
11. Write a PHP program to Develop student registration form and display all the submitted data on another page.
12. Write a PHP program to sort the student records which are stored in the database using selection sort.

|                |                     |          |          |          |          |
|----------------|---------------------|----------|----------|----------|----------|
| <b>MCA2038</b> | <b>MINI PROJECT</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                |                     |          |          | <b>4</b> | <b>2</b> |

**(For Students admitted from 2020 onwards)**

**COURSE OBJECTIVES**

- To provide insights to the process of software development

**COURSE OUTCOMES**

On completion of the course, the students will be able to

CO1: This Laboratory aims at developing a mini-project by students working in a team and doing the following activities:

CO2: Each student develops few modules in the mini-project

CO3: Integrate all the modules into a single project.

CO4: Exercise team work in developing and integrating into a single project.

**Areas**

- Android using Java or Kotlin
- Cryptography using C# or Java
- Data Analytics using Python
- Digital Image Processing using Java or Python
- Natural Language Processing using Java or VB.NET
- Networking using Java
- Web applications using PHP MVC Framework like Laravel or CodeIgniter
- Web applications using Angular, Node JS/ React JS
- Web applications using Java Frameworks like Hibernate, Struts or Spring
- Web applications using MVC, C# and .NET
- Machine Learning and Deep Learning using Python

|                |                     |          |          |           |           |
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| <b>MCA2041</b> | <b>PROJECT WORK</b> | <b>L</b> | <b>T</b> | <b>P</b>  | <b>C</b>  |
|                |                     |          |          | <b>24</b> | <b>12</b> |

(For Students admitted from 2020 onwards)

**COURSE OBJECTIVE:**

To impart knowledge on

- To understand the software engineering methodologies for project development.
- To gain knowledge on recent technologies
- To develop software products in various domains
- To improve their communication and presentation skill
- To get training for testing the software products

**COURSE OUTCOME:**

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

- CO-1: Analyze and design software in an efficient manner
- CO-2: Understand the features of current technologies
- CO-3: Implement the applications in various domains
- CO-4: Create Test Plan and apply various testing methods
- CO-5: Able to communicate and present the software product

**Syllabus:**

MCA students have to do projects in an Industry/Research Organization.

The software products will be developed and tested in various domains using current technologies.