

**ESTD. 1939**

## KARNATAK LAW SOCIETY'S GOGTE INSTITUTE OF TECHNOLOGY

**"JNANA GANGA" UDYAMBAG, BELAGAVI-590008, KARNATAKA, INDIA.**

## Approved by AICTE & UGC

**Permanently Affiliated and Autonomous Institution Under ESTD. 1979**

## Visvesvaraya Technological University, Belagavi [www.git.edu](http://www.git.edu/)



2022-23 Scheme

# Department: MCA Programme: MCA

**1st to 4th Semester Scheme of Teaching and Examination 1st and 2nd Semester Syllabus**

## INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

## MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

## QUALITY POLICY

* Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
* Fostering cultural, ethical, moral and social values in the human resources of the institution.
* Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

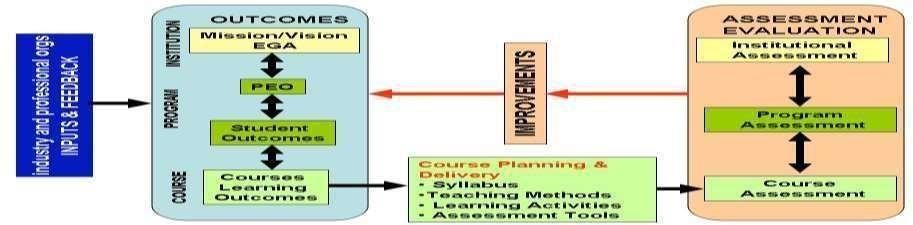
## DEPARTMENT VISION

The department of Master of Computer Applications shall strive to stand out as par excellence in generating and grooming, technically competent and skilled intellectual professionals to meet the challenges of the modern computing industry.

## MISSION

To train the graduates to become IT professionals having strong fundamental knowledge in the field of computer application with ethical values to meet increasing global challenges of ever evolving technologies.

## OUTCOME BASED EDUCATION (OBE)



|  |  |
| --- | --- |
| **PROGRAM OUTCOMES (POs) :** | |
| 1. | Apply the knowledge of mathematics and computing fundamentals to abstract and  conceptualize models from defined problems and requirements. |
| 2. | Ability to identify, formulate and conduct literature review to solve complex computing problems for obtaining optimal inference. |
| 3. | Design and develop solutions for complex computing problems, components or  processes to meet the specified needs after considering public health and safety, cultural, societal, and environmental factors. |
| 4. | Apply research-based knowledge and methods to design experiments, analyze and  interpret data with synthesis of information to provide valid conclusions. |
| 5 | Ability to create, select, adapt and apply appropriate techniques using modern  computing tools with an understanding of the limitations. |
| 6 | Understand and commit to professional ethics and cyber regulations,  responsibilities, and norms of professional computing practices. |
| 7 | Ability to engage in independent and lifelong learning in the context of technological advancements for continual development as a computing professional |
| 8 | Demonstrate knowledge and understanding of the computing and management principles as a member and leader in a team, to manage projects in  multidisciplinary environments |
| 9. | Ability to communicate effectively on complex computing activities with computing community and the society at large. |
| 10. | Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities  relevant to professional computing practice |
| 11. | Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments |
| 12. | Ability to identify an opportunity and execute innovative ideas to create value and  sustainable well-beings for the individu3al and society at large |

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

**PEO1: Real Life Problem Solving:** Postgraduates of the programme will develop solutions to the real world problems by developing computer applications using the knowledge of mathematics, computer science and engineering in the diverse field of Information Technology.

**PEO2: High-Quality Computer Professionals:** The postgraduates shall practice and grow as computer professionals by conducting research, design, develop, test and maintain projects in varied fields of computer science and engineering using the state-of-the-art tools and technologies.

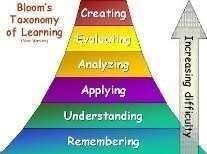
**PEO3: Leadership Skills:** The postgraduates will exhibit their leadership skills with ethics, integrity, competency and social responsibility.

**PEO4: Lifelong Learning:** The postgraduates shall always stand out of the crowd by enhancing their abilities in their profession through lifelong learning.

## BLOOM’S TAXONOMY OF LEARNING OBJECTIVES

Bloom’s Taxonomy in its various forms represents the process of learning. It was developed in 1956 by Benjamin Bloom and modified during the 1990’s by a new group of cognitive psychologists, led by Lorin Anderson (a former student of Bloom’s) to make it relevant to the 21stcentury. The **revised taxonomy** given below emphasizes what a learner “Can Do”.

|  |  |  |
| --- | --- | --- |
| **Lower order thinking skills(LOTS)** | | |
| L1 | Remembering | Retrieve relevant knowledge from memory. |
| L2 | Understanding | Construct meaning from instructional material including oral, writtenand graphic communication. |
| L3 | Applying | Carry out or use a procedure in a given situation – using learnedknowledge. |
| **Higher order thinking skills(HOTS)** | | |
| L4 | Analyzing | Break down knowledge into its components and determine the relationships of the components to one another and then how they relateto an overall structure or task. |
| L5 | Evaluating | Make judgments based on criteria and standards, using previouslylearned knowledge. |
| L6 | Creating | Combining or reorganizing elements to form a coherent or functionalwhole or into a new pattern, structure or idea. |



## Scheme of Teaching and Examination -1st to 4thSemester MCA

**As per the guidelines of UGC CBCS the courses can be classified into:**

1. **Professional Courses (PC)**: This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirements of a program in a said discipline of study. These courses will have 4 credits per course.
2. **Foundation Courses**: The Foundation Courses are of two kinds:

**Compulsory Foundation:** These courses are the courses based upon the content that leads to Knowledge enhancement. These courses provide opportunities to improve technological knowledge before entering industry as well as preparing students for higher degrees in technological subjects. They are mandatory for all disciplines. These courses will have 4 credits per course.

**Foundation Electives**: These are value based courses aimed at man making education. The course is related to

## Humanities and Social Science Courses (HS).

1. **Elective Courses:** This is course, which can be chosen from the pool of papers. It may be supportive to the discipline/ providing extended scope/enabling an exposure to some other discipline / domain / nurturingstudent proficiency skills.
2. **Mandatory Non-Credit Courses (MNC)**: These courses are mandatory for students joining MCA Program and students have to successfully complete these courses before the completion of degree.

**Scheme for 2022 M.C.A.**

**Total credits for M.C.A. Program**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Semester** | **Credits per Semester** | **Total credits** |
| 1st year | 1 | 24 | 49 |
| 2 | 25 |
| 2nd year | 3 | 25 | 51 |
| 4 | 26 |
|  | **Total** | **100** | **100** |

**Curriculum framework:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Course** | | **Credits** |
| 1. | Professional Core | PC | 71 |
| 2. | General Elective | GE | 12 |
| 3. | Compulsory Foundation | CF | 11 |
| 4. | Academic Writing | SC | 4 |
| 5. | Societal Project | SP | 2 |
|  | **Total** |  | 100 |

**Credit definition:**

Lecture (L): One Hour /week – 1 credit Tutorial (T): Two hour /week – 1 credit Practical (P): Two hours/week –1credit

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **I Semester** | | | | | | | | | | | | | | |
| **S.**  **No.** | **Course Code** | **Course Title & Category** | | **Contact Hours** | **Contact Hours/ week** | **Credit**  **Allocation** | | | **Total credit** | **Marks** | | | | |
| **L– T-P** | **L** | **T** | **P** | **CIE** | | **SEE** | | **TOTAL** |
| **Theory** | **Lab** | **Theory** | **Lab** |
| 1. | 22MCA11 | Python Programming(I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 2. | 22MCA12 | Database  Management System (I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 3. | 22MCA13 | Computer Networks and Communication(I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 4. | 22MCA14 | Research Methodology | CF | 4 – 0 – 0 | 4 | 4 | 0 | 0 | 4 | 100 | NA | 100 | NA | 200 |
| 5. | 22MCA15 | Mathematical Foundations | CF | 4 – 2– 0 | 6 | 4 | 1 | 0 | 5 | 100 | NA | 100 | NA | 200 |
|  |  | **Total** | |  | **32** |  |  |  | **24** | **380** | **120** | **500** | **NA** | **1000** |

**CIE:** Continuous Internal Evaluation **SEE:** Semester End Examination **L:** Lecture **T:** Tutorial **P:** Practical **PC:** Professional Course **CF:** Compulsory Foundation **I**:

Integrated course **MNC:** Mandatory Non-Credit Course **GE:** General Elective **SP:** Societal Project #Bridge course as per University Guidelines

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **I Semester** | | | | | | | | | | | | | |
| **Course Code** | **Course Title & Category** | | **Contact Hours** | **Contact Hours/ week** | **Credit**  **Allocation** | | | **Total credit** | **Marks** | | | | |
| **L– T-P** | **L** | **T** | **P** | **CIE** | | **SEE** | | **TOTAL** |
| **Theory** | **Lab** | **Theory** | **Lab** |
| 22MCA16 | Basics of Programming Languages – Bridge Course (I) | PC | 4 – 0 – 2 | 6 | - | - | - | MNC | 60 | 40 | 100 | NA | 200 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **II semester** | | | | | | | | | | | | | | |
| **S.**  **No.** | **Course Code** | **Course Title & Category** | | **Contact Hours** | **Contact Hours/ week** | **Credit**  **Allocation** | | | **Total credit** | **Marks** | | | | |
| **L– T–P** | **L** | **T** | **P** | **CIE** | | **SEE** | | **TOTAL** |
| **Theory** | **Lab** | **Theory** | **Lab** |
| 1. | 22MCA21 | Web Design and Development (I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 2. | 22MCA22 | Data Structures and Algorithms (I) | PC | 3 – 2 – 2 | 7 | 3 | 1 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 3. | 22MCA23 | Programming using Java and J2EE (I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 4. | 22MCA24 | IT Infrastructure Management | PC | 4 – 0 – 0 | 4 | 4 | 0 | 0 | 4 | 100 | NA | 100 | NA | 200 |
| 5. | 22MCA25X | Elective-1 | GE | 4 – 0 – 0 | 4 | 4 | 0 | 0 | 4 | 100 | NA | 100 | NA | 200 |
| 6. | 22MCA26 | Professional  Communication and Ethics | CF | 0 – 0 – 2 | 2 | 0 | 0 | 1 | 1 | 100 | NA | NA | NA | 100 |
| 7. | 22MCA27 | Employability Skill | CF | 3 – 0 – 0 | 3 | 1 | 0 | 0 | 1 | 100 | NA | NA | NA | 100 |
|  |  | **Total** | |  | **32** |  |  |  | **25** | **580** | **120** | **500** | **NA** | **1200** |

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## Certification Course:

* + One certification is compulsory and need to be completed before start of 4th semester.
  + Choose certifications, which have industrial acceptance.
  + Students must submit the certificate with valid score of the certifications they have completed to the department during 4th

## semester. This is mandatory for the award of the credits and degree.

* + These certifications are evaluated by a panel formed at college level during 4th semester for the award of 2 credits.

## Professional Practice (Internship)

The students have to undergo a mandatory professional practice of **6 weeks duration**. This activity should be carried out during the vacation between 2nd and 3rd semester or between 3rd and 4th semester.

## Societal Project

Working out solutions for societal problems. Applying the technology to solve the societal problems. Those, who have not pursued /completed the Societal Project, shall be declared as fail in the that course. There is no SEE (University examination) for this course.

Elective-1

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Course Code** | **Course Title** |
| 1 | 22MCA251 | NoSQL |
| 2 | 22MCA252 | Cloud Computing |
| 3 | 22MCA253 | Cyber Security and Cyber Laws |
| 4 | 22MCA254 | Data Analysis with R\*\* |
| 5 | 22MCA255 | Information Network Security |

**NOTE:** The courses with the ‘\*\*’ mark indicate that the courses will be **Project Based Learning (PBL).** For these courses the Semester End Examination will be a project.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **III semester** | | | | | | | | | | | | | | |
| **S.**  **No.** | **Course Code** | **Course Title & Category** | | **Contact Hours** | **Contact Hours/ week** | **Credit**  **Allocation** | | | **Total credit** | **Marks** | | | | |
| **L– T-P** | **L** | **T** | **P** | **CIE** | | **SEE** | | **TOTAL** |
| **Theory** | **Lab** | **Theory** | **Lab** |
| 1. | 22MCA31 | C# Programming using  .NET (I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 2. | 22MCA32 | Machine Learning(I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 3. | 22MCA33 | Big Data Paradigm(I) | PC | 4 – 0 – 2 | 6 | 4 | 0 | 1 | 5 | 60 | 40 | 100 | NA | 200 |
| 4. | 22MCA34X | Elective-2 | GE | 4 – 0 – 0 | 4 | 4 | 0 | 0 | 4 | 100 | NA | 100 | NA | 200 |
| 5. | 22MCA35X | Elective-3 | GE | 4 – 0 – 0 | 4 | 4 | 0 | 0 | 4 | 100 | NA | 100 | NA | 200 |
| 6. | 22MCA36 | Societal Project | SP | 0 – 0 – 3 | 3 | 3 | 0 | 0 | 2 | 100 | NA | NA | NA | 100 |
|  |  | **Total** | |  | **29** |  |  |  | **25** | **480** | **120** | **500** | **NA** | **1100** |

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**Elective-2 Elective-3**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Course Code** | **Course Title** |
| 1 | 22MCA341 | Block Chain Technology |
| 2 | 22MCA342 | Management and Entrepreneurship for IT  Industry |
| 3 | 22MCA343 | Full Stack Development\*\* |
| 4 | 22MCA344 | Internet of Things\*\* |
| 5 | 22MCA345 | Advanced Database Management System |

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Course Code** | **Course Title** |
| **1** | 22MCA351 | Django Framework\*\* |
| 2 | 22MCA352 | DevOps |
| 3 | 22MCA353 | Artificial Intelligence |
| 4 | 22MCA354 | Software Project Management |
| 5 | 22MCA355 | Ethical Hacking\*\* |

**NOTE:** The courses with the ‘\*\*’ mark indicate that the courses will be **Project Based Learning (PBL).** For these courses the Semester End Examination will be a project.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **IV Semester** | | | | | | | | | |
| **Sl.**  **No.** | **Course Code** | **Course Title& Category** | | **Contact Hours/W eek** | **Credits** | **Marks** | | | **Total Marks** |
| **CIE** | **SEE** | |
| **Demonstration, Presentation**  **and Viva** | **Dissertation** |
| 1 | 22MCA41 | Professional Practice | PC | -- | 5 | 100 | 100 | NA | 200 |
| 2 | 22MCA42 | Project Work | PC | FT | 15 | 100 | 50 | 50 | 200 |
| 3 | 22MCA43 | Academic Writing | SC | 1 | 4 | 100 | NA | NA | 100 |
| 4 | 22MCA44X | Technical Certification | PC | 8 Weeks | 2 | NA | NA | NA | -- |
|  |  | **Total** | | **--** | **26** | **300** | **150** | **50** | **500** |

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## 22MCA43: Academic Writing

The seminar presented, may be published in a reputed peer reviewed or Scopus journals.

## 22MCA44X: Certification Course

Please refer to the II (Second) semester Scheme for guidelines

**PYTHON PROGRAMMING (I)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA11** | **Course**  **type** | **Integrated** | **Credits L-T-P** | 4 - 0 - 1 |
| **Hours/week: L - T- P** | 4- 0 - 2 | | | **Total credits** | 5 |
| **Total Contact Hours** | L = 52 Hrs; T = 0Hrs; P = 24 Hrs  Total = 76 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

|  |  |
| --- | --- |
| 1. | To create the ability to design and build applications for problem solving using core and object  oriented concepts of python programming |
| 2. | To introduce file handling mechanism and usage of SQLite database with Python  Programming |
| 3. | To explore GUI, multithreading concept and key features of exception handling supported by  python |

**Required Knowledge: NA**

|  |  |
| --- | --- |
| **Unit – I** | **Contact Hours = 11 Hours** |
| **Basics of Python Programming:** Features of python, writing and executing first python program, Literal constants, variables and identifiers, data types, input operation, comments, reserved words, indentation, operators and expressions, operations on strings. Decision control statements. **Data Structures:** Lists, Tuple, Sets, Dictionaries.  Textbook Chapter 3.1, 3.4 - 3.12.4, 3.14, 4, 8.1, 8.2.1 – 8.2.6, 8.2.9 – 8.2.10, 8.3, 8.4 – 8.6 | |

|  |  |
| --- | --- |
| **Unit – II** | **Contact Hours = 11 Hours** |
| **Functions:** Introduction, Function Definition, Function Call, Variable scope and lifetime, the return statement, more on defining functions. Lambda functions. **Modules:** The from…import statement, Name of Module, Making your own Modules, The dir() function. **Regular Expressions:** The match() function, The search() function, The sub() function, The findall(), finditer() functions, Met acharacters in regular expressions, groups.  Textbook Chapter 5.1 – 5.7, 5.11.1 – 5.11.4, 6 | |

|  |  |
| --- | --- |
| **Unit – III** | **Contact Hours = 10 Hours** |
| **Classes and Objects:** Introduction, Classes and Objects, class method and self argument, The init method, Class Variables and Object Variables, The del () method, Other special methods, Public and Private data members, Private Methods, Calling a class method from another class methods, static methods. **Operator Overloading:** Introduction, Concept of Operator Overloading, Reverse adding.  Textbook Chapter 9.1 – 9.10, 9.15, 11.1 – 11.3 | |

|  |  |
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| **Unit – IV** | **Contact Hours = 10 Hours** |
| **File Handling:** Introduction, File Path, Types Of Files, Opening And Closing Files, Reading And Writing Files, File Positions, Renaming And Deleting Files, Directory Methods, Methods From os Module. **Working with Database:** Connecting to a SQLite database, execute select statements, execute insert, update, delete statements.  Textbook Chapter 7.1 – 7.8.  Reference Book Chapter 17.1 – 17.4 | |

|  |  |
| --- | --- |
| **Unit – V** | **Contact Hours =10 Hours** |
| **Error and Exception Handling:** Introduction to Errors and Exceptions, Handling Exceptions, Multiple Except Blocks, Multiple Exceptions in a Single Block, Except Block Without Exception, The else Clause, Rising Exceptions, Handling Exceptions in invoked functions, Built-in and user defined exceptions, The finally block. **Multi-threading:** Introduction, starting a new thread using the \_thread module, The threading module, Synchronizing threads. **GUI Programming with tkinter Package:** Introduction, Widgets.  Textbook Chapter 12.1 – 12.11, Appendix A, Appendix B | |

**List of Experiments**

|  |  |  |
| --- | --- | --- |
| **Unit No.** | **No. of**  **Experiments** | **Topic(s) related to Experiment** |
| 1 | **2** | 1. Decision Control Structure Statements 2. List/Dictionary |
| 2 | **2** | 1. User Defined Functions 2. Regular Expressions |
| 3 | **2** | 1. Object Oriented Concepts 2. Overloading Operator |
| 4 | **2** | 1. File Handling mechanism 2. Working with database |
| 5 | **2** | 1. Exception Handling 2. GUI application |

|  |  |
| --- | --- |
| **Books** | |
| **Text Books** | |
| 1. | Reema Thareja, “Python Programming using problem solving approach”, Oxford University  Press, 2017 |
| **Reference Books** | |
| 1. | Paul Gries, Jennifer Campbell, Jason, Practical Programming, An introduction to Computer  Science using Python 3.6, 3rd Edition, Pragmetic Bookshelf. |
| 2. | Charles Dierbach, "Introduction to Computer Science using Python”, Wiley India Edition |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | The joy of computing using python <https://onlinecourses.nptel.ac.in/noc21_cs32/preview> |
| 2. | Programming in python <https://onlinecourses.swayam2.ac.in/cec22_cs20/preview> |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project /Course Seminar |
| 3. | Practice session/Demonstrations in Labs | 3. | Lab Test |
|  |  | 4. | Semester End Examination |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Explain** core elements of Python Programming and key  features of Object Oriented Programming | L2 | PO1 |
| CO2 | **Build** applications for problem solving using core and object  oriented concepts of python programming | L3 | PO1, PO3, PO5 |
| CO3 | **Build** GUI applications | L3 | PO3, PO5 |
| CO4 | **Analyze** the problem to determine the operations and constraints and choose the right data structure & other programming elements that best meets these  requirements for implementation | L4 | PO3, PO5 |

**Scheme of Continuous Internal Evaluation (CIE):**

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test

**(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THEORY (60 marks)** | | | **LAB (40 marks)** | | Total |
| IA test 1 | IA test 2 | Other Assessment  (OBA/Seminar/Project) | Conduction | Lab test |
| 25 marks | 25 marks | 10 marks | 15 marks | 25 marks | 100 marks |
| **IA Test:**   1. No objective part in IA question paper 2. All questions descriptive | | | | | |
| **Conduct of Lab:**   1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks | | | | | |
| **Lab test: (Batch wise with 15 students/batch)**   1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks. 4. Conduction, Calculations, results and graphs (if applicable): 10 marks. 5. Viva voce: 10 marks. | | | | | |
| **Eligibility for SEE:**  **Minimum Marks to Score for CIE is 50% of the maximum marks of CIE.**   1. 50% and above (30 marks and above) in theory component 2. 50% and above (20 marks and above) in lab component 3. **Lab test is COMPULSORY** 4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE | | | | | |

|  |  |
| --- | --- |
| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

**Rubrics:**

|  |  |
| --- | --- |
| **Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Articulation Matrix** | | | | | | | | | | | | |
| CO | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the**  **course** |
| 1 | Solid foundation in Python syntax, data types, data structures, control structures, functions, modules, and error handling Problem-solving: Ability to analyze, design and implement solutions for a wide range of problems  Ability to build graphical user interfaces  and create desktop applications. | Workflow automation Test Automation  Data Analytics Gaming | Software Developer, Test Automation Engineer, Data Analyst, Web Developer |

**Database Management System (I)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA12** | **Course**  **type** | **Integrated** | **Credits L-T-P** | 4 - 0 - 1 |
| **Hours/week: L - T- P** | 4 - 0 - 2 | | | **Total credits** | 5 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 24 Hrs  Total = 76 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

|  |  |
| --- | --- |
| 1. | To provide the knowledge of the basic database concepts, applications, data models and  schemas. |
| 2. | To emphasize on database design approaches with ER modeling and Normalization. |
| 3. | To provide an insight on SQL to solve complex queries. |
| 4. | To provide knowledge of PL/SQL, cursors and indexes. |

**Required Knowledge: NA**

|  |  |
| --- | --- |
| **Unit – I** | **Contact Hours = 10 Hours** |
| **Basic concepts:** Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Data models, schemas and instances, Three -schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client -server architectures, Classification of Database Management systems.  Textbook Chapter 1.1 to 1.8, 2.1 to 2.6 | |

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| **Unit – II** | **Contact Hours = 11 Hours** |
| **Database Design using ER modeling and Relational Model:** Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types, Relational Database Design Using ER-to-Relational Mapping, Relational Model Concepts, Relational Model Constraints and Relational Database Schema, Functional Dependencies, Normalization (1 NF, 2 NF, 3 NF, BCNF), Codd’s rules.  Textbook Chapter 7.1 to 7.9, 15.1 to 15.6 | |

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| **Unit – III** | **Contact Hours = 11 Hours** |
| **Structured Query Language:** SQL Data Definition and Data Types, specifying basic constraints in SQL, Schema change statements in SQL, Basic queries in SQL, JOINs and types of JOINs, More complex SQL Queries. Insert, Delete and Update statements in SQL, Views (Virtual Tables) in SQL.  Textbook Chapter 4.1 to 4.5, 5.1 to 5.4 | |

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| **Unit – IV** | **Contact Hours = 10 Hours** |
| **PL/SQL:** Introduction to PL/SQL, language fundamentals, conditional and sequential control, Iterative processing and loops. Exception handlers, triggers. Functions, stored procedures. Creating and planning PL/SQL Creating indexes, changing an index, recreating an index, obtaining information about indexes, eliminating an index. Creating cursors, accessing cursor rows, attributes of cursors (explicit and implicit).  Textbook Chapter 1, 2, 3 ,4, 5, 6, 7 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Transaction Processing and Concurrency Control:** Introduction to Transaction Processing Concepts and Theory, Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL, Concurrency Control Techniques, Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques  Textbook Chapter 15.1 – 15.10, 16.1-16.5 | |

**List of Experiments**

|  |  |  |
| --- | --- | --- |
| **Unit No.** | **No. of**  **Experiments** | **Topic(s) related to Experiment** |
| **2** | **1** | 1. ER Modeling and schema diagram |
| 3 | **2** | 1. Simple Queries 2. Nested Queries 3. JOINS and Views |
| 4 | **3** | 1. Cursors 2. Stored procedures 3. Triggers |

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| **Books** | |
| **Text Books:** | |
| 1. | Elmasri and Navathe: Fundamentals of Database Systems, 6thEdition, Addison -Wesley, 2011. |
| 2. | Steven Feuerstein, Bill Pribyl & Chip Dawes: Oracle PL/SQL Language Pocket Reference, 5th  Edition, Orielly. |
| **Reference Books:** | |
| 1. | Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition,  McGraw-Hill, 2003. |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | [https://onlinecourses.nptel.ac.in/](https://onlinecourses.nptel.ac.in/noc22_cs51/preview) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project/Course Seminar |
| 3. | Practice session/Demonstrations in Labs | 3. | Lab Test |
|  |  | 4. | Semester End Examination |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Explain** the different components of DBMS  and databases. | L 2 | PO 1 |
| CO2 | **Apply** different modeling techniques and  formal design guidelines to develop a database schema. | L 3 | PO 1, 3, 5 |
| CO3 | **Develop** efficient SQL queries and PL/SQL  programs to access the database. | L 3 | PO 1, 5 |
| CO4 | **Examine** the given requirements and create a database by taking into consideration the various modeling techniques, normalization,  SQL and PL/SQL | L 4 | PO 1 |

**Scheme of Continuous Internal Evaluation (CIE):**

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THEORY (60 marks)** | | | **LAB (40 marks)** | | Total |
| IA test 1 | IA test 2 | Other Assessment  (OBA/Seminar/Project) | Conduction | Lab test |
| 25 marks | 25 marks | 10 marks | 15 marks | 25 marks | 100 marks |
| **IA Test:**   1. No objective part in IA question paper 2. All questions descriptive | | | | | |
| **Conduct of Lab:**   1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks | | | | | |
| **Lab test: (Batch wise with 15 students/batch)**   1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs **(if applicable)**: 10 marks 5. Viva voce: 10 marks | | | | | |
| **Eligibility for SEE:** | | | | | |

**Minimum Marks to Score for CIE is 50% of the maximum marks of CIE.**

1. 50% and above (30 marks and above) in theory component
2. 50% and above (20 marks and above) in lab component
3. **Lab test is COMPULSORY**
4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

**Rubrics:**

|  |  |
| --- | --- |
| **Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |  |  |  |  |  |
| **4** |  |  |  |  |  |  |  |  |  |  |  |  |
| **5** |  |  |  |  |  |  |  |  |  |  |  |  |
| **6** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| --- | --- | --- | --- |
| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take**  **up after undergoing the course** |
| 1. | Able to query the database for useful data/information.  Able to administer the usage and enhance the performance of the database. | Healthcare, Banking, ERPs, HR management etc | Database Admin, Database programmer, Database Designer. |

**Computer Networks and Communications (I)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA13** | **Course**  **type** | **Integrated** | **Credits L-T-P** | 4 - 0 - 1 |
| **Hours/week: L - T- P** | 4 - 0 - 2 | | | **Total credits** | 5 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 24 Hrs  Total = 76 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

|  |  |
| --- | --- |
| 1. | To give an insight of computer networks and data communications with its types, topology,  models and its uses. |
| 2. | To impart the knowledge of layers in computer networks along with their functionalities,  services and study important protocols in higher layers of network. |
| 3. | To identify the key design issues in each layer and use the algorithms solve the design issues. |
| 4. | To simulate the wired and wireless network functions and protocols using a simulation tool. |

**Required Knowledge: NA**

|  |  |
| --- | --- |
| **Unit – I** | **Contact Hours = 10 Hours** |
| **Introduction to computer networks and Physical Layer**  Introduction to Network: Characteristics of Data Communication; Components of Data Communication; Data Representation and Data Flow, Network Criteria; Types of Connection; Physical Topology; Uses of Computer Networks; Types of Networks. Reference models: TCP/IP Model, the OSI Model, comparison of the OSI and TCP/IP reference model.  Physical Layer: Theoretical Basis for Data Communication. Guided Transmission Media and Wireless Transmission, Digital Modulation and Multiplexing.  Textbook: Chapter 1, 2 | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **Data Link Layer**  Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols. Experiments on: Framing techniques  Textbook: Chapter 3 | |

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| **Unit – III** | **Contact Hours = 11 Hours** |
| **Network Layer**  Network Layer Design issues, Routing algorithms- The Optimality Principal, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical routing, Routing for Mobile Host, Congestion Control Algorithms, Quality of Service, Internetworking, The Network Layer in the Internet, IP Addressing.  Textbook: Chapter 5 | |

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| **Unit – IV** | **Contact Hours = 11 Hours** |
| **Transport Layer**  The transport services, Elements of Transport Protocols, Congestion control, The Internet Transport Protocols: TCP and UDP.  Textbook: Chapter 6 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Application Layer**  Introduction to NS-2, DNS-Domain Name System, Email, WWW, Introduction to Streaming Audio and Video.  Textbook: Chapter 7 | |

**List of Experiments**

|  |  |  |
| --- | --- | --- |
| **Unit No.** | **No. of**  **Experiments** | **Topic(s) related to Experiment** |
| 1 | 3 | 1. Star Topology 2. LAN Wired Network 3. Client - Server architecture |
| 2 | 1 | 1. Framing Technique |
| 3 | 2 | 1. Bottleneck Analysis of network 2. Distance Vector Routing algorithm implementation |
| 4 | 2 | 1. Traffic Shaping Techniques 2. IP Tracing |

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| --- | --- |
| **Books** | |
| **Text Books:** | |
| 1. | Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th edition, Pearson  Education. |
| **Reference Books:** | |
| 1. | Behrouz A. Forouzan, Data Communications and Networking, 4th Edition, Tata McGraw-Hill,  2018. |
| 2. | William Stallings, Data and Computer Communication, 10th Edition, Pearson Education,  2014. |
| **E-resources (NPTEL/SWAYAM… Any Other)- mention links** | |
| 1. | https://[www.digimat.in/nptel/courses/video/106105183/L01.html](http://www.digimat.in/nptel/courses/video/106105183/L01.html) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project/Course Seminar |
| 3. | Practice session/Demonstrations in Labs | 3. | Lab Test |
|  |  | 4. | Semester End Examination |

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| --- | --- | --- | --- |
| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Explain** Computer Network concepts with it types, topologies, transmission media, layered protocols and network models and  architectures in layered architecture. | L2 | PO1 |
| CO2 | **Identify** different data transmission modes along with error detection and correction techniques and solve routing and congestion  control algorithms in data transmission. | L3 | PO1 |
| CO3 | **Experiment** the working principles of various network types, topologies, architecture, algorithms and protocols in different layers  using a simulation tool. | L3 | PO1, PO5 |
| CO4 | **Analyze** the design issues, services, interfaces, protocols and flow of data in computer networks and explain different performance  issues related to networking. | L4 | PO1 |

**Scheme of Continuous Internal Evaluation (CIE):**

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test

**(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THEORY (60 marks)** | | | **LAB (40 marks)** | | Total |
| IA test 1 | IA test 2 | Other Assessment  (OBA/Seminar/Project) | Conduction | Lab test |
| 25 marks | 25 marks | 10 marks | 15 marks | 25 marks | 100 marks |
| **IA Test:**   1. No objective part in IA question paper 2. All questions descriptive | | | | | |
| **Conduct of Lab:**   1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks | | | | | |
| **Lab test: (Batch wise with 15 students/batch)**   1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs **(if applicable)**: 10 marks 5. Viva voce: 10 marks | | | | | |
| **Eligibility for SEE:**  **Minimum Marks to Score for CIE is 50% of the maximum marks of CIE.**   1. 50% and above (30 marks and above) in theory component 2. 50% and above (20 marks and above) in lab component | | | | | |

1. **Lab test is COMPULSORY**
2. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

|  |  |
| --- | --- |
| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

**Rubrics:**

|  |  |
| --- | --- |
| **Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **CO-PO Mapping Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | **√** |  |  |  |  |  |  |  |  |  |  |  |
| **2** | **√** |  |  |  |  |  |  |  |  |  |  |  |
| **3** | **√** |  |  |  | **√** |  |  |  |  |  |  |  |
| **4** | **√** |  |  |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO** | | | | | | | | | | | | |

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| --- | --- | --- | --- |
| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the**  **course** |
| 1. | Enhancement of Computer Network Knowledge and ability to experiment the computer concepts learnt using simulation  tool. | Networking | Network Administrator and Network Analyst. |

**Research Methodology**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA14** | **Course**  **type** | **Theory** | **Credits L-T-P** | 4 - 0 - 0 |
| **Hours/week: L - T- P** | 4- 0 - 0 | | | **Total credits** | 4 |
| **Total Contact Hours** | L = 52Hrs; T = 0 Hrs; P = 0Hrs  Total = 52Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

|  |  |
| --- | --- |
| 1. | To provide an overview of the research methodology and to elaborate the technique of  defining a research problem. |
| 2. | To elaborate various aspects of reviewing the literature and to develop concepts of research  designs. |
| 3. | To explore details of sampling design and to elaborate tests of hypotheses. |
| 4. | To provide different methods of analysis and display of data and develop the art of  interpreting and writing of research reports. |
| 5. | To explore various forms of the intellectual property rights and its relevance. |

**Required Knowledge of Basics of programming**

|  |  |
| --- | --- |
| **Unit – I** | **Contact Hours = 10 Hours** |
| **Research Methodology, Defining the Research Problem**  Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.  Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.  Textbook 1 Chapter 1,2 | |

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| --- | --- |
| **Unit – II** | **Contact Hours = 10 Hours** |
| **Reviewing the literature, Research Design**  Place of the literature review in research, How to Review the literature, Searching the existing literature, reviewing and developing theoretical or conceptual framework, Writing about the literature reviewed.  Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs.  Textbook 2 Chapter 3  Textbook 1 Chapter 3 | |

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| **Unit – III** | **Contact Hours = 10 Hours** |
| **Data Collection, Sampling Design**  Census and Sample Survey, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Implications of a Sample Design, Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs, How to Select a Random Sample, Random Sample from an Infinite Universe, Complex Random Sampling Designs.  Textbook 1 Chapter 4, 6 | |

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| --- | --- |
| **Unit – IV** | **Contact Hours = 12 Hours** |
| **Analysis and Display of Data, Interpretation and Report Writing**  Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Asymmetry (Skewness), Measures of Relationship, Simple Regression Analysis, Methods of Communicating and Displaying Analyzed Data, Text, Tables, Graphs.  Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Precautions for Writing Research Reports.  Textbook 1 Chapter 7, 14  Textbook 2 Chapter 16 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Overview of Intellectual Property, Patents**  Introduction and the need for intellectual property right (IPR) – Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, IPR in India: Genesis and development – IPR in abroad – Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the WIPO Convention, 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994.  Patents – Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application  - Non – Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and license, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties – Patent office and Appellate Board  Textbook 3 Chapter 1, 2 | |

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| --- | --- |
| **Books** | |
| **Text Books:** | |
| 1. | C.R. Kothari, Research Methodology: Methods and Techniques, New Age International Publishers,  Second Revised Edition. ISBN (13) : 978-81-224-2488-1 |
| 2. | Ranjit Kumar (2011), Research Methodology a step-by-step guide for beginners, SAGE  Publications Ltd, 3rdEdition. |
| 3. | Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN:  Cengage Learning India Private Limited. |
| **Reference Books:** | |
| 1. | Neeraj, P., &Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private  Limited. |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |

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| --- | --- |
| 1. | World Intellectual Property Organization. (2004). WIPO Intellectual property Handbook. Retrieved  from<https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf> |

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| --- | --- | --- | --- |
| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | Quiz |
| 3. | Online classes | 3. | OBA/Course Project/Course Seminar |
|  |  | 4. | Semester End Examination |
|  |  |  |  |

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| --- | --- | --- | --- |
| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Illustrate** the fundamentals of Research methodology, Research problem, Literature review, Research Design, Data Collection, Data Analysis, Data Interpretation, Report Writing, Intellectual  Property and Patents. | L2 | PO1 |
| CO2 | **Model** a research problem using proper literature review and  **plan** a research design | L3 | PO2,PO3 |
| CO3 | **Plan** a proper research process involving all its steps | L3 | PO3 |
| CO4 | **Analyze** data using different statistical methods. | L4 | PO3,PO4 |

**Scheme of Continuous Internal Evaluation (CIE)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA Test 1** | **IA Test 2** | **Other Assessment**  **(OBA/Seminar/Project)** | **Quiz 1** | **Quiz 2** |
| **25** | **25** | **20** | **15** | **15** | **100** |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

|  |  |
| --- | --- |
| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

|  |  |
| --- | --- |
| **Rubrics Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | ✓ |  |  |  |  |  |  |  |  |  |  |  |
| **2** |  | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| **3** |  |  | ✓ |  |  |  |  |  |  |  |  |  |
| **4** |  |  | ✓ | ✓ |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO** | | | | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the**  **course** |
| 1. | 1. Develop fundamental knowledge of research process and methodology 2. Make use of techniques involved in defining research problems 3. Develop requisite skills for an effective research 4. Develop good understanding of intellectual property rights | Universities, Research labs | Research Associate, Research Scholar(JRF) |

**MATHEMATICAL FOUNDATIONS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA15** | **Course**  **type** | **Theory** | **Credits L-T-P** | 4 - 1 - 0 |
| **Hours/week: L - T- P** | 4- 2 - 0 | | | **Total credits** | 5 |
| **Total Contact Hours** | L =52 Hrs; T = 12 Hrs; P = 0 Hrs  Total = 52 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

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| --- | --- |
| 1. | To explore the concepts of set theory and logic. |
| 2. | To impart the knowledge of relations and functions. |
| 3. | To recognize the applicability of regression analysis for the purpose of estimation. |
| 4. | To provide the clear sense of statistics and probability distributions. |
| 5. | To identify the potential areas to apply concepts of graph theory. |

**Required Knowledge of Basics of Mathematics**

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| --- | --- |
| **Unit – I** | **Contact Hours = 10 Hours** |
| **Set Theory, Matrices and Logic:** Fundamentals of Set theory, inclusion-exclusion principle, pigeonhole principle, matrices, finding Eigen values and Eigen vectors, Basic Connectives and Truth Tables, Logic Equivalence, The laws of Logic, Logical Implications: Rules of Inference, Quantifiers, Proofs of theorems. Textbook 1 Chapter 1,2,3,5.4 | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **Relations and Functions** Properties of Relations, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Computer recognition-Zero One Matrices and Directed graphs, Posets and Hasse Diagrams, Equivalence relation and Partitions, lattices.  Functions- types of functions, Special Functions, Function composition and Inverse function  Textbook 1 Chapter 5,6 | |

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| **Unit – III** | **Contact Hours = 10 Hours** |
| **Statistics and Regression Analysis**  Measures of Central Tendency (Mean, Median, Mode, Other averages), Measures of Dispersion (range, mean deviation, standard deviation),  Correlation and linear regression analysis. Introduction, Methods of Studying Correlation, Scatter diagram method, Karl Pearson's Coefficient of Correlation, Probable Error, Correlation in Bivariate Frequency table, Rank Correlation Method.  Linear Regression Analysis: Introduction, Lines of regression, Coefficients of regression. Correlation Analysis Vs Regression Analysis  Textbook 2 Chapter 9.3 to 9.11, 10.3 to 10.8  Textbook 3 Chapter: 8, 9 | |

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| **Unit – IV** | **Contact Hours = 12 Hours** |
| **Probability and Distributions** Introduction, Probability, A Priori Probability, Mathematics of probability, Addition Rule of Probability, Conditional Probabilities, The Multiplication Rule, Bayes Theorem on inverse probability, Random variables- discrete and continuous, probability mass function, probability density function,. Binomial distribution, Poisson distribution and Normal distribution.  Textbook 2 Chapter 16.1 to 16.9  Textbook 4 Chapter 1, 2. | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Graph Theory and Semi graphs**  Graphs and Graphs models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring, Introduction to Semi graphs and their applications.  Textbook 5 Chapter 1, 4.1, 5.4 | |

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| **Books** | |
| **Text Books:** | |
| 1. | Dr D. S. Chandrasekhariah, “Discrete Mathematical Structures”, 4th Edition, Prism Books Pvt Ltd |
| 2. | C B Gupta, Vijay Gupta “An Introduction to Statistical Methods”, 23rd Edition, Vikas publishing  House Pvt. Ltd, India |
| 3. | S C Gupta : Fundamentals of Statistics, 6th Revised and Enlarged Edition, Himalaya Publishing  House,2009 |
| 4. | R H Dhareshwar and Sangeeta Shetti, Business Statistics - II, R Chand & CO Publishers, 1st Edition,  2018 |
| 5. | Dr. D. S. Chandrasekharaiah, “Applied Mathematics – Part II (Graph Theory)”, Prism Books Pvt Ltd,  2001 |
| **Reference Books:** | |
| 1. | Discrete and Combinatorial Mathematics, An Applied Introduction, Ralph P Grimaldi, B.V.Ramana,  5th Edition, 2007, Pearson Education, ISBN-10: 8177584243, ISBN- 13: 9788177584240 |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links:** | |
| 1. | https://onlinecourses.nptel.ac.in/noc22\_cs123/preview |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project/Course Seminar |
| 3. | Practice session | 3. | Quiz |
|  |  | 4. | Semester End Examination |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Illustrate** the fundamental concepts of sets, relations, functions,  logic, statistics, probability and graph theory | L2 | PO1 |
| CO2 | **Make use of** concepts of sets, relations, functions, logic, statistics,  probability and graph theory to solve problems. | L3 | PO1 |
| CO3 | **Identify** the suitable mathematical and or statistical construct to use  for the given problem to find solution. | L3 | PO1 |
| CO4 | **Analyze** mathematical concepts like logic, sets, relations and  functions, statistics, probability and graph theory to optimize the solutions of engineering problem. | L4 | PO3 |

**Scheme of Continuous Internal Evaluation (CIE)**

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| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA Test 1** | **IA Test 2** | **Other Assessment**  **(OBA/Seminar/Project)** | **Quiz 1** | **Quiz 2** |
| **25** | **25** | **20** | **15** | **15** | **100** |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

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| --- | --- |
| **Rubrics: Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | ✓ |  |  |  |  |  |  |  |  |  |  |  |
| **2** | ✓ |  |  |  |  |  |  |  |  |  |  |  |
| **3** | ✓ |  |  |  |  |  |  |  |  |  |  |  |
| **4** |  |  | ✓ |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| --- | --- | --- | --- |
| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take**  **up after undergoing the course** |
| 1. | Fundamentals of Mathematics and Statistics | Data Analytics | Data Analyst and roles related to Data science field |

**Basics of Programming Languages Bridge Course (I)**

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| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA16** | **Course**  **type** | **Integrated** | **Credits L-T-P** | MNC |
| **Hours/week: L - T- P** | 4- 0 - 2 | | | **Total credits** | -- |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 24 Hrs  Total = 76 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

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| --- | --- |
| 1. | To provide the basics of programming like decision making, looping and arrays. |
| 2. | To explore implementation of functions and structures. |
| 3. | To emphasize on pointers and dynamic memory allocation |
| 4. | To introduce the concepts of classes, objects, member functions and constructors. |
| 5. | To impart the knowledge of object-oriented concepts like encapsulation, inheritance, and  polymorphism. |

**Required Knowledge of Basics of programming**

|  |  |
| --- | --- |
| **Unit – I** | **Contact Hours = 10 Hours** |
| **C Programming**: decision making, control structures and arrays: Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the switch statement, the ?: operator, programming examples. The while statement, the do...while statement, for statement, nested loops, jumps in loops, the continue statement, programming examples. One dimensional and two-dimensional arrays, declaration, and initialization of arrays, reading, writing and manipulation of  above types of arrays. Textbook 1: Chapter 6, 7, 8, 9 | |

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| **Unit – II** | **Contact Hours = 12 Hours** |
| **Functions, Recursion, Structures**: Concept of Function, User defined Function, System Defined Function, Types of parameter passing in function, Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures.  Textbook 1 Chapter 10, 11 | |

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| **Unit – III** | **Contact Hours = 10 Hours** |
| **Pointers, Dynamic Memory Allocations**: Introduction to pointers, understanding pointers, Accessing the address of a variable, declaring pointer variable, initialization of pointer variable, accessing a variable through its pointers. Pointers as function arguments, functions returning pointers. Dynamic memory allocation, allocating a block of memory MALLOC, allocating multiple blocks of memory: CALLOC, releasing the used space: free.  Textbook 1 Chapter 12, 14 | |

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| **Unit – IV** | **Contact Hours = 10 Hours** |
| **Introduction to C++:** Introduction to classes and objects, defining member functions, making an outside function inline, nesting of member functions, private member functions, arrays within a class, memory allocation for objects, static data member as static member functions, arrays of objects, objects as function arguments, returning objects. Constructors and destructors: introduction, constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, dynamic initialization of objects, copy constructor, destructors.  Textbook 2 Chapter 5, 6 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Object Oriented concepts in C++:** Introduction to inheritance, defining derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, abstract classes. Constructors in derived classes. Pointers, virtual functions and polymorphism. Textbook 2 Chapter 8, 9 | |

**List of Experiments**

|  |  |  |
| --- | --- | --- |
| **Unit No.** | **No. of**  **Experiments** | **Topic(s) related to Experiment** |
| 1 | **3** | 1. Programs on Looping constructs like if..else, do...while, For etc., 2. Programs on constructs like switch 3. Programs on array handling. |
| 2 | **2** | 1. Programs on functions, parameter passing in function 2. Programs on handling structures. |
| 3 | **3** | 1. Programs on handling pointers, Accessing the address of a variable 2. Programs on Pointers as function arguments, functions returning pointers 3. Programs on Dynamic memory allocation (MALLOC, CALLOC etc.,) |
| 4 | **2** | 1. Programs on classes and objects 2. Programs on Constructors and destructors |
| 5 | **2** | 1. Programs on inheritance 2. Programs on polymorphism |

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| --- | --- |
| **Books** | |
| **Text Books:** | |
| 1. | E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill. |
| 2. | Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill. |
| **Reference Books:** | |
| 1. | Brian W. Kernighan and Dennis M. Ritchie, The ‘C’ Programming Language, Prentice Hall of India. |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html |
| 2. | https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more  clarity in understanding the topics and verities of problem solving methods. |
| 3. | <https://tinyurl.com/4xmrexre> |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project/Course Seminar |
| 3. | Practice session/Demonstrations in Labs | 3. | Lab Test |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Illustrate** the usage of basic concepts of procedural  programming and object oriented programming. | L2 | PO1 |
| CO2 | **Apply** the concepts of procedural programming based on the  given problem statements. | L3 | PO1 |
| CO3 | Build software solutions with object oriented programing  concepts as per the needs and specifications. | L3 | PO3, PO5 |
| CO4 | **Analyze** complex problems and discover the need for decision making, looping, basic data structures, user defined and built-in functions or use of Object Oriented concepts like classes objects inheritance, polymorphism to solve the  problem. | L4 | PO3, PO5 |

**Scheme of Continuous Internal Evaluation (CIE):**

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test

**(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THEORY (60 marks)** | | | **LAB (40 marks)** | | Total |
| IA test 1 | IA test 2 | Other Assessment  (OBA/Seminar/Project) | Conduction | Lab test |
| 25 marks | 25 marks | 10 marks | 15 marks | 25 marks | 100 marks |
| **IA Test:**   1. No objective part in IA question paper 2. All questions descriptive | | | | | |
| **Conduct of Lab:**   1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks | | | | | |
| **Lab test: (Batch wise with 15 students/batch)**   1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs (if applicable): 10 marks 5. Viva voce: 10 marks | | | | | |
| **Eligibility for SEE:**   1. 50% and above (30 marks and above) in theory component 2. 50% and above (20 marks and above) in lab component 3. **Lab test is COMPULSORY** 4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE | | | | | |

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| --- | --- |
| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

**Rubrics:**

|  |  |
| --- | --- |
| **Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |  |  |  |  |  |
| **4** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take**  **up after undergoing the course** |
| 1. | Logic building and basic programming skills | Information technology, Product based software  companies | Software Developer |

# 2nd Semester Master of Computer Applications (M.C.A.) Syllabus (2022-23 Scheme)

**Web Design and Development (I)**

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| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA21** | **Course**  **type** | **Integrated** | **Credits L-T-P** | 4 - 0 - 1 |
| **Hours/week: L - T- P** | 4- 0 - 2 | | | **Total credits** | 5 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 24 Hrs  Total = 76 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

|  |  |
| --- | --- |
| 1. | To introduce the basics of designing webpage with HTML, CSS, JavaScript and jQuery. |
| 2. | To emphasize the server side scripting using PHP. |
| 3. | To guide on connecting web applications to backend database MySQL. |
| 4. | To provide knowledge of sessions cookies and user authentication |

**Required Knowledge : Basic knowledge of programming**

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| **Unit – I** | **Contact Hours = 11 Hours** |
| **Coding the front end - HTML and CSS**: Structuring the Page with HTML, Learning the Fundamental Structure of an HTML5 Web Page, Applying the Basic Text Tags, Creating Links, Building Bulleted and Numbered Lists, Carving Up the Page. Styling the Page with CSS: Adding Styles to a Page, Styling Page Text, Working with Colors, Using CSS Selectors, Sizing and Positioning Page Elements.  Textbook Chapter Book 1 | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **Coding the front end - Javascript:** An overview of JavaScript, understanding variables, building expressions, controlling the flow of JavaScript, harnessing the power of functions, working with arrays, manipulating date.  Textbook Chapter Book 3 | |

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| **Unit – III** | **Contact Hours = 11 Hours** |
| **Coding the front end - jQuery:** Developing Pages Faster with jQuery: Getting Started with jQuery, Selecting Elements with jQuery, Manipulating Page Elements with jQuery, Livening Up Your Page with Events and Animation: Building Reactive Pages with Events, Building Lively Pages with Animation.  Textbook Chapter Book 4 | |

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| --- | --- |
| **Unit – IV** | **Contact Hours = 10 Hours** |
| **Coding the back end - PHP and MySQL:** Learning the Basic Syntax of PHP Scripts, Outputting Text and Tags, Working with PHP Arrays, Controlling the Flow of Your PHP Code, Working with PHP Functions, Using PHP to Access MySQL Data, File Handling.  Textbook Chapter Book 5 | |

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| --- | --- |
| **Unit – V** | **Contact Hours = 10 Hours** |
| **Advanced PHP techniques:** Using Cookies in PHP, setting a Cookie, accessing a Cookie, destroying a Cookie, HTTP Authentication, Storing Usernames and Passwords, Salting, Using Sessions, starting a Session, ending a Session, Setting a Time Out, Session Security.  Textbook No 2 Chapter 12 | |

**List of Experiments**

|  |  |  |
| --- | --- | --- |
| **Unit No.** | **No. of**  **Experiments** | **Topic(s) related to Experiment** |
| 1 | **2** | 1. HTML 2. CSS |
| 2 | **1** | 3. Javascript functions |
| 3 | **1** | 4. Jquery animations and events |
| 4 | **3** | 1. PHP functions 2. MySQL and PHP 3. File Handling |
| 5 | **1** | 8. Sessions in PHP |

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| **Books** | |
| **Text Books:** | |
| 1. | Paul McFedries, Web Coding & Development All-in-One For Dummies, Web Coding &  Development All-in-One For Dummies. |
| 2. | Robin Nixon, Learning PHP, MySQL & JavaScript, 1st Edition, O’Reilly. |
| **Reference Books:** | |
| 1. | W. Jason Gilmore, Beginning PHP and MySQL from Novice to Professional, 4th Edition, Apress. |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | https://[www.paulmcfedries.com/webcodingfordummies/](http://www.paulmcfedries.com/webcodingfordummies/) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project/Course Seminar |
| 3. | Practice session/Demonstrations in Class  and Labs | 3. | Lab Test |
|  |  | 4. | Semester End Examination |

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| --- | --- | --- | --- |
| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Explain** the basic constructs of the web programming  constructs. | L 2 | PO 1 |
| CO2 | **Make use of** scripting languages for making web pages  dynamic. | L 3 | PO 1, PO5 |
| CO3 | **Build** web applications with animations and event handling. | L 3 | PO 1, PO5 |
| CO4 | **Analyze** the web components in building an application | L 4 | PO 1, PO3 |

**Scheme of Continuous Internal Evaluation (CIE):**

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THEORY (60 marks)** | | | **LAB (40 marks)** | | Total |
| IA test 1 | IA test 2 | Other Assessment  (OBA/Seminar/Project) | Conduction | Lab test |
| 25 marks | 25 marks | 10 marks | 15 marks | 25 marks | 100 marks |
| **IA Test:**   1. No objective part in IA question paper 2. All questions descriptive | | | | | |
| **Conduct of Lab:**   1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks | | | | | |
| **Lab test: (Batch wise with 15 students/batch)**   1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs **(if applicable)**: 10 marks 5. Viva voce: 10 marks | | | | | |
| **Eligibility for SEE:**   1. 50% and above (30 marks and above) in theory component 2. 50% and above (20 marks and above) in lab component 3. **Lab test is COMPULSORY** 4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE | | | | | |

|  |  |
| --- | --- |
| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

**Rubrics:**

|  |  |
| --- | --- |
| **Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |  |  |  |  |  |
| **4** |  |  |  |  |  |  |  |  |  |  |  |  |
| **5** |  |  |  |  |  |  |  |  |  |  |  |  |
| **6** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| --- | --- | --- | --- |
| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the**  **course** |
| 1 | Design and build dynamic web applications for various domains | Healthcare, Banking, Social Media, Education  etc | Front end designer, jQuery developer, PHP programmer, Javascript developer etc. |

**DATA STRUCTURES AND ALGORITHMS (I)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA22** | **Course**  **type** | **Integrated** | **Credits L-T-P** | 3 - 1 - 1 |
| **Hours/week: L - T- P** | 3 - 1 - 2 | | | **Total credits** | 5 |
| **Total Contact Hours** | L = 40 Hrs; T = 12 Hrs; P = 24 Hrs  Total = 54 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

|  |  |
| --- | --- |
| 1. | To provide knowledge of data structures like stacks and queues. |
| 2. | To explore the various operation on linked data structures. |
| 3. | To elaborate design of algorithms, understand algorithms, analyze algorithms and  appreciate the working of an efficient algorithm |
| 4. | To impart the knowledge of algorithmic power and how the limitation can be coped up  By using design techniques like backtracking and branch-and-bound, and finally conclude with a discussion of few approximation algorithms |

**Required Knowledge of Basics of C programming**

|  |  |
| --- | --- |
| **Unit – I** | **Contact Hours = 8 Hours** |
| Stack: Primitive operation, implementing the push operation. Example: Infix, postfix and prefix, evaluating a postfix expression, converting an expression from infix to postfix.  Queue: Queues, Circular queue and its implementation  Textbook 1 : Chapter 1, 4.1 | |

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| **Unit – II** | **Contact Hours = 8 Hours** |
| Singly linked list, primitive operations on singly linked list, doubly linked lists, primitive operations on doubly linked list, Trees – Binary tree and operations, tree traversals, Binary Search Tree, Depth First Search, Breadth First Search  Textbook 1 : Chapter 4.2, 5.1, 5.2, 5.5 | |

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| **Unit – III** | **Contact Hours = 8 Hours** |
| **Analysis of algorithmic efficiency, Divide and Conquer**  Notion of Algorithm, Fundamentals of algorithmic problem solving, Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms, Examples  Divide and Conquer technique, Merge Sort, Quick Sort, Binary Search  Textbook 2 : Chapter 1, 2 | |

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| **Unit – IV** | **Contact Hours = 8 Hours** |
| **Dynamic Programming, Greedy techniques**  Warshall’s Algorithm, Floyd’s Algorithm,  Greedy Knapsack Problem, Kruskal’s Algorithm, Dijikstra’s Algorithm, Huffman Trees. Textbook 2 : Chapter 8, 9 | |

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| **Unit – V** | **Contact Hours = 8 Hours** |
| **Backtracking and Branch-and-bound**  Backtracking: n – Queens’s problem, Subset – Sum Problem.  Branch-and-Bound: Assignment Problem, Traveling Salesperson Problem. Textbook 2 : Chapter 12.1, 12.2 | |

**List of Experiments**

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| **Unit No.** | **No. of**  **Experiments** | **Topic(s) related to Experiment** |
| 1 | **2** | 1. Application of stack 2. Application of queue |
| 2 | **2** | 1. Linked List 2. Tree / Binary Search tree |
| 3 | **1** | 5. Divide and Conquer |
| 4 | **2** | 1. Dynamic programming 2. Greedy technique |
| 5 | **2** | 1. Backtracking 2. Branch and bound |

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| **Books** | |
| **Text Books:** | |
| 1. | Yedidyah Langsam, Moshe J.Augenstein and Aaron M. Tenanbaum, Data structures using C, PHI. |
| 2. | Anany Levitin, Introduction to design and analysis of algorithms, Pearson Education, 2003 |
| **Reference Books:** | |
| 1. | Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education  Asia. |
| 2. | Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla: Data Structures and Program Design  in C, 2nd Edition, Pearson Education. |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | https://[www.geeksforgeeks.org/data-structures/](http://www.geeksforgeeks.org/data-structures/) |
| 2. | https://[www.geeksforgeeks.org/fundamentals-of-algorithms/](http://www.geeksforgeeks.org/fundamentals-of-algorithms/) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course project/Course Seminar |
| 3. | Practice session/Demonstrations in Labs | 3. | Lab Test |
| 4. | Virtual Labs ( if present) | 4. | Semester End Examination |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Illustrate** the basic concepts of data structures and algorithms | L2 | PO1 |
| CO2 | **Make use of** suitable data structures to solve the given problem. | L3 | PO3 |
| CO3 | **Apply** relevant data structures and problem-solving technique to solve the given problem. | L3 | PO3 |
| CO4 | **Analyze and examine** the algorithms based on the data  structures used, order of notation and performance metrics. | L4 | PO1, PO3 |

**Scheme of Continuous Internal Evaluation (CIE):**

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test

**(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

|  |  |  |  |  |  |
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| **THEORY (60 marks)** | | | **LAB (40 marks)** | | Total |
| IA test 1 | IA test 2 | Other Assessment  (OBA/Seminar/Project) | Conduction | Lab test |
| 25 marks | 25 marks | 10 marks | 15 marks | 25 marks | 100 marks |
| **IA Test:**   1. No objective part in IA question paper 2. All questions descriptive | | | | | |
| **Conduct of Lab:**   1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks | | | | | |
| **Lab test: (Batch wise with 15 students/batch)**   1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs (if applicable): 10 marks 5. Viva voce: 10 marks | | | | | |
| **Eligibility for SEE:**   1. 50% and above (30 marks and above) in theory component 2. 50% and above (20 marks and above) in lab component 3. **Lab test is COMPULSORY** 4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE | | | | | |

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

**Rubrics:**

|  |  |
| --- | --- |
| **Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | ✓ |  |  |  |  |  |  |  |  |  |  |  |
| **2** |  |  | ✓ |  |  |  |  |  |  |  |  |  |
| **3** |  |  | ✓ |  |  |  |  |  |  |  |  |  |
| **4** | ✓ |  | ✓ |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take**  **up after undergoing the course** |
| 1 | Data Structure and Algorithms concepts. Algorithm analysis concepts | Applicable as a basic element in many areas like, Computer Networks,  Database, CPU scheduling | Data Analyst, Data Engineer, Database related roles, Business Intelligence related roles |

**Programming Using Java & J2EE (I)**

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| --- | --- | --- | --- | --- | --- |
| **Course Code** | 22MCA23 | **Course**  **type** | **Integrated** | **Credits L-T-P** | 4 - 0 - 1 |
| **Hours/week: L - T- P** | 4 - 0 - 2 | | | **Total credits** | 5 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 24 Hrs  Total = 76 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

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| --- | --- |
| 1. | To provide emphasize on the strengths of Java Language like interface, Multithreaded  programming and exceptions. |
| 2. | To introduce the core components of advanced Java programming language like JSP,  Servlets, JDBC and Java Beans. |
| 3. | To explore servlet life cycle and handling request headers, response headers, and status  codes in servlets |
| 4. | To elaborate life cycle of JSP with the advantages of JSP and how to make use of action  tags, implicit objects, directive tags, and scriptlet tags |
| 5. | To explore database connectivity using JDBC API |

**Required Knowledge of Basics of programming.**

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| --- | --- |
| **Unit – I** | **Contact Hours = 12 Hours** |
| **The Java Language, Inheritance and Interfaces:** The Java language: The Java Buzz words, Object Oriented Programming, The Three OOP Principles, A first simple program, The Primitive Types, variables and Control Statements. Introducing Classes: class fundamentals, declaring objects, introducing methods, constructors, this keyword, Inheritance: Basics of inheritance, Method overloading and Method Overriding, Dynamic Method Dispatch, Introduction to JavaFX  Textbook 1 Chapter 1 to 8. | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **Interfaces and Exception Handling:** Using Abstract classes, Interfaces, Default Interface Methods, Use of variables in an Interface Exception Handling: Exception Handling Fundamentals, Exception types, uncaught exceptions, using try and catch, Multiple catch clauses, Nested try statements, throw,  throws, finally, Java’s built-in Exceptions. Creating Your Own Exception.  Textbook 1 Chapter 9. | |

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| **Unit – III** | **Contact Hours =10 Hours** |
| **Servlets**: Servlet Structure, Lifecycle, and Single Thread model interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies.  Textbook 2 Chapter 3.1-3.8,4.1-4.4,5.1-5.3,6.1-6.2,7.1-7.5,8.1-8.7 | |

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| **Unit – IV** | **Contact Hours = 10 Hours** |
| **Java Server Pages and Controlling the Structure of generated Servlets:** Overview of JSP Technology, Need of JSP, Benefits of JSP, Basic syntax, using JSP expressions, writing scriptlets, using scriptlets to make parts of JSP conditional, predefined variables. The JSP page directive, import attribute, session attribute, isELignored attribute, buffer and auto flush attributes, info attribute, errorPage and isErrorPage attributes, isThreadsafe Attribute, extends attribute, language attribute, including files and applets in JSP Pages, using Java beans components in JSP documents.  Textbook 2 Chapter 10.1,10.2,10.3 and 10.6, 11.1 to 11.13,12.1 to 12.12,13.1 to 13.4,14.1 to 14.3 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **JDBC:** Talking to Database, Types of JDBC, Essential JDBC program, JDBC Drivers, packages, Callable Statement, Statement Objects, using Prepared Statement JDBC in Action Result sets, Batch updates. Textbook 3 Chapter 29 and Chapter 30. | |

**List of Experiments**

|  |  |  |
| --- | --- | --- |
| **Unit No.** | **No. of**  **Experiments** | **Topic(s) related to Experiment** |
| 1 | 1 | 1. GUI development using JavaFX |
| 2 | 2 | 1. Interfaces. 2. Exceptions |
| 3 | 1 | 4. Servlet handling data from client (Client request) |
| 4 | 3 | 5. JSP Scripting tags, all attributes of JSP Page directive tags, JSP Action  tags (JSP: include, JSP: forward), JSP application using Java Bean class |
| 5 | 1 | 6. JDBC (Database connectivity with different Statement objects) in  Java/JSP /Servlet. |

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| **Books** | |
| **Text Books:** | |
| 1. | Herbert Schildt, Java The Complete Reference, Eight Edition. Tata McGraw-Hill Edition – 2011 |
| 2 | Marty Hall, Larry Brown, Core Servlets and Java Server Pages. Volume 1: Core Technologies.  Second Edition |
| 3. | Java 6 Programming Black Book, Dreamtech Press. 2012 |
| **Reference Books:** | |
| 1. | Web Technologies: HTML, Javascript, XML and , PHP, Java, JSP ASP.net, Ajax Black Book Kogent  learning Solutions Inc/Wiley india 2008. |
| **E-resourses (NPTEL/SWAYAM. Any Other)- mention links** | |
| 1. | https://[www.roseindia.net/java/](http://www.roseindia.net/java/) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project/Course Seminar |
| 3. | Practice session/Demonstrations in Labs | 3. | Lab Test |
|  | | 4. | Semester End Examination |

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| --- | --- | --- | --- |
| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Illustrate** basic concepts of OOPs and other concepts of  core Java technology. | L2 | PO1 |
| CO2 | **Make use of** core Java concepts like interface, exception  handling and GUI development in console applications. | L3 | PO1,PO3 |
| CO3 | **Develop** enterprise web applications using J2EE technologies namely servlet ,JSP and Java beans to process client request, cookies  and session tracking. | L3 | PO1,PO3,PO5 |
| CO4 | **Build and analyze** database enterprise applications for  the business logic. | L4 | PO1,PO3,PO5 |

**Scheme of Continuous Internal Evaluation (CIE):**

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test

**(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THEORY (60 marks)** | | | **LAB (40 marks)** | | Total |
| IA test 1 | IA test 2 | Other Assessment  (OBA/Seminar/Project) | Conduction | Lab test |
| 25 marks | 25 marks | 10 marks | 15 marks | 25 marks | 100 marks |
| **IA Test:**   1. No objective part in IA question paper 2. All questions descriptive | | | | | |
| **Conduct of Lab:**   1. Conducting and execution: 5 marks 2. Viva-Voce: 5 marks 3. Lab record write-up: 5 marks | | | | | |
| **Lab test: (Batchwise with 15 students/batch)**   1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Write Up: 5 marks 4. Conduction, Calculations, results and graphs (if applicable): 10 marks 5. Viva voce: 10 marks | | | | | |
| **Eligibility for SEE:**   1. 50% and above (30 marks and above) in theory component 2. 50% and above (20 marks and above) in lab component 3. **Lab test is COMPULSORY** 4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE | | | | | |

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| --- | --- |
| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

**Rubrics:**

|  |  |
| --- | --- |
| **Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | **√** |  |  |  |  |  |  |  |  |  |  |  |
| **2** | **√** |  | **√** |  |  |  |  |  |  |  |  |  |
| **3** | **√** |  | **√** |  | **√** |  |  |  |  |  |  |  |
| **4** | **√** |  | **√** |  | **√** |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take**  **up after undergoing the course** |
| 1 | General programming skills. Build Enterprise applications/web applications development along with database. | All the Programming Service sectors. Front end back end developers. Mobile Applications.  Testing. | Software engineer. Fullstack developer Front end developer Backend developer System Engineer Test Engineer  System architect |

**IT Infrastructure Management**

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| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA24** | **Course**  **type** | **Theory** | **Credits L-T-P** | 4 - 0 - 0 |
| **Hours/week: L - T- P** | 4- 0 - 0 | | | **Total credits** | 4 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 00 Hrs  Total = 52 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

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| --- | --- |
| 1. | To introduce practical implementation of Information Technology Service Management  (ITSM) |
| 2. | To impart knowledge on how an integrated ITSM framework can be utilized to achieve IT  business integration, cost reductions and increased productivity |
| 3. | To introduce the best practices of ITSM methodology. |

**Required Knowledge: NA**

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| --- | --- |
| **Unit – I** | **Contact Hours = 10 Hours** |
| **Introduction:** IT Infrastructure management, challenges in IT infrastructure management, design issues of IT organizations and IT infrastructure, determining customers’ requirements, IT systems management process, IT service management process, information system design process, patterns for IT systems management, IT infrastructure library.  Textbook Chapter 2 | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **Service Delivery Process:** Service level management, financial management, IT service continuity management, capacity management, availability management.  Textbook Chapter 3 | |

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| **Unit – III** | **Contact Hours = 10 Hours** |
| **Service Support Process:** Configuration Management, Incident Management, Problem Management, Change Management & Release Management.  Textbook Chapter 4 | |

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| **Unit – IV** | **Contact Hours = 11 Hours** |
| **Storage Management:** Storage, Backup, Archive and Retrieve, Disaster Recovery, Space Management, Database and Application Protection and Data Retention.  Textbook Chapter 5 | |

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| **Unit – V** | **Contact Hours = 11 Hours** |
| **Security Management**: Computer Security, Internet Security, Physical Security, Identity Management, Access Control System and Intrusion Detection.  Textbook Chapter 6 | |

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| **Books** | |
| **Text Books:** | |
| 1. | Phalguni Gupta, Surya Prakash & Umarani Jayaraman, “IT Infrastructure & Its Management”,  Tata McGraw-Hill Education. |
| **Reference Books:** | |
| 1. | Anita Sengar, “IT Infrastructure Management”, S.K. Kataria and Sons, 2nd Edition, 2009. |
| **E-resources (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | https://[www.classcentral.com/course/system-administration-it-infrastructure--10219](http://www.classcentral.com/course/system-administration-it-infrastructure--10219) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/Course Project/Course Seminar |
|  |  | 3. | Semester End Examination |
|  |  | 4. | Quiz |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Explain** the various components of the IT infrastructure. | L 2 | PO 1 |
| CO2 | **Make use of** ITSM to ensure that IT services are implemented,  managed and delivered in ways that meet an organization's needs | L 3 | PO 1 |
| CO3 | **Implement s**torage and security measures in an IT  infrastructure set up | L 3 | PO1, PO6 |
| CO4 | **Inspect** proper methodology to configure an IT infrastructure solution for a small organization, including a network based on standard technology components, servers, security devices,  and several different types of computing clients. | L 4 | PO 1, PO3, PO6 |

**Scheme of Continuous Internal Evaluation (CIE):**

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| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA TEST 1** | **IA TEST 2** | **Other Assessment**  **(OBA/Project/Seminar)** | **Quiz 1** | **Quiz 2** |
| 25 | 25 | 20 | 15 | 15 | 100 |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

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| --- | --- |
| **Rubrics Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |  |  |  |  |  |
| **4** |  |  |  |  |  |  |  |  |  |  |  |  |
| **5** |  |  |  |  |  |  |  |  |  |  |  |  |
| **6** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take**  **up after undergoing the course** |
| 1 | Address the challenges related to IT infrastructure.  Manage issues related to data storage and security. | Healthcare, Banking, Education, Mission critical  systems etc | Data Center admin. |

**Professional Communication and Ethics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | 22MCA26 | **Course type** | Theory | **Credits L-T-P** | 0 – 0 - 1 |
| **Hours/week: L - T- P** | 0 – 0 – 2 | | | **Total credits** | 1 |
| **Total Contact Hours** | L = 40 Hrs; T = 0 Hrs; P = 0 Hrs  Total = 40 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | NA |

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| **Course learning objectives** | |
| 1. | To prepare Learner to use appropriate English grammar and avoid the common errors in English  while communicating. |
| 2. | To train the learners to improve their listening, speaking, reading and writing skills. |
| 3. | To prepare the learner to face job interviews and actively participate in group discussions. |
| 4. | To provide the knowledge of professionalism and ethics in the world of Information Technology  and study few case studies. |

**Required Knowledge: NA**

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| --- | --- |
| **Unit – I** | **Contact Hours = 5 Hours** |
| **English Grammar and Common Errors in English English Grammar**  Articles, Prepositions, Tenses, Subject-Verb Agreement, Active and Passive Voice, Direct and Indirect Speech  **Common Errors in English**  Word Confusion, Redundancies, Aesthetic Errors, Unique Indian English Expressions, Miscellaneous Errors.  Textbook 3: Chapter 20, 21, 22, 23, 25  Textbook 2: Chapter 11, 12, 13, 15 | |

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| **Unit – II** | **Contact Hours = 5 Hours** |
| **Reading and Writing Reading**  Techniques for Good Comprehension, SQ3 Reading Technique,  **Writing**  Letter Writing, Business Letters, Cover Letters, Resumes, Memos, Emails, Reports Standards for Punctuation, Standards for the use of Numbers.  Textbook 1: Chapter 10, 15 | |

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| **Unit – III** | **Contact Hours = 5 Hours** |
| **Ethics in Information Technology**  Pillars of Professionalism, Professionalism and Ethical Responsibilities, Causes of Software Failures, Improving Software Quality, Producer Protection, Case Studies: Historic Examples of Software Risks. Textbook 4: Chapter 4, 8, 9 | |

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| --- | --- |
| **Unit – IV** | **Contact Hours = 5 Hours** |
| **Listening and Speaking Listening**  Significance of Listening, Active Listening, Barriers to Active Listening, Types of Listening  **Speaking**  Vowels and Consonants, The Syllable, Weak Forms, Tone Groups, Rhythm and Intonation, Basic and Advanced Telephonic Skills.  Textbook 1: Chapter 4, 5 | |

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| **Unit – V** | **Contact Hours = 5 Hours** |
| **Interviews and Group Communication**  Job Interviews: Stages of Interview, Face-to-face Interviews (Campus and On Site) and Telephonic Interviews.  Group Discussion as a part of Selection Process: Characteristics, Evaluation and Analysis.  Textbook 1: Chapter 5, 8 | |

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| **Books** | |
| **Text Books:** | |
| 1. | Meenakshi Raman, Sangeeta Sharma, Technical Communication Principles and Practices, Second  Edition: Oxford University Press. |
| 2. | Sheetal Bandekar, Tarala Deshpande, Common Errors in English: An Indian Perspective, Kindle Edition, Amazon Asia-Pacific Holdings Private Limited. |
| 3. | English Language Communication Skills, Urmila Rai, Himalaya Publishing House. |
| 4. | Joseph Migga Kizza, Ethical and Social Issues in the Information Age, Sixth Edition, Springer. |
| **Reference Books:** | |
| 1. | Lesikar, Flatley, Basic Business Communication, Tenth Edition: Tata McGraw Hill. |
| **E-resources (NPTEL/SWAYAM... Any Other)- mention links** | |
| 1. | <https://learnenglish.britishcouncil.org/> |
| 2. | https://[www.bbc.co.uk/learningenglish/](http://www.bbc.co.uk/learningenglish/) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | Speaking test |
| 3. | Individual and Group Tasks | 3. | Case Study Reports |
|  |  | 4. | MCQ on Listening Tasks |

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| **Course Outcomes (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Apply** the knowledge of English grammar in professional  communication avoiding the common errors. | L3 | PO9 |
| CO2 | **Apply** the traits of a good listener and speaker to communicate  effectively in a professional setup like job interviews, group discussions, seminars etc. | L3 | PO9 |
| CO3 | **Utilise** reading skills for effective communication and apply writing skills to develop different types of letters, emails,  memos, reports and resumes. | L3 | PO9 |
| CO4 | **Utilise** the knowledge of Ethics to make appropriate principle-  based decisions when faced with difficult situations. | L3 | PO6, PO10 |

**Scheme of Continuous Internal Evaluation (CIE)**

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| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA Test 1** | **IA Test 2** | **Other Assessment (Case Study Report)** | **Speaking Test** | **MCQ on Listening**  **Task** |
| **25** | **25** | **20** | **15** | **15** | **100** |

**Minimum marks required to pass the CIE**

1. 50% and above (50 marks and above) in theory component.

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| **Rubrics: Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** |  |  |  |  |  |  |  |  | **√** |  |  |  |
| **2** |  |  |  |  |  |  |  |  | **√** |  |  |  |
| **3** |  |  |  |  |  |  |  |  | **√** |  |  |  |
| **4** |  |  |  |  |  | **√** |  |  |  | **√** |  |  |
| **Tick mark the CO and PO** | | | | | | | | | | | | |

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| **S.No** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the**  **course** |
| 1 | Enhancement in Listening, Speaking, Reading and Writing skills using English language at work place. | All technical and non-technical domains. | Technical Content Writer, Customer Services related jobs where English is used for  communication. |

**NoSQL**

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| **Course Code** | **22MCA251** | **Course**  **type** | Theory | **Credits L-T-P** | 4 - 0 - 0 |
| **Hours/week: L - T- P** | 4 - 0 - 0 | | | **Total credits** | 4 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 0 Hrs;  Total = 52 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

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| --- | --- |
| 1. | To introduce the concepts of NoSQL, NoSQL in Cloud and explore different NoSQL tools and  utilities. |
| 2. | To explore different flavors of NoSQL like MongoDB, HBase, Cassandra. |
| 3. | To give an insight in to the designing, storing and accessing the data base using NoSQL |
| 4. | To emphasize on developing web application using PHP and NoSQL |

**Required Knowledge of Database Management System (I) (22MCA12)**

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| **Unit – I** | **Contact Hours = 10 Hours** |
| **Introduction to NoSQL**  Definition of NoSQL, History of NoSQL and Different NoSQL products, Exploring MongoDB Java/Ruby/Python, NoSQL Storage Architecture.  Textbook 1: Chapter 1,2,3 | |

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| **Unit – II** | **Contact Hours = 11 Hours** |
| **NoSQL Basics**  CRUD operations with MongoDB and HBase, Querying, Modifying and Managing NoSQL Data stores, Indexing and ordering datasets (MongoDB).  Textbook 1: Chapter 5,6,8 | |

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| **Unit – III** | **Contact Hours = 10 Hours** |
| **Advanced NoSQL**  NoSQL in Cloud, Parallel Processing with Map Reduce, Big Data with Hive, choosing NoSQL flavors. Textbook 1: Chapter 10,11,12,14 | |

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| **Unit – IV** | **Contact Hours = 11 Hours** |
| **Database Internals and Cassandra**  Surveying Database Internals, using MySQL as a NoSQL solution migrating from RDBMS to NoSQL, the Cassandra Data Model, Reading and Writing Data: Query Basic write properties, basic read properties, and Deleting data.  Textbook 1: Chapter 13  Textbook 2: Chapter 2, 7 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Developing Web Application with NoSQL**  Comparing Documents in MongoDB and PHP, MongoDB Classes, Connecting and Disconnecting, Inserting Data, Listing Your Data, returning a Single Document, Listing All Documents, Modifying Data with PHP, Deleting Data, DBRef, Tools and Utilities.  Textbook 1: Chapter 3, 17 | |

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| **Unit No.** | **Self-Study Topics** |
| 2 | Redis database, CouchDB model |
| 5 | Developing Web Application |

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| **Books** | |
| **Text Books:** | |
| 1. | Professional NOSQL, Shashank Tiwari, 2011, WROX Press. |
| 2. | Cassandra: The Definitive Guide, Eben Hewitt, O’Reilly |
| **Reference Books:** | |
| 1. | The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, Apress 2010 |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | <https://nptel.ac.in/courses/106104135> |
| 2. | <https://www.ibm.com/cloud/learn/nosql-databases> |
| 3 | <https://www.geeksforgeeks.org/introduction-to-nosql/> |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/ Course Project/ Course Seminar |
|  |  | 3. | Semester End Examination |
|  |  | 4. | Quiz |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Infer** the limitations of RDBMs and **Outline** the need of NoSQL,  different NoSQL products with their storage architecture. | L2 | PO5 |
| CO2 | **Apply** CRUD operations with MongoDB and HBase, storing,  indexing data and accessing data with MongoDB. | L3 | PO1, PO5 |
| CO3 | **Utilize** the properties of Cloud, MapReduce - parallel  programming model and **Identify** MongoDB internals and Cassandra operations | L3 | PO3, PO5 |
| CO4 | **Examine** the applications using MongoDB with PHP and  **Outline** the various tools and utilities of NoSQL | L4 | PO5 |

**Scheme of Continuous Internal Evaluation (CIE)**

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| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA Test 1** | **IA Test 2** | **Other Assessment**  **(OBA/Seminar/Project)** | **Quiz 1** | **Quiz 2** |
| **25** | **25** | **20** | **15** | **15** | **100** |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

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| **Rubrics: Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** |  |  |  |  | **√** |  |  |  |  |  |  |  |
| **2** | **√** |  |  |  | **√** |  |  |  |  |  |  |  |
| **3** |  |  | **√** |  | **√** |  |  |  |  |  |  |  |
| **4** |  |  |  |  | **√** |  |  |  |  |  |  |  |
| **Tick mark the CO and PO** | | | | | | | | | | | | |

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| **Sl.**  **No.** | **Skill & Competence enhanced**  **after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after**  **undergoing the course** |
| 1 | Knowledge about NOSQL Products viz; MongoDB, Cassandra and Web Application with NoSQL. | Database Cloud  Mobile Applications E-Commerce  E-Gaming | MongoDB Developer NOSQL DBA  Java Full Stack(NoSQL) NOSQL Sr Engineer  NOSQL Data Engineer |

**Cloud Computing**

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| **Course Code** | **22MCA252** | **Course**  **type** | Theory | **Credits L-T-P** | 4- 0 - 0 |
| **Hours/week: L - T- P** | 4- 0 - 0 | | | **Total credits** | 4 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 0 Hrs;  Total = 52 Hrs | | | **CIE Marks** | 100 |
|  | | | | **SEE Marks** | 100 |

**Course learning objectives**

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| --- | --- |
| 1. | To impart fundamental concepts in the area of cloud computing. |
| 2. | To introduce the concept of virtualization and cloud resource management. |
| 3. | To give an insight in to knowledge applications of cloud computing. |
| 4. | To introduce the features of cloud security. |

**Required Knowledge of** NA

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| **Unit – I** | **Contact Hours = 11 Hours** |
| **Introduction to Cloud Computing and its Platforms**  Introduction ,Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility- Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka  Textbook 1: Chapter 1 | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **Cloud Resource Virtualization**  Virtualization, Layering and Virtualization, Virtual machine monitors, Virtual machines,Performance and Security Isolation, Full Virtualization and Paravirtualization, Hardwaresupport for Virtualization, Case Study: Xen, a VMM based on Paravirtualization, The darker side of Virtualization.  Textbook 2: Chapter 5.1 to 5.8, 5.12 | |

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| **Unit – III** | **Contact Hours = 11 Hours** |
| **Cloud Resource Management and Scheduling**  Policies and Mechanisms for Resource Management, Stability of Two-Level Resource Allocation Architecture, and Feedback control Based on Dynamic Thresholds, Resource Building:Combinatorial Auctions for Cloud Resources, Scheduling Algorithms for Computing Clouds,Fair Queuing, Resource Management and Dynamic Application Scaling.  Textbook 2: Chapter 6.1, 6.3, 6.4, 6.7, 6.8, 6.9, 6.14 | |

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| **Unit – IV** | **Contact Hours = 10 Hours** |
| **Cloud Computing Applications**  Cloud Applications Scientific Applications, Healthcare: ECG Analysis in the Cloud, Biology:Protein Structure Prediction, Biology: Gene Expression Data Analysis for Cancer Diagnosis, Geoscience: Satellite Image Processing, Business and Consumer Applications, CRM and ERP Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.  Textbook 1: Chapter 10.1 to 10.2.5 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Cloud Security**  Cloud Security Risks, Security: The Top Concern for Cloud Users, Privacy and Privacy Impact Assessment, Trust, Operating System Security, Virtual Machine Security, Security of Virtualization, Security Risks Posed by Shared Images, Security Risks Posed by a Management OS, Xoar: Breaking the Monolithic Design of the TCB, A Trusted Virtual Machine Monitor.  Textbook 3 : Chapter 9.1 to 9.11 | |

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| **Unit No.** | **Self-Study Topics** |
| 1 | Energy efficiency in clouds. |
| 2 | BigTable, GFS. |

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| **Books** | |
| **Text Books:** | |
| 1. | Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw  Hill Education edition, 2013 |
| 2. | Dan C. Marinescu, cloud Computing Theory and Practice, Elsevier Inc., 2013 |
| 3. | Ronald Krutz and Russell Dean Vines, Cloud Security, Wiley-India |
| **Reference Books:** | |
| 1. | Judith Hurwitz, R. Bloor, M. Kanfman, F. Halper, Cloud Computing for Dummies, Wiley India  Edition |
| **E-resources (NPTEL/SWAYAM. Any Other)- mention links** | |
| 1. | <https://nptel.ac.in/courses/106105167> |
| 2. | <https://onlinecourses.nptel.ac.in/noc23_cs27/preview> |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | OBA/ Course Project / Course Seminar |
|  | | 3. | Semester End Examination |
|  | | 4. | Quiz |

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| **Course Outcome (COs)**  At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Outline** the fundamental concepts of cloud computing and the importance of cloud security | L2 | PO1, PO6 |
| CO2 | **Make use of** the cloud resource virtualization concept | L2 | PO1 |
| CO3 | **Apply** cloud resource management and scheduling algorithms for computing clouds. | L3 | PO1, PO3 |
| CO4 | **Distinguish** the different cloud applications in various fields. | L4 | PO1, PO3 |

**Scheme of Continuous Internal Evaluation (CIE)**

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| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA Test 1** | **IA Test 2** | **Other Assessment**  **(OBA/Seminar/Project)** | **Quiz 1** | **Quiz 2** |
| **25** | **25** | **20** | **15** | **15** | **100** |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

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| **Rubrics: Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | ✔ |  |  |  |  | ✔ |  |  |  |  |  |  |
| **2** | ✔ |  |  |  |  |  |  |  |  |  |  |  |
| **3** | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |
| **4** | ✔ |  | ✔ |  |  |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| **Sl.**  **No.** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the course** |
| **1.** | General skills that are needed to build a career in cloud computing | Amazon Cloud Microsoft Azure,  All the cloud computing service sectors | Cloud administrator. Cloud support engineer. Cloud software engineer. Cloud security analyst.  Cloud network engineer. Cloud consultant.  Cloud data scientist.  Cloud architect |

**Cyber Security and Cyber Laws**

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| --- | --- | --- | --- | --- | --- |
| **Course Code** | **22MCA253** | **Course type** | **Theory** | **Credits L-T-P** | 4 - 0 - 0 |
| **Hours/week: L - T- P** | 4- 0 - 0 | | | **Total credits** | 4 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 0 Hrs  Total = 52 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

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| **Course learning objectives** | |
| 1. | To introduce the concept of cybercrime and cyber offenses. |
| 2. | To emphasize on security challenges of mobile devices and organizational measures to handle  such threats. |
| 3. | To explore the tools and methods used in cybercrime. |
| 4. | To elaborate on the legal perspectives of cybercrimes in India. |
| 5. | To introduce the concept of Computer forensics |

**Required Knowledge of Computer Networks & Communications (I) (22MCA13)**

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| --- | --- |
| **Unit – I** | **Contact Hours = 10 Hours** |
| **Introduction to Cybercrime, Cyber offenses:**  Definition and Origins of the Word Cybercrime, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes; Cybercrime - The Legal Perspectives, Cybercrimes - An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes,  How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Attack Vector, Cloud Computing.,  Textbook: Chapter 1.1-1.9, 2.1-2.4, 2.7-2.8 | |

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| **Unit – II** | **Contact Hours = 11 Hours** |
| **Cybercrime in case of Mobile and Wireless devices, Phishing and Identity Theft**  Proliferation of Mobile and Wireless Devices, Trends in Mobility, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication Service Security, Attacks on Mobile/Cell phones, Mobile Devices- Security implications for organizations, Organizational measures for handling mobile devices-related security issues, Organizational security policies and measures in mobile computing era.  Phishing; Identity theft  Textbook: Chapter 3.1-3.11, 5.1-5.3 | |

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| **Unit – III** | **Contact Hours = 11 Hours** |
| **Tools and Methods Used in Cybercrime**  Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection.  Textbook: Chapter 4.1-4.10 | |

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| **Unit – IV** | **Contact Hours = 10 Hours** |
| **The Legal Perspectives**  Cybercrime and the Legal Landscape around the World, Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Digital Signatures and the Indian IT Act.  Textbook: Chapter 6.1-6.7 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Computer Forensics**  Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Special Tools and Techniques, Forensics Auditing.  Textbook: Chapter 7.1 –7.10, 7.12, 7.17-7.18 | |

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| **Unit No.** | **Self-Study Topics** |
| 1 | Botnets - The Fuel for Cybercrime, |
| 3 | Buffer Overflow |
| 5 | Setting up of a computer forensics laboratory: Understanding the requirements |

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| **Books** | |
| **Text Books:** | |
| 1. | Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And LegalPerspectives”, Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First  Edition (Reprinted 2018) |
| **Reference Books:** | |
| 1. | Computer Forensics and Cyber Crime An Introduction by Marjie T. Britz ,Pearson publication, 2nd  edition |
| **E-resources (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | https://in.coursera.org/specializations/intro-cyber-security |
| 2. | https://in.coursera.org/learn/cybersecurity-for-everyone |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | Online Quizzes (Surprise and Scheduled) |
|  |  | 3. | Open Book Tests (OBT) |
|  |  | 4. | Course Seminar |
|  |  | 5. | Semester End Examination |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Interpret** cyber offenses, concepts of Computer forensics, Phishing, Identity theft and Cybercrimes in case of Mobile  and Wireless devices. | L2 | PO1, PO6 |
| CO2 | **Make use of** tools and methods used in cybercrime and  Computer forensics. | L3 | PO1, PO5,  PO6 |
| CO3 | **Apply** the legal perspectives of cybercrimes. | L3 | PO6, PO10 |
| CO4 | **Examine** different techniques used in cybercrime, different aspects of organizational security policies and methods used  in Cyberforensics. | L4 | PO1, PO6, PO10 |

**Scheme of Continuous Internal Evaluation (CIE)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA Test 1** | **IA Test 2** | **Other Assessment**  **(OBA/Seminar/Project)** | **Quiz 1** | **Quiz 2** |
| **25** | **25** | **20** | **15** | **15** | **100** |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

|  |  |
| --- | --- |
| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

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| **Rubrics Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | **√** |  |  |  |  | **√** |  |  |  |  |  |  |
| **2** | **√** |  |  |  | **√** | **√** |  |  |  |  |  |  |
| **3** |  |  |  |  |  | **√** |  |  |  | **√** |  |  |
| **4** | **√** |  |  |  |  | **√** |  |  |  | **√** |  |  |
| **Tick mark the CO and PO** | | | | | | | | | | | | |

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| **Sl.**  **No.** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the course** |
| **1.** | Fundamental knowledge about different types of Cyber attacks(including phishing attacks) and the methodology adopted by the attackers carry- out such attacks.  Gain knowledge about important  tools used to carry out cyber attacks.  Become aware of Cyber Laws and amendments relevant to cybercrimes.  Gain fundamental knowledge of Cyber forensic | Web application security, Network security, Cloud security etc. | Security analysis |

**Data Analysis with R\*\***

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| **Course Code** | **22MCA254** | **Course**  **type** | **Elective** | **Credits L-T-P** | 4 - 0 - 0 |
| **Hours/week: L - T- P** | 4- 0 - 0 | | | **Total credits** | 4 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 0 Hrs  Total = 52 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

**Course learning objectives**

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| 1. | To emphasize to learn R Programming language. |
| 2. | To explore Graphics, modelling, write functions and use R in an efficient way. |
| 3. | To fit some basic types of statistical models and use R in their own research work. |
| 4. | To perform data analytics, data visualisation using R. |
| 5. | To emphasize students to become data analyst. |

**Required Knowledge of:**

Basics of Mathematics and Statistics Basics of Programming

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| **Unit – I** | **Contact Hours = 10 Hours** |
| **Introduction**  Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.  Textbook 2 Chapter 1 (1.1 to 2.2, 4.1-5.4) | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **R Programming Structures**  R Programming Structures, Control Statements, Loops, - Looping Over Non vector Sets-If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quick sort Implementation- Extended Example: A Binary Search Tree.  Textbook 1 Chapter 7 (7.1 to 7.9) | |

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| **Unit – III** | **Contact Hours = 10 Hours** |
| **Doing Math and Simulation in R**  Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions for Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.  Textbook 1 Chapter 8 (8.1 to 10.2) | |

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| **Unit – IV** | **Contact Hours = 11 Hours** |
| **Graphics and working with databases in R**  Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot () Function – Customizing Graphs, Saving Graphs to Files, Connecting with database in R– Connecting MySQL with R, create tables, insert into tables, updating a tables and dropping tables in R.  Textbook 1 Chapter 12 (12.1. to 12.3) | |

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| **Unit – V** | **Contact Hours = 11 Hours** |
| **Probability Distributions**  Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance. Linear Models, Simple Linear Regression, - Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Spines- Decision- Random Forests Textbook 2 Chapter 17 (17.1 to 23.67) | |

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| **Unit No.** | **Self-Study Topics** |
| 2 | Extended Example: A Binary Search Tree. |
| 3 | Extended Example: Finding Stationary Distribution of Markov Chains |

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| **Books** | |
| **Text Books:** | |
| 1. | The Art of R Programming, Norman Matloff, Cengage Learning / No starch press, 2011 |
| 2. | Jared P Lander, R for Everyone: advanced analytics and graphics, Pearson Education, 2013 |
| **Reference Books:** | |
| 1. | R Cookbook, Paul Teetor, Oreilly, 2011. |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | <https://www.geeksforgeeks.org/working-with-databases-in-r-programming/> |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | Online Quizzes |
| 3. | Practice session | 4. | OBA/Course Project/Course Seminar |
|  |  | 5. | Semester End Examination |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Illustrate** the basic structures of R Programming, built-in  functions for math, visualisation, probability distributions and database connectivity. | L2 | PO1 |
| CO2 | **Experiment with** basic structures, advanced data structures in R, built-in functions for math, statistical distributions and  database connectivity for solving given problem. | L3 | PO3 |
| CO3 | **Make use of** basic structures of R, built-in functions for math,  basic types of statistical distributions, and data visualization in R, database connectivity for performing effective data analytics. | L3 | PO3 |
| CO4 | **Examine** and apply the suitable and useful R programming  constructs to solve the engineering problems. | L4 | PO3, PO5 |

**Scheme of Continuous Internal Evaluation (CIE):**

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| **IA Test 1** | **IA Test 2** | **Project Evaluation**  **Phase 1** | **Project Evaluation**  **Phase 2** | **Quiz 1** | **Total** |
| **25** | **25** | **20** | **20** | **10** | **100** |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

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| **Scheme of Semester End Examination (SEE):** | | | |
| **Project Viva-Voce:** | | | |
|  | Problem definition and objectives | 15 | 100 marks |
| Data Analysis based on the objectives | 20 |
| Plotting and Visualization | 20 |
| Presentation | 10 |
| Modifications | 20 |
| Project Dissertation | 15 |
|  | It will be conducted for 100 marks having 3 hours duration. | | |
|  | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** | | |

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| **Rubrics: Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | **√** |  |  |  |  |  |  |  |  |  |  |  |
| **2** |  |  | **√** |  |  |  |  |  |  |  |  |  |
| **3** |  |  | **√** |  |  |  |  |  |  |  |  |  |
| **4** |  |  | **√** |  | **√** |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| **Sl.**  **No.** | **Skill & Competence enhanced after undergoing the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the course** |
| **1.** | General skills that have basic statistical and mathematical knowledge and reporting tools. | Healthcare Consulting Finance Media | Data Scientist Data Analyst  R programmer  Data Visualization Analyst |

**Information Network Security**

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| **Course Code** | 22MCA255 | **Course type** | Theory | **Credits L-T-P** | 4 – 0 - 0 |
| **Hours/week: L - T- P** | 4 – 0 – 0 | | | **Total credits** | 4 |
| **Total Contact Hours** | L = 52 Hrs; T = 0 Hrs; P = 0 Hrs  Total = 52 Hrs | | | **CIE Marks** | 100 |
|  |  | | | **SEE Marks** | 100 |

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| **Course learning objectives** | |
| 1. | To establish the foundation for understanding the broader field of information security and  the various threats facing organizations. |
| 2. | To provide an understanding on access control, Firewall technology and models of intrusion  detection & prevention systems. |
| 3. | To describe the operating principles of cryptography and cryptographic tools |
| 4. | To understand difference between law and ethics and describe management’s role in in the  development, maintenance and enforcement of policy, standards, practices, procedures and risk management in information security. |

**Required Knowledge of** Computer Networks and communications (I) (22MCA13).

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| **Unit – I** | **Contact Hours = 10 Hours** |
| **Introduction to Information Security**  What is security? components of an information system, security in systems life cycle, security professionals and the organization  Textbook 1 Chapter 1 | |

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| **Unit – II** | **Contact Hours = 10 Hours** |
| **The need for security**  Introduction, threats and attacks, compromises to intellectual property, deviations in quality of service, espionage and trespass, forces of nature, human error or failure, information extortion, sabotage or vandalism, software attacks, technical hardware failure or errors, technical software failure or errors. Textbook 1 Chapter 2 | |

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| **Unit – III** | **Contact Hours = 11 Hours** |
| **Security Technology: Firewalls, VPNs and Intrusion detection**  Introduction, Access control, Firewalls, intrusion detection and prevention systems. Textbook 1 Chapter 6, Chapter 7 | |

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| **Unit – IV** | **Contact Hours = 11 Hours** |
| **Cryptography**  Introduction, foundations of Cryptology, cipher methods, cryptographic algorithms, cryptographic tools.  Textbook 1 Chapter 8 | |

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| **Unit – V** | **Contact Hours = 10 Hours** |
| **Legal, Ethical and Professional Issues in Information Security, Planning for security and risk management**  Introduction, Law and Ethics in Information Security. Introduction to security planning, information security planning and governance, information security policy, standards and practices. Introduction to risk management, An overview of risk management, risk identification, risk assessment, risk control.  Textbook 1 Chapter 3, Chapter 4, Chapter 5 | |

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| **Unit No.** | **Self-Study Topics** |
| 1 | The history of information security, Information security: is it an art or science. |
| 3 | Protecting remote connections, Remote access, VPNs, Honeypots, Honeynets and Padded  cell systems. |
| 4 | Protocols for secure communication |

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| **Books** | |
| **Text Books:** | |
| 1. | Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, Cengage  learning, Fifth edition. |
| **Reference Books:** | |
| 1. | Harold Tipton and Micki Krause, Information Security Management Handbook, Auerbach  Publications, Fifth Edition. |
| **E-resourses (NPTEL/SWAYAM.. Any Other)- mention links** | |
| 1. | <http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS835.html> |
| 2. | https://[www.crypto-textbook.com/movies.php](http://www.crypto-textbook.com/movies.php) |

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| **Course delivery methods** | | **Assessment methods** | |
| 1. | Chalk and Talk | 1. | IA tests |
| 2. | PPT and Videos | 2. | Online Quizzes (Surprise and Scheduled) |
|  |  | 3. | Open Book Tests (OBT) |
|  |  | 4. | Course Seminar |
|  |  | 5. | Semester End Examination |

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| **Course Outcome (COs)** | | | |
| At the end of the course, the student will be able to | | **Learning Level** | **PO(s)** |
| CO1 | **Understand and Summarize** the terms and critical  concepts of information security, need for security, role of access control, principles of cryptography. | L2 | PO1, PO6 |
| CO2 | **Identify** the laws that affect information security, various security technologies and protocols for secure  communications. | L3 | PO1, PO6 |
| CO3 | **Organize** information security roles, threats, attacks, ethical, legal and professional issues and management’s role in the development, maintenance and enforcement of policy, standards, practices, procedures and risk  management in information security. | L3 | PO6, PO8 |
| CO4 | **Inspect** the various methods of cryptography, risk based on probability of occurrence and approaches to firewall  implementation. | L4 | PO1, PO5 |

**Scheme of Continuous Internal Evaluation (CIE)**

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| --- | --- | --- | --- | --- | --- |
| **Theory 100 marks** | | | | | **Total** |
| **IA Test 1** | **IA Test 2** | **Other Assessment**  **(OBA/Seminar/Project)** | **Quiz 1** | **Quiz 2** |
| **25** | **25** | **20** | **15** | **15** | **100** |

**Eligibility for SEE:**

1. 50% and above (50 marks and above) in theory component

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 100 marks of 3 hours duration. |
| 2. | **Minimum marks required in SEE to pass: 40% of the maximum marks i.e 40 out of 100.**  **In aggregate the students have to secure 50% total marks of the course (CIE + SEE).** |

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| **Rubrics: Levels** | **Target** |
| **1 (Low)** | Low (L): If 60% of marks are scored by less than 50% of the students. |
| **2 (Medium)** | Medium (M): If 60% of marks are scored by 50% to 70% of the students. |
| **3 (High)** | High (H): If 60% of marks are scored by 70% of the students. |

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| **Course Articulation Matrix** | | | | | | | | | | | | |
| **CO** | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO**  **12** |
| **1** | **√** |  |  |  |  | **√** |  |  |  |  |  |  |
| **2** | **√** |  |  |  |  | **√** |  |  |  |  |  |  |
| **3** |  |  |  |  |  | **√** |  | **√** |  |  |  |  |
| **4** | **√** |  |  |  | **√** |  |  |  |  |  |  |  |
| **Tick mark the CO and PO mapping** | | | | | | | | | | | | |

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| --- | --- | --- | --- |
| **Sl.**  **No.** | **Skill & Competence enhanced after undergoing**  **the course** | **Applicable**  **Sectors & domains** | **Job roles students can take up after undergoing the course** |
| 1 | Clear understanding of information security principles and able to formulate interdisciplinary solutions for system  vulnerabilities. | Government sectors, corporate Business organizations, Defense organizations | Chief information officer(CIO),  Chief information security officer(CISO), Risk assessment specialist and  Security professionals |