**M.Sc. (INFORMATION TECHNOLOGY)**

**Syllabus**

**(With effect from 2022-2023)**

**Program Code : CSEF**



**BHARATHIAR UNIVERSITY**

**DEPARTMENT OF INFORMATION TECHNOLOGY**

**Bharathiar University**

**(A State University, Accredited with “A” Grade by NAAC and**

**13th Rank among Indian Universities by MHRD-NIRF)**

**Coimbatore 641 046, TAMILNADU, INDIA**

**BHARATHIAR UNIVERSITY, COIMBATORE – 641 046**

**DEPARTMENT OF INFORMATION TECHNOLOGY**

**MISSION**

* **To mould the students as innovative and high quality IT professionalto meet the global challenges.**
* **To provide value-based IT education to the students and enrich their knowledge.**
* **To engage the students in research and development to pursue higher education.**

**BHARATHIAR UNIVERSITY, COIMBATORE – 641 046**

**M. Sc INFORMATION TECHNOLOGY (CBCS)**

**(Effective from the academic Year 2022 - 2023)**

1. **Eligibility for Admission to the Programme**

Candidates for admission to the First year programme leading to the Degree of Master of Science in Information Technology (M.Sc. IT) will be required to possess:

1. A Pass with 50% of marks in B.Sc. Computer Science / B.C.A. /B.Sc.(Computer Technology / B.Sc. Information Technology).

(or)

1. B.Sc (Artificial Intelligence & Machine Learning), B.Sc (Computer Science & Data Analytics) B.Sc (Multimedia & Web Technology),B.Sc (Computer Science & Cognitive Systems), B.Sc (Animation), B.Sc (Maths with Computer Applications),B.Sc (Electronics and Communication Systems), B.Com (Computer Science), B.Com (Information Technology), B.Com (Computer Applications),B.Com (Computer Science & Computer Applications), B.Com (E-Commerce), BBA (Computer Application), BBA (Information Systems), B.Voc. (Networking and Mobile Applications), B.Voc. (Web Technology),[B.Voc. (Business Process and Data Analytics](https://b-u.ac.in/31/department-extension-career-guidance-and-student-welfare-programmes-offered)), [B.Voc. (Multimedia and Animation](https://b-u.ac.in/31/department-extension-career-guidance-and-student-welfare-programmes-offered).

(or)

(iii) Any Degree with PGDCA (First Class)

In case of SC/ST candidates, a mere pass in any of the above said degree will be sufficient.

2. **Duration of the Programme**

The programme shall be offered on a full-time basis. The programme will consist of three semesters of course work and laboratory work and the fourth semester consists of project work.

3. **Regulations**

The general Regulations of the Bharathiar University Choice Based Credit System Programme are applicable to this programme.

4. **The Medium of Instruction and Examinations**

The medium of instruction and Examinations shall be in English.

5. **Submission of Record Notebooks for Practical Examinations & Project Viva-Voce.**

Students taking the Practical Examinations should submit bonafide Record Note Books prescribed for the Examinations. Otherwise the students will not be permitted to take the Practical Examinations.

Students taking the Project Viva Examination should submit Project Report prescribed for the Examinations. Otherwise the students will not be permitted to take the Project Viva-voce Examination.

**6. Online Courses**

Students have to complete one online course of 8 weeks to complete the M.Sc.(IT) programme from Swayam/NPTEL/BU-MOOCs. This will carry 2 credits over and above the 96 credits.

7**. Job Oriented Course/ Value Added Course**

Students have to complete one Job Oriented course and one Value Added Course apart from their regular curriculum.

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| **Program Educational Objectives(PEOs)** | | |
| The M.Sc. Information Technology program describe accomplishments that graduates are expected to attain within five to seven years after graduation | | |
| PEO1 | | Be a Software Engineer or Developer either as an individual or as a team player in the Information Technology industry and allied branches providing viable solutions. |
| PEO2 | | Initiate life-long learning to acquire new technologies and adapt to the changing needs of Information Technology Industry through self-study, graduate work and professional development. |
| PEO3 | | Exhibit professional excellence, ethics, soft skills, leadership qualities as a responsible citizen with societal interest to match the standards of the Industry 4.0/5.0 |
| PEO4 | | Graduate will be able to pursue higher studies in the field of Information Technology. |
| PEO5 | | Provide simplest automated solution to various legacy systems. |
| PEO6 | | Analize, Design and Create innovative products for real time applications. |
| PEO7 | | Take up studies in the higher education institution in applied automated research. |
| PEO8 | | Acquire the skills needed to become an entrepreneur in the Information Technology areas. |
| PEO9 | | Able to get placed in Government / Public sectors to take care of Information Technology based solutions. |
| PEO10 | | Provide knowledge and skills to participate and be successful in choosing careers in the CIVIL services. |
| **Program Specific Outcomes (PSOs)**  **After the successful Completion of M.Sc.(IT) Programme, the students are expected to** | | |
| PSO1 | Gain thorough knowledge about the theoretical fundamentals in the Information Technology field. | |
| PSO2 | Familiarity and practical exposure in a broad range of programming languages. | |
| PSO3 | Get gain expertise in the design and development of Open Source platform. | |
| PSO4 | Design, Develop and Test software systems for real world problems. | |
| PSO5 | Inculcate skills to excel in the field of Information Technology. | |
| PSO6 | Formalize and practice innovative ideas to suit the development as per the Industry 4.0/5.0 specifications. | |

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| **Program Outcomes (POs)** | |
| On Successful completion of the M.Sc.(Information Technology) programme, the students will be able to | |
| PO1 | Apply the knowledge of Mathematics, Science and Computing in the core Information Technologies. |
| PO2 | Create, Select, and Apply appropriate techniques, resources and modern Information Technology tools including prediction and modeling to complex activities with an understanding of the limitations. |
| PO3 | Get Problem solving and programming ability to solve complex problems is the field of Information Technology. |
| PO4 | Develop techniques for Capturing, Analysing and Storing the digital data in a structure format. |
| PO5 | Design and Integrate different networks for fast and secure data transfer in the different network platforms. |
| PO6 | Create need based customized tools and software for Industrial Automations. |
| PO7 | Enrich the skill set to meet professional expectations in the Multimedia, Image processing, IoT, Mobile Application Development, and Augmented Reality |
| PO8 | Develop and Implement solutions to real time problems using latest algorithms and techniques. |
| PO9 | Provide Web based solutions in the field of Commerce and Industry 4.0./5.0 |
| PO10 | Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |

**BHARATHIAR UNIVERSITY : : COIMBATORE 641 046**

**M. Sc. (Information Technology) Curriculum (University Department)**

**(For the students admitted during the academic year 2022 – 23 onwards)**

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| **Suggested Code** | **Title of Course** | | | **Credits** | | **Hours** | | | | | **Maximum Marks** | | | | |
| **Theory** | | **Practical** | | | **CIA** | **ESE** | | | **Total** |
| **First Semester** | | | | | | | | | | | | | | | |
| 22IT13A | | Design and Analysis of Algorithm | | 4 | | 62 | | - | 50 | | | 50 | | | 100 |
| 22IT13B | | Advanced Java Programming | | 4 | | 62 | | - | 50 | | | 50 | | | 100 |
| 22IT13C | | Advanced Web Technology | | 4 | | 62 | | - | 50 | | | 50 | | | 100 |
| 22IT13P | | Practical:  Design and Analysis of Algorithm - Lab | | 4 | | - | | 62 | 50 | | | 50 | | | 100 |
| 22IT13Q | | Practical:  Advanced Java Programming - Lab | | 4 | | - | | 62 | 50 | | | 50 | | | 100 |
| 22IT13R | | Practical:  Advanced Web Technology - Lab | | 4 | | - | | 62 | 50 | | | 50 | | | 100 |
| 22IT1EX | | Elective – I | | 4 | | 62 | | - | 50 | | | 50 | | | 100 |
| 22IT1GSXX | | Supportive | | 2 | | 26 | | - | 25 | | | 25 | | | 50 |
| **Total** | | | | 30 | | 274 | | 186 | 375 | | | 375 | | | 750 |
| **Second Semester** | | | | | | | | | | | | | | | |
| 22IT23A | | | Graphics and Multimedia Systems | | 4 | 62 | - | | | 50 | | | 50 | 100 | |
| 22IT23B | | | Cryptography and Network Security | | 4 | 62 | - | | | 50 | | | 50 | 100 | |
| 22IT23C | | | Python Programming | | 4 | 62 | - | | | 50 | | | 50 | 100 | |
| 22IT23P | | | Practical :  Graphics and Multimedia Systems- Lab | | 4 | - | 62 | | | 50 | | | 50 | 100 | |
| 22IT23Q | | | Practical : Cryptography and Network Security - Lab | | 4 | - | 62 | | | 50 | | | 50 | 100 | |
| 22IT23R | | | Practical :  Python Programming - Lab | | 4 | - | 62 | | | 50 | | | 50 | 100 | |
| 22IT2EX | | | Elective – II | | 4 | 62 | - | | | 50 | | | 50 | 100 | |
| 22IT2GSXX | | | Supportive | | 2 | 26 | - | | | 25 | | | 25 | 50 | |
| Total | | | | | 30 | 274 | 186 | | | 375 | | | 375 | 750 | |

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| **Third Semester** | | | | | | | |
| 22IT33A | Internet of Things | 4 | 62 |  | 50 | 50 | 100 |
| 22IT33B | Mobile Application Development | 4 | 62 |  | 50 | 50 | 100 |
| 22IT33C | Advanced Data Base Management Systems | 4 | 62 |  | 50 | 50 | 100 |
| 22IT33P | Practical :  Internet of Things - Lab | 4 |  | 62 | 50 | 50 | 100 |
| 22IT33Q | Practical :  Mobile Application Development - Lab | 4 |  | 62 | 50 | 50 | 100 |
| 22IT33R | Practical :  Advanced Data Base Management Systems - Lab | 4 |  | 62 | 50 | 50 | 100 |
| 22IT3EX | Elective – III | 4 | 62 |  | 50 | 50 | 100 |
| 22IT3GSXX | Supportive | 2 | 26 |  | 25 | 25 | 50 |
| Total | | 30 | 274 | 186 | 375 | 375 | 750 |
| **Fourth Semester** | | | | | | | |
| 22ITPRO | Project work and Viva-Voce | 6 | - | - | 100 | 100 | 200 |
| Total | | 6 |  |  | 100 | 100 | 200 |
| Grand Total | | **96** | **822** | **558** | **1225** | **1225** | **2450** |

**M.Sc.(Information Technology) - (University Department) 2022-23**

**ELECTIVE PAPERS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Suggested Code** | **Title of Course** | **Credits** | **Hours** | | **Maximum Marks** | | |
| **Theory** | **Practical** | **CIA** | **ESE** | **Total** |
| 22ITE01 | Object Oriented Software Engineering | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE02 | Artificial Intelligence and Machine Learning | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE03 | Open Source Technologies | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE04 | Advanced Computer Network | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE05 | Deep Learning | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE06 | Cloud Computing | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE07 | Digital Image Processing | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE08 | Block Chain Technology | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE09 | Robotics and Automation | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE10 | Introduction to Fintech | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE11 | Augmented Reality | 4 | 62 | - | 50 | 50 | 100 |
| 22ITE12 | Industrial Internet of Things | 4 | 62 | - | 50 | 50 | 100 |

**M.Sc. (Information Technology) - (University Department) 2022-2023**

**LIST OF SUPPORTIVE COURSES**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Suggested Code** | **Title of course** | **Credits** | **Hours** | | **Maximum Marks** | | |
| **Theory** | **Practical** | **CIA** | **ESE** | **Total** |
| 22ITS01 | Introduction to Industry 4.0 | 2 | 32 | - | 25 | 25 | 50 |
| 22ITS02 | Introduction to Artificial Intelligence & Machine Learning | 2 | 32 | - | 25 | 25 | 50 |
| 22ITS03 | Introduction to IoT | 2 | 32 | - | 25 | 25 | 50 |
| 22ITS04 | Artificial Intelligence and Machine Learning for Bioinformatics | 2 | 32 | - | 25 | 25 | 50 |
| 22ITS05 | Python Programming | 2 | 32 | - | 25 | 25 | 50 |
| 22ITS06 | Python Programming for Financial Applications | 2 | 32 | - | 25 | 25 | 50 |
| 22ITS07 | Artificial Intelligence and Machine Learning for Business Applications | 2 | 32 | - | 25 | 25 | 50 |

**M.Sc. Information Technology (University Department) 2022-2023**

**LIST OF JOB ORIENTED COURSES/ VALUE ADDED COURSES**

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| **Title of course** | |
| JOVA01 | Certificate course on “Word Press” |
| JOVA02 | Certificate course on “Ethical Hacking and Cyber Forensics” |
| JOVA03 | Certificate course on “Embedded systems and Wireless Sensor Networks for IoT” |

**M.Sc. Information Technology (University Department)**

**LIST OF CERTIFICATE COURSES OFFERED TO OTHER DEPARTMENT AND AFFILIATED COLLEGE STUDENTS (2022-2023)**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Suggested Code** | **Title of course** | **Credits** | **Hours** | | **Maximum Marks** | | |
| **Theory** | **Practical** | **CIA** | **ESE** | **Total** |
| 22ITC01 | Introduction to Industry 4.0 | 2 | 32 | - | 25 | 25 | 50 |
| 22ITC02 | Artificial Intelligence & Machine Learning | 2 | 32 | - | 25 | 25 | 50 |
| 22ITC03 | Introduction to IoT | 2 | 32 | - | 25 | 25 | 50 |
| 22ITC04 | Cyber Threats | 2 | 32 | - | 25 | 25 | 50 |
| 22ITC05 | Augmented Reality | 2 | 32 | - | 25 | 25 | 50 |

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| **Course code** | | | | **22IT13A** | | **DESIGN AND ANALYSIS OF ALGORITHMS** | **L** | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | | **Core** | **3** | | | | **1** | **-** | **4** |
| **Pre-requisite** | | | | | | **Data Structures at UG level** | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The Main Objectives of this Course are to:   1. This Course willenable Students to Solve a given Problem Using an Algorithm. 2. It Enables to Mathematically Analyse the Algorithms for its Efficiency and Effectiveness. 3. It also improves the Knowledge of the Students to do Research in Further Developments. | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | | Summarize the relevance of algorithms for computational Problems solving and real time applications. | | | | | | | | | K2 | |
| 2 | | | Differentiate different algorithmic approaches, techniques and methods | | | | | | | | | K4 | |
| 3 | | | Apply design and analysis techniques for a given algorithm. | | | | | | | | | K3 | |
| 4 | | | Apply optimization techniques for improving the efficiency of algorithms. | | | | | | | | | K3 | |
| 5 | | | Calculate difficult steps with algorithms | | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | | |
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| **UNIT:1** | | | | | **ALGORITHMS** | | | | | **12 HOURS** | | | |
| Algorithms - Insertion Sort - Analyzing Algorithms - Designing Algorithms - Asymptotic Notation - Standard Notations and Common Functions - The Maximum-Sub Array Problem – Strassen’s Algorithm for Matrix Multiplication - The Substitution Method for Solving Recurrences - The Recursion-Tree Method for Solving Recurrences - The Master Method for Solving Recurrences. | | | | | | | | | | | | | |
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| **UNIT:2** | | | | | **PROBABILISTIC ANALYSIS AND RANDOMIZED ALGORITHMS** | | | | **12 HOURS** | | | | |
| The Hiring Problem - Worst-Case Analysis - Probabilistic Analysis - Randomized Algorithms - Indicator Random Variables - Problems - Randomly Permuting Arrays - Probabilistic Analysis and Further Uses of Indicator Random Variables - The Birthday Paradox - An Analysis Using Indicator Random Variables - Balls and Bins - The On-Line Hiring Problem - Problems. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **UNIT:3** | | | | | **SORTING ALGORITHMS** | | **12 HOURS** | | | | | | |
| Heap Sort – Heaps - Maintaining the Heap Property - Building a Heap – Initialization – Maintenance - Termination – The Heap Sort Algorithm – Priority Queues – Quicksort - Description of Quicksort - Performance of Quicksort - A Randomized Version of Quicksort - Analysis of Quicksort - Sorting in Linear Time - Lower Bounds for Sorting - Counting Sort - Radix Sort - Bucket Sort. | | | | | | | | | | | | | |
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| **UNIT:4** | | | | | **STACKS AND QUEUES** | | **12 HOURS** | | | | | | |
| Elementary Data Structures - Stacks and Queues - Linked Lists - Sentinels - Implementing Pointers and Objects - Representing Rooted Trees - Binary Trees - Binary Search Trees - Binary Search Tree - Querying a Binary Search Tree - Insertion and Deletion - Randomly Built Binary Search Trees - Red-Black Trees - Properties of Red-Black Trees – Rotations – Insertion – Deletion. | | | | | | | | | | | | | |
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| **UNIT:5** | | | | | **DYNAMIC PROGRAMMING** | | | **12 HOURS** | | | | | |
| Matrix Chain Multiplication - Elements of Dynamic Programming - Longest Common Subsequence - Improving the Code - Optimal Binary Search Trees - Greedy Algorithms - An Activity Selection Problem - Huffman Codes - Improving the Code - Prefix Codes - Constructing a Huffman Code - Correctness of Huffman’s Algorithm - Amortized Analysis - Aggregate Analysis. | | | | | | | | | | | | | |
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| **UNIT:6** | | | | | **CONTEMPORARY ISSUES** | | | **2 HOURS** | | | | | |
| Expert Lectures, Online Seminars – Webinars | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
|  | | | | | **TOTAL LECTURE HOURS** | | | **62 HOURS** | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | Sandeep Sen, Amit Kumar, “Design and Analysis of Algorithms: A Contemporary Perspective”,Cambridge, 2019 | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Robert Karamagi, “Design and Analysis of Algorithms” , 2020 | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | Design and Analysis of Algorithms by Prof. AbhiramRanade, Dept. of CSE, IIT Bombay. | | | | | | | | | | | |
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| Course Designed By:**Dr. T. RAMESH** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | L | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | M | L |
| **CO3** | S | S | M | S | S | S | S | S | S | S |
| **CO4** | L | M | L | L | S | M | S | S | S | S |
| **CO5** | M | L | M | S | L | S | S | S | L | M |

\*S-Strong; M-Medium; L-Low

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| **Course Code** | | | **22IT13B** | **ADVANCED JAVA PROGRAMMING** | **L** | | **T** | **P** | **C** |
| **Core/ Elective/ Supportive** | | | | **Core** | **3** | | **1** |  | **4** |
| **Pre-requisite** | | | | UG-Degree level: Basic Java, OOPs Concepts, Applet | **Syllabus Version** | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | | |
| The main objectives of this course are to:   1. To deepen student’s programming skills by analyzing the real world problem in a programmer’s point of view and implement the concepts in real time projects 2. To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming and how it impacts the social and economic development of society 3. To get a job in in the industry | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | | Describes about the basic object oriented concepts like encapsulation, polymorphism and various AWT concepts. | | | | | | **K2/ K3** | |
| 2 | | Able to develop a Graphical User Interface (GUI) with Applet and Swing | | | | | | **K2/K3/K4** | |
| 3 | | Develop a Client-Server Application with Database Maintenance | | | | | | **K5/K6** | |
| **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6**– Create | | | | | | | | | |
| **UNIT: 1** | | | **Design Patterns** | | | **12HOURS** | | | |
| Design Patterns: Introduction to Design patterns - Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern- Adapter Pattern- Proxy Pattern-Decorator Pattern- Command Pattern- Template Pattern- Mediator Pattern-Collection Framework – Array List class – Linked List class – Array List vs. Linked List - List Iterator interface - Hash Set class- Linked Hash Set class-Tree Set class Priority Queue class - Map interface-Hash Map class- Linked Hash Map class –Tree Map class - Comparable interface -Comparator interface-Comparable vs. Comparator | | | | | | | | | |
|  | | | | | | | | | |
| **UNIT: 2** | | | **Applet Fundamentals and AWT Components** | | | **12 HOURS** | | | |
| Applet Fundamentals- Applet Class - Applet lifecycle- Steps for Developing Applet Programs- Passing Values through Parameters- Graphics in Applets- GUI Application **-** Dialog Boxes - Creating Windows - Layout Managers – AWT Component classes – Swing component classes- Borders – Event handling with AWT components - AWT Graphics classes - File Choosers - Color Choosers – Tree – Table –Tabbed panels–Progressive bar - Sliders. | | | | | | | | | |
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| **UNIT: 3** | | | **JDBD Connection** | | | **12HOURS** | | | |
| JDBC **-**Introduction - JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database and Table with JDBC - Working with Database Metadata; Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and Inet address classes. | | | | | | | | | |
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| **UNIT: 4** | | | **JSP and Servlet** | | | **12HOURS** | | | |
| Servlet: Advantages over Applets - Servlet Alternatives - Servlet Strengths - Servlet Architecture - Servlet Life Cycle – Generic Servlet, Http Servlet - First Servlet - Invoking Servlet - Passing Parameters to Servlets - Retrieving Parameters - Server-Side Include – Cookies- JSP Engines - Working with JSP - JSP and Servlet - Anatomy of a JSP Page- Database Connectivity using Servlets and JSP. | | | | | | | | | |
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| **UNIT: 5** | | | **Lambda Expressions** | | | **12HOURS** | | | |
| Lambda Expressions- Method Reference- Functional Interface- Streams API, Filters- Optional Class- Nashorn- Base 64 Encode Decode- JShell(RPEL)- Collection Factory Methods- Private Interface Methods- Inner Class Diamond Operator- Multiresolution Image API. | | | | | | | | | |
|  | | | | | | | | | |
| **UNIT: 6** | | | **Contemporary Issues** | | | **2 HOURS** | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | |
| Latest Development / Topics in Advanced Java Programming | | | | | | | | | |
|  | | | **Total Lecture hours** | | | **62 HOURS** | | | |
| **Text Book(s)** | | | | | | | | | |
| 1 | Java: The Complete Reference, Twelfth EditionBy [HerbertSchildt](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsYdg1B0V4fifqfLSWzJlDYcUOQ_hQ:1654497688225&q=inauthor:%22Herbert+Schildt%22&tbm=bks) · 2021 [McGraw-HillEducation](https://www.google.co.in/search?hl=en&gbpv=1&bsq=advanced+java+programming+latest+edition+textbooks&dq=advanced+java+programming+latest+edition+textbooks&printsec=frontcover&q=inpublisher:%22McGraw-Hill+Education%22&tbm=bks&sa=X&ved=2ahUKEwjPyOWXnJj4AhWo8DgGHb_iDc8QmxMoAHoECBcQAg&sxsrf=ALiCzsYdg1B0V4fifqfLSWzJlDYcUOQ_hQ:1654497688225) | | | | | | | | |
| 2 | Programming with Java By [E Balagurusamy](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsaQyyu0i8zoBTFAX6_N4Hcroc7j-Q:1654497491274&q=inauthor:%22E+Balagurusamy%22&tbm=bks) · 2019, [McGraw-Hill Education](https://www.google.co.in/search?hl=en&gbpv=1&dq=advanced+java+programming+latest+edition+textbooks&printsec=frontcover&q=inpublisher:%22McGraw-Hill+Education%22&tbm=bks&sa=X&ved=2ahUKEwiDz--5m5j4AhXJUGwGHctKDCYQmxMoAHoECBcQAg&sxsrf=ALiCzsaQyyu0i8zoBTFAX6_N4Hcroc7j-Q:1654497491274) | | | | | | | | |
| 3 | Java ProjectsLearn the Fundamentals of Java 11 Programming by Building Industry Grade Practical Projects, 2nd EditionBy [Peter Verhas](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsZ9YRB3KYZozlzZjuOdrPh9-bkxrQ:1654497631568&q=inauthor:%22Peter+Verhas%22&tbm=bks) · 2018 | | | | | | | | |
| 4 | Advanced Java, By [Anuradha A. Puntambekar](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsZzBCWVCaIWFhjPyxfR5r8tk8AZbQ:1654497400258&q=inauthor:%22Anuradha+A.+Puntambekar%22&tbm=bks) · 2020, [UNICORN Publishing Group](https://www.google.co.in/search?hl=en&gbpv=1&dq=advanced+java+programming+latest+edition+textbooks&printsec=frontcover&q=inpublisher:%22UNICORN+Publishing+Group%22&tbm=bks&sa=X&ved=2ahUKEwj77byOm5j4AhU1SGwGHSgBDQcQmxMoAHoECBAQAg&sxsrf=ALiCzsZzBCWVCaIWFhjPyxfR5r8tk8AZbQ:1654497400258) | | | | | | | | |
| 5 | Warburton Richard, “Java 8 Lambdas”, Shroff Publishers & Distributors Pvt Ltd. | | | | | | | | |
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| **Reference Book(s)** | | | | | | | | | |
| 1 | | Java How To Program, By [Paul Deitel](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsZJW_faJOLGT75qhlD0RczCztxW_g:1654498189918&q=inauthor:%22Paul+Deitel%22&tbm=bks), [Harvey Deitel](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsZJW_faJOLGT75qhlD0RczCztxW_g:1654498189918&q=inauthor:%22Harvey+Deitel%22&tbm=bks) · 2019, [Pearson Education](https://www.google.co.in/search?hl=en&q=inpublisher:%22Pearson+Education%22&tbm=bks&sa=X&ved=2ahUKEwjp3vuGnpj4AhUq9zgGHf0HCrQQmxMoAHoECBkQAg&sxsrf=ALiCzsZJW_faJOLGT75qhlD0RczCztxW_g:1654498189918) | | | | | | | |
| 2 | | Jan Graba, “An Introduction to Network Programming with Java 7 Compatible”, 3rd Edition, Springer. | | | | | | | |
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| **Related Online Contents [MOOK, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | |
| 1 | | <https://nptel.ac.in/courses/106.105.106105191/>,  <https://www.digimat.in/courses/video/106105191/L01.html>,  <https://nptel.ac.in/noc/courses/noc20SEMI/noc20-cs08/>,  <https://www.youtube.com/watch/vkpSUw_FTg4>,  <https://www.youtube.com/watch/vVksxhztD8kQ>  <https://swayam.gov.in/nd1_noc19_cs84/preview> | | | | | | | |
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| Course Designed By: Dr.R.VADIVEL | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | L | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | M | L |
| **CO3** | S | S | M | S | S | S | S | S | S | S |
| **CO4** | L | M | L | L | S | M | S | S | S | S |
| **CO5** | M | L | M | S | L | S | S | S | L | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT13C** | **ADVANCED WEB TECHNOLOGY** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | **3** | | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **KNOWLEDGE ABOUT WEB DESIGN** | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To understand the basics of web page development using ASP.Net 2. To understand Web control and database connectivity using ADO.NET 3. To Design and Development of Web services | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | Design a web page with Web form and web control classes | | | | | | | | K2 | |
| 2 | | | Design a Client/Server Model with knowledge of ASP.NET and ADO.NET | | | | | | | | K2 | |
| 3 | | | Differentiate between cookies, session, validation control, data list and data grid. | | | | | | | | K3 | |
| 4 | | | Design and develop Web application using Visual Studio.NET | | | | | | | | K6 | |
| 5 | | | Get a job with their own skills. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | | | |
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| **UNIT:1** | | | | **ASP.Net Basics** | | | | **12 HOURS** | | | | |
| The .NET framework – Data types – Variables - Scope and Accessibility – Variables – Operations - Object Based manipulation - Conditional Structures- Loop Structures - Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes - Value types and Reference types - Name spaces and assemblies - Setting Up ASP.NET and IIS . | | | | | | | | | | | | |
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| **UNIT:2** | | | | **Application Development Using ASP.Net, Web Controls and Visual Studio.Net** | | | **12 HOURS** | | | | | |
| ASP.NET Applications: ASP.NET applications – Global.asax application file - ASP.NET Classes - ASP.NET Configuration. Web Form fundamentals: Page Applet- Currency converter - HTML control classes - Page class - HTML server controls. Web controls: Web Control Classes – Auto PostBack and Web Control events- Accessing web controls. Visual Studio.NET: Visual Studio.NET Project- Web form Designer- Writing code- ET debugging. Validation and Rich Controls: Validation - regular expressions - Validated customer form. State management - Tracing, Logging, and Error Handling. | | | | | | | | | | | | |
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| **UNIT:3** | | | | **Working with Data** | | **12 HOURS** | | | | | | |
| Basics of ADO.NET - ADO.NET and data management - Characteristics of ADO.NET- ADO.NET object model. ADO.NET data access : SQL basics – Select , Update, Insert, Delete statements- Accessing data- Creating a connection- Using a command with a DataReader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding with data bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Web Services** | | **12 HOURS** | | | | | | |
| **Web services Architecture :** History - WSDL–SOAP- Communicating with a web service - Web service discovery and UDDI. Creating Web services : Web service basics- The StockQuote web service – Documenting the web service - Testing the web service - Web service Data types - ASP.NET intrinsic objects. Using web services: Consuming a web service - Using the proxy class | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Component Based Programming, Caching/Performance tuning and Security** | | **12 HOURS** | | | | | | |
| Component Based Programming: Creating a simple component – Properties and state- Database components- Using COM components. Custom controls: User Controls- Deriving Custom controls. Caching and Performance Tuning: Designing and scalability– Profiling- Catching- Output catching- Data catching. Implementing security: Determining security requirements- The ASP.NET security model- Forms authentication- Windows authentication. | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | |
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|  | | | | **Total Lecture hours** | | **62 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Dino Esposito, Programming ASP.NET Core, Eastern Economy Edition, Prentice Hall of India, 2019. | | | | | | | | | | | |
| 2 | James Chambers, David Paquette, Simons Timms, ASP.Net Core Application Development, Eastern Economy Edition, Prentice Hall of India, 2015 | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | |
| 1 | Andrew Lock, “ASP.NET Core in Action”, Simon and Schuster,2018 | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | https://www.mooc-list.com/tags/aspnet | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| CO5 | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT13P** | | **DESIGN AND ANALYSIS OF ALGORITHM - LAB** | | | **L** | | | **T** | | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | | **Core** | | | **-** | | | **-** | | | **4** | **4** |
| **Pre-requisite** | | | | | | **Data Structures at UG level** | | | **Syllabus Version** | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. This Course Will Enable Students to solve a given Problem Using an Algorithm. 2. Also, It Enables to Mathematically Analyse the Algorithms for its Efficiency and Effectiveness. | | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | | |
| 1 | | | Analyze the performance of algorithms in terms of asymptotic notations. | | | | | | | | | | **K4** | | | |
| 2 | | | Demonstrate and have exposure in major algorithms and data structures. | | | | | | | | | | **K3** | | | |
| 3 | | | Apply design paradigms of algorithms and methods of analysis for writing optimized code. | | | | | | | | | | **K3** | | | |
| 4 | | | Synthesize efficient algorithms in real-time design situations. | | | | | | | | | | **K5** | | | |
| 5 | | | Apply different procedures on algorithms to define the solutions. | | | | | | | | | | **K3** | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | | **Basic Concept** | | | | | | **12 HOURS** | | | | | |
| Insertion Sort - Asymptotic Notation - The Maximum-Sub Array Problem – Strassen’s Algorithm for Matrix Multiplication - The Substitution Method for Solving Recurrences - The Recursion-Tree Method for Solving Recurrences - The Master Method for Solving Recurrences. | | | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | | **Hiring Problem** | | | | | **12 HOURS** | | | | | | |
| The Hiring Problem - Randomly Permuting Arrays - The Birthday Paradox - Balls and Bins - The On-Line Hiring Problem. | | | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | | **Sorting** | | | **12 HOURS** | | | | | | | | |
| Heap Sort –Priority Queues – Quicksort - Counting Sort - Radix Sort - Bucket Sort. | | | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | | Stacks and Queues | | | **12 HOURS** | | | | | | | | |
| Stacks and Queues - Linked - Binary Trees - Binary Search Trees -Querying a Binary Search Tree - Insertion and Deletion - Red-Black Trees– Rotations – Insertion – Deletion. | | | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | | **Greedy Algorithms** | | **12 HOURS** | | | | | | | | | |
| Matrix Chain Multiplication - Longest Common Subsequence - Optimal Binary Search Trees - Greedy Algorithms - Huffman Codes - Amortized Analysis - Aggregate Analysis. | | | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | | | |
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|  | | | | | **Total Lecture hours** | | **62HOURS** | | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | | |
| 1 | Sandeep Sen, Amit Kumar, “Design and Analysis of Algorithms: A Contemporary Perspective”, Cambridge, 2019 | | | | | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | | | | | |
| 1 | Robert Karamagi, “Design and Analysis of Algorithms” , 2020 | | | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | | |
| 1 | | Design and Analysis of Algorithms by Prof. AbhiramRanade, Dept of CSE, IIT Bombay. | | | | | | | | | | | | | | |
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| Course Designed By:Dr. **T. RAMESH** | | | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | M | S | S | M | S | S |
| **CO3** | S | S | S | S | S | S | S | L | S | M |
| **CO3** | S | S | S | S | S | S | S | M | M | M |
| **CO4** | S | S | M | S | S | S | S | L | M | S |
| **CO5** | M | L | L | L | L | S | S | L | S | S |
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\*S-Strong; M-Medium; L-Low

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| **Course Code** | | **22IT13Q** | **ADVANCED JAVA PROGRAMMING- LAB** | **L** | | **T** | **P** | **C** |
| **Core/ Elective/ Supportive** | | | **Core** | **-** | |  | **4** | **4** |
| **Pre-requisite** | | | UG-Degree Level: Basic JAVA, OOPS concepts, JDBC/ODBC connection. | **Syllabus Version** | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | |
| The main objectives of this course are to:   1. Objective of this course to provide the ability to design console based applications, GUI based and web based applications. 2. Students will also be able to understand integrated development environment to create, debug and run. 3. Multi-tier and enterprise-level applications. Design and analyse programs using remote method invocations (RMI). | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Implement the basic object-oriented programming concepts like encapsulation, polymorphism, and various AWT concepts, overriding and overloading methods. | | | | | | **K3** | |
| 2 | Using advanced java concepts to develop Client/Server communication and Remote Method Invocation (RMI), URL connection establish. | | | | | | **K3** | |
| 3 | Initialize the Applet Program and Develop the delegation event model, Mouse event Handling. | | | | | | **K3** | |
| 4 | Connections establish between JDBC vs ODBC, and also write the simple servlet program. | | | | | | **K3** | |
| 5 | Create the EJB, Message Driven Beans. | | | | | | **K3** | |
| **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6**– Create | | | | | | | | |
| **UNIT: 1** | | **Basic Concepts** | | | **12HOURS** | | | |
| Encapsulation, Inheritance, Polymorphism, Method Overriding, Method Overloading, Swing and AWT Components- java.sql packages. | | | | | | | | |
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| **UNIT: 2** | | **Distributed Applications and Networking** | | | **12 HOURS** | | | |
| RMI- Parameters in RMI- JVM, Java Serialization, Java networking, Classes and Interfaces, TCP/IP Client & Server Sockets, Http URL Connection, Datagrams. | | | | | | | | |
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| **UNIT: 3** | | **Applets and Events** | | | **12 HOURS** | | | |
| Applets, HTML applet tag, Order of Applet initialization, Sizing graphics, passing parameters to applets, Mouse Event handling, the Delegation Event Model. | | | | | | | | |
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| **UNIT: 4** | | **JDBC and Servlets** | | | **12 HOURS** | | | |
| Servlet program- Database Connectivity with JDBC, ODBC using servlet, servlet development options, JavaScript. | | | | | | | | |
| **UNIT: 5** | | **JSP and EJP** | | | **12 HOURS** | | | |
| JSP tags, Servlet vs JSP, JSP Syntax Basics, JSP Directories, Entity beans vs Session Beans, Message Driven Beans. | | | | | | | | |
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| **UNIT: 6** | | **Contemporary Issues** | | | **2 HOURS** | | | |
| Expert lectures, online seminars – webinars | | | | | | | | |
| Applications in Advanced Java Programming | | | | | | | | |
|  | | **Total Lecture hours** | | | **62 HOURS** | | | |
| **Text Book(s)** | | | | | | | | |
| 1 | Java: The Complete Reference, TwelfthEditionBy [Herbert Schildt](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsYdg1B0V4fifqfLSWzJlDYcUOQ_hQ:1654497688225&q=inauthor:%22Herbert+Schildt%22&tbm=bks) · 2021 [McGraw-Hill Education](https://www.google.co.in/search?hl=en&gbpv=1&bsq=advanced+java+programming+latest+edition+textbooks&dq=advanced+java+programming+latest+edition+textbooks&printsec=frontcover&q=inpublisher:%22McGraw-Hill+Education%22&tbm=bks&sa=X&ved=2ahUKEwjPyOWXnJj4AhWo8DgGHb_iDc8QmxMoAHoECBcQAg&sxsrf=ALiCzsYdg1B0V4fifqfLSWzJlDYcUOQ_hQ:1654497688225) | | | | | | | |
| 2 | Programming with Java By [E Balagurusamy](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsaQyyu0i8zoBTFAX6_N4Hcroc7j-Q:1654497491274&q=inauthor:%22E+Balagurusamy%22&tbm=bks) · 2019, [McGraw-Hill Education](https://www.google.co.in/search?hl=en&gbpv=1&dq=advanced+java+programming+latest+edition+textbooks&printsec=frontcover&q=inpublisher:%22McGraw-Hill+Education%22&tbm=bks&sa=X&ved=2ahUKEwiDz--5m5j4AhXJUGwGHctKDCYQmxMoAHoECBcQAg&sxsrf=ALiCzsaQyyu0i8zoBTFAX6_N4Hcroc7j-Q:1654497491274) | | | | | | | |
| 3 | Java – The Complete Reference, Herbert Schildt, Tata McGraw –Hill, ninth edition, 2018. | | | | | | | |
|  | | | | | | | | |
| **Reference Book(s)** | | | | | | | | |
| 1 | Java How To Program, By [Paul Deitel](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsZJW_faJOLGT75qhlD0RczCztxW_g:1654498189918&q=inauthor:%22Paul+Deitel%22&tbm=bks), [Harvey Deitel](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsZJW_faJOLGT75qhlD0RczCztxW_g:1654498189918&q=inauthor:%22Harvey+Deitel%22&tbm=bks) · 2019, [Pearson Education](https://www.google.co.in/search?hl=en&q=inpublisher:%22Pearson+Education%22&tbm=bks&sa=X&ved=2ahUKEwjp3vuGnpj4AhUq9zgGHf0HCrQQmxMoAHoECBkQAg&sxsrf=ALiCzsZJW_faJOLGT75qhlD0RczCztxW_g:1654498189918) | | | | | | | |
| 2 | Java ProjectsLearn the Fundamentals of Java 11 Programming by Building Industry Grade Practical Projects, 2nd EditionBy [Peter Verhas](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsZ9YRB3KYZozlzZjuOdrPh9-bkxrQ:1654497631568&q=inauthor:%22Peter+Verhas%22&tbm=bks) · 2018 | | | | | | | |
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| **Related Online Contents [MOOK, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | <https://nptel.ac.in/courses/106.105.106105191/>,  <https://www.digimat.in/nptel/courses/video/106105191/L01.html>,  <https://nptel.ac.in/noc/courses/noc20SEMI/noc20-cs08/>,  <https://www.youtube.com/watch/v=VksxhzfD8kQ>  <https://swayam.gov.in/nd1_noc19_cs84/preview> | | | | | | | |
| 2 | <https://www.goeduhub.com/free-solution-for-different-universities-java-lab-experiments> | | | | | | | |
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| Course Designed By:**Dr.R.VADIVEL** | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | L | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | M | L |
| **CO3** | S | S | M | S | S | S | S | S | S | S |
| **CO4** | L | M | L | L | S | M | S | S | S | S |
| **CO5** | M | L | M | S | L | S | S | S | L | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT13R** | **ADVANCED WEB TECHNOLOGY LAB** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **PRACTICAL EXPERIENCE &INTRODUCTION OF WEB DESIGN** | **-** | | | **-** | | **4** | **4** |
| **Pre-requisite** | | | | |  | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To understand the basics of web page development using ASP.Net 2. To understand Web control and database connectivity using ADO.NET 3. To Design and Development of Web services | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | Design a web page with Web form and web control classes | | | | | | | | K2 | |
| 2 | | | Design a Client/Server Model with knowledge of ASP.NET and ADO.NET | | | | | | | | K2 | |
| 3 | | | Differentiate between cookies, session, validation control, data list and data grid. | | | | | | | | K3 | |
| 4 | | | Design and develop Web application using Visual Studio.NET | | | | | | | | K6 | |
| 5 | | | Get a job with their own skills. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:1** | | | | **ASP.Net Basics** | | | | **12 HOURS** | | | | |
| ASP.NET programming using class | | | | | | | | | | | | |
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| **UNIT:2** | | | | **Application Development Using ASP.Net, Web Controls and Visual Studio.Net** | | | **12 HOURS** | | | | | |
| ASP.NET Applications - Page class - HTML server controls. Web controls - Visual Studio.NETWeb form Designer- Writing code- ET debugging - Validation and Rich Controls | | | | | | | | | | | | |
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| **UNIT:3** | | | | **Working with Data** | | **12 HOURS** | | | | | | |
| ADO.NET data access - Using a command with a DataReader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Web Services** | | **12 HOURS** | | | | | | |
| Creating Web services , Testing the web service, Using web services | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Component Based Programming, Caching/Performance tuning and Security** | | **12 HOURS** | | | | | | |
| Component Based Programming: Creating a simple component, Custom controls, User Controls.Forms authentication- Windows authentication. | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **62 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Dino Esposito, Programming ASP.NET Core, Eastern Economy Edition, Prentice Hall of India, 2019. | | | | | | | | | | | |
| 2 | James Chambers, David Paquette, Simons Timms, ASP.Net Core Application Development, Eastern Economy Edition, Prentice Hall of India, 2015 | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | |
| 1 | Andrew Lock, “ASP.NET Core in Action”, Simon and Schuster,2018 | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | <https://www.mooc-list.com/tags/aspnet> | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| CO5 | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course Code** | | **22IT23A** | **GRAPHICS AND MULTIMEDIA SYSTEMS** | **L** | | **T** | **P** | **C** |
| **Core/ Elective/ Supportive** | | | **Core** | **3** | | **1** | **-** | **4** |
| **Pre-requisite** | | | **Computer Graphics, Multimedia** | **Syllabus Version** | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | |
| The main objectives of this course are to:   1. To give a brief understanding of computer graphics and input-output devices. 2. To enable students to know about 2-D and 3-D geometrical transformation. 3. To describe the ways in which multimedia information is captured, processed, and rendered. 4. To introduce various new multimedia images file formats such as TIFF and JFIF. 5. To learn the step-by-step process of how to develop non-computer and computer-based animations. | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Describe technical characteristics and performance of multimedia systems and terminals. | | | | | | **K2** | |
| 2 | Design creative approach in the application of multimedia devices, equipment, and systems. | | | | | | **K6** | |
| 3 | Carry out experiments and measurements on the multimedia systems in laboratory conditions on real components and equipment. | | | | | | **K3** | |
| 4 | Interpret and analyze measurement results obtained on the multimedia system and components. | | | | | | **K4** | |
| 5 | Understand all file formats. | | | | | |  | |
| **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6**– Create | | | | | | | | |
| **Unit: 1** | | **INTRODUCTION TO COMPUTER GRAPHICS** | | | **12 HOURS** | | | |
| Introduction to Computer Graphics: Applications of Computer Graphics, Operations of Computer Graphics, Graphics Software Packages, Requirements, Graphical User Interface. Graphical I/O Devices: Raster Video Principals, Random Scan Devices, Graphics Accelerators, and Graphics Co-Processors. Scan Conversion: Methods, Polynomial Method, DDA Algorithms, Bresenhams Algorithms. | | | | | | | | |
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| **Unit: 2** | | **TRANSFORMATIONS** | | | **12 HOURS** | | | |
| 2-DGeometrical Transformations: Basic Transformations, Homogeneous Coordinate Systems, Other Transformations, Combined Transformations, Inverse of Combined Transformations, 3-D Geometrical Transformations: Basic 3-D Transformations, 3-D Translation. Scaling, Rotation, Rotation about an Arbitrary Axis in Space, Other 3-D transformations, 3-D Reflection, Reflection about any Arbitrary Plane, 3-D Shearing. | | | | | | | | |
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| **Unit: 3** | | **INTRODUCTION TO MULTIMEDIA** | | | **12 HOURS** | | | |
| Introduction to Multimedia: Concepts of Multimedia, Types, Multimedia data Streams, hardware/Software Requirements, Applications, Multimedia Authoring, Digital Audio, MIDI, Image Compression Standards, Video Compression and Encoding, Hypertext and Hypermedia. | | | | | | | | |
| **Unit: 4** | | **FILE FORMATS** | | | **12 HOURS** | | | |
| Graphics Image File Formats: Image File Formats, Raster Formats, Bitmap Format, Graphics Interchange Format, Joint Photographic Experts Group, Tagged Image File Format, Microsoft Image Extensions, Portable Network Graphics, BMP Format, Overview, Bitmap Compression, JPEG and JFIF, JPEG Encoding Steps, JFIF Format, GIF Format, GIF Extension Blocks, TIFF File Formats. | | | | | | | | |
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| **Unit: 5** | | **TOOLS FOR WORLD WIDE WEB** | | | **12HOURS** | | | |
| Multimedia Tools in the Information Commons, Audio, Video, Photo, Text Scanning, and OCR, Font Editing and Design Tools, Text Editing and Word Processing Tool, Image Editing Tool, Painting, and Drawing Tools, Sound Editing Tool, Digitized Audio, MIDI, Comparison between MIDI and Digitized Audio, Advantages and Disadvantages of Digitized Audio and MIDI, Animation, Video, and Digital Movie Tool, Video Formats. | | | | | | | | |
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| **Unit: 6** | | **CONTEMPORARY ISSUES** | | | **2HOURS** | | | |
| Expert lectures, online seminars – webinars | | | | | | | | |
|  | | **Total Lecture HOURS** | | | **62HOURS** | | | |
| **Text Book(s)** | | | | | | | | |
| 1 | Fundamentals of Computer Graphics, International Student EditionBy Steve (Cornell University Marschner, Ithaca New York USA), Peter Shirley · 2022, Taylor and Francis Limited Publication | | | | | | | |
| 2 | Computer Graphics And Multimedia (Hb 2022) by Moody L, Kaufman Press | | | | | | | |
| 3 | Multimedia Computing, By Gerald Friedland, Ramesh Jain · 2014, Cambridge University Press | | | | | | | |
| 4 | Computer Graphics- Theory and PracticeBy Jonas Gomes, Luiz Velho, Mario Costa Sousa · 2012, CRC Press | | | | | | | |
|  | | | | | | | | |
| **Reference Book(s)** | | | | | | | | |
| 1 | Fundamentals of Computer GraphicsBy Steve Marschner, PeterShirley, Michael Ashikhmin, Michael Gleicher, Naty Hoffman, Garrett Johnson, Peter Willemsen, Tamara Munzner, Erik Reinhard, William B. Thompson, Brian Wyvill · 2021, CRC Press/Taylor & Francis Group publication | | | | | | | |
| 2 | Malay K. Pakhira, “Computer Graphics, Multimedia Animation”, PHI Learning, 2010. | | | | | | | |
|  | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | Introduction to Computer Graphics, Dr.PremKalra, Dept of CSE, IIT.  <https://www.youtube.com/watch?v=6LjVtIcSbK8&list=PLwdnzlV3ogoWaYiowRtJ8t8FeR-ODfSV1>  <https://www.youtube.com/watch?v=fwzYuhduME4&list=PL338D19C40D6D1732>  <https://www.youtube.com/watch?v=V4mP2pQyou0&list=PL112A527F83F7A5E4>  <https://www.youtube.com/watch?v=davcYvCJ63w>  https://www.youtube.com/watch?v=fAJzLuce\_ms | | | | | | | |
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| Course Designed By: **Dr.R.VADIVEL** | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | L | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | M | L |
| **CO3** | S | S | M | S | S | S | S | S | S | S |
| **CO4** | L | M | L | L | S | M | S | S | S | S |
| **CO5** | M | L | M | S | L | S | S | S | L | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT23B** | **CRYPTOGRAPHY AND NETWORK SECURITY** | **L** | | | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | **3** | | | | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **UG level – Cryptography and Network Security** | **Syllabus Version** | | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. This course focuses on the fundamentals of Cryptography and Network Security that are used in protecting both the information present in computer storage as well as information traveling over computer networks. 2. Interest in network security has been spurred by the pervasive use of computer-based applications such as information systems, databases, and the Internet. 3. Cryptography and Network security is enabled through securing data, computers, and networks. By the end of this course, student will be able to describe major network security issues and trends, and advise an individual seeking to protect data. | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Recognize the network security policies, standards and procedures for completeness and alignment with generally accepted practices | | | | | | | | | | K2 | |
| 2 | | | Explain the functionalities of Cryptography and Network security | | | | | | | | | | K2 | |
| 3 | | | Describe Authentication and Security practice | | | | | | | | | | K2 | |
| 4 | | | Analyze the root causes of cyber crime | | | | | | | | | | K3 | |
| 5 | | | Implement suitable security techniques for a given problem | | | | | | | | | | K3 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
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| **Unit:1** | | | | **Introduction** | | | | | | **12 HOURS** | | | | |
| Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques - , transposition techniques, steganography. | | | | | | | | | | | | | | |
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| **Unit:2** | | | | **Symmetric Encryption and Public-Key Cryptography** | | | | | **12 HOURS** | | | | | |
| Block Ciphers and the Data Encryption Standard - The Data Encryption Standard - Advanced Encryption Standard - AES Key Expansion - Multiple Encryption and Triple DES.The RSA Algorithm - Description of the Algorithm - Computational Aspects - The Security of RSA. | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **Electronic Mail and Web Security** | | | | **12 HOURS** | | | | | | |
| Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME –DomainKeys Identified Mail. Web Security Considerations - Secure Socket Layer and Transport Layer Security - Transport Layer Security – HTTPS - Secure Shell (SSH). | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **IP and Wireless Network Security** | | | | **12 HOURS** | | | | | | |
| IP Security – Overview - IP Security Policy - Encapsulating Security Payload - Combining Security Associations - Internet Key Exchange - Cryptographic Suites. Wireless Network Security - Wireless LAN Overview - Wireless LAN Security - Wireless Application Protocol Overview - Wireless Transport Layer Security - WAP End-to-End Security. | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Intruders, Malicious Software and Firewalls** | | | **12 HOURS** | | | | | | | |
| Intruders - Intrusion Detection - Password Management. Malicious Software - Types of Malicious Software – Viruses - Virus Countermeasures – Worms - Distributed Denial of Service Attacks. Firewalls - The Need for Firewalls - Firewall Characteristics - Types of Firewall. | | | | | | | | | | | | | | |
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| **Unit:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | |
| Latest developments/topics in Cryptography & Network Security | | | | | | | | | | | | | | |
|  | | | | **Total Lecture HOURS** | | | **62 HOURS** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | William Stallings, “Cryptography & Network Security”, 6th Edition, Pearson Education, New Delhi 2013. | | | | | | | | | | | | | |
| 2 | William Stallings, “Network Security Essentials Applications and Standards”Third Edition, Pearson Education, 2008. | | | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | | | |
| 1 | Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007, Reprint 2015. | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | Foundations of CryptographyBy Prof. Ashish Choudhury, IIIT Bangalore. | | | | | | | | | | | | |
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| Course Designed By: **Dr.W.ROSE VARUNA** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | L | S | S | L | M | S | S |
| **CO3** | S | S | S | M | M | M | L | M | L | S |
| **CO3** | M | M | S | S | S | M | L | M | M | M |
| **CO4** | L | L | M | S | S | S | L | M | L | S |
| **CO5** | M | M | M | S | S | M | L | M | L | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT23C** | **PYTHON PROGRAMMING** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | **3** | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **Knowledge about the Internet and any one of the Scripting Languages** | **Syllabus Version** | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | |
| The main objectives of this course are to:   1. Understand the basics of Python Programming 2. Get a Job in the IT industry as a python programmer 3. Use Python programming in their research | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | | Understand the basics of Python Programming | | | | | | | K2 | |
| 2 | | | Understand OOPs concepts | | | | | | | K2 | |
| 3 | | | Design and Develop Python Programming | | | | | | | K3 | |
| 4 | | | Get a job in the IT industry as a Python Programmer | | | | | | | K6 | |
| 5 | | | Work as a freelance Python Programmer | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | |
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| **UNIT:1** | | | | **Introduction to Python** | | | **12 HOURS** | | | | |
| Introduction to Python : Python interpreter - Overview of programming in Python - Python built-in types - Arithmetic in Python - Program input and Program output- Variables and assignment.  Control Statements: -if statements - while statement -for statements | | | | | | | | | | | |
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| **UNIT:2** | | | | **List, Dictionary, Tuples and Functions** | | | **12HOURS** | | | | |
| Strings and string operations - List basics - List operations - Dictionaries - Dictionary basics and Tuples- Functions - formal arguments - variable-length arguments - Exceptions - detecting and handling exceptions. | | | | | | | | | | | |
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| **UNIT:3** | | | | **OOP in Python** | | | **12 HOURS** | | | | |
| Classes - class attributes - instances - instance attributes - binding and method invocation - inheritance - polymorphism - Built-in functions for classes and instances. | | | | | | | | | | | |
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| **UNIT:4** | | | | **File Handling** | | | **12 HOURS** | | | | |
| Files and input/output - reading and writing files - methods of file objects - using standard library functions - dates and times | | | | | | | | | | | |
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| **UNIT:5** | | | | **Database and Packages** | | | **12HOURS** | | | | |
| Python database application programmer’s interface (DB- API) - connection and cursor objects - Type objects and constructors - python database adapters.  Packages : Modules – creating and using modules | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | |
|  | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62 HOURS** | | | | |
| **Text Book(s)** | | | | | | | | | | | |
|  | | | | | | | | | | | |
| 1 | Amit Ashok Kamthane and Ashok N. Kamthane, (2018)“ Python Programming”, McGraw Hill Education; First edition | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | |
| 1 | Python Tricks (2017),A Buffet of Awesome Python Features, Dan Bader | | | | | | | | | | |
| 2 | Harsh Bhasin, (2017), Python for Beginners, New Age International (P) Ltd Publishers | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | | http://docs.python.org/tutorial/ | | | | | | | | | |
| 2 | | https://nptel.ac.in/courses/106/106/106106182/ | | | | | | | | | |
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| Course Designed By**: Dr.T.RAMESH.** | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | L | S | S | S | M | S | M | S |
| **CO3** | L | S | L | S | S | S | M | S | M | S |
| **CO3** | S | S | S | S | S | S | M | S | M | M |
| **CO4** | L | M | M | M | S | S | M | S | M | M |
| CO5 | L | M | M | M | S | S | M | S | M | M |

\*S-Strong; M-Medium; L-Low

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| **Course Code** | | **22IT23P** | **GRAPHICS AND MULTIMEDIA SYSTEMS - LAB** | **L** | | **T** | **P** | **C** |
| **Core/ Elective/ Supportive** | | | **Core** | **-** | | **-** | **4** | **4** |
| **Pre-requisite** | | | UG Degree level: Graphics and Multimedia | **Syllabus Version** | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | |
| The main objectives of this course are to:   1. To give a brief understanding of computer graphics. 2. To enable students to know the writing program for DDA, Bresenham’s, Midpoint Circle   Generation, and Ellipse Generation Algorithms.   1. To describe the ways to create various types of texts and fonts. 2. To introduce programming knowledge in 2-D and 3-D transformation. 3. To learn the step-by-step process of how to develop a program for Curve Generation and animations. | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | | |
| 1 | Describe technical characteristics and performance of multimedia systems and terminals. | | | | | | **K2** | |
| 2 | Design creative approach in the application of multimedia devices, equipment, and systems | | | | | | **K6** | |
| 3 | Carry out experiments and measurements on the multimedia systems in laboratory conditions on real components and equipment. | | | | | | **K3** | |
| 4 | Interpret and analyze measurement results obtained on the multimedia system and components. | | | | | | **K4** | |
| **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6**– Create | | | | | | | | |
| **UNIT:1** | | **INTRODUCTION TO COMPUTER GRAPHICS** | | | **12HOURS** | | | |
| Introduction to Computer Graphics: Applications of Computer Graphics, Operations of Computer Graphics, Graphics Software Packages, Requirements, Scan Conversion: Methods, Polynomial Method, DDA Algorithms, Bresenham’s Algorithms. | | | | | | | | |
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| **UNIT:2** | | **TRANSFORMATIONS** | | | **12 HOURS** | | | |
| 2-DGeometrical Transformations: Basic Transformations, Homogeneous Coordinate Systems, Creating two-dimensional objects, Two Dimensional Transformations, 3-D Geometrical Transformations: Basic 3-D Transformations, 3-D Translation. Scaling, Rotation, Three Dimensional Transformations. | | | | | | | | |
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| **UNIT:3** | | **INTRODUCTION TO MULTIMEDIA** | | | **12HOURS** | | | |
| Introduction to Multimedia: Concepts of Multimedia, Types, Multimedia data Streams, hardware/Software Requirements, Applications, MIDI, Image Compression Standards, Video, Hypertext and Hypermedia,Coloring the Pictures, Curve Generation | | | | | | | | |
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| **UNIT:4** | | **FILE FORMATS** | | | **12HOURS** | | | |
| Graphics Image File Formats: Image File Formats, Joint Photographic Experts Group, Tagged Image File Format, JPEG and JFIF, JFIF Format, GIF Format, TIFF File Formats. Creating various types of texts and fonts, Creating various types of images. | | | | | | | | |
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| **UNIT:5** | | **TOOLS FOR THE WORLD WIDE WEB** | | | **12HOURS** | | | |
| Multimedia Tools in the Information Commons, Audio, Video, Photo, Text Scanning, and OCR, Font Editing and Design Tools, Text Editing and Word Processing Tool, Image Editing Tool, Painting and Drawing Tools, Sound Editing Tool, Animation, Video, Simple Animations using transformations, Key Frame Animation | | | | | | | | |
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| **UNIT:6** | | **CONTEMPORARY ISSUES** | | | **2HOURS** | | | |
| Expert lectures, online seminars – webinars | | | | | | | | |
|  | | **Total Lecture hours** | | | **62HOURS** | | | |
| **Text Book(s)** | | | | | | | | |
| 1 | Fundamentals of Computer Graphics, International Student Edition By Steve (Cornell University Marschner, Ithaca New York USA), Peter Shirley · 2022, Taylor and Francis Limited Publication | | | | | | | |
| 2 | Computer Graphics And Multimedia (Hb 2022) by Moody L, Kaufman Press | | | | | | | |
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| **Reference Book(s)** | | | | | | | | |
| 1 | Computer Graphics: Theory and PracticalBy [Dr.PulasthiGunawardhana](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsYRULSsbluNj4kbTjhtSGXu6SYywQ:1654506666218&q=inauthor:%22Dr.+Pulasthi+Gunawardhana%22&tbm=bks) · 2020, [Scientific Research Publishing, Inc. US](https://www.google.co.in/search?hl=en&gbpv=1&dq=graphics+practical+text+books&printsec=frontcover&q=inpublisher:%22Scientific+Research+Publishing,+Inc.+USA%22&tbm=bks&sa=X&ved=2ahUKEwjU--rQvZj4AhXnZWwGHQl7D10QmxMoAHoECBkQAg&sxsrf=ALiCzsYRULSsbluNj4kbTjhtSGXu6SYywQ:1654506666218)A. | | | | | | | |
| 2 | Introduction to Computer GraphicsA Practical Learning ApproachBy Fabio Ganovelli, Massimiliano Corsini, SumantaPattanaik, Marco Di Benedetto · 2014, CRC Press | | | | | | | |
|  | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | Introduction to Computer Graphics, Dr.PremKalra, Dept of CSE, IIT. | | | | | | | |
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| Course Designed By: **Dr.R.VADIVEL** | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | L | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | M | L |
| **CO3** | S | S | M | S | S | S | S | S | S | S |
| **CO4** | L | M | L | L | S | M | S | S | S | S |
| **CO5** | M | L | M | S | L | S | S | S | L | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT23Q** | **CRYPTOGRAPHY AND NETWORK SECURITY - LAB** | **L** | | | | | **T** | **P** | | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | **-** | | | | | **-** | **4** | | **4** |
| **Pre-requisite** | | | | | **UG level – Cryptography and Network Security** | **Syllabus Version** | | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To learn different cipher techniques 2. To implement the algorithms DES, RSA,MD5,SHA-1 3. To use network security tools and vulnerability assessment tools | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Develop code for classical Encryption Techniques to solve the problems. | | | | | | | | | | K5 | |
| 2 | | | Build cryptosystems by applying symmetric and public key encryption algorithms. | | | | | | | | | | K6 | |
| 3 | | | Construct code for authentication algorithms. | | | | | | | | | | K4 | |
| 4 | | | Develop a signature scheme using Digital signature standard. | | | | | | | | | | K6 | |
| 5 | | | Demonstrate the network security system using open source tools | | | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Substitution and Transposition techniques** | | | | | | **12 HOURS** | | | | |
| 1. Perform encryption, decryption using the following substitution techniquesi. Ceaser cipher  ii. Playfair cipher iii. Hill Cipher iv. Vigenere cipher.  2. Perform encryption and decryption using following transposition techniques Rail fence - Row & Column Transformation | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **DES&AES algorithm** | | | | | **12HOURS** | | | | | |
| 3. Apply DES algorithm for practical applications.  4. Apply AES algorithm for practical applications. | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **RSA &Diffie-Hellman Key Exchange** | | | | **12HOURS** | | | | | | |
| 5. Implement RSA Algorithm using HTML and JavaScript  6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem. | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Digital Signature** | | | | **12HOURS** | | | | | | |
| 7. Calculate the message digest of a text using the SHA-1 algorithm  8. Implement the SIGNATURE SCHEME - Digital Signature Standard.  9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w. | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Defeating Malware** | | | **12HOURS** | | | | | | | |
| 10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool  11. Defeating Malware - Building Trojans, Rootkit Hunter | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | |
| Latest developments/topics in Cryptography & Network Security | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62HOURS** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | William Stallings, “Cryptography & Network Security”, 6th Edition, Pearson Education, New Delhi 2013. | | | | | | | | | | | | | |
| 2 | William Stallings, “Network Security Essentials Applications and Standards”Third Edition, Pearson Education, 2008. | | | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | | | |
| 1 | Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata McGraw Hill, 2007, Reprint 2015. | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | Foundations of CryptographyBy Prof. Ashish Choudhury, IIIT Bangalore. | | | | | | | | | | | | |
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| Course Designed By: **Dr.W.ROSEVARUNA** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **S** | **S** | **S** | **L** | **M** | **S** | **S** |
| **CO3** | **S** | **S** | **S** | **S** | **S** | **S** | **L** | **M** | **M** | **S** |
| **CO3** | **M** | **M** | **M** | **S** | **S** | **L** | **L** | **L** | **M** | **M** |
| **CO4** | **L** | **L** | **S** | **S** | **S** | **L** | **L** | **M** | **S** | **M** |
| CO5 | **M** | **M** | **S** | **S** | **S** | **M** | **L** | **L** | **S** | **S** |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT23R** | **PYTHON PROGRAMMING - LAB** | **L** | | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | **-** | | | | | **-** | **4** | **4** |
| **Pre-requisite** | | | | | **Knowledge about the Internet and any one of the Scripting Languages** | **Syllabus Version** | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Understand the basics of Python Programming 2. Get a Job in the IT industry as a python programmer 3. Use Python programming in their research | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | | Understand the basics of Python Programming | | | | | | | | | K2 | |
| 2 | | | Understand OOPs concepts | | | | | | | | | K2 | |
| 3 | | | Design and Develop Python Programming | | | | | | | | | K3 | |
| 4 | | | Get a job in the IT industry as a Python Programmer | | | | | | | | | K6 | |
| 5 | | | Work as a freelance Python Programmer | | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Introduction to Python** | | | | | | **12 HOURS** | | | |
| Control Statements: -if statements - while statement -for statements | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **List, Dictionary, Tuples and Functions** | | | | | **12 HOURS** | | | | |
| Strings and string operations - List operations - Dictionaries - Tuples  Functions - Exceptions handling | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **OOP in Python** | | | | **12 HOURS** | | | | | |
| Classes - class attributes - instances - instance attributes - binding and method invocation - inheritance - Built-in functions for classes and instances. | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **File Handling** | | | | **12 HOURS** | | | | | |
| Files and input/output - reading and writing files - methods of file objects - using standard library functions - dates and times | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Database and Web programming** | | | **12HOURS** | | | | | | |
| Using Database – creating and using modules | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | Amit Ashok Kamthane and Ashok N. Kamthane, “ Python Programming”, McGraw Hill Education; First edition (2 July 2018) | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Python Tricks: A Buffet of Awesome Python Features, Dan Bader,2017 | | | | | | | | | | | | |
| 2 | **Harsh Bhasin, Python for Beginners, New Age International (P) Ltd Publishers,2017** | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | http://docs.python.org/tutorial/ | | | | | | | | | | | |
| 2 | | https://nptel.ac.in/courses/106/106/106106182/ | | | | | | | | | | | |
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| Course Designed By**: Dr. T.RAMESH.** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | L | S | S | S | M | S | M | S |
| **CO3** | L | S | L | S | S | S | M | S | M | S |
| **CO3** | S | S | S | S | S | S | M | S | M | M |
| **CO4** | L | M | M | M | S | S | M | S | M | M |
| CO5 | L | M | M | M | S | S | M | S | M | M |

\*S-Strong, M-Medium L-Low

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| **Course Code** | | **22ITE33A** | **INTERNET OF THINGS** | **L** | | **T** | **P** | **C** |
| **Core/ Elective/ Supportive** | | | **CORE** | **3** | | **1** | **-** | **4** |
| **Pre-requisite** | | | Basic knowledge of hardware,  programming in c | **Syllabus Version** | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | |
| The main objectives of this course are to:   1. In order to gain knowledge on bases of Internet of Things (IoT), IoT Architecture, and the Protocols related to IoT 2. To understand the concept of the Web of Thing and the relationship between the IoT and WoT. | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| CO1 | Gain the basic knowledge about IoT and they will be able to use IoT related products in real life. | | | | | | **K2/ K3** | |
| CO2 | It helps to rely less on physical resources and started to do their work smarter. | | | | | | **K4/K5/K6** | |
| **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6**– Create | | | | | | | | |
| **UNIT:1** | | **INTRODUCTION to IoT** | | | **12 HOURS** | | | |
| Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels and Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology. | | | | | | | | |
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| **UNIT:2** | | **IoT ARCHITECTURE** | | | **12 HOURS** | | | |
| M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model | | | | | | | | |
| - IoT reference architecture | | | | | | | | |
| **UNIT:3** | | **IoT PROTOCOLS** | | | **12 HOURS** | | | |
| Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security | | | | | | | | |
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| **UNIT:4** | | **WEB OF THINGS** | | | **12 HOURS** | | | |
| Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture. | | | | | | | | |
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| **UNIT:5** | | **APPLICATIONS** | | | **12 HOURS** | | | |
| The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging. | | | | | | | | |
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| **UNIT:6** | | **CONTEMPORARY ISSUES** | | | **2 HOURS** | | | |
| Expert lectures, online seminars – webinars | | | | | | | | |
|  | | **Total Lecture Hours** | | | **62 HOURS** | | | |
| **Text Book(s)** | | | | | | | | |
| 1 | Fundamentals of Internet of ThingsBy [Sudhir Kumar](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsYk2Jfzri2KzSfC6USCO5gbH6Zq7A:1654498729352&q=inauthor:%22Sudhir+Kumar%22&tbm=bks) · 2021, CRC Press | | | | | | | |
| 2 | Internet of Things (IoT)- Principles, Paradigms and Applications of IoTBy Dr KamleshLakhwani, Dr Hemant Kumar Gianey, Joseph Kofi Wireko, Kamal Kant Hiran · 2020 | | | | | | | |
| 3 | David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 | | | | | | | |
| 4 | Internet of Things (IoT)- Systems and Applications2019 by Jamil Y. Khan, Mehmet R. Yuce, [Jenny Stanford Publishing](https://www.google.co.in/search?hl=en&gbpv=1&dq=internet+of+things+latest+edition+text+books&printsec=frontcover&q=inpublisher:%22Jenny+Stanford+Publishing%22&tbm=bks&sa=X&ved=2ahUKEwjTk-qLoJj4AhUTRmwGHdUbD28QmxMoAHoECBgQAg&sxsrf=ALiCzsaw34Okl3lvg8wuJltBRPAt-DpHXA:1654498736822) | | | | | | | |
| 5 | ArshdeepBahga, Vijay Madisetti, “Internet of Things – A handson approach”, Universities Press, 2015. | | | | | | | |
|  | | | | | | | | |
| **Reference Book(s)** | | | | | | | | |
| 1 | Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010. | | | | | | | |
| 2 | Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012. | | | | | | | |
|  | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | Introduction to IOT  <https://nptel.ac.in/courses/106.105.106105166/> | | | | | | | |
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| Course Designed By: **Dr.R.VADIVEL** | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| CO5 | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT33B** | **MOBILE APPLICATION DEVELOPMENT** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | **3** | | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **Basics about the Networking, TCP/IP and Programming Skills** | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To understand the User Interface Design, Back end databases, other services for mobile applications. 2. To get a job using mobile application development skills 3. To get exposure to Android and IOS development environment | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | Understand the principles of Mobile networks | | | | | | | | K2 | |
| 2 | | | Understand the different mobile network technology | | | | | | | | K2 | |
| 3 | | | Get familiar with Android and IOS environment | | | | | | | | K3 | |
| 4 | | | Design and develop Mobile application using Android and IOS. | | | | | | | | K6 | |
| 5 | | | Get a job with their own skills. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:1** | | | | **Mobile Communication and Technology** | | | | **12HOURS** | | | | |
| Mobile Communication - Mobile Computing - Mobile Computing Architecture  Mobile Communication and Technologies :GSM - CDMA - Bluetooth –ZigBee - IrDA - RFID – IEEE 802.11 – GPS - NFC | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:2** | | | | **5G Communication Technology** | | | **12HOURS** | | | | | |
| 5G System Concepts – 5G Architecture – Functional Architecture – Machine type Communication – Device to Device 4G to 5G | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:3** | | | | **User Interface Design and Files/Directories** | | **12HOURS** | | | | | | |
| User Interface Design : Fundamental - Views - Layouts – Drawable Resources - Resolution and Density Independence - Creating and Using Menus- Intents – Adapters - Internet Resources - Dialogs  Files and Directories: Files - Saving – retrieving – file Management - Databases – SQLite - Cursors and Content –Values – Working with SQlite. | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Networking, Location-Based Services and Multimedia Services** | | **12HOURS** | | | | | | |
| Networking and Emailing services - Maps – Geocoding – Location - Based Services – Alarm – service – Toast – Threads – using sensors – Graphics – Media Player – Camera – Video – Working with Bluetooth, NFC and WiFi – Handling Telephony and SMS – Email. | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Android and IOS** | | **12HOURS** | | | | | | |
| Android: Development Tools – Architecture - Manifest - Application Life Cycle - Application  Priority and Process States IOS: iPhone Developer - Apple Developer Connection - Memory Management - Fundamental iPhone Design Patterns – Tables and Views | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **62HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | William Lee, Mobile Communications Engineering: Theory and Applications, Willey, 2017 | | | | | | | | | | | |
| 2 | Ajit Singh 5G Simplified, SPD,299 | | | | | | | | | | | |
| 3 | Neil Smith, Android Studio 3.0 Development Essentials - Android 8 Edition,Payload Media, Inc. 207 | | | | | | | | | | | |
| 4 | Ahmad Sahar , Craig Clayton, iOS 15 Programming for Beginners - Sixth Edition, Packt 2021 | | | | | | | | | | | |
| 5 | AfifOsseiran, Jose F. Monserrat, PathickMarsch, 5G Mobile Wireless Communication, Cambridge University Press, 2016 | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | Pradeep Kothari, “Android Application Development” Dream tech Press, 2015 | | | | | | | | | | | |
| 2 | Matt Neuburg, Programming IOS 13 : Dive Deep into Views, View Controllers and Frame works,Orelly, 2019. | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | <https://onlinecourses.nptel.ac.in/noc16_cs13> | | | | | | | | | | |
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| Course Designed By**: Dr. T.RAMESH.** | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| CO5 | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT33C** | **ADVANCED DATABASE**  **MANAGEMENT SYSTEMS** | | | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | | | **3** | | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **UG level – Database management system** | | | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. This course aims at facilitating the student to understand the various functionalities of DBMS software. 2. It helps to perform many operations related to creating, manipulating and maintaining databases for Real-world applications 3. It helps the students to understand the various designing concepts, storage methods, querying and managing databases. | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Explain the structure and model of the relational database system | | | | | | | | | | K2 | |
| 2 | | | Design multiple tables, and using group functions, sub queries | | | | | | | | | | K3 | |
| 3 | | | Design a database based on a data model considering thenormalization to a specified level | | | | | | | | | | K4 | |
| 4 | | | Estimate the storage size of the database and designappropriate storage techniques | | | | | | | | | | K3 | |
| 5 | | | Analyze the requirements of transaction processing,concurrency control | | | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **UNIT:1** | | | | **Introduction** | | | | | | **12 HOURS** | | | | |
| Database Design and the E-R Model: The Entity-Relationship Model, Entity-Relationship Diagrams, Normalization: Introduction, Nonloss Decomposition and Functional Dependencies, 1NF, 2NF and 3NF, Boyce/ Codd Normal Form. Parallel Databases: I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism. | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **Object-Based Distributed and Databases** | | | | | **12 HOURS** | | | | | |
| Distributed Databases: Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Object-Based Databases: Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational. | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **XML** | | | **12 HOURS** | | | | | | | |
| XML: Structure of XML Data, XML Document Schema - Document Type Definition (DTD) - XML Schema, XML Querying and Transformation - Tree Model of XML – Xpath – Xquery, Application Program Interfaces to XML, Storage of XML Data - Nonrelational Data Stores - Relational Databases - SQL/XML, XML Applications - Storing Data with Complex Structure - Standardized Data Exchange Formats - Web Services - Data Mediation. | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Spatial and Temporal Data and Mobility** | | | **12 HOURS** | | | | | | | |
| Time in Databases - Time Specification in SQL - Temporal Query Languages, Spatial and Geographic Data - Representation of Geometric Information - Design Databases - Geographic Data - Spatial Queries - Indexing of Spatial Data, Multimedia Databases - Multimedia Data Formats - Continuous-Media Data - Similarity-Based Retrieval, Mobility and Personal Databases - A Model of Mobile Computing - Routing and Query Processing - Broadcast Data - Disconnectivity and Consistency. | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **NoSQL** | | **12 HOURS** | | | | | | | | |
| NoSQL Basics - Definition and Introduction - Sorted Ordered Column-Oriented Stores - Key/Value Stores - Document Databases - Graph Databases - Interfacing and Interacting with NoSQL - Language Bindings for NoSQL Data Stores – Storage Architecture- HBase Distributed Storage Architecture - NoSQL in Cloud - Google App Engine Data Store- Amazon SimpleDB – Case Study in MongoDB. | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | | | |
| Expert lectures, online seminars– webinars | | | | | | | | | | | | | | |
| Latest developments/topics in Advanced DBMS | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **62HOURS** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | Silberschatz, Korth, Sudarshan, “Database system concepts”, 6th Edition, Tata McGraw Hill (For UNITS I, IV), 2011. | | | | | | | | | | | | | |
| 2 | C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8th Edition, Pearson Education Reprint 2016. | | | | | | | | | | | | | |
| 3 | Shashank Tiwari, “Professional NoSQL” (For UNIT V), 2011. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1 | RamezElmasri, Shamkant B. Navathe,“Fundamentals ofDatabaseSystems”, 6th Edition, Addison-Wesley. | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | Database Management SystemBy Dr. B. Lavanya, Associate Professor, University of Madras, Chennai, Tamil Nadu, Duration : 12 weeks | | | | | | | | | | | | |
| Course Designed By:**Dr.W.ROSEVARUNA** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | S | S | L | M | S | S |
| **CO3** | S | S | S | S | S | S | L | M | M | S |
| **CO3** | M | M | M | S | S | L | L | L | M | M |
| **CO4** | L | L | S | S | S | L | L | M | S | M |
| **CO5** | M | M | S | S | S | M | L | L | S | S |

\*S-Strong; M-Medium; L-Low

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| **Course Code** | | **22IT33P** | **INTERNET OF THINGS - LAB** | **L** | | **T** | **P** | **C** |
| **Core/ Elective/ Supportive** | | | **Core** | **-** | | **-** | **4** | **4** |
| **Pre-requisite** | | | **UG-Degree level: Basic in Cloud Computing and Internet of Things** | **Syllabus Version** | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | |
| The main objectives of this course are to:   1. In order to gain knowledge on the bases of the Internet of Things (IoT), IoT Architecture, and the Protocols related to IoT 2. To understand the concept of the Web of Things and the relationship between the IoT and WoT. 3. To study IoT Access technologies. 4. To study the design methodology and different IoT hardware platforms. 5. Familiarization with Arduino/ Raspberry Pi and perform necessary software installation | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | | |
| 1 | Gain the basic knowledge about IoT and they will be able to use IoT-related products in real life. | | | | | | **K2/K3** | |
| 2 | It helps to rely less on physical resources and started to do their work smarter. | | | | | | **K3** | |
| 3 | It helps to Easy interface to all microprocessors. | | | | | | **K3** | |
| 4 | Able to realize the revolution of the Internet in Mobile Devices, Cloud & Sensor  Networks. | | | | | | **K3** | |
| **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** – Create | | | | | | | | |
| **UNIT:1** | | **INTRODUCTION to IoT** | | | **12 HOURS** | | | |
| * Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies, Domain-Specific IoTs, Connected appliances. | | | | | | | | |
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| **UNIT:2** | | **IoT ARCHITECTURE** | | | **12 HOURS** | | | |
| * M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Smart home security systems. | | | | | | | | |
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| **UNIT:3** | | **IoT PROTOCOLS** | | | **12 HOURS** | | | |
| * Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – Zigbee Architecture – Network layer – Autonomous farming equipment- Wearable health monitors. | | | | | | | | |
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| **UNIT:4** | | **WEB OF THINGS** | | | **12 HOURS** | | | |
| * Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Smart factory equipment- Wireless inventory trackers. | | | | | | | | |
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| **UNIT:5** | | **APPLICATIONS** | | | **12 HOURS** | | | |
| * The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Ultra-high-speed wireless internet- IOT data Analytics | | | | | | | | |
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| **UNIT:6** | | **CONTEMPORARY ISSUES** | | | **2HOURS** | | | |
| Expert lectures, online seminars – webinars | | | | | | | | |
| Applications in the Internet of Things. | | | | | | | | |
|  | | **Total Lecture hours** | | | **62HOURS** | | | |
| **Text Book(s)** | | | | | | | | |
| 1 | Internet of Things (IoT)- Systems and Applications2019 by Jamil Y. Khan, Mehmet R. Yuce, [Jenny Stanford Publishing](https://www.google.co.in/search?hl=en&gbpv=1&dq=internet+of+things+latest+edition+text+books&printsec=frontcover&q=inpublisher:%22Jenny+Stanford+Publishing%22&tbm=bks&sa=X&ved=2ahUKEwjTk-qLoJj4AhUTRmwGHdUbD28QmxMoAHoECBgQAg&sxsrf=ALiCzsaw34Okl3lvg8wuJltBRPAt-DpHXA:1654498736822) | | | | | | | |
| 2 | Internet of Things (IoT)- Principles, Paradigms and Applications of IoTBy Dr KamleshLakhwani, Dr Hemant Kumar Gianey, Joseph Kofi Wireko, Kamal Kant Hiran · 2020 | | | | | | | |
| 3 | Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-toMachine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014. | | | | | | | |
|  | | | | | | | | |
| **Reference Book(s)** | | | | | | | | |
| 1 | Fundamentals of Internet of ThingsBy [Sudhir Kumar](https://www.google.co.in/search?hl=en&sxsrf=ALiCzsYk2Jfzri2KzSfC6USCO5gbH6Zq7A:1654498729352&q=inauthor:%22Sudhir+Kumar%22&tbm=bks) · 2021, CRC Press | | | | | | | |
| 2 | Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012. | | | | | | | |
|  | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | Introduction to IOT  <https://nptel.ac.in/courses/106.105.106105166/> | | | | | | | |
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| Course Designed By: **Dr.R.VADIVEL** | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| **CO5** | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT33Q** | **MOBILE APPLICATION DEVELOPMENT - LAB** | **L** | | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | **-** | | | | | **-** | **4** | **4** |
| **Pre-requisite** | | | | | **Knowledge about the Internet, web and Mobile Networks** | **Syllabus Version** | | | | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To understand development of mobile applications. 2. To understand User Interface Design, Back end databases, other services for mobile applications. 3. To get exposure to Android and IOS development environment | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | | To understand User Interface Design, Back end databases, other services for mobile applications | | | | | | | | | K2 | |
| 2 | | | Understand the different mobile network technology | | | | | | | | | K2 | |
| 3 | | | Get familiar with Android and IOS environment | | | | | | | | | K3 | |
| 4 | | | Design and develop Mobile application using Android and IOS. | | | | | | | | | K6 | |
| 5 | | | Get a job with their own skills. | | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Mobile Communication and Technology Implementation** | | | | | | **12HOURS** | | | |
| Bluetooth –ZigBee - IrDA - RFID – IEEE 802.11 – GPS – NFC - Delivery of voice and text message | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **User Interface Design and Files/Directories** | | | | | **12HOURS** | | | | |
| User Interface Design - Files and Directories | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **Databases and Networking** | | | | **12HOURS** | | | | | |
| Databases – SQLite - Cursors and Content –Values – Working with SQlite  Networking and Emailing services - Maps – Geocoding – Location - Based Services – Alarm – service – Toast – – using sensors – Graphics – Media Player – Camera – Video | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Android** | | | | **12HOURS** | | | | | |
| Android Application Development | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **IOS** | | | **12HOURS** | | | | | | |
| IOS: iPhone Developer - Apple Developer Connection - Memory Management - Fundamental iPhone Design Patterns – Tables and Views | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | William Lee, Mobile Communications Engineering: Theory and Applications, Willey, 2017 | | | | | | | | | | | | |
| 2 | Ajit Singh 5G Simplified, SPD, 299 | | | | | | | | | | | | |
| 3 | Neil Smith, Android Studio 3.0 Development Essentials - Android 8 Edition,Payload Media, Inc. 207 | | | | | | | | | | | | |
| 4 | Ahmad Sahar , Craig Clayton, iOS 15 Programming for Beginners - Sixth Edition, Packt 2021 | | | | | | | | | | | | |
| 5 | AfifOsseiran, Jose F. Monserrat, PathickMarsch, 5G Mobile Wireless Communication, Cambridge University Press, 2016 | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Pradeep Kothari, “Android Application Development” Dream tech Press, 2015 | | | | | | | | | | | | |
| 2 | Matt Neuburg, Programming IOS 13 : Dive Deep into Views, View Controllers and Frame works,Orelly, 2011 | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | <https://onlinecourses.nptel.ac.in/noc16_cs13> | | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| **CO5** | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22IT33R** | **ADVANCED DATABASE**  **MANAGEMENT SYSTEMS - LAB** | | | **L** | | | **T** | **P** | | **C** |
| **Core/Elective/Supportive** | | | | | **Core** | | | **-** | | | **2** | **4** | | **4** |
| **Pre-requisite** | | | | | **UG level – Database management system** | | | **Syllabus Version** | | | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. This course aims at giving adequate exposure to students on the Database design and E-R modeling. 2. The course also facilitates students with hands on training on SQL, oracle and NoSQL (Mongo DB) within the DBMS environment. 3. It helps the students to understand the various designing concepts, storage methods, querying and managing databases. | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Model Entity Relationship with E-R diagrams | | | | | | | | | K3 | | |
| 2 | | | Design database schema considering normalization and Relationships within database | | | | | | | | | K3 | | |
| 3 | | | Write SQL queries to user specifications | | | | | | | | | K3 | | |
| 4 | | | Develop triggers, procedures, user defined functions and designaccurate and PLSQL programs in Oracle, XML and NoSQL. | | | | | | | | | K3 | | |
| 5 | | | Use the database from a front end application | | | | | | | | | K3 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Introduction** | | | | | | **12 HOURS** | | | | |
| Basic SQL – DDL & DML, Views, Group operations, aggregate operations, System  Operations in Oracle | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **UNIT:2** | | | | **Object-Based Distributed and Databases** | | | | | **12HOURS** | | | | | |
| Intermediate SQL –Joins, Subqueries, DCL operations, Advanced SQL – Nested tables, V-arrays | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **XML** | | | **12 HOURS** | | | | | | | |
| ER Modeling, Database Design and Normalization | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Spatial and Temporal Data and Mobility** | | | **12HOURS** | | | | | | | |
| Stored procedures and using them in a client application, DBA mechanisms – Installation, Backup and recovery operations, Batch processing | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **NoSQL** | | **12HOURS** | | | | | | | | |
| Mini Project - The course instructor shall provide real time problems / specifications to the students for mini project. The project shall be completed before the commencement of 2nd semester and a report shall be submitted. | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | **2HOURS** | | | | | | | | |
| Expert lectures, online seminars - webinars | | | | | | | | | | | | | | |
| Latest applications in RDBMS | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **62 HOURS** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | Silberschatz, Korth, Sudarshan, “Database system concepts”, 6th Edition, Tata McGraw Hill, 2011. | | | | | | | | | | | | | |
| 2 | C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8th Edition, Pearson Education Reprint 2016. | | | | | | | | | | | | | |
| 3 | Shashank Tiwari, “Professional NoSQL”, 2011. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1 | RamezElmasri,Shamkant B. Navathe, “Fundamentals ofDatabaseSystems”, 6th Edition, Addison-Wesley, 2011. | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | Database Management SystemBy Dr. B. Lavanya, Associate Professor, University of Madras, Chennai, Tamil Nadu.Duration : 12 weeks | | | | | | | | | | | | |
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| Course Designed By: **Dr.W.ROSEVARUNA** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | S | S | L | M | S | S |
| **CO3** | S | S | S | S | S | S | L | M | M | S |
| **CO3** | M | M | M | S | S | L | L | L | M | M |
| **CO4** | L | L | S | S | S | L | L | M | S | M |
| **CO5** | M | M | S | S | S | M | L | L | S | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE01** | **OBJECT ORIENTED SOFTWARE ENGINEERING** | **L** | | | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Elective** | **3** | | | | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **UG level – Software Engineering** | **Syllabus Version** | | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. This course aims at introducing to the students about the product that is to be engineered and the process that provides a framework for the engineering technology. 2. The course facilitates the students to analyse risk in software design and quality and to plan, design, develop and validate the software project. 3. It also improves the knowledge of the students to do research in further developments. | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Explain a process model for a software project Development. | | | | | | | | | | K1 | |
| 2 | | | Prepare the SRS, Design document, Project plan of a given software system | | | | | | | | | | K6 | |
| 3 | | | Apply Project Management and Requirement analysis, Principles to S/W Project development. | | | | | | | | | | K3 | |
| 4 | | | Analyse the cost estimate and problem complexity using various Estimation techniques | | | | | | | | | | K4 | |
| 5 | | | Explain software configuration process. | | | | | | | | | | K1 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Software Process and Life Cycle Models** | | | | | | **12 HOURS** | | | | |
| Software Development in Theory - Waterfall Life-Cycle Model - Rapid-Prototyping Life-Cycle Model - Open-Source Life-Cycle Model - Spiral Life-Cycle Model - Agile Processes - The Software Process - Improving the Software Process - Capability Maturity Models - Other Software Process Improvement Initiatives - Costs and Benefits of Software Process Improvement. | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **Planning and Estimation** | | | | | **12 HOURS** | | | | | |
| Planning and Estimating - Planning and the Software Process - Estimating Duration and Cost - Intermediate COCOMO - COCOMO II - Estimation Issues - Components of a Software Project Management Plan - Software Project Management Plan Framework - Planning Testing - Training Requirements - Documentation Standards - Testing the Software Project Management Plan. | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **Workflow of Software Life Cycle** | | | | **12 HOURS** | | | | | | |
| The Requirements Workflow - Overview of the Requirements Workflow - The BusinessModel - Initial Requirements - Metrics for the Requirements Workflow - Challenges of the Requirements Workflow - The Analysis Workflow - Extracting the Entity Classes - Challenges of the Analysis Workflow - The Design Workflow - Object-Oriented Design - Formal Techniques for Detailed Design - Metrics for Design - Challenges of the Design Workflow. | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Implementation Workflow** | | | | **12 HOURS** | | | | | | |
| The Implementation Workflow - Choice of Programming Language - Good Programming Practice - Coding Standards - Test Case Selection - Black-Box Unit-Testing Techniques - Comparison of Unit-Testing Techniques - Integration Testing - Product Testing- Acceptance Testing - Metrics for the Implementation Workflow - Challenges of the Implementation Workflow. | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Software Configuration Management** | | | **12 HOURS** | | | | | | | |
| Software Configuration Management - Software Configuration Items - The SCM Process - Identification of Objects in the Software Configuration - Version Control - Object Pool Representation of Components, Variants, and Versions - Change Control - The Change Control Process - Access and Synchronization Control - Configuration Audit - Status Reporting - SCM Standards. | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62 HOURS** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | Bernd Bruegge, “Object oriented software engineering”, Second Edition, Pearson Education. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1 | Stephan R. Schach, “Object Oriented Software Engineering”, Tata McGraw Hill, 2008. | | | | | | | | | | | | | |
| 2 | Roger Pressman, “Software Engineering”, sixth edition, Tata McGraw Hill, 2014. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | Software Engineering, Prof. Rajib Mall, Dept of CSE, IIT Kharagpur. | | | | | | | | | | | | |
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| Course Designed By: **Dr.W.ROSE VARUNA** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | M | S | S | M | S | S |
| **CO3** | S | S | S | S | S | S | S | L | S | M |
| **CO3** | S | S | S | S | S | S | S | M | M | M |
| **CO4** | S | S | M | S | S | S | S | L | M | S |
| **CO5** | M | L | L | L | L | S | S | L | S | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE02** | **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Elective** | **3** | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **UG-Level AI and Machine Learning** | **Syllabus version** | | | | **2022-23** | |
| **Course objectives** | | | | | | | | | | | |
| 1. To understand artificial intelligence 2. To understand machine learning 3. To familiar with AL & ML algorithms | | | | | | | | | | | |
| Expected Course Outcomes: | | | | | | | | | | | |
| On the successful completion of the course | | | | | | | | | | | |
| 1 | Students will also be able to understand basics of AI | | | | | | | | **K1** | | |
| 2 | To get exposure to students on the machine learning | | | | | | | | **K2** | | |
| 3 | To understand the basics of supervised learning and Unsupervised Learning | | | | | | | | **K3** | | |
| 4 | Students will Apply AI & Ml algorithms to solve the problems of complexity | | | | | | | | **K4** | | |
| 5 | To get a job in the AL & ML domain | | | | | | | | **K5** | | |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create | | | | | | | | | | | |
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| **UNIT:1** | | | **ARTIFICIAL INTELLIGENCE** | | | | 12 **HOURS** | | | | |
| Overview of Artificial Intelligence: importance of knowledge-knowledge based systems-knowledge organization-knowledge manipulation. LISP and AI Programming: Syntax and Numeric function, functions, predicates and conditionals-input and output and variables-properties lists and arrays | | | | | | | | | | | |
| **UNIT:2** | | | **NLP AND EXPERT SYSTEMS** | | | | 12 **HOURS** | | | | |
| Natural Language Processing: overview of linguistics-grammar and languages-basic parsing techniques-semantic analysis and representation structures-natural language generation-natural language generation and system. Expert systems and Architecture: rule based and non-production system architecture- dealing with uncertainty-knowledge acquisition and building tools. | | | | | | | | | | | |
| **UNIT:3** | | | **SUPERVISED LEARNING** | | | | 12 **HOURS** | | | | |
| Linear Models for Regression – Linear Basis Function Models – Bayesian Linear Regression– Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression– Linear Models for Classification – Common Classification Algorithms – K-Nearest-Neighbors – Decision Trees – Random Forest model – Support Vector Machines. | | | | | | | | | | | |
| **UNIT:4** | | | **UNSUPERVISED LEARNING** | | | | 12 **HOURS** | | | | |
| Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models –Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality –Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM). | | | | | | | | | | | |
| **UNIT:5** | | | **GRAPHICAL MODELS ADVANCED LEARNING** | | | | 12 **HOURS** | | | | |
| Bayesian Networks – Conditional Independence – Markov Random Fields – Learning –Naive Bayes Classifiers – Markov Model – Hidden Markov Model. Reinforcement Learning – Representation Learning – Neural Networks – Active Learning –Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines –Deep Learning. | | | | | | | | | | | |
| **UNIT:6** | | | **Contemporary Issues** | | | | 2 **HOURS** | | | | |
| Latest Development / Topics in Augmented Reality  Expert lectures, online seminars – Webinars | | | | | | |  | | | | |
| **Total lecture hours** | | | | | | | 62**HOURS** | | | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | | Dan W.Patterson “ Introduction to Artificial Intelligence and Expert System” Prentice Hall of India 2002 | | | | | | | | | |
|  | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | |
| 1 | | EthemAlpaydin, “Introduction to Machine Learning”, Third Edition, Prentice Hall of India,  2015 | | | | | | | | | |
| 2 | | Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006 | | | | | | | | | |
| 3 | | Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition,  CRC Press, 2014 | | | | | | | | | |
| 4 | | Fabio Nelli, “Python Data Analytics with Pandas, Numpy, and Matplotlib”, Second Edition,  Apress, 2018. | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | | https://archive.nptel.ac.in/courses/106/106/106106236/ | | | | | | | | | |
| 2 | | link https://archive.nptel.ac.in/courses/106/102/106102220/# | | | | | | | | | |
| 3 | | https://dl.matlabyar.com/siavash/ML/Book/Ethem%20Alpaydin-Introduction%20to%20Machine%20Learning-The%20MIT%20Press%20(2014).pdf | | | | | | | | | |
| 4 | | https://www.microsoft.com/en-us/research/uploads/prod/2006/01/Bishop-Pattern-Recognition-and-Machine-Learning-2006.pd | | | | | | | | | |
| 5 | | <http://noiselab.ucsd.edu/ECE228/>Murphy\_Machine\_Learning.pdf | | | | | | | | | |
| Course Designed By:**Dr.T. RAMESH** | | | | | | | | | | | |

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| Mapping with Programme Outcomes | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **M** | **M** | **M** | **S** | **M** | **S** | **M** | **S** | **M** |
| **CO2** | **S** | **S** | **S** | **S** | **M** | **S** | **M** | **L** | **S** | **L** |
| **CO3** | **M** | **M** | **L** | **L** | **L** | **M** | **L** | **M** | **M** | **M** |
| **CO4** | **M** | **S** | **M** | **L** | **S** | **S** | **M** | **L** | **L** | **S** |
| **CO5** | **M** | **S** | **S** | **M** | **M** | **L** | **S** | **M** | **M** | **L** |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE03** | | **OPEN SOURCE TECHNOLOGY** | **L** | | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | | **Elective** | **3** | | | | | **1** | **-** | **4** |
| **Pre-requisite** | | | | | | **Knowledge about Operating System, Internet and Web Programming** | **Syllabus Version** | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Students are able to learn fundamentals of open source operating system 2. Students are able to learn open source Desktop environment 3. Develop their own open source software using these tools | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Familiar with open source Operating System | | | | | | | | | | K2 | |
| 2 | | | Familiar with open source software tools and package | | | | | | | | | | K2 | |
| 3 | | | Design their own software package using open source software | | | | | | | | | | K3 | |
| 4 | | | Get a job with their own open source software development skills | | | | | | | | | | K6 | |
| 5 | | | Contribute the open software community | | | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | | **FOSS** | | | | | | **12 HOURS** | | | |
| Open Source - Definition – Terms - Technology – Need - Free and Open Source Software ( FOSS ) Open Source Software Licenses.. | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | | **Linux** | | | | | **12 HOURS** | | | | |
| Linux Kernel -Architecture - Internal representation of files -Inodes –Structure of a regular file –Directories – shell - Basic commands - Desktop environment –KDE –GNOME -Development environment tools and systems | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | | **Perl** | | | **12 HOURS** | | | | | | |
| Overview of Perl – Variables – Statements - Scalar values - Operators - Control structures – regular expressions – Arrays – Hashes – List processing - Pattern Matching – File Handling | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | | **PHP** | | | **12 HOURS** | | | | | | |
| Basic Syntax of PHP – web environment - Common PHP Script - Elements -Using Variables - Constants – Data types - Operators - Statements – Flow Control functions – Dates and Times - Working With Arrays - Using Functions - String Manipulation and Regular Expression - File and Directory Handling - Working With Forms - OOP | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | | **MySQL** | | | | **12 HOURS** | | | | | |
| Data Types -Primary Keys and Auto Increment Fields – Queries - SQL programs - Create Database and Tables – ODBC - Connecting to MySQL with PHP - Creating, opening and Closing a Connection - Inserting data with PHP - Retrieving data with PHP. | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | | **Contemporary Issues** | | | | **2 HOURS** | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
|  | | | | | **Total Lecture hours** | | | | **62 HOURS** | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | Michael Hausenblas, “Learning Modern Linux” O'Reilly, 2022 | | | | | | | | | | | | | |
| 2 | William "Bo" Rothwell, “Beginning Perl Programming: From Novice to Professional”, Apress,2019 | | | | | | | | | | | | | |
| 3 | Jon Duckett, “PHP & MySQL” Wrox2022 | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | | | |
| 1 | Marty Matthews, “Php And Mysql Web Development: A Beginner's Guide” McGraw Hill, 2015 | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | <https://swayam.gov.in/nd2_aic20_sp24/preview> | | | | | | | | | | | | |
| 2 | | <https://swayam.gov.in/nd2_aic20_sp31/preview> | | | | | | | | | | | | |
| 3 | | <https://swayam.gov.in/nd2_aic20_sp32/preview> | | | | | | | | | | | | |
| 4 | | <https://swayam.gov.in/nd1_noc19_cs41/preview> | | | | | | | | | | | | |
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| Course Designed By: **Dr. T. RAMESH** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | L | M | S | S | S | S | S | S | S | L |
| **CO3** | L | M | S | S | S | S | S | S | S | L |
| **CO3** | L | M | S | S | S | S | S | S | S | M |
| **CO4** | L | M | S | S | S | S | S | S | S | S |
| **CO5** | L | M | S | S | S | S | S | S | S | S |

\*S-Strong; M-Medium; L-Low

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| **Course Code** | | **22ITE04** | **ADVANCED COMPUTER NETWORKS** | **L** | | **T** | **P** | **C** |
| **Core/ Elective/ Supportive** | | | **Elective** | **3** | | **1** | **-** | **4** |
| **Pre-requisite** | | | **UG-Degree level: Computer Networks** | **Syllabus Version** | | | **2022-23** | |
| **Course Objectives:** | | | | | | | | |
| The main objectives of this course are to:   1. To study communication network protocols, different communication layer structure 2. To learn the security mechanism for data communication | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | To master the terminology and concepts of the OSI reference model and the TCPIP reference model. | | | | | | **K2** | |
| 2 | To master the concepts of protocols, network interfaces, anddesign/performance issues in local area networks and wide area networks. | | | | | | **K3/K4** | |
| 3 | To be familiar with wireless networking concepts, and be familiar with contemporary issues in networking technologies. | | | | | | **K2/K3/K4** | |
| 4 | To be familiar with network tools and network programming | | | | | | **K5/K6** | |
| **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6**– Create | | | | | | | | |
| **UNIT: 1** | | **Introduction** | | | **12 HOURS** | | | |
| Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP models – Example networks: Internet, 3G Mobile phone networks, Wireless LANs –RFID and sensor networks - Physical layer – the theoretical basis for data communication - guided transmission media | | | | | | | | |
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| **UNIT: 2** | | **Wireless transmission** | | | **12 HOURS** | | | |
| Wireless transmission - Communication Satellites – Digital modulation and multiplexing - Telephones network structure – local loop, trunks, and multiplexing, switching. Datalink layer: Design issues – error detection and correction. | | | | | | | | |
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| **UNIT: 3** | | **Elementary data link protocols** | | | **12 HOURS** | | | |
| Elementary data link protocols - sliding window protocols – Example Data Link protocols – Packet over SONET, ADSL - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols. | | | | | | | | |
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| **UNIT: 4** | | **Network layer** | | | **12 HOURS** | | | |
| Network layer - design issues - Routing algorithms - Congestion control algorithms – Quality of Service – Network layer of Internet- IP protocol – IP Address – Internet Control Protocol. | | | | | | | | |
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| **UNIT: 5** | | **Transport layer** | | | **12 HOURS** | | | |
| Transport layer – transport service- Elements of transport protocol - Addressing, Establishing & Releasing a connection – Error control, flow control, multiplexing and crash recovery - Internet Transport Protocol – TCP - Network Security: Cryptography. | | | | | | | | |
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| **UNIT: 6** | | **Contemporary Issues** | | | **2 HOURS** | | | |
| Expert lectures, online seminars – webinars | | | | | | | | |
| Latest Development / Topics in Advanced Networking | | | | | | | | |
|  | | **Total Lecture hours** | | | **62 HOURS** | | | |
| **Text Book(s)** | | | | | | | | |
| 1 | S. Tanenbaum, 2011, Computer Networks, Fifth Edition, Pearson Education, Inc. | | | | | | | |
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| **Reference Book(s)** | | | | | | | | |
| 1 | B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, New Delhi. | | | | | | | |
| 2 | F. Halsall, 1995, Data Communications, Computer Networks and Open Systems, Addison Wessley. | | | | | | | |
| 3 | D. Bertsekas and R. Gallagher, 1992, Data Networks, Prentice hall of India, New Delhi. | | | | | | | |
| 4 | Lamarca, 2002, Communication Networks, Tata McGraw Hill, New Delhi. | | | | | | | |
| 5 | Teresa C.Piliouras, “Network Design Management and Technical Perspectives, Second Edition”, Auerbach Publishers, 2015. | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | <http://peasonhighered.com/tanenbaum> | | | | | | | |
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| Course Designed By: **Dr.R.VADIVEL** | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | M | S | S | M | S | S |
| **CO3** | S | S | S | S | S | S | S | L | S | M |
| **CO3** | S | S | S | S | S | S | S | M | M | M |
| **CO4** | S | S | M | S | S | S | S | L | M | S |
| **CO5** | M | L | L | L | L | S | S | L | S | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **DEEP LEARNING** | **L** | **T** | | **P** | **C** | |
| **Core/Elective/Supportive** | | | | **Elective** | **3** | **1** | | **-** | **4** | |
| **Pre-requisite** | | | | **UG level - AI & ML** | **Syllabus version** | | | **2022-23** | | |
| **Course objectives** | | | |  | | | | | | | |
| 1. To introduce the fundamental techniques and principles of Neural Networks 2. To study the different models in ANN and their applications 3. To familiarize deep learning concepts with Convolutional Neural Network case studies | | | | | | | | | | | |
| Expected Course Outcomes: | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | Propose a simple Neural Networks using Linear Perceptron | | | | | | | | | **K1** | |
| 2 | Implement a Convolutional Neural Networks using TensorFlow | | | | | | | | | **K2** | |
| 3 | Improve an application based on Recurrent Neural Network | | | | | | | | | **K3** | |
| 4 | Explain the Deep Reinforcement Learning problem | | | | | | | | | **K4** | |
| 5 | Construct the Speech and Text applications based Deep neural network. | | | | | | | | | **K5** | |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create | | | | | | | | | | | |
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| **UNIT:1** | | | **NEURAL NETWORK** | | | | **12 HOURS** | | | | |
| Mechanics of Machine Learning-Neuron-Linear Perceptron-Feed-Forward Neural Networks-Sigmoid, Tanh, and ReLU Neurons- Training Feed-Forward Neural Networks-Fast-Food Problem-Gradient Descent Delta Rule and Learning Rates-backpropagation-gradient Decent. | | | | | | | | | | | |
| **UNIT:2** | | | **CONVOLUTIONAL NEURAL NETWORKS** | | | | **12 HOURS** | | | | |
| TensorFlow: Creating and Manipulating TensorFlow Variables-TensorFlow Operations-Neurons in Human Vision Convolutional Layer-Building a Convolutional Network-Visualizing Learning in Convolutional Networks-Learning Lower Dimensional Representations- Principal Component Analysis- Autoencoder Architecture- Implementing an Autoencoder in TensorFlow-sparsity in autoencoders-input vector-word2Vec framework-implementing skip gram architecture. | | | | | | | | | | | |
| **UNIT:3** | | | **RECURRENT NEURAL NETWORKS** | | | | **12 HOURS** | | | | |
| Recurrent Neural Networks- Challenges with Vanishing Gradients- Long Short-Term Memory (LSTM) Units TensorFlow Primitives for RNN Models- Implementing a Sentiment Analysis Model- Solving seq2seq Tasks with Recurrent Neural Networks-Memory Augmented Neural Networks: Neural Turing Machines, Attention-Based Memory Access, NTM memory address, Differentiable neural Computers (DNC) -Memory Reuse - Temporal Linking – DNC Controller Network – Visualizing – Implementing the DNC in TensorFlow. | | | | | | | | | | | |
| **UNIT:4** | | | **DEEP REINFORCEMENT LEARNING** | | | | **12 HOURS** | | | | |
| Deep Reinforcement Learning - Masters Atari Games-Markov Decision Processes (MDP), Explore Versus Exploit -Policy Versus Value Learning, PoleCart with Policy Gradients ,Open AI gym, building the model and optimizer, sample actions, keep track of history, bellman equation-Q-Learning and Deep Recurrent Q-Networks. | | | | | | | | | | | |
| **UNIT:5** | | | **APPLICATIONS** | | | | **12 HOURS** | | | | |
| Applications in Object Recognition and Computer Vision- Unsupervised or generative feature learning Supervised feature learning and classification- Applications in Multimodal and Multi-task Learning- Multimodalities: Text and image-Speech and image- Multi-task learning within the speech, NLP or image domain | | | | | | | | | | | |
| Total lecture hours | | | | | | | **62 HOURS** | | | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | | Nikhil Buduma, Nicholas Locascio, “Fundamentals of Deep Learning: Designing Next-Generation MachineIntelligence Algorithms”, O'Reilly Media, 2017. | | | | | | | | | |
| 2 | | Li Deng and Dong Yu “Deep Learning Methods and Applications”, Foundations and Trends in Signal Processing, 2013. | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | |
| 1 | | Ian Goodfellow, YoshuaBengio, Aaron Courville, ”Deep Learning (Adaptive Computation and Machine Learningseries”, MIT Press, 2017. | | | | | | | | | |
| 2 | | SandroSkansi“Introduction to Deep Learning From Logical Calculus to Artificial Intelligence”Springer, 2018. | | | | | | | | | |
| 3 | | Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015. | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1. | | https://www.oreilly.com/ai/free/files/fundamentals-of-deep-learning-sampler.pdf | | | | | | | | | |
| Course Designed By: **Dr.T. RAMESH** | | | | | | | | | | | |

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| Mapping with Programme Outcomes | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | M | L | M | L | M |
| **CO2** | S | L | L | S | M | M | M | L | M | S |
| **CO3** | M | M | L | L | L | M | L | M | M | M |
| **CO4** | M | L | M | L | L | S | M | S | L | S |
| **CO5** | M | S | S | M | M | L | S | M | M | L |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE06** | **CLOUD COMPUTING** | **L** | | | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | Elective | **3** | | | | | | **1** | **-** | **4** |
| **Pre-requisite** | | | | | **UG level – Networking and System Infrastructure** | **Syllabus Version** | | | | | **2022-23** | | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Students will gain knowledge on Cloud computing fundamentals and Architecture by learning Cloud computing toolkits 2. Cloud computing paradigm covers a range of distributed computing, hosting and access solutions, including service-based computing 3. The objective of the course is to provide comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations. | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Describe the key technologies, architecture, strengths, limitations and applications of Cloud computing | | | | | | | | | | K2 | |
| 2 | | | Explain the types and service models of cloud. | | | | | | | | | | K2 | |
| 3 | | | Describe the core issues such as security, privacy, and interoperability in cloud platform. | | | | | | | | | | K2 | |
| 4 | | | Apply suitable technologies, algorithms, and applications in cloud computing driven systems | | | | | | | | | | K3 | |
| 5 | | | Provide appropriate cloud computing solutions for the current scenario | | | | | | | | | | K5 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Computing Basics** | | | | | | **12HOURS** | | | | |
| Cloud computing definition-Characteristics-Benefit-Challenges-DistributedSystems- Virtualization-Service-oriented computing- Utility-oriented computing-Building Cloud Computing environments-Applicationdevelopment-Infrastructureandsystemdevelopment- computing platforms & technologies. | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **Virtualization and Cloud Architecture** | | | | | **12HOURS** | | | | | |
| Virtualization: Virtualization- Characteristics- taxonomy-types-Virtualization and cloud computing - Pros and Cons - Advantages of virtualization – Disadvantages. Architecture: The cloud reference model - Types of clouds - Economics of the cloud - Open challenges - Cloud interoperability and standards - Scalability and fault tolerance - Security, trust, and privacy. | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **CloudPlatformsinIndustry** | | | | **12HOURS** | | | | | | |
| Amazonwebservices – Computeservices – Storageservices – Communicationservices – Additionalservices – GoogleAppEngine – Architectureandcoreconcepts – Applicationlifecycle – Costmodel - MicrosoftAzure – Azurecoreconcepts – SQLAzure – WindowsAzureplatformappliance. | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Secure Distributed data storage in Cloud Computing** | | | | **12HOURS** | | | | | | |
| Introduction - Cloud Storage: from LANs TO WANs - Moving From LANs to WANs -Existing Commercial Cloud Services - Vulnerabilities in Current Cloud Services - Bridge the Missing Link - Technologies for Data Security in Cloud Computing - Database Outsourcing and Query Integrity Assurance - Data Integrity in Untrustworthy Storage - Web-Application-Based Security - Multimedia Data Security Storage - Open Questions and Challenges. | | | | | | | | | | | | | | |
| **UNIT:5** | | | | **Data security in Cloud** | | | **12HOURS** | | | | | | | |
| An Introduction to the Idea of Data Security - The Current State of Data Security in the Cloud - Cloud Computing and Data Security Risk - Cloud Computing and Identity – Identity, Reputation, and Trust - Identity for Identity’s Sake - Cloud Identity - The Cloud, Digital Identity, and Data Security - Content Level Security—Pros and Cons - Future Research Directions. | | | | | | | | | | | | | | |
| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | | |
| Expert lectures, online seminars - webinars | | | | | | | | | | | | | | |
| Latest developments/topics in Cloud Computing | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62HOURS** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | Buyya, Vecciola and Selvi, “Mastering Cloud Computing: Foundations and Applications Programming”, Tata McGraw Hill, 2013. | | | | | | | | | | | | | |
| 2 | RajkumarBuyya, James Broberg, Andrzej Goscinski, “CLOUD COMPUTINGPrinciples and Paradigms”, Wiley publications 2011. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1 | Haley Beard,“Cloud Computing best practices”. | | | | | | | | | | | | | |
| 2 | Michael Miller ,“Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online” 2009. | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | Cloud computingBy Prof. SoumyaKanti Ghosh | IIT Kharagpur | | | | | | | | | | | | |
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| Course Designed By: **Dr.W.ROSEVARUNA** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **L** | **S** | **S** | **M** | **L** | **M** | **M** | **S** |
| **CO3** | **S** | **S** | **M** | **S** | **S** | **M** | **L** | **S** | **M** | **L** |
| **CO3** | **S** | **S** | **M** | **S** | **S** | **M** | **L** | **S** | **M** | **M** |
| **CO4** | **S** | **S** | **M** | **S** | **S** | **M** | **L** | **S** | **M** | **M** |
| **CO5** | **S** | **S** | **M** | **S** | **S** | **M** | **L** | **M** | **M** | **M** |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE07** | | **DIGITAL IMAGE PROCESSING** | **L** | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | **Elective** | | | **3** | | | | **1** | **-** | **4** |
| **Pre-requisite** | | | | Degree Level - Digital Electronics, Probability and Statistics, Calculus, Mathematics, Digital signal processing. | | | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To study basic image processing techniques for solving real problems. 2. To study the image transform and Image enhancement techniques in image processing. 3. To study the Image compression and Segmentation procedures. | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | | Understand about the fundamentals of Digital Image Processing. | | | | | | | | | K2 | |
| 2 | | | Describe about advanced concepts in image compression and segmentation. | | | | | | | | | K2 | |
| 3 | | | Apply, design and implement solutions for digital image processing problems. | | | | | | | | | K3 | |
| 4 | | | Describe and apply the concepts of feature selection and extraction for digital image retrieval. | | | | | | | | | K4 | |
| 5 | | | Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner. | | | | | | | | | K5 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | | |
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| **UNIT:1** | | | | | **Digital Image Fundamentals** | | | | | **12 HOURS** | | | |
| Digital Image, Applications of Digital Image Processing- Elements of Digital Image Processing- Digital Camera, Line Scan CCD Sensor – Display Element Perception – Luminance – Brightness, Contrast- Color Models – RGB, CMY, HSI.  . | | | | | | | | | | | | | |
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| **UNIT:2** | | | | | **Image Transform** | | | | **12 HOURS** | | | | |
| Fourier Transforms- Unitary Transform- Properties of Unitary Transform – 2D DFT – DCT- Discrete Wavelet Transform- Hotelling Transform – SVD Transform – Slant, Hadamard Transform, Haar Transforms. | | | | | | | | | | | | | |
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| **UNIT:3** | | | | | **Image Enhancement and Restoration** | | | | | **12 HOURS** | | | |
| Contrast Stretching – Intensity Level Slicing – Histogram Equalization – Spatial Averaging – Smoothing – Maximum, Minimum, Median filtering – Inverse Filtering – Wiener Filtering - Constrained Least Square Filtering - Geometric Mean Filter– Edge Detection – Degradation Model –Estimating the Degradation Function. | | | | | | | | | | | | | |
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| **UNIT:4** | | | | | **Image Compression** | | | | | **12 HOURS** | | | |
| Huffman’s Coding – Binary Codes – Predictive Coding – Bit Plane Coding - Arithmetic Coding - Run Length Coding- Transform Coding – JPEG and MPEG Coding. | | | | | | | | | | | | | |
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| **UNIT:5** | | | | | **Image Segmentation** | | | | | **12 HOURS** | | | |
| Point, Line and Edge Detection: Detection of Isolated Points – Line Detection – Edge Models – Basic Edge Detection – Thresholding: Basic Global thresholding – Multiple Thresholds – Variable Thresholding – Region based Segmentation: Region Growing – Region Splitting and Merging. | | | | | | | | | | | | | |
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| **UNIT:6** | | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | |
| Latest developments/topics in Digital Image Processing. | | | | | | | | | | | | | |
|  | | | | | **Total Lecture hours** | | | **62 HOURS** | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | Gonzalez R.C and Woods R. E, “Digital image processing”, Pearson/Prentice Hall, Fourth Edition, 2018. | | | | | | | | | | | | |
| 2 | S.Jayaraman, S.Esakkirajan and T.Veerakumar, “Digital Image Processing”, Tata McGraw Hill Education Private Limited, 2015 | | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | | |
| 1 | Anil K Jain “Fundamentals of Digital image processing”, Pearson, First Edition, 2015. | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | <https://swayam.gov.in/nd1_noc19_ee55/preview> | | | | | | | | | | | |
| 2 | | <https://www.classcentral.com/course/swayam-digital-image-processing-14005> | | | | | | | | | | | |
| Course Designed By: **Dr. T. RAMESH** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | L | L | M | L | M | L | M | M | M | M |
| **CO3** | M | M | L | M | S | M | L | M | M | L |
| **CO3** | M | S | M | L | M | M | S | M | L | M |
| **CO4** | M | M | S | S | M | S | S | M | L | M |
| **CO5** | S | S | M | M | M | S | S | M | M | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE08** | **BLOCKCHAIN TECHNOLOGY** | **L** | | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Elective** | **3** | | | | | **1** | **-** | **4** |
| **Pre-requisite** | | | | | **UG level – Computer Science** | **Syllabus Version** | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To give students the understanding of emerging abstract models for Blockchain Technology and to familiarise with the functional/operational aspects of cryptocurrency eco-system. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | | Describe the basic concepts and technology used for blockchain. | | | | | | | | | K1 | |
| 2 | | | Describe the primitives of the distributed computing and cryptography related to blockchain. | | | | | | | | | K6 | |
| 3 | | | Illustrate the concepts of Bitcoin and their usage. | | | | | | | | | K3 | |
| 4 | | | Apply security features in blockchain technologies. | | | | | | | | | K4 | |
| 5 | | | Use smart contract in real world applications. | | | | | | | | | K1 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Digital Money and Cryptography** | | | | | | **12 HOURS** | | | |
| Digital Money: Interbank Payments - Same Bank - Different Banks - Correspondent Bank -Accounts - Central Bank Accounts - International Payments - E-Money Wallets. Cryptography: Cryptography - Encryption and Decryption – Hashes - Digital Signatures. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **UNIT:2** | | | | **Crypto currencies - Bitcoin** | | | | | **12 HOURS** | | | | |
| Bitcoin: - Bitcoin, Bitcoin Working Principles - Bitcoin’s Ecosystem - Bitcoin in Practice - Bitcoin’s Predecessors - Bitcoin’s Early History - Bitcoin’s Price - Storing Bitcoins - Software Wallets - Hardware Wallets - Buying and Selling Bitcoins – Exchanges - Over the Counter (OTC) Brokers – Localbitcoins . | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **Crypto currencies - Ethereum, Forks** | | | | **12 HOURS** | | | | | |
| Ethereum: Ethereum - Smart Contracts - Ethereum’s History - Actors in the Ethereum Ecosystem - Ether Price. Forks: A Fork of a Codebase - A Fork of a Live Blockchain: Chainsplits - Result of a Deliberate, Deliberate Chainsplit Working principles - Media Descriptions - Hard Forks vs Soft Forks. | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Blockchain Technology** | | | | **12 HOURS** | | | | | |
| Blockchain Technology: - Public Blockchains – Speculation - Darknet Markets - Cross Border Payments - Initial Coin Offerings (ICOs) – Other - Private Blockchains - Notable Private Blockchains - Blockchain Experiments. | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Initial Coin Offerings and Investing** | | | **12 HOURS** | | | | | | |
| Initial Coin Offerings: -ICO –ICO working principles- Whitepapers - The Token Sale - ICO Funding Stages – Whitelisting - Funding Caps – Treasury - Exchange Listing – Token a Security Investing: Pricing - Controls the Price of Utility Tokens - Risks and Mitigations - Market Risk - Liquidity Risk - Exchange Risks - Wallet Risks - Regulatory Risks – Scams. | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | Antony Lewis, “The Basics of Bitcoins and Blockchains”, 2018, Mango Publishing Group. | | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | | |
| 1 | Narayanan, Bonneau, Felten, Miller and Goldfeder, “Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction”, Princeton University Press. | | | | | | | | | | | | |
| 2 | Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017. | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | Blockchain By Dr.Mayank Aggarwal, GurukulKangriVishwavidyalaya, Haridwar | | | | | | | | | | | |
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| Course Designed By: **Dr.W.ROSE VARUNA** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | M | S | S | M | S | S |
| **CO3** | S | S | S | S | S | S | S | L | S | M |
| **CO3** | S | S | S | S | S | S | S | M | M | M |
| **CO4** | S | S | M | S | S | S | S | L | M | S |
| **CO5** | M | L | L | L | L | S | S | L | S | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE09** | **ROBOTICS AND AUTOMATION** | **L** | | | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Elective** | **3** | | | | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **Basics about the Automation** | **Syllabus Version** | | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Students can understand the concept of Automation 2. Students can familiar with the concept of Robotics, Micro Robotics Humanoid Robotics and Industrial Robotics 3. Students can contribute their own design and development of Industrial Robotics | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Understand the concept of Automation | | | | | | | | | | K2 | |
| 2 | | | Redesign the existing Automation system in the Industry | | | | | | | | | | K3 | |
| 3 | | | Understand the working principles of Robotics, Micro Robotics and Industrial Robotics | | | | | | | | | | K2 | |
| 4 | | | Understand the Merits, Demerits and Challenges of designing a Robotics system | | | | | | | | | | K5 | |
| 5 | | | Contribute to design and develop new Robotics system | | | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **UNIT:1** | | | | **Introduction to Robotics** | | | | | | **12 HOURS** | | | | |
| History of Robotics - Classification of Robotics - Industrial Automation Theory of Machines and Mechanisms : Popular Mechanisms - Gear and Gear Trains Synthesis of Mechanisms - Kinematic Analysis of Mechanisms - Practical Guide to use Various Mechanisms - Introduction to Electronics : Basic Elements - Sensor Design - Using the Parallel and Serial Port of the Computer - Microcontroller - Actuators. | | | | | | | | | | | | | | |
| **UNIT:2** | | | | **Kinematics of Robotic Manipulator and Sensors in Robotics** | | | | | **12 HOURS** | | | | | |
| Introduction - Position and Orientation - Frames - Forward Kinematics - Links and Joints - Notations - Kinematic Modeling - Manipulator - Geometric Solution - Systematic Solution Sensors in Robotics **:** Classification of Sensors - Encoders and Dead Reckoning - Infrared Sensors - Ground-Based RF Systems - Active Beacons - Ultrasonic Transponder - Trilatertion - Acceleretometers - Gyroscopes - Gyros - Laser Range-Finder - Vision Based Sensors - Color-Tracking Sensors - Sensor Mounting Arrangement Design of the Circuitry - Reading the Pulses in a Computer | | | | | | | | | | | | | | |
| **UNIT:3** | | | | **Wheeled Mobile Robot and Legged Robots** | | | | **12 HOURS** | | | | | | |
| Introduction - Classification - Kinematics and Mathematical Modeling - Control of WMR - Identification and Elimination of the Problem - Kinematics of Robotic Manipulator – Legged Robots - Balance of Legged Robots - Analysis of Gaits in Legged Animals - Kinematics of Leg Design | | | | | | | | | | | | | | |
| **UNIT:4** | | | | **Introduction to Micro Robotics and Humanoid Robotics** | | | | **12 HOURS** | | | | | | |
| Micro Robotics : Introduction - Size and Fabrication Technology - Mobility and Functional for MEMS based micro-robots - Arrayed actuator - principles - actuators - Micro-conveyors - Walking MEMS Micro-robots – Micro-robot powering - Micro-robot communication - Micro-fabrication principles - Design selection criteria for micromachining - Packaging and Integration aspects – Micro-assembly platforms and manipulators Humanoid Robotics : Characteristics – Kinematics of Humanoid robotics – Dynamics of Humanoid Robotics – 2D walking pattern and Whole Body motion | | | | | | | | | | | | | | |
| **UNIT:5** | | | | **Industrial Applications and Case Studies** | | | **12 HOURS** | | | | | | | |
| Robot Applicator – Industrial Application – Material Handling – Processing Application – Assembly Application – Inspection Application – Principles of Robot application and play Case studies : Automation in automobile Industries – Textile Industries – Mechanical Industries – Humanoid Robotics | | | | | | | | | | | | | | |
| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | |
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|  | | | | **Total Lecture hours** | | | **62 HOURS** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | R Mittle, I Nagrath,“Robotics and Control”, McGraw Hill, 2017 | | | | | | | | | | | | | |
| 2 | Nagarajan, “Introduction To Industrial Robotics”, PEARSON INDIA, 2016 | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1 | Kajita, S., Hirukawa, H., Harada, K., Yokoi, K., Introduction to Humanoid Robotics, , Springer 2014 | | | | | | | | | | | | | |
| 2 | Frank Chongwoo Park and Kevin M. Lynch, Modern Robotics: Mechanics, Planning, and Control, , Cambridge University Press, 2017 | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | <https://swayam.gov.in/nd1_noc19_me74/preview> | | | | | | | | | | | | |
| 2 | | https://nptel.ac.in/courses/107/106/107106090/ | | | | | | | | | | | | |
| 3 | | https://nptel.ac.in/courses/112/101/112101099/ | | | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | M | S | M | S | L | L |
| **CO3** | M | M | S | L | M | S | M | S | L | S |
| **CO3** | M | M | S | L | M | S | M | S | L | M |
| **CO4** | M | M | S | L | M | S | M | S | L | L |
| CO5 | M | M | S | L | M | S | M | S | L | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE10** | **INTRODUCTION TO FINTECH** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Elective** | **3** | | | **1** | | **-** | **4** |
| **Pre-requisite** | | | | | **Knowledge about E-Commerce** | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are :  CO1: To understand the evolutionary of financial technology  CO2: To explain the impact of AI on financial services  CO3: To understand the technology of modern financial technology | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | Gain knowledge about the evolution of financial technology | | | | | | | | K2 | |
| 2 | | | Understand the technology impact in financial services | | | | | | | | K2 | |
| 3 | | | Apply modern financial technology concepts in financial services | | | | | | | | K3 | |
| 4 | | | Create their own technology in financial services | | | | | | | | K6 | |
| 5 | | | Get a job with their own skills. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Introduction to FinTech** | | | | **12 HOURS** | | | | |
| Evolution of FinTech - FinTech Evolution 1.0: Infrastructure - FinTech Evolution 2.0: Banking industry - FinTech Evolution 3.0 & 3.5: Startups and Emerging Markets - Importance of FinTech - Global FinTech Investment, Main FinTech Hubs | | | | | | | | | | | | |
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| **UNIT:2** | | | | **FinTech in Financial Services Industry - I** | | | **12 HOURS** | | | | | |
| FinTech in Payment Industry - Multichannel digital wallets - applications supporting wallets - onboarding and KYC application - FinTech in Lending Industry : Formal lending - Informal lending - P2P lending - POS lending - Online lending - Payday lending - Microfinance - Crowdfunding | | | | | | | | | | | | |
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| **UNIT:3** | | | | **FinTech in Financial Services Industry-II** | | **12 HOURS** | | | | | | |
| FinTech in Wealth Management Industry : Financial Advice - Automated investing - Socially responsible investing - Fractional Investing - Social Investing.  FinTech in Insurance Industry : P2P insurance - On-Demand Insurance - On-Demand Consultation -Customer engagement through Quote to sell - policy servicing - Claims Management - Investment linked health insurance. | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Modern Technology and FinTech Innovations** | | **12 HOURS** | | | | | | |
| 4G and 5G networks - transforming customer experience using Mobile Applications and smart phones, embedded sensors and social media, Cloud computing, Web 2.0, Rapid Web Design, JavaScript Technologies, IoT, Big Data Analytics and AI | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Digital Finance** | | **12 HOURS** | | | | | | |
| Payments, Digital Finance and Alternative Finance - RTGS SystemsCrypto currencies and Blockchain Technology- Legal and Regulatory - Implications of Crypto currenciesAdvantages of New Payment Stacks - Digitization of Financial Services - FinTech& Funds | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **62 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Sanjay Phadke (2020), Fintech Future : The Digital DNA of Finance, Sage Publications | | | | | | | | | | | |
| 2 | Pranay Gupta, T. Mandy Tham (2018). Fintech: The New DNA of Financial Services,  RBI(2017). Report of working group on FinTech and Digital Banking | | | | | | | | | | | |
| 3 | Parag Y Arjunwadkar (2018), FinTech: The Technology Driving Disruption in the financial service industry CRC Press. | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | Susanne Chishti, Janos Barberis (2016). The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, Wiley Publications | | | | | | | | | | | |
| 2 | Richard Hayen (2016). FinTech: The Impact and Influence of Financial Technology on Banking and the Finance Industry | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | <https://onlinecourses.nptel.ac.in> | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| CO5 | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | **22ITE11** | **AUGMENTED REALITY** | **L** | **T** | **P** | | **C** | |
| **Core/Elective/Supportive** | | | | **Elective** | **3** | **1** | **-** | | **4** | |
| **Pre-requisite** | | | | **UG-Level - Computer Graphics and Image Processing** | **Syllabus version** | | **2022-23** | | | |
| **Course objectives** | | | | | | | | | | | |
| 1. To provide a foundation to the fast growing field of AR 2. To make the students aware of the various AR devices. 3. To get the job in the AR domain | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| CO1 | Define how AR systems work and list the applications of AR. | | | | | | | | | **K1** | |
| CO2 | Understand and evaluates the hardware requirement of AR. | | | | | | | | | **K2** | |
| CO3 | Use computer vision concepts for AR and describe AR techniques | | | | | | | | | **K3** | |
| CO4 | Analyse and understand the working of various state of the art AR devices | | | | | | | | | **K4** | |
| CO5 | Gain knowledge of mixed reality | | | | | | | | | **K5** | |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create | | | | | | | | | | | |
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| **UNIT:**1 | | **Introduction to Augmented Reality** | | | | | | **12HOURS** | | | |
|  | | Augmented Reality – Definition – History - Relationship Between Augmented Reality and Other Technologies- Media, Technologies - Applications of augmented reality- Augmented Reality Concepts | | | | | | | | | |
| **UNIT:**2 | | **Augmented Reality Hardware** | | | | | | **12HOURS** | | | |
|  | | **Augmented Reality Display Hardware :**Audio Displays, Haptic Displays, Visual Displays, Othersensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model.**Processors : -**Role of Processors, Processor System Architecture, Processor Specifications.**Tracking & Sensors**: Tracking, Calibration, and Registration, Characteristics of Tracking Technology,Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion. | | | | | | | | | |
| **UNIT:**3 | | **Computer Vision and Software for Augmented Reality** | | | | | | **12HOURS** | | | |
|  | | **Computer Vision for Augmented Reality** - Marker Tracking, Multiple-Camera Infrared Tracking,Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking**Augmented Reality Software** - Introduction, Major Software Components for Augmented RealitySystems, Software used to Create Content for the Augmented Reality Application. | | | | | | | | | |
| **UNIT:**4 | | **Calibration and Visual Coherence** | | | | | | **12 HOURS** | | | |
|  | | Calibration and registration: camera calibration-display calibration-registration-geometric measurement distortions-error propagation-latency-filtering and prediction.Visual Coherence: registration-occlusion-photometric registration-common illumination-diminished reality-camera simulation-stylized augmented reality. | | | | | | | | | |
| **UNIT:**5 | | **Modeling Annotation and Authoring** | | | | | | **12HOURS** | | | |
|  | | Modeling annotation-specifying geometry-appearance-semi automatic reconstruction-freeform modeling-annotation. Authoring-requirements of AR Authoring-elements of authoring-stand-alone authoring solutions.Navigation-human navigation-exploring and discovery -route visualization view point guidance-multiple perspective. | | | | | | | | | |
| **UNIT:**6 | | **Contemporary Issues** | | | | | | 2 **HOURS** | | | |
|  | | Expert lectures, online seminars – webinars  Latest Development / Topics in Augmented Reality | | | | | | | | | |
| **Total lecture hours** | | | | | | | | 62 **HOURS** | | | |
|  | | **Text Book(s)** | | | | | | | | | |
| 1 | | Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178 | | | | | | | | | |
| 2 | | Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India;First edition (12 October 2016),ISBN-10: 9332578494 | | | | | | | | | |
|  | |  | | | | | | | | | |
|  | | **Reference Books** | | | | | | | | | |
| 1 | | Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN:9781491962381 | | | | | | | | | |
| 2 | | SanniSiltanen- Theory and applications of marker-based augmented reality. Julkaisija –Utgivare Publisher. 2012. ISBN 978-951-38-7449-0 | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| <https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf>  https://docs.microsoft.com/en-us/windows/mixed-reality/  <https://docs.microsoft.com/en-us/archive/msdn-magazine/2016/november/hololensintroduction-to-the-hololens>  https://www.coursera.org/learn/ar https://www.udemy.com/share/101XPi/ | | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | | |

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| Mapping with Programme Outcomes | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | M | S | L | L | M |
| **CO2** | S | M | S | S | M | S | M | L | M | L |
| **CO3** | M | L | M | M | L | L | L | M | L | M |
| **CO4** | M | S | M | L | S | S | M | L | S | S |
| **CO5** | M | M | S | M | M | L | S | M | M | L |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITE12** | **INDUSTRIAL INTENET OF THINGS** | **L** | | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Elective** | **3** | | | | | **1** | **-** | **4** |
| **Pre-requisite** | | | | | **Knowledge about the Networks Fundamentals and TCP/IP** | **Syllabus Version** | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Students can understand Internet of Things and Industrial Internet of Things 2. Students can familiar with open source Sensor and Actuator devices and Communication technology and security techniques 3. Students can contribute their own design and development of IoT and IIoT devices | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | | Remember the concept of Internet and Intranet | | | | | | | | | K1 | |
| 2 | | | Understand the concept of IoT and IIoT Devices, Data Flow and Security | | | | | | | | | K2 | |
| 3 | | | Understand the existing process in the Home/Industrial automation | | | | | | | | | K4 | |
| 4 | | | Redesign the existing system in the Home/Industries automation | | | | | | | | | K5 | |
| 5 | | | Contribute to design and develop new protocols/ privacy control/ Industrial Devices | | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | | | | |
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| **UNIT:1** | | | | **Industry 4.0** | | | | | | **12 HOURS** | | | |
| Need – Reason for Adopting Industry 4.0 - Definition – Goals and Design Principles -Technologies of Industry 4.0 – Big Data – Artificial Intelligence . Industrial TransfermationIoT Definition– Scope––Structure – Characteristics – Generation; I/O Devices : Sensors – Convertors - Actuators – Keyboard basics - LCD modules - Clock and Timer - Interrupts - Service routines - Interrupt-driven pulse width modulation- Analog and digital values - Auto port detection - Capturing analog information - A2D and D2A -Digital Data Acquisition - Bridges – Relay drives - DC/ Stepper Motor Control - [Measurements and the Actuator Chain](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/1c749651-6973-48da-b1d1-fb55233593df.xhtml)  . | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **UNIT:2** | | | | **IoT Devices and Managing Devices** | | | | | **12 HOURS** | | | | |
| [Multipurpose Computers](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#multipurpose_computers) - [Controllers](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/43c30b63-1ab5-41d2-bd17-26a037b95548.xhtml) - [Microcontrollers](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/5d0b7786-749c-4784-98e8-0f38c655510f.xhtml) - [PLCs](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/4cee8a26-d707-4498-b547-d4c1100db024.xhtml) - [DCS](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/713319eb-e1a4-4fb0-9cd4-682992f1fc05.xhtml) - [Embedded Hardware](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#embedded_hardware) - [Embedded Software](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#embedded_software) - [Connected Sensors](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#connected_sensors) - [Passively Trackable Objects](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#passively_trackable_objects) -  [Powering Devices](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#challenge_of_powering_devices) - [Conserving Battery Life](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#conserving_battery_life) -  [Physical Objects in IoT](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch07.html#introduction_to_thinking_about_physical) – Devices and Design – Design Process – Three faces of Physical product -  [Interface and Interaction Design](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch08.html) - Types of interaction – Challenges and Opportunities of Design; [Interoperability](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch10.html) : Network – Data - Devices - Configuration and Managing IoT Devices, Platforms and [Connected](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch12.html#platforms) Devices. | | | | | | | | | | | | | |
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| **UNIT:3** | | | | [**Technology of Connectivity**](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch03.html) **and IoT Network Protocols** | | | | **12 HOURS** | | | | | |
| [Technology of Connected Devices](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html) - [Types of Connected Device](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#types_of_connected_device) -[Architecture of the IoT](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch03.html#architecture_of_the_internet_of_things) - Networking Issues - [Types of Network](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch03.html#types_of_network) - [Network Communication Patterns](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch03.html#network_communication_patterns) - [Push, Pull, and Polling](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch03.html#pushcomma_pullcomma_and_polling) - [IoT Application Protocols](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch03.html#iot_application_protocols) - [RFID and NFC](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#rfid_and_nfc) - [Beacons](https://learning.oreilly.com/library/view/designing-connected-products/9781449372682/ch02.html#beacons) - IOT messaging and communication protocols. IoT Protocols : PHY/MAC Layer - Network Layer - Transport Layer - Session Layer - Service Layer | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Industrial IIoT Basics** | | | | **12 HOURS** | | | | | |
| Industrial IIoT Basics - Business Model and reference Architecture of IIoT  Industrial Process and Devices - Technical requirements - Automation in the industrial process - Control and measurement systems - Types of industrial processes - The CIM pyramid | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Industrial Data Transmission and Data Acquisition, Industrial Plant Safety and Security** | | | **12 HOURS** | | | | | | |
| Industrial Data Transmission and Data Acquisition, Industrial Plant Safety and Security  [IIoT data flow](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/845da51e-f94e-4fd2-84b5-9a7a52c5ae33.xhtml):  [Data flow in a factory](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/8089b7c9-d7ab-4712-8115-a0ace0516d13.xhtml) -  [Edge device](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/32c167db-1419-4a53-b1f1-fb2c9e91e154.xhtml) - [IIoT data flow in the cloud](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/2d9a8894-87d1-4774-a2c6-dbb666020358.xhtml) - [Industrial Data Flow and Devices](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/d931a116-19d7-480a-8a96-41a46158c0fd.xhtml) - IIoT data flow [Industrial protocols](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/95c4d189-d89b-406b-b066-115d8f9e8193.xhtml) - [Supervisory Control and Data Acquisition](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/214f5e34-33df-44b1-83f6-4bdcd6b9c0b6.xhtml) - [Historian](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/ddfe892c-67bc-4bd8-a8e2-e1bf1ed18540.xhtml)[ERP and MES](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/6e8550a4-ddd0-42d9-b75e-19dbc080a709.xhtml)-  [Asset model](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/bb4c369d-0b39-4681-8b42-e7016f55e660.xhtml) -  [OPC](https://learning.oreilly.com/library/view/hands-on-industrial-internet/9781789537222/87114879-df0a-4011-a396-ed00618ee9ec.xhtml) | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **62 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | [Martin Charlier](https://learning.oreilly.com/search/?query=author%3A%22Martin%20Charlier%22&sort=relevance&highlight=true), [Alfred Lui](https://learning.oreilly.com/search/?query=author%3A%22Alfred%20Lui%22&sort=relevance&highlight=true), [Claire Rowland](https://learning.oreilly.com/search/?query=author%3A%22Claire%20Rowland%22&sort=relevance&highlight=true), [Elizabeth Goodman](https://learning.oreilly.com/search/?query=author%3A%22Elizabeth%20Goodman%22&sort=relevance&highlight=true), [Ann Light](https://learning.oreilly.com/search/?query=author%3A%22Ann%20Light%22&sort=relevance&highlight=true), “Designing Connected Products”, [O'Reilly Media, Inc.](https://learning.oreilly.com/library/publisher/oreilly-media-inc/) 2015 | | | | | | | | | | | | |
| 2 | Giacomo Veneri and Antonia Capasso, “Hands on Industrial Internet of Things”, Pack Publishing Ltd., 2018 | | | | | | | | | | | | |
| 3 | Pranjal Sharma, “India Automated: How the Fourth Industrial Revolution is Transforming India Hardcover, 2019 | | | | | | | | | | | | |
| 4 | UthayanElangovan, “Industry 5.0The Future of the Industrial Economy,2022, CRC Press | | | | | | | | | | | | |
| 5 | InduAnandarup Mukherjee, Chandana Roy, and SudipMisra, “ Introduction to Industrial Internet of Things and Industry 4.0, CRC Press, 2020 | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications | | | | | | | | | | | | |
| 2 | Vijay Madisetti and ArshdeepBahga, **“**Internet of Things (A Hands-on-Approach)**”,** 1st Edition, VPT, 2014. | | | | | | | | | | | | |
| 3 | Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer | | | | | | | | | | | | |
| 4 | Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **“**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**”,** 1st Edition, Academic Press, 2014. | | | | | | | | | | | | |
| 5 | Peter Waher**, “**Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | https://nptel.ac.in/courses/108/108/108108123/ | | | | | | | | | | | |
| 2 | | https://nptel.ac.in/courses/106/105/106105195/ | | | | | | | | | | | |
| 3 | | <https://swayam.gov.in/nd1_noc19_cs65/preview> | | | | | | | | | | | |
| 4 | | <https://swayam.gov.in/nd1_noc20_cs24/preview> | | | | | | | | | | | |
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| Course Designed By:**Dr. T.RAMESH** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | M | S | M | S | L | L |
| **CO3** | M | M | S | L | M | S | M | S | L | S |
| **CO3** | M | M | S | L | M | S | M | S | L | M |
| **CO4** | M | M | S | L | M | S | M | S | L | L |
| **CO5** | M | M | S | L | M | S | M | S | L | S |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITS01** | | **INTRODUCTION TO INDUSTRY 4.0** | | | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | | **Supportive** | | | **2** | | | **-** | | **-** | **2** |
| **Pre-requisite** | | | | | | **Big Data, Artificial Intelligence** | | | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are to:  1. At the end of completing this course, students will have knowledge on Industry 4.0,  2. Need for digital transformation and the following Industry 4.0 tools: | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | | Understand the need of Industry 4.0. | | | | | | | | | | | K2 | |
| 2 | | | Analyse the usage of Artificial Intelligence. | | | | | | | | | | | K4 | |
| 3 | | | Understand the Evolution of Big Data. | | | | | | | | | | | K2 | |
| 4 | | | Implement various applications in Big Data. | | | | | | | | | | | K5 | |
| 5 | | | Analyse the tools to perform Analytics. | | | | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | | **INDUSTRY 4.0** | | | | | | **6 HOURS** | | | | |
| Need – Reason for Adopting Industry 4.0 - Definition – Goals and Design Principles -Technologies of Industry 4.0 – Big Data – Artificial Intelligence (AI). | | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | | **ARTIFICIAL INTELLIGENCE** | | | | | **6 HOURS** | | | | | |
| Artificial Intelligence: Artificial Intelligence (AI) – What & Why? - History of AI - Foundations of AI -The AI - Environment - Societal Influences of AI – Application Domains and Tools | | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | | **INTRODUCTION TO BIG DATA** | | | **6 HOURS** | | | | | | | |
| Evolution - Data Evolution - Data : Terminologies - Big Data Definitions - Essential of Big Data in Industry 4.0 - Big Data Merits and Advantages - Big Data Components : Big Data Characteristics - Big Data Processing Frameworks | | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | | **BIG DATA APPLICATIONS** | | | **6 HOURS** | | | | | | | |
| Big Data Applications - Big Data Tools - Big Data Domain Stack : Big Data in Data Science – Big Data in IoT - Big Data in Machine Learning - Big Data in Databases - Big Data for Industry -Big Data Roles and Skills -Big Data Roles - Learning Platforms | | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | | **APPLICATIONS AND TOOLS OF INDUSTRY 4.0** | | **6 HOURS** | | | | | | | | |
| Applications Of IoT – Manufacturing – Healthcare – Education – Aerospace and Defense –Agriculture – Transportation and Logistics – Impact of Industry 4.0 on Society: Impact on Business, Government, People. | | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | | **CONTEMPORARY ISSUES** | | **2 HOURS** | | | | | | | | |
| Expert Lectures, Online Seminars – Webinars | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
|  | | | | | **Total Lecture hours** | | **32 HOURS** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | |
| 1 | P. Kaliraj, T. Devi, Higher Education for Industry 4.0 and Transformation to Education 5.0, 2020 | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | |
| 1 | V. Bhuvaneswari, T. Devi, “Big Data Analytics: Scitech Publisher , 2018 | | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | |
| 1 | | https://onlinecourses.nptel.ac.in/noc22\_cs52/preview | | | | | | | | | | | | | |
| 2 | | https://onlinecourses.nptel.ac.in/noc22\_cs56/preview | | | | | | | | | | | | | |
| 3 | | https://onlinecourses.swayam2.ac.in/arp20\_ap10/preview | | | | | | | | | | | | | |
| 4 | | https://onlinecourses.nptel.ac.in/noc22\_cs53/preview | | | | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH** | | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | M | S | S | L | M | S | L |
| **CO3** | S | S | S | L | M | S | M | S | S | M |
| **CO3** | S | M | S | S | L | S | S | S | S | L |
| **CO4** | M | L | M | S | S | M | S | L | M | M |
| **CO5** | L | S | L | S | S | L | S | M | L | L |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | | **22ITS02** | **Artificial intelligence and Machine Learning** | **L** | **T** | **P** | | **C** | |
| **Core/Elective/Supportive** | | | | | | **Supportive** | **2** | **-** | **-2** | | **2** | |
| **Pre-requisite** | | | | | | **UG-Level AI and Machine Learning** | **Syllabus version** | | **2022-23** | | | |
| **Course objectives** | | | | | | | | | | | | |
| 1. To understand artificial intelligence 2. To understand machine learning 3. To familiar with AL & ML algorithms | | | | | | | | | | | | |
| Expected Course Outcomes: | | | | | | | | | | | | |
| On the successful completion of the course | | | | | | | | | | | | |
| 1 | Students will also be able to understand basics of AI | | | | | | | | | | | **K1** |
| 2 | To get exposure to students on the machine learning | | | | | | | | | | | **K2** |
| 3 | To understand the basics of supervised learning and Unsupervised Learning | | | | | | | | | | | **K3** |
| 4 | Students will Apply AI & Ml algorithms to solve the problems of complexity | | | | | | | | | | | **K4** |
| 5 | To get a job in the AL & ML domain | | | | | | | | | | | **K5** |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create | | | | | | | | | | | | |
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| **UNIT:1** | | | **ARTIFICIAL INTELLIGENCE** | | | | | | | 6 **HOURS** | | |
| Overview of Artificial Intelligence: importance of knowledge-knowledge based systems-knowledge organization-knowledge manipulation. | | | | | | | | | | | | |
| **UNIT:2** | | | | **SUPERVISED LEARNING - I** | | | | | | 6 **HOURS** | | |
| Linear Models for Regression – Linear Basis Function Models – Bayesian Linear Regression– Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression | | | | | | | | | | | | |
| **UNIT:3** | | | | **SUPERVISED LEARNING – II** | | | | | | 6 **HOURS** | | |
| – Linear Models for Classification – Common Classification Algorithms – k-Nearest-Neighbors – Decision Trees – Random Forest model – Support Vector Machines. | | | | | | | | | | | | |
| **UNIT:4** | | | | **UNSUPERVISED LEARNING - I** | | | | | | 6 **HOURS** | | |
| Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models –Spectral Clustering – Hierarchical Clustering | | | | | | | | | | | | |
| **UNIT:5** | | | | **UNSUPERVISED LEARNING - II** | | | | | | 6 **HOURS** | | |
| The Curse of Dimensionality –Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM). | | | | | | | | | | | | |
| **UNIT:6** | | | | **Contemporary Issues** | | | | | | 2 **HOURS** | | |
| Expert lectures, online seminars – webinars, Latest Development / Topics in AI/ML | | | | | | | | | |  | | |
| **Total lecture HOURS** | | | | | | | | | | 32 **HOURS** | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | | Dan W.Patterson “ Introduction to Artificial Intelligence and Expert System” Prentice Hall of India 2002 | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | | Ethempaydin, “Introduction to Machine Learning”, Third Edition, Prentice Hall of India,  2015 | | | | | | | | | | |
| 2 | | Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006 | | | | | | | | | | |
| 3 | | Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition,  CRC Press, 2014 | | | | | | | | | | |
| 4 | | Fabio Nelli, “Python Data Analytics with Pandas, Numpy, and Matplotlib”, Second Edition,  Apress, 2018. | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | https://archive.nptel.ac.in/courses/106/106/106106236/ | | | | | | | | | | |
| 2 | | link https://archive.nptel.ac.in/courses/106/102/106102220/# | | | | | | | | | | |
| 3 | | https://dl.matlabyar.com/siavash/ML/Book/Ethem%20Alpaydin-Introduction%20to%20Machine%20Learning-The%20MIT%20Press%20(2014).pdf | | | | | | | | | | |
| 4 | | https://www.microsoft.com/en-us/research/uploads/prod/2006/01/Bishop-Pattern-Recognition-and-Machine-Learning-2006.pd | | | | | | | | | | |
| 5 | | http://noiselab.ucsd.edu/ECE228/Murphy\_Machine\_Learning.pdf | | | | | | | | | | |
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| Course Designed by : **Dr. T. RAMESH** | | | | | | | | | | | | |

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| Mapping with Programme Outcomes | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | M | S | M | S | M |
| **CO2** | S | S | S | S | M | S | M | L | S | L |
| **CO3** | M | M | L | L | L | M | L | M | M | M |
| **CO4** | M | S | M | L | S | S | M | L | L | S |
| **CO5** | M | S | S | M | M | L | S | M | M | L |

\*S-Strong; M-Medium; L-Low

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| Course code | | | | **22ITS03** | **INTRODUCTION to IoT** | **L** | | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Supportive** | **2** | | | | | **-** | **-** | **2** |
| **Pre-requisite** | | | | | **Basic knowledge of hardware,**  **Programme in C** | **Syllabus Version** | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are:  1. To gain insight about the architecture and enabling technologies of Internet of Things  2. To understand Arduino micro controller and IDE  3. To develop simple IoT Applications for different domains | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| CO1 | | | To learn the importance of smart objects and smart environment | | | | | | | | | K1 | |
| CO2 | | | To understand and use the microcontroller and various sensors | | | | | | | | | K2 | |
| CO3 | | | To create programs using Arduino IDE and extract data | | | | | | | | | K3 | |
| CO4 | | | To perform WiFi data communications, remote data storage in cloud, and handle the data using web applications | | | | | | | | | K3,K4 | |
| CO5 | | | To identify potential problems and develop solutions using IOT | | | | | | | | | K5,K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **UNIT:1** | | | | **Introduction to IoT** | | | | | | **6 HOURS** | | | |
| Introduction to IOT - Enabling technologies of IOT - Physical and logical design of IoT Application domains of IoT: Home automation – Cities – Environment – Energy – Industry – Agriculture – Transportation - Health care & Lifestyle. | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **UNIT:2** | | | | **Basic Electronics for IoT** | | | | | **6 HOURS** | | | | |
| Understanding basic electronic components and power elements Electric Charge, Resistance, Current and Voltage – Resistors, Capacitors, Diodes, LED, Potentiometer, circuit boards - Analog and digital circuits – Microcontrollers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **UNIT:3** | | | | **Sensors and Devices** | | | | **7 HOURS** | | | | | |
| Understanding Sensors and Devices - Understanding the Inputs from Sensors - Working with Temperature Sensors -Working with Ultrasound Sensor -Working with humidity sensor - Working with Motion Sensor - Working with IR Sensor - Working with Proximity Sensor - Working with Accelerometer and vibration sensor. | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Medical Sensors and Actuators** | | | | **7 HOURS** | | | | | |
| Understanding Medical Sensors: Flow Sensor - Optical Sensor - Body Temperature Sensor - Blood Pressure Sensor -Airflow sensor (breathing) - Patient position sensor (accelerometer) - UD - Annexure No.55A1 - Pulse and oxygen in blood sensor (SPO2) - Galvanic skin response (GSR - sweating) sensor.  Actuators :Activating LED Lights - Activating Relay - Activating Buzzer - Running DC Motors - Running Stepper Motors and Servo Motors. | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Data Communication from IoT Devices** | | | **4 HOURS** | | | | | | |
| Communication Devices for IoT - Communication Principles to Transfer the data from IOT Devices; Using WIFI to Transfer the data from IOT Sensor | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **32 hours** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | ArshdeepBahga, Vijay Madisetti, ‗Internet of Things: A Hands-On Approach‘, Universities Press, 2015. | | | | | | | | | | | | |
| 2 | Boris Adryan, Dominik Obermaier, Paul Fremantle, ‘The Technical Foundations of IoT’, Artech Houser Publishers, 2017. | | | | | | | | | | | | |
| 3 | Michael Margolis, “Arduino Cookbook” 2nd Edition, O'Reilly Media, 2012. | | | | | | | | | | | | |
| 4 | Marco Schwartz, ‘Internet of Things with ESP8266’, Packt Publishing, 2016 | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Charles Platt, “Make Electronics – Learning by discovery”, O'Reilly Media, 2015. | | | | | | | | | | | | |
| 2 | Michael Miller, “ The Internet of Things,” Pearson India, 2015. | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | Introduction to IOT,https://nptel.ac.in/courses/106/105/106105166/ | | | | | | | | | | | |
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| **Course Designed By: Dr. T.RAMESH.** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | M | S | S | L | M | S | L |
| **CO3** | S | S | S | L | M | S | M | S | S | M |
| **CO3** | S | M | S | S | L | S | S | S | S | L |
| **CO4** | M | L | M | S | S | M | S | L | M | M |
| **CO5** | L | S | L | S | S | L | S | M | L | L |
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\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITS04** | **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR BIOINFORMATICS** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Supportive** | **2** | | | **-** | | **-** | **2** |
| **Pre-requisite** | | | | | **Basics about Bioinformatics** | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To understand the Artificial Intelligence and Machine Learning 2. To Apply AI & ML concepts in Bioinformatics 3. To get a job as a managerial assistant | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | Understand how AI & ML are reshaping bioinformatics | | | | | | | | K2 | |
| 2 | | | Analyze how AI & ML are reshaping bioinformatics | | | | | | | | K2 | |
| 3 | | | Help the students spot the different intelligent agents operating in bioinformatics | | | | | | | | K3 | |
| 4 | | | Understand the role of AI & ML as an applied science | | | | | | | | K6 | |
| 5 | | | Get a job as bioinformatics specialist. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:1** | | | | **Introduction to AI** | | | | **6 HOURS** | | | | |
| Introduction to AI : Definition - Data – information – knowledge – knowledge organisation – knowledge manipulation - History, Evolution, Types | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:2** | | | | **Machine Learning basics and Supervised Learning** | | | **6 HOURS** | | | | | |
| Machine Learning : Machine Learning, Types, Supervised Learning: Classification, Decision Trees, Random Forest | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:3** | | | | **Unsupervised Learning** | | **6 HOURS** | | | | | | |
| Unsupervised Learning : Clustering, Association, Reinforcement learning | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Applications of AI in Bioinformatics - I** | | **6 HOURS** | | | | | | |
| Tetranucleotide Frequency - Transcribing DNA into mRNA - Reverse Complement of DNAParsing FASTA and Analyzing Sequences | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Applications of AI in Bioinformatics - II** | | **6 HOURS** | | | | | | |
| Translating mRNA into Protein - Find a Motif in DNA – Inferring mRNA from ProteinDNA Synthesizer – FASTX - BLAST | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **32 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Ken Youens-Clark (2021), Mastering Python for Bioinformatics, O'Reilly Media, Inc. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | Harsh Bhasin, (2017), Python for Beginners, New Age International (P) Ltd Publishers | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | https://onlinecourses.nptel.ac.in | | | | | | | | | | |
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| **Course Designed By: Dr. T.RAMESH.** | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| **CO5** | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITS05** | **PYTHON PROGRAMMING** | **L** | | | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Supportive** | **2** | | | | | **-** | | **-** | **2** |
| **Pre-requisite** | | | | | **Knowledge about the Internet and any one of the Scripting Languages** | **Syllabus Version** | | | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Understand the basics of Python Programming 2. Get a Job in the IT industry as a python programmer 3. Use Python programming in their research | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Understand the basics of Python Programming | | | | | | | | | | K2 | |
| 2 | | | Exposure to python list, tuple and dictionary | | | | | | | | | | K2 | |
| 3 | | | Design and Develop Python Programming | | | | | | | | | | K3 | |
| 4 | | | Get a job in the IT industry as a Python Programmer | | | | | | | | | | K6 | |
| 5 | | | Work as a freelance Python Programmer | | | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **UNIT:1** | | | | **Introduction to Python** | | | | | | **5 HOURS** | | | | |
| Introduction to Python : Python interpreter - Overview of programming in Python - Python built-in types - Arithmetic in Python - Program input and Program output- Variables and assignment. | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **Control Statements and Strings Operations** | | | | | **5 HOURS** | | | | | |
| Control Statements: -if statements - while statement -for statements Strings and string operations | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **List, Dictionary and Tuples** | | | | **5 HOURS** | | | | | | |
| List basics - List operations - Dictionaries - Dictionary basics and Tuples - | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Function and Exception Handling** | | | | **5 HOURS** | | | | | | |
| Functions - formal arguments - variable-length arguments - Exceptions - detecting and handling exceptions. | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **File Handling** | | | **5 HOURS** | | | | | | | |
| Files and input/output - reading and writing files - methods of file objects - using standard library functions for file handling | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **32 HOURS** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| 1 | Amit Ashok Kamthane and Ashok N. Kamthane, (2018)“ Python Programming”, McGraw Hill Education; First edition | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1 | Python Tricks (2017),A Buffet of Awesome Python Features, Dan Bader | | | | | | | | | | | | | |
| 2 | Harsh Bhasin, (2017), Python for Beginners, New Age International (P) Ltd Publishers | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | http://docs.python.org/tutorial/ | | | | | | | | | | | | |
| 2 | | https://nptel.ac.in/courses/106/106/106106182/ | | | | | | | | | | | | |
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| **Course Designed By: Dr.T.RAMESH.** | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | L | S | S | S | M | S | M | S |
| **CO3** | L | S | L | S | S | S | M | S | M | S |
| **CO3** | S | S | S | S | S | S | M | S | M | M |
| **CO4** | L | M | M | M | S | S | M | S | M | M |
| CO5 | L | M | M | M | S | S | M | S | M | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITS06** | **Python for Financial Applications** | **L** | | | **T** | | **P** | **C** |
| **Certificate Programme** | | | | | **Supportive** | **2** | | | **-** | | **-** | **2** |
| **Pre-requisite** | | | | | **Basics about the Accounting and Finance** | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are to:  CO1 :To explain the structure, syntax, and semantics of the Python language.  CO2 :To explain how object-oriented programming concepts work in Python.  CO3 : To explain how financial and accounting problems can solved using Python | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | Understand the principles of Financial Accounting | | | | | | | | K2 | |
| 2 | | | Understand the programming principles of Python languages | | | | | | | | K2 | |
| 3 | | | Get exposure in programming Python | | | | | | | | K3 | |
| 4 | | | Design and develop Financial application using Python | | | | | | | | K6 | |
| 5 | | | Get a job with their own skills. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:1** | | | | **Introduction to Python, Strings and Control Flow** | | | | **6 HOURS** | | | | |
| Introduction to Python : Identifiers, Keywords, Statements and Expressions, Variables, Comments, Data Types, Operators, Reading Input, Print Output, Type Conversions  Strings : Creating and Storing Strings, String Operations, Accessing Characters in String, Strings Slicing and Joining, String Methods, Strings Formatting  Control Flow Statements : If Statement, Nested if Statement, While Loop, for Loop, Continue and Break Statements, Exception Handling | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:2** | | | | **Functions and Data Structures** | | | **9 HOURS** | | | | | |
| Functions : Built-In Functions, Function Definition and Calling the Function, return statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, Command Line Arguments.  Data Structures : Lists - Creating Lists, List Operations, Indexing and Slicing, Built-In Functions on Lists, List Methods, The del Statement. Dictionaries - Creating Dictionary, Accessing and Modifying key value Pairs in Dictionaries, Built-In Functions on Dictionaries, Dictionary Methods, The del Statement, Tuples and Sets, Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Operations on Sets | | | | | | | | | | | | |
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| **UNIT:3** | | | | **Handling Financial datasets** | | **5 HOURS** | | | | | | |
| Handling financial datasets : Multiple asset classes, indices, components and economic data. | | | | | | | | | | | | |
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| **UNIT:4** | | | | **Statistical Finance using Python** | | **5 HOURS** | | | | | | |
| Handling statistical data analysis in Python : Data cleaning, data frames, working with timestamps, Performing regression, multiple regression, detection of problems in OLS, GLS, Forecasting models, Classification models | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Portfolio Modelling using Python** | | **5 HOURS** | | | | | | |
| Portfolio Modelling using Python : Portfolio construction and Risk Management, Monte Carlo simulations portfolios | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **32 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Mohammad Zoynul Abedin, M. Kabir Hassan, Petr Hajek, Mohammed Mohi Uddin, The Essentials of Machine Learning in Finance and Accounting 2021. Taylor and Francis Group | | | | | | | | | | | |
| 2 | Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning,ISBN: 978-1111822705 | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | WeselyJ.Chun, (2015), Core Python Application Programming, Prentice Hall, Third edition. | | | | | | | | | | | |
| 2 | R.Padmanabhan, (2016), Programming with Python, Springer Publications. | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | https://onlinecourses.nptel.ac.in | | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH**. | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| **CO5** | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITS07** | **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR BUSINESS APPLICATIONS** | **L** | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **Supportive** | **2** | **-** | | **-** | **2** |
| **Pre-requisite** | | | | | **Basics about Financial Accounting** | **Syllabus Version** | | **2021-22** | | |
| **Course Objectives:** | | | | | | | | | | |
| The main objectives of this course are to:   1. To understand the Artificial Intelligence and Machine Learning 2. To Apply AI & ML concepts in Business 3. To get a job as a managerial assistant | | | | | | | | | | |
|  | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | |
| 1 | | | Understand how AI & ML are reshaping financial services | | | | | | K2 | |
| 2 | | | Analyze how AI & ML are reshaping financial services | | | | | | K2 | |
| 3 | | | Help the students spot the different intelligent agents operating in financial technologies | | | | | | K3 | |
| 4 | | | Understand the role of AI & ML as an applied science | | | | | | K6 | |
| 5 | | | Get a job as a managerial assistant. | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | |
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| **UNIT:1** | | | | **Introduction to AI** | | **5 HOURS** | | | | |
| Introduction to AI : Definition - Data – information – knowledge – knowledge organisation – knowledge manipulation - History, Evolution, Types | | | | | | | | | | |
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| **UNIT:2** | | | | **Machine Learning basics and Supervised Learning** | | **5 HOURS** | | | | |
| Machine Learning : Machine Learning, Types, Supervised Learning: Classification, Decision Trees, Random Forest | | | | | | | | | | |
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| **UNIT:3** | | | | **Unsupervised Learning** | | **5 HOURS** | | | | |
| Unsupervised Learning : Clustering, Association, Reinforcement learning | | | | | | | | | | |
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| **UNIT:4** | | | | **AI and Machine Learning in Financial Services - I** | | **5 HOURS** | | | | |
| Customer focused uses-credit scoring, insurance and client facing chatbots, Trading and portfolio management | | | | | | | | | | |
|  | | | | | | | | | | |
| **UNIT:5** | | | | **AI and Machine Learning in Financial Services – II** | | **5 HOURS** | | | | |
| Robo-Advisory Operation focused uses-Capital optimization, model risk management and stress testing, market impact analysis | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | **2 HOURS** | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | |
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|  | | | | **Total Lecture hours** | | **32 HOURS** | | | | |
|  | | | |  | |  | | | | |
| **Text Book(s)** | | | | | | | | | | |
| 1 | Steven Finlay, (2017), Artificial Intelligence and Machine Learning for Business: A No‐ Nonsense Guide to Data Driven Technologies, Relativistic. | | | | | | | | | |
| 2 | RajendraAkerkar (2019), Artificial Intelligence for Business, Springer | | | | | | | | | |
|  | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | |
| 1 | Stuart J. Russell, Peter Norvig,(2015), Artificial Intelligence: A Modern Approach (3rd edition) Prentice Hall | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | |
| 1 | | https://onlinecourses.nptel.ac.in | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| **CO5** | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **WORD PRESS** | | | | | | | | | |
| **Sub Code : JOVA01** | | | | | | **Credit : 2** | | **Max.Marks : 50** | |
| **Name of the Department** | | | | | | | Information Technology | | |
| **Name of the Faculty Member i/c With Complete Address with Phone and e-mail** | | | | | | | Dr.R.VADIVEL  Assistant Professor  Department of Information Technology, School of Computer Science and Engineering  Bharathiar University  Email ID:rvadivelit@buc.edu.in | | |
| **Inter / Intra Department Course** | | | | | | | Intra Department | | |
| **Duration of the Course** | | | | | | | 30 Hours | | |
| **Eligibility** | | | | | | | M.Sc. (IT/CS/Data Analytics/Cyber Security), MCA | | |
| **Number of Candidates to be Admitted** | | | | | | | 50 | | |
| **Mode of the Course** | | | | | | | Regular | | |
| **Collaboration if any with Companies** (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | | Yes,  MaylancerTechiosPvt Ltd, 61, Park Street, Kattoor, Coimbatore- 641009  7708899146, 7010209365  maylancertechios@gmail.com | | |
| **Registration Procedure** | | | | | | | Online registration and payment | | |
| **Job Opportunities**: WordPress Development | | | | | | | | | |
| The objectives of the Course are: | | | | | | | | | |
| The main objectives of this course are to: | | | | | | | | | |
| 1 | | | To Understand the working of content Management System | | | | | | |
| 2 | | | To Create A CMS WordPress Site | | | | | | |
| 3 | | | To Use Plugins and Widgets in the WordPress Site | | | | | | |
| **Course Content** | | | | | Lecture and Practical | | | | |
| **Module 1** | | | | Introduction | | | | | 6hours |
| **Module 2** | | | | Configurations | | | | | 6hours |
| **Module 3** | | | | Posts & Media | | | | | 6hours |
| **Module 4** | | | | Pages, Comments and Plugins | | | | | 6hours |
| **Module 5** | | | | User and Widgets | | | | | 6hours |
| **Book(s) for Study** | | | | | | | | |  |
| 1 | | Matthew MacDonald, WordPress: The Missing Manual- The Book That Should Have Been In The Box, Third Edition (Grayscale Indian Edition) | | | | | | | |
| 2 | | WordPress Development By Tutorials Point | | | | | | | |
| **Book(s) for reference** | | | | | | | | | |
| 1 | WordPress Web Development: Basic to Advance by Sayyed Majid- Code Academy( January 2021) | | | | | | | | |

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| **Ethical Hacking and Cyber Forensics** | | | | | | | | |
| **Sub Code: JOVA02** | | | | | **Credit:2** | | **Max.Marks : 50** | |
| Name of the Department | | | | | | Information Technology | | |
| Name of the Faculty Member i/c With Complete Address with Phone and e-mail | | | | | | Dr. T.RAMESH  Associate Professor and Head  Department of Information Technology  Bharathiar University  Coimbatore-641046  Mobile No: 98945 11879  Email ID:: [ramesh.t@buc.edu.in](mailto:ramesh.t@buc.edu.in) | | |
| Inter / Intra Department Course | | | | | | Intra Department | | |
| Duration of the Course | | | | | | 30 Hours | | |
| Eligibility | | | | | | M.Sc. (IT/CS/Data Analytics/Cyber Security), MCA | | |
| Number of Candidates to be Admitted | | | | | | 50 | | |
| Mode of the Course | | | | | | Regular | | |
| Collaboration if any with Companies (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | Hackup Technologies  Coimbatore | | |
| Registration Procedure | | | | | | Online registration and payment | | |
| Job Opportunities: Cyber Security based Industrial Opportunities | | | | | | | | |
| The objectives of the Course are: | | | | | | | | |
| The main objectives of this course are to: | | | | | | | | |
| 1 | | | Equip the student with basic knowledge to deal with Cyber security threats in real life scenario. | | | | | |
| 2 | | | Hands-on training Ethical Hacking. | | | | | |
| 3 | | | Understanding the Cyber security measures. | | | | | |
| 4 | | | Take prevention measures for cyber attack | | | | | |
| 5 | | | Get a cyber security jobs IT/ITES industries | | | | | |
| Course Content | | | | Lecturer & Practical | | | | Hours |
| Module 1 | | | | Introduction to Cyber Security- The Hacking Impacts & its Framework - Reconnaissance - System Security - Process of Information Security - Risk Analysis in Cyber Security. | | | | 6 |
| Module 2 | | | | Cyber Security Methodologies and setting up Lab for Cyber Security - Introduction to Firewall - Virtualization - VmWare& Virtual Box Installation - Lab Setup for Cyber Security - Kali Linux Overview. | | | | 6 |
| Module 3 | | | | Ethical Hacking & cyber Security methodologies - Introduction to ethical hacking - Types of Hackers - Metasploit tool for Hacking - Social Engineering Tools - Kali linux Commands.  Web Hacking & Security - Web Server Overview - Domain , HTTP , DNS , URL - Common Vulnerabilities - OSINT - Reporting POC | | | | 6 |
| Module 4 | | | | Mobile Pentesting& Wireless Security - Introduction to wifi network and Pentesting - Wifi Data Collection and analysis - WIFI attack and Security - Mobile App Pentesting - Reporting Tools for Mobile Pentesting.  Dark web and Deep Web - Introduction to Darknet - Lab Setup for Darknet and Deep web  Tor Browser and Accessing Darknet&Deepweb - Darknet Hosting & Search Engine - Protection against Darknet Website | | | | 6 |
| Module 5 | | | | Pen testing & Bug Hunting - Introduction to Pentesting - Installation of Burp Suite Tool - Nessus Tool for Pentesting - Android Forensics - Open Source Intelligence  Cyber Forensics- SIntroduction to Digital Forensics - Process of Forensics Investigation - Imaging of Operating system - Digital Forensics Analysis - Anti-Forensics Techniques & Detection | | | | 6 |
| **Book(s) for Study** | | | | | | | | |
| 1  2  3  4 | | Desai, M. M., Hacking for Beginners: A beginners guide to learn ethical hacking, 2010  Johnny long, Kali Linux Revealed ,Mastering the Penetration Testing Distribution,2021  Henderson. L., Tor and the Dark Art of Anonymity, 2015, Van Haren Publishing.  Britz, M. Computer forensics and cyber crime: An introduction, 2013,Pearson. | | | | | | |
| Book(s) for reference | | | | | | | | |
| 1 | Engebretson, P. (2011). The basics of hacking and penetration testing: Ethical hacking and penetration testing made easy, 2011, Syngress. | | | | | | | |
| Related Online Contents | | | | | | | | |
| 1 | https://nptel.ac.in/courses/106106129 | | | | | | | |

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| **EMBEDDED SYSTEM & WIRELESS SENSOR NETWORK FOR IoT** | | | | | | | | | |
| **Subject Code : JOVA03** | | | | | | **Credit : 2** | | **Max. Marks : 50** | |
| **Name of the Department** | | | | | | | Information Technology | | |
| **Name of the Faculty Member i/c With Complete Address with Phone and e-mail** | | | | | | | Dr. W.RoseVaruna  Assistant Professor  Department of Information Technology  Bharathiar University  Coimbatore-641046  Mobile No:9994950331  Email ID:hvaruna@gmail.com | | |
| **Inter / Intra Department Course** | | | | | | | Intra Department | | |
| **Duration of the Course** | | | | | | | 30 Hours | | |
| **Eligibility** | | | | | | | M.Sc. (IT/CS/Data Analytics/Cyber Security), MCA | | |
| **Number of Candidates to be Admitted** | | | | | | | 50 | | |
| **Mode of the Course** | | | | | | | Regular | | |
| **Collaboration if any with Companies** (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | | Will decide later | | |
| **Registration Procedure** | | | | | | | Online registration and payment | | |
| **Job Opportunities**: IoT based Industrial Opportunities | | | | | | | | | |
| The objectives of the Course are: | | | | | | | | | |
| The main objectives of this course are to: | | | | | | | | | |
| 1 | | | Establishing basic concepts and key components of Internet of Things. | | | | | | |
| 2 | | | Hands-on training in handling IoT building blocks. | | | | | | |
| 3 | | | Understanding the interaction between cloud computation and sensors. | | | | | | |
| 4 | | | Troubleshooting the errors while implementing IoT for practical applications. | | | | | | |
| 5 | | | Establishing the usage of commercially available components. | | | | | | |
| Course Content | | | | | Lecture / Practical / Project / Internship | | | | |
| **Module 1** | | | | IoT Overview | | | | | 3hours |
| **Module 2** | | | | Demo HTTP Web Server, Preparing Sensor Node | | | | | 3hours |
| **Module 3** | | | | Creating Own Web Server | | | | | 3hours |
| **Module 4** | | | | Experiment Thingspeak cloud server, Experiment Freeboard Cloud server | | | | | 3hours |
| **Module 5** | | | | Experiment MQTT IBM CLOUD, Experiment MQTT Eclipse cloud mobile app | | | | | 3hours |
| **Module 6** | | | | Experiment Sending Email | | | | | 3hours |
| **Module 7** | | | | Experiment SMS Alert | | | | | 3hours |
| **Module 8** | | | | Experiment Wireless Sensor Network, Project WSN | | | | | 3hours |
| **Module 9** | | | | Experiment PubNub cloud server | | | | | 3hours |
| **Module 10** | | | | Project Preparation | | | | | 3hours |
| **Book(s) for Study** | | | | | | | | |  |
| 1 | | Building Blocks for IoT Analytics Internet-of-Things Analytics by MONCEF GABBOUJ, THANOS STOURAITIS, 2017, River Publishers. | | | | | | | |
| **Book(s) for reference** | | | | | | | | | |
| 1 | Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies by DimitriosSerpanos, Marilyn Wolf, 2018, Springer. | | | | | | | | |
| **Related Online Contents** | | | | | | | | | |
| 1 | Introduction to internet of things By Prof. SudipMisra, IIT Kharagpur | | | | | | | | |

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| **Course code** | | | | **22ITC01** | | **INTRODUCTION TO INDUSTRY 4.0/5.0** | | | **L** | | | **T** | | **P** | **C** |
|  | | | | | | **Certificate Course** | | | **2** | | | **-** | | **-** | **2** |
| **Pre-requisite** | | | | | | **Big Data, Artificial Intelligence** | | | **Syllabus Version** | | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are to:  1. At the end of completing this course, students will have knowledge on Industry 4.0,  2. Need for digital transformation and the following Industry 4.0 tools: | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | | Understand the need of Industry 4.0. | | | | | | | | | | | K2 | |
| 2 | | | Analyse the usage of Artificial Intelligence. | | | | | | | | | | | K4 | |
| 3 | | | Understand the Evolution of Big Data. | | | | | | | | | | | K2 | |
| 4 | | | Implement various applications in Big Data. | | | | | | | | | | | K5 | |
| 5 | | | Analyse the tools to perform Analytics. | | | | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | | | | |
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| **UNIT:1** | | | | | **INDUSTRY 4.0** | | | | | | **6 HOURS** | | | | |
| Need – Reason for Adopting Industry 4.0 - Definition – Goals and Design Principles -Technologies of Industry 4.0 – Big Data – Artificial Intelligence (AI). | | | | | | | | | | | | | | | |
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| **UNIT:2** | | | | | **ARTIFICIAL INTELLIGENCE** | | | | | **6 HOURS** | | | | | |
| Artificial Intelligence: Artificial Intelligence (AI) – What & Why? - History of AI - Foundations of AI -The AI - Environment - Societal Influences of AI – Application Domains and Tools | | | | | | | | | | | | | | | |
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| **UNIT:3** | | | | | **INTRODUCTION TO BIG DATA** | | | **6 HOURS** | | | | | | | |
| Evolution - Data Evolution - Data : Terminologies - Big Data Definitions - Essential of Big Data in Industry 4.0 - Big Data Merits and Advantages - Big Data Components : Big Data Characteristics - Big Data Processing Frameworks | | | | | | | | | | | | | | | |
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| **UNIT:4** | | | | | **BIG DATA APPLICATIONS** | | | **6 HOURS** | | | | | | | |
| Big Data Applications - Big Data Tools - Big Data Domain Stack : Big Data in Data Science – Big Data in IoT - Big Data in Machine Learning - Big Data in Databases - Big Data for Industry -Big Data Roles and Skills -Big Data Roles - Learning Platforms | | | | | | | | | | | | | | | |
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| **UNIT:5** | | | | | **APPLICATIONS AND TOOLS OF INDUSTRY 4.0** | | **6 HOURS** | | | | | | | | |
| Applications Of IoT – Manufacturing – Healthcare – Education – Aerospace and Defense –Agriculture – Transportation and Logistics – Impact of Industry 4.0 on Society: Impact on Business, Government, People. | | | | | | | | | | | | | | | |
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| **UNIT:6** | | | | | **CONTEMPORARY ISSUES** | | **2 HOURS** | | | | | | | | |
| Expert Lectures, Online Seminars – Webinars | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
|  | | | | | **Total Lecture hours** | | **32 HOURS** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | |
| 1 | P. Kaliraj, T. Devi, Higher Education for Industry 4.0 and Transformation to Education 5.0, 2020 | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | |
| 1 | V. Bhuvaneswari, T. Devi, “Big Data Analytics: Scitech Publisher , 2018 | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | |
| 1 | | https://onlinecourses.nptel.ac.in/noc22\_cs52/preview | | | | | | | | | | | | | |
| 2 | | https://onlinecourses.nptel.ac.in/noc22\_cs56/preview | | | | | | | | | | | | | |
| 3 | | https://onlinecourses.swayam2.ac.in/arp20\_ap10/preview | | | | | | | | | | | | | |
| 4 | | https://onlinecourses.nptel.ac.in/noc22\_cs53/preview | | | | | | | | | | | | | |
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| Course Designed By: **Dr. E. BOOPATHI KUMAR**. | | | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | M | S | S | L | M | S | L |
| **CO3** | S | S | S | L | M | S | M | S | S | M |
| **CO3** | S | M | S | S | L | S | S | S | S | L |
| **CO4** | M | L | M | S | S | M | S | L | M | M |
| **CO5** | L | S | L | S | S | L | S | M | L | L |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | | **22ITC02** | **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR BUSINESS APPLICATIONS** | **L** | **T** | | **P** | **C** | | |
|  | | | | | | **Certificate Course** | **2** | **-** | | **-** | **2** | |
| **Pre-requisite** | | | | | | **UG-Level AI and Machine Learning** | **Syllabus version** | | | **2022-23** | | | |
| **Course objectives** | | | | | | | | | | | | | |
| 1. To understand artificial intelligence 2. To understand machine learning 3. To familiar with AL & ML algorithms | | | | | | | | | | | | | |
| Expected Course Outcomes: | | | | | | | | | | | | | |
| On the successful completion of the course | | | | | | | | | | | | | |
| 1 | Students will also be able to understand basics of AI | | | | | | | | | | | **K1** | |
| 2 | To get exposure to students on the machine learning | | | | | | | | | | | **K2** | |
| 3 | To understand the basics of supervised learning and Unsupervised Learning | | | | | | | | | | | **K3** | |
| 4 | Students will Apply AI & Ml algorithms to solve the problems of complexity | | | | | | | | | | | **K4** | |
| 5 | To get a job in the AL & ML domain | | | | | | | | | | | **K5** | |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create | | | | | | | | | | | | | |
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| **UNIT:1** | | | **ARTIFICIAL INTELLIGENCE** | | | | | | **6 HOURS** | | | | |
| Overview of Artificial Intelligence: importance of knowledge-knowledge based systems-knowledge organization-knowledge manipulation. | | | | | | | | | | | | | |
| **UNIT:2** | | | | **SUPERVISED LEARNING - I** | | | | | **6 HOURS** | | | | |
| Linear Models for Regression – Linear Basis Function Models – Bayesian Linear Regression– Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression | | | | | | | | | | | | | |
| **UNIT:3** | | | | **SUPERVISED LEARNING – II** | | | | | **6HOURS** | | | | |
| Linear Models for Classification – Common Classification Algorithms – k-Nearest-Neighbors – Decision Trees – Random Forest model – Support Vector Machines. | | | | | | | | | | | | | |
| **UNIT:4** | | | | **UNSUPERVISED LEARNING - I** | | | | | **6HOURS** | | | | |
| Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models –Spectral Clustering – Hierarchical Clustering | | | | | | | | | | | | | |
| **UNIT:5** | | | | **UNSUPERVISED LEARNING - II** | | | | | **6 HOURS** | | | | |
| The Curse of Dimensionality –Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM). | | | | | | | | | | | | | |
| **UNIT:6** | | **Contemporary Issues** | | | | | | | **2HOURS** | | | | |
| Expert lectures, online seminars – webinars, Latest Development / Topics in AI/ML | | | | | | | | |  | | | | |
| **Total lecture hours** | | | | | | | | | **32 HOURS** | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | | Dan W.Patterson “ Introduction to Artificial Intelligence and Expert System” Prentice Hall of India 2002 | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | | Ethempaydin, “Introduction to Machine Learning”, Third Edition, Prentice Hall of India,  2015 | | | | | | | | | | | |
| 2 | | Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006 | | | | | | | | | | | |
| 3 | | Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition,  CRC Press, 2014 | | | | | | | | | | | |
| 4 | | Fabio Nelli, “Python Data Analytics with Pandas, Numpy, and Matplotlib”, Second Edition,  Apress, 2018. | | | | | | | | | | | |
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| Course Designed By: **Dr. T. RAMESH** | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | |
| 1 | https://archive.nptel.ac.in/courses/106/106/106106236/ |
| 2 | link https://archive.nptel.ac.in/courses/106/102/106102220/# |
| 3 | https://dl.matlabyar.com/siavash/ML/Book/Ethem%20Alpaydin-Introduction%20to%20Machine%20Learning-The%20MIT%20Press%20(2014).pdf |
| 4 | https://www.microsoft.com/en-us/research/uploads/prod/2006/01/Bishop-Pattern-Recognition-and-Machine-Learning-2006.pd |
| 5 | http://noiselab.ucsd.edu/ECE228/Murphy\_Machine\_Learning.pdf |

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| Mapping with Programme Outcomes | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | M | S | M | S | M |
| **CO2** | S | S | S | S | M | S | M | L | S | L |
| **CO3** | M | M | L | L | L | M | L | M | M | M |
| **CO4** | M | S | M | L | S | S | M | L | L | S |
| **CO5** | M | S | S | M | M | L | S | M | M | L |

\*S-Strong; M-Medium; L-Low

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| Course code | | | | **22ITC03** | **INTRODUCTION TO INTERNET OF THINGS** | **L** | | | | | **T** | **P** | **C** |
| **Certificate Course** | | | | | | **2** | | | | | **-** | **-** | **2** |
| **Pre-requisite** | | | | | Basic knowledge of hardware,  Programme in C | **Syllabus Version** | | | | | **2020-21** | | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are:  1. To gain insight about the architecture and enabling technologies of Internet of Things  2. To understand Arduino micro controller and IDE  3. To develop simple IoT Applications for different domains | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| CO1 | | | To learn the importance of smart objects and smart environment | | | | | | | | | K1 | |
| CO2 | | | To understand and use the microcontroller and various sensors | | | | | | | | | K2 | |
| CO3 | | | To create programs using Arduino IDE and extract data | | | | | | | | | K3 | |
| CO4 | | | To perform WiFi data communications, remote data storage in cloud, and handle the data using web applications | | | | | | | | | K3,K4 | |
| CO5 | | | To identify potential problems and develop solutions using IOT | | | | | | | | | K5,K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **UNIT:1** | | | | **Introduction to IoT** | | | | | | **6 HOURS** | | | |
| Introduction to IOT - Enabling technologies of IOT - Physical and logical design of IoT Application domains of IoT: Home automation – Cities – Environment – Energy – Industry – Agriculture – Transportation - Health care & Lifestyle. | | | | | | | | | | | | | |
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| **UNIT:2** | | | | **Basic Electronics for IoT** | | | | | **6 HOURS** | | | | |
| Understanding basic electronic components and power elements Electric Charge, Resistance, Current and Voltage – Resistors, Capacitors, Diodes, LED, Potentiometer, circuit boards - Analog and digital circuits – Microcontrollers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation | | | | | | | | | | | | | |
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| **UNIT:3** | | | | **Sensors and Devices** | | | | **6 HOURS** | | | | | |
| Understanding Sensors and Devices - Understanding the Inputs from Sensors - Working with Temperature Sensors -Working with Ultrasound Sensor -Working with humidity sensor - Working with Motion Sensor - Working with IR Sensor - Working with Proximity Sensor - Working with Accelerometer and vibration sensor. | | | | | | | | | | | | | |
| **UNIT:4** | | | | **Medical Sensors and Actuators** | | | | **6 HOURS** | | | | | |
| Understanding Medical Sensors: Flow Sensor - Optical Sensor - Body Temperature Sensor - Blood Pressure Sensor -Airflow sensor (breathing) - Patient position sensor (accelerometer) - UD - Annexure No.55A1 - Pulse and oxygen in blood sensor (SPO2) - Galvanic skin response (GSR - sweating) sensor.  Actuators :Activating LED Lights - Activating Relay - Activating Buzzer - Running DC Motors - Running Stepper Motors and Servo Motors. | | | | | | | | | | | | | |
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| **UNIT:5** | | | | **Data Communication from IoT Devices** | | | **4 HOURS** | | | | | | |
| Communication Devices for IoT - Communication Principles to Transfer the data from IOT Devices; Using WIFI to Transfer the data from IOT Sensor | | | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **32 HOURS** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | ArshdeepBahga, Vijay Madisetti, ‗Internet of Things: A Hands-On Approach‘, Universities Press, 2015. | | | | | | | | | | | | |
| 2 | Boris Adryan, Dominik Obermaier, Paul Fremantle, ‘The Technical Foundations of IoT’, Artech Houser Publishers, 2017. | | | | | | | | | | | | |
| 3 | Michael Margolis, “Arduino Cookbook” 2nd Edition, O'Reilly Media, 2012. | | | | | | | | | | | | |
| 4 | Marco Schwartz, ‘Internet of Things with ESP8266’, Packt Publishing, 2016 | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Charles Platt, “Make Electronics – Learning by discovery”, O'Reilly Media, 2015. | | | | | | | | | | | | |
| 2 | Michael Miller, “ The Internet of Things,” Pearson India, 2015. | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | Introduction to IOT,https://nptel.ac.in/courses/106/105/106105166/ | | | | | | | | | | | |
| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | L | S | S | S | M | S | M | S |
| **CO3** | L | S | L | S | S | S | M | S | M | S |
| **CO3** | S | S | S | S | S | S | M | S | M | M |
| **CO4** | L | M | M | M | S | S | M | S | M | M |
| CO5 | L | M | M | M | S | S | M | S | M | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITC04** | **CYBER THREATS** | **L** | | **T** | | **P** | **C** |
|  | | | | | **Certificate Courses** | **2** | | **-** | | **-** | **2** |
| **Pre-requisite** | | | | | **Working knowledge about Computers and Internet** | **Syllabus Version** | | | **2022-23** | | |
| **Course Objectives:** | | | | | | | | | | | |
| The main objectives of this course are to:   1. To understand the basic cyber threats 2. To understand the digital vulnerable 3. To protect their digital environment | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | | Understand cyber threats | | | | | | | K2 | |
| 2 | | | Understand the vulnerable | | | | | | | K2 | |
| 3 | | | Protect the working environment | | | | | | | K3 | |
| 4 | | | Predict the security breach | | | | | | | K6 | |
| 5 | | | Make the digital environment safe | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **UNIT:1** | | | | **Security Basics** | | | **6 HOURS** | | | | |
| Securing Infrastructures – Access Control and Monitoring Systems | | | | | | | | | | | |
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| **UNIT:2** | | | | **Local Host Security** | | | **6 HOURS** | | | | |
| Local Host Security – Securing Devices – Protecting inner perimeter | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **UNIT:3** | | | | **Local Network Security** | | | **6 HOURS** | | | | |
| Securing local network – transmission media vulnerabilities – security challenges | | | | | | | | | | | |
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| **UNIT:4** | | | | **Internet security** | | | **6 HOURS** | | | | |
| Internet security – firewall – proxy server – DMZs - VPN | | | | | | | | | | | |
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| **UNIT:5** | | | | **Defending Vulnerables** | | | **6 HOURS** | | | | |
| Identifying vulnerable -defending against vulnerabilities | | | | | | | | | | | |
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| **UNIT:6** | | | | **Contemporary Issues** | | | **2 HOURS** | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | |
|  | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | | **32 HOURS** | | | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | Charles J. Brooks, Christopher Grow, Philip A. Craig, Jr., Donald Short Cyber security Essentials·Sybex, 2018 | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | Noah Zhang Cyber Security: The Beginners Guide to Learning The Basics of Information Security and Modern Cyber Threats 2019 | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | | https://nptel.ac.in/courses/106106129 | | | | | | | | | |
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| Course Designed By: **Dr. T.RAMESH.** | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | L | S | S | L | S | S | M |
| **CO3** | L | M | S | S | S | S | L | S | S | S |
| **CO3** | L | L | S | S | S | S | S | S | S | S |
| **CO4** | M | M | S | S | S | S | L | M | S | S |
| CO5 | M | M | S | S | S | S | M | M | S | M |

\*S-Strong; M-Medium; L-Low

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| **Course code** | | | | **22ITC05** | **AUGMENTED REALITY** | **L** | **T** | **P** | | **C** | |
|  | | | | | **Certificate Course** | **2** | **-** | **-** | | **2** | |
| **Pre-requisite** | | | | | **Introduction to Computer Graphics and Image Processing** | **Syllabus version** | | **2022-23** | | | |
| **Course objectives** | | | | | | | | | | | |
| 1. To provide a foundation to the fast growing field of AR 2. To make the students aware of the various AR devices. 3. To get exposure to AR concepts | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | Define how AR systems work and list the applications of AR. | | | | | | | | | **K1** |
| 2 | | Understand and evaluates the hardware requirement of AR. | | | | | | | | | **K2** |
| 3 | | Use computer vision concepts for AR and describe AR techniques | | | | | | | | | **K3** |
| 4 | | Analyse and understand the working of various state of the art AR devices | | | | | | | | | **K4** |
| 5 | | Gain knowledge of mixed reality | | | | | | | | | **K5** |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create | | | | | | | | | | | |
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| **UNIT:1** | | | | **Introduction to Augmented Reality** | | | | **6 HOURS** | | | |
|  | | | | **Augmented Reality :**Definition – History - Applications of augmented reality- Augmented Reality Concepts | | | | | | | |
| **UNIT:2** | | | | **Augmented Reality Hardware** | | | | **6 HOURS** | | | |
|  | | | | **Augmented Reality Display Hardware :**Audio Displays, Haptic Displays, Visual Displays, Othersensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model.. | | | | | | | |
| **UNIT:3** | | | | **Tracking & Sensors** | | | | **6 HOURS** | | | |
|  | | | | Tracking & Sensors : Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion | | | | | | | |
| **UNIT:4** | | | | **Computer Vision for Augmented Reality** | | | | **6 HOURS** | | | |
|  | | | | Computer Vision for Augmented Reality- Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking | | | | | | | |
| **UNIT:5** | | | | **Augmented Reality Software** | | | | **6 HOURS** | | | |
|  | | | | Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application | | | | | | | |
| **UNIT:6** | | | | **Contemporary Issues** | | | | **2 HOURS** | | | |
|  | | | | Expert lectures, online seminars – webinars  Latest Development / Topics in Augmented Reality | | | | | | | |
| **Total lecture hours** | | | | | | | | | **32 HOURS** | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | | | Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018. | | | | | | | | |
| 2 | | | Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India;First edition, 2016. | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | | | Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016. | | | | | | | | |
| 2 | | | SanniSiltanen- Theory and applications of marker-based augmented reality. Julkaisija –Utgivare Publisher. 2012. | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| **1** | <https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf>  https://docs.microsoft.com/en-us/windows/mixed-reality/  <https://docs.microsoft.com/en-us/archive/msdn-magazine/2016/november/hololensintroduction-to-the-hololens>  https://www.coursera.org/learn/ar https://www.udemy.com/share/101XPi/ | | | | | | | | | | |
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| Course Designed By: **Dr. T. RAMESH** | | | | | | | | | | | |

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| Mapping with Programme Outcomes | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | M | S | L | L | M |
| **CO2** | S | M | S | S | M | S | M | L | M | L |
| **CO3** | M | L | M | M | L | L | L | M | L | M |
| **CO4** | M | S | M | L | S | S | M | L | S | S |
| **CO5** | M | M | S | M | M | L | S | M | M | L |

\*S-Strong; M-Medium; L-Low