## 

**M.Sc., Computer Science**

Syllabus

UNIVERSITY DEPARTMENT

**Program Code: CSEE**

**2025 – 2026 onwards**



**BHARATHIAR UNIVERSITY**

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

**Ranked 21st among Indian Universities by MHRD-NIRF)**

**Coimbatore - 641 046, Tamil Nadu, India**

**BHARATHIAR UNIVERSITY : : COIMBATORE 641046**

**DEPARTMENT OF COMPUTER SCIENCE**

**(Effective from the academic Year 2025-2026)**

MISSION

* Creating and disseminating of world class knowledge in global context
* Equip students with knowledge on up-to-date technological developments to take part in global software industry
* Promote state of art inter disciplinary research in computer science
* Imbibe entrepreneurial culture through curriculum, pedagogy, research and mentoring

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

Candidates for admission to the first year programme leading to the Degree of Master of Science in Computer Science (M.Sc. – CS) will be required to possess:

A pass in B.Sc. Computer Science/ Information Technology/ Computer Applications or its equivalents.

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.**

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

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

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| **Program Educational Objectives (PEOs)** | |
| The **M. Sc. Computer Science** program describe accomplishments that graduates are expected to attain within five to seven years after graduation | |
| PEO1 | Employed in software industry and engaging in understanding and applying new ideas and thoughts as the field evolves |
| PEO2 | Promotion of inter disciplinary research for inventions/innovations for professional careers to meet the needs of the society |
| PEO3 | Enhanced to cope up with the changing technologies in the frontier of computer science and allied field |
| PEO4 | Incorporating Industry 5.0 Technologies in their career based on industry needs |
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| **Program Specific Outcomes (PSOs)** | |
| After the successful completion of M.Sc Computer Science program, the students are expected to | |
| PSO1 | Take up higher education in top Institutions |
| PSO2 | Get expertise in developing smart applications |
| PSO3 | Get career opportunities as Data Scientist/ Data Analyst |
| PSO4 | Become an entrepreneur in designing and development |
| PSO5 | Demonstrate proficiency in problem solving techniques using Industry 4.0 and Industry 5.0 |
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| **Program Outcomes (POs)** | |
| On successful completion of the M. Sc. Computer Science program | |
| PO1 | Gain and apply the knowledge of computer science concepts in appropriate domain of interest |
| PO2 | Ability to analyze the problem, identify the required computing facility and implement it to obtain solutions |
| PO3 | Ability to create a new design for the complex computational problems which meets the specific needs for environmental and societal impact domains |
| PO4 | Students can independently enable to acquire the innovative ideas and solve complex real-time problems by considering professional, ethical, legal and social issues |
| PO5 | Understand and choose the appropriate modern techniques and tools for the complex systems of various domains and understands the advantages and limitations |
| PO6 | Ability to work in a group with an effective rapport building with team members in computer industries to accomplish a common goal |
| PO7 | Ability to communicate effectively in the basis of presenting their research work and gain knowledge on documentation and reports writing in a professional way |
| PO8 | Ability to distinguish the ethical, legal and societal issues of computing surroundings and will take the responsibility by applying computer skill practices |
| PO9 | Ability to analyze the local and global impact of computing on individuals, organizations and society |
| PO10 | Demonstrate the principles of computer science and apply these in the multidisciplinary environments to manage project |
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BHARATHIAR UNIVERSITY : : COIMBATORE 641 046

**M. Sc Computer Science Curriculum (University Department)**

*(For the students admitted during the academic year 2025-2026 onwards)*

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Title of the Course** | **Credits** | **Hours** | | **Maximum Marks** | | |
| **Theory** | **Practical** | **CIA** | **ESE** | **Total** |
| **FIRST SEMESTER** | | | | | | | |
| 25CS1C1 | Advanced Operating System | 4 | 4 | - | 25 | 75 | 100 |
| 25CS1C2 | Data Structures and Algorithms | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS1C3 | Advanced Java Programming | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS1C4 | Python Programming | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS1C5 | Mathematical Foundations of Computer Science | 4 | 4 | - | 25 | 75 | 100 |
| 25CS1EX | Elective – I | 4 | 4 | - | 25 | 75 | 100 |
| PDC | Industry Literacy | 1 | - | - | 25 | - | 25 |
| 1GS | General Supportive - I | 2 | - | - | 12 | 38 | 50 |
| 25CS1JOC1 | Job-Oriented Course | 2 | - | - | 50 | - | 50 |
| **Total** | | **29** |  |  |  |  | **725** |
| **SECOND SEMESTER** | | | | | | | |
| 25CS2C1 | Linux Programming | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS2C2 | Compiler Design | 4 | 4 | - | 25 | 75 | 100 |
| 25CS2C3 | Internet of Things | 4 | 4 | - | 25 | 75 | 100 |
| 25CS2C4 | Data Mining Techniques and Tools | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS2C5 | Database Administration and Management | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS2EX | Elective - II | 4 | 4 | - | 25 | 75 | 100 |
| 25CS2MP | Mini Project - I | 2 |  |  | 50 |  | 50 |
| 2GS | General Supportive - II | 2 |  |  | 12 | 38 | 50 |
| 25CS2VAC1 | Value Added Course | 2 |  |  | 50 | - | 50 |
| **Total** | | **30** |  |  |  |  | **750** |
| **THIRD SEMESTER** | | | | | | | |
| 25CS3C1 | C# and .NET Technology | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS3C2 | Software Project Management | 4 | 4 | - | 25 | 75 | 100 |
| 25CS3C3 | Cloud Computing | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS3C4 | Big Data Analytics | 4 | 2 | 4 | 25 | 75 | 100 |
| 25CS3EX | Elective - III | 4 | 4 | - | 25 | 75 | 100 |
| 25CS3MP | Mini Project - II | 4 | - | - | 100 | - | 100 |
| PDC | Research Review Analysis | 1 | - | - | 25 | - | 25 |
| 3GS | General Supportive - III | 2 | 2 | - | 12 | 38 | 50 |
| General | Value Added Course(Health and Wellness) | 2 | - | - | 50 | - | 50 |
| **Total** | | **29** |  |  |  |  | **725** |
| **FOURTH SEMESTER** | | | | | | | |
| 25CS4PW | Project Work | 12 |  |  | 180 | 120 | 300 |
| **Total** | | 12 |  |  |  |  | **300** |
| **Grand Total** | | **100** |  |  |  |  | **2500** |

**Note: Students must mandatorily publish or present their Research Review Analysis work in an international journal/conference before attending the viva-voce**

**Online Course**

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|  | SWAYAM – MOOC Course\* | 2 |  |  |  |  |  |

\*Swayam – Mooc online course shall be for at least 4 weeks with at least 2 credits.

The course shall be mandatory and shall be completed within the third semester (i.e., before the beginning of the fourth semester)

**Elective Papers**

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| --- | --- | --- | --- | --- |
| **Sem** | **Elective** | **Suggested Code** | **Title of the Paper** | **No. of Credits** |
| I | Elective – I | 25CS1E1 | Information Security | 4 |
| 25CS1E2 | Artificial Intelligence | 4 |
| 25CS1E3 | Business Intelligence | 4 |
| II | Elective – II | 25CS2E1 | Wireless Networks | 4 |
| 25CS2E2 | Machine Learning Techniques | 4 |
| 25CS2E3 | Health Care Analytics | 4 |
| III | Elective – III | 25CS3E1 | Cyber Security | 4 |
| 25CS3E2 | Deep Learning Techniques | 4 |
| 25CS3E3 | Social Media Analytics | 4 |

**Supportive Papers**

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| --- | --- | --- | --- | --- | --- |
| Suggested Code | Sem | Title of the paper | Hrs | Credits | Marks |
| 25CSS01 | I/II/III | Windows and MS Word | 2 | 2 | 50 |
| 25CSS02 | Internet and HTML Programming | 2 | 2 | 50 |
| 25CSS03 | Relational Database Management System | 2 | 2 | 50 |
| 25CSS04 | Object Oriented Programming | 2 | 2 | 50 |
| 25CSS05 | Software Engineering | 2 | 2 | 50 |
| 25CSS06 | Multimedia Systems | 2 | 2 | 50 |

**List of Job-Oriented Courses**

1. Data Analysis using Excel

2. Power BI for Data Analytics

3. Mobile Application Development

4. Smart Applications with the Internet of Things

5. DevOps

**List of Value-Added Courses**

1. Software Testing Tools

2. Cyber Security and Digital Forensics

3. Remote Sensing and GIS

4. Digital Marketing

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| **Course Code** | | | | **25CS1C1** | **ADVANCED OPERATING SYSTEMS** | | | **L** | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **CORE** | | | **4** | | | | **0** | **0** | **4** |
| **Pre-requisite** | | | | | Fundamentals of Operating Systems | | | **Syllabus Version** | | | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To review the basic concepts of operating system and to introduce the advanced concepts. 2. To discuss about process synchronization, distributed operating systems, real time operating systems, operating system for handheld systems, LINUX OS and iOS. 3. To inculcate the working principles, features, various services and limitations of different types of operating system. | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | | Understand the functions, types, advanced concepts in operating system, and the process concepts. Analyze deadlock situations, the reason for deadlock, recovery of deadlocks and how to avoid deadlocks. | | | | | | | | K2/K4 | | | |
| 2 | | | Understand and analyze the concepts of distributed operating systems, issues and file system coding in distributed system. | | | | | | | | K2/K4 | | | |
| 3 | | | Analyze the need of Real time operating system and describe about security issues and applications of real time operating system. | | | | | | | | K2/K4 | | | |
| 4 | | | Understand how to use the Palm OS and Android in handheld devices. | | | | | | | | K2/K3/K4 | | | |
| 5 | | | Understand the information about the Linux operating system and iOS architecture, layers and their functions. | | | | | | | | K2/K3/K4 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
| **Unit:1** | | | | **Process Synchronization** | | | | | | **12 hours** | | | | |
| Overview - Introduction – Functions of an operating system – Design approaches – Why advance operating systems – Types of advanced operating systems. Synchronization mechanisms: Introduction – Concept of a process – Concurrent processes – The critical section problem – Other synchronization problems. Process deadlocks: Introduction – preliminaries – models of deadlocks | | | | | | | | | | | | | | |
| **Unit:2** | | | | **Distributed Operating Systems** | | | | | **10 hours** | | | | | |
| Issues – Communication Primitives – Lamport’s Logical Clocks – Deadlock handling strategies – Issues in deadlock detection and resolution- distributed file systems –design issues – Case studies – The Sun Network File System-Coda. | | | | | | | | | | | | | | |
| **Unit:3** | | | | **Real Time Operating Systems** | | | **15 hours** | | | | | | | |
| Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling | | | | | | | | | | | | | | |
| **Unit:4** | | | | **Operating Systems for Handheld Systems** | | | **10 hours** | | | | | | | |
| Requirements – Technology Overview – Handheld Operating Systems – Palm OS - Android –Architecture of android – Securing handheld systems | | | | | | | | | | | | | | |
| **Unit:5** | | | | **Linux and iOS** | | **11 hours** | | | | | | | | |
| Linux System: Introduction – Memory Management – Process Scheduling – Scheduling Policy - Managing I/O devices – Accessing Files- iOS: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System | | | | | | | | | | | | | | |
| **Unit:6** | | | | **Contemporary Issues** | | **2 hours** | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars - Workshops | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **60 hours** | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | | |
| 1 | MukeshSinghal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill ​ Publishers​, 2011 | | | | | | | | | | | | | |
| 2 | Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India ​ Publishers, Second Edition, 2008. | | | | | | | | | | | | | |
| 3 | Daniel.P.Bovet& Marco Cesati, ”Understanding the Linux kernel”, O‟ReillyPublishers , 3rd edition, 2005 | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1 | Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Payload media Publishers, Fourth Edition 2011 | | | | | | | | | | | | | |
| 2 | YoonSeokPyo, HanCheol Cho, RyuWoon Jung, TaeHoon Lim, “ROS Robot Programming From the basic concept to practical programming and robot application”, ROBOTICS Co., Ltd, 2017. | | | | | | | | | | | | | |
| 3 | Pramod Chandra P.Bhatt, “An Introduction To Operating Systems, Concept And Practice”, PHI publishers, Third edition, 2013. | | | | | | | | | | | | | |
| 4 | Andrew S. Tanenbaum, “Modern Operating System”, Prentice-Hall, Inc, Third edition, 2008 | | | | | | | | | | | | | |
| 5 | AnisKoubaa, “Robot Operating System (ROS) The Complete Reference (Volume 1)”, Springer Publishers, First Edition, 2016 | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | |
| 1 | | <http://nptel.ac.in/courses/Webcourse-contents/IIScBANG/Operating%20Systems/New_index1.html> | | | | | | | | | | | | |
| 2 | | <https://www.tutorialspoint.com/operating_system/index.htm> | | | | | | | | | | | | |
| 3 | | <https://www.coursera.org/courses?languages=en&query=operating+system> | | | | | | | | | | | | |
| 4 | | <https://in.udacity.com/course/advanced-operating-systems--ud189> | | | | | | | | | | | | |
| 5 | | <http://wiki.ros.org/ROS/Tutorials> | | | | | | | | | | | | |
| 6 | | <https://www.toptal.com/robotics/introduction-to-robot-operating-system> | | | | | | | | | | | | |
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| Course Designed By: **Dr. S.Vijayarani** | | | | | | | | | | | | | | |

**Mapping with programme outcomes:**

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| **COS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| CO1 | **S** | **M** | **L** | **L** | **M** | **L** | **L** | **L** | **M** | **L** |
| CO2 | **S** | **M** | **M** | **M** | **L** | **M** | **S** | **M** | **S** | **S** |
| CO3 | **S** | **M** | **M** | **L** | **M** | **M** | **L** | **L** | **M** | **S** |
| CO4 | **S** | **S** | **S** | **L** | **M** | **M** | **M** | **L** | **S** | **S** |
| CO5 | **S** | **L** | **M** | **L** | **M** | **L** | **L** | **M** | **S** | **S** |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | | **25CS1C2** | **DATA STRUCTURES AND ALGORITHMS** | | | | **L** | **T** | | **P** | **C** |
| **Core/Elective/Supportiveee** | | | | | **CORE** | | | | **2** | **0** | | **4** | **4** |
| **Pre-requisite** | | | | | Students should be able to program in any standard programming language | | | | **Syllabus**  **Version** | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are to:  1. Provide a good background in data structures and algorithms to prepare the students for job in industry  2. Learn systematic way of solving the problems  3. Solve the problems using data structures and algorithms | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | Remember and Understand the fundamental data structures and implement them using programming languages | | | | | | | | | K1/K2 | | |
| 2 | | Understand and Apply the time complexity of different problems | | | | | | | | | K2/K3 | | |
| 3 | | Understand efficient data structures and apply them to solve the problems | | | | | | | | | K2/K3 | | |
| 4 | | Analyze and Evaluate the various algorithms | | | | | | | | | K4/ K5 | | |
| 5 | | Understand and Create data structures and algorithms for various domains | | | | | | | | | K2/K6 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Unit:1** | | | | **DATA STRUCTURES BASICS** | | | | **11 hours** | | | | | |
| Introduction: Definition, Structure and Properties of algorithms –Development of an algorithm –Data Structures and algorithms –Data Structure definition and classification. Analysis of algorithms: Efficiency of algorithms –Apriori analysis –Asymptotic notations –Time complexity of an algorithm using O notation –Polynomial Vs Exponential algorithms –Average, Best and Worst-case complexities –Analyzing recursive programs. | | | | | | | | | | | | | |
| **Unit:2** | | | | **STACK AND QUEUE** | | | | **11 hours** | | | | | |
| Stacks: Introduction -Stack Operations –Applications –Recursion -Evaluation of Expressions. Queues: Introduction -Operations on Queues –Circular queues –Application of a linear queue. Linked Lists: Introduction - Singly linked lists -Circularly linked lists -Doubly linked lists -Applications –polynomial addition | | | | | | | | | | | | | |
| **Unit:3** | | | | **TREES AND GRAPHS** | | | **12 hours** | | | | | | |
| Binary Trees: Introduction –Representation of Trees –Binary Tree Traversals. Binary Search Trees: Introduction –Operations. AVL Trees: Definition -Operations. B-Trees: Introduction – m-way search trees -B trees definition and operations. Graphs: Introduction –Definitions –Representation of Graphs –Graph Traversal -Depth-First and Breadth-First Algorithms -Topological Sorting | | | | | | | | | | | | | |
| **Unit:4** | | | | **ALGORITHM DESIGN TECHNIQUES I** | | | **12 hours** | | | | | | |
| Divide and Conquer: General Method –Binary Search –Merge Sort –Quick Sort. Greedy Method: General Method –Knapsack Problem –Minimum Cost Spanning Tree –Single Source Shortest Path | | | | | | | | | | | | | |
| **Unit:5** | | | | **ALGORITHM DESIGN TECHNIQUES II** | | | **12 hours** | | | | | | |
| Dynamic Programming: General Method –Multistage Graphs –All Pair Shortest Path –Traveling Salesman Problem. Backtracking: General Method –8-Queens Problem –Sum of Subsets –Hamiltonian Cycles. Branch and Bound: The Method –0/1 Knapsack Problem –Traveling Salesperson | | | | | | | | | | | | | |
| **Unit:6** | | | **CASE STUDY** | | | **02 hours** | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | |
|  | | | **Total Lecture hours** | | | **60 hours** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | GAV Pai, Data Structures and Algorithms Concepts, Techniques and Applications, Tata McGraw Hill, 2008. | | | | | | | | | | | | |
| 2 | Robert Sedgewick, Phillipe Flajolet, “An Introduction to the Analysis of Algorithms”, Second Edition, Addison- Wesley Professional, 2013. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Jean Paul Tremblay, Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill, Second Edition. | | | | | | | | | | | | |
| 2 | Sartaj Sahni, “Data Structures, Algorithms and Applications in C++”, Second Edition, Universities Press, 2005. | | | | | | | | | | | | |
| 3 | Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Second Edition, Universities Press, 2008. | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | <https://swayam.gov.in/nd1_noc20_cs10/preview> | | | | | | | | | | | | |
| 2 | Hsuan – Hao Hsu, Chen – Hsuan Huang, and Shiang – Tai Lin, 2019, New data structure for computational molecular design with atomic or fragment resolution, J. Chem. Inf. Model, 59 (9), 3703-3713. Available at: <https://pubs.acs.org/doi/abs/10.1021/acs.jcim.9b00478> | | | | | | | | | | | | |
| Course Designed By: **Dr.D.Ramyachitra** | | | | | | | | | | | | | |

**List of Programs**

1. Creation of Stack and its operations
2. Creation of Queue and its operations
3. Creation of Circular queue and the operations
4. Implementation of Singly linked list
5. Implementation of Circular linked list
6. Implementation of Doubly linked list
7. Implementation of Binary tree
8. Implementation of Binary tree traversal
9. Implementation of Binary search tree
10. AVL tree and the operations
11. B tree and the operations
12. Graph traversal
13. Binary search
14. Merge sort
15. Quick sort
16. Implementation of Knapsack problem
17. Implementation of Minimum cost spanning tree
18. Implementation of Multistage graph
19. Implementation of N Queens problem
20. Implementation of Travelling salesman problem

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

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Course code** | | | | **25CS1C3** | **ADVANCED JAVA PROGRAMMNG** | | | **L** | | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **CORE** | | | **2** | | | | **0** | | **4** | **4** |
| **Pre-requisite** | | | | | Basic Java, Object Oriented Programming concepts | | | **Syllabus Version** | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. To inculcate the students to understand the advanced JAVA concepts 2. To develop Java based applications by applying these advanced concepts to implement in web based applications | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | | Create Applications using Swing Components. | | | | | | | | | | | K2/K3/K4/K6 | |
| 2 | | | Write distributed applications using RMI | | | | | | | | | | | K2/K3/K4/K6 | |
| 3 | | | Establishing DATABASE Connectivity using JAVA | | | | | | | | | | | K2/K3/K4 | |
| 4 | | | Understand the JavaScript language & the Document Object Model. | | | | | | | | | | | K2/K3/K4 | |
| 5 | | | Understand and apply Well-Formed XML and different types of XML Schemas | | | | | | | | | | | K2/K3/K6 | |
| 6 | | | Understand AJAX | | | | | | | | | | | K2/K3/K4 | |
| 7 | | | **Learn how to build interactive web pages using ReactJS, manage data on the client side, and connect to APIs.** | | | | | | | | | | | K2/K3/K4 | |
| 8 | | | **Understand how to create a backend using Node.js and Express, work with databases, and add secure login using cookies and JWT.** | | | | | | | | | | | K2/K3/K4  /K5 | |
| 9 | | | Understand Struts, Spring and Hibernate frameworks | | | | | | | | | | | K2/K3 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | **Java GUI Programming using Swing** | | | | | | **9 -- hours** | | | | | |
| Java GUI Programming: Features of Java GUI – Platform independence – Event-driven programming basics. Classes and Packages: Introduction to Swing-related packages – Importing and using GUI classes. MVC Architecture: Basic understanding of Model-View-Controller pattern – Role of components and event listeners. Swing Basic Components: Introduction to Swing – Creating GUI using JFrame – Components: JButton, JLabel, JList, JComboBox, and JMenu – Basic event handling using ActionListener. Simple GUI Application: Creating a basic form interface – Using Swing components to design interactive layouts – Example demonstrating user input and event handling. | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | **Distributed and Database Programming in Java** | | | | | **10-- hours** | | | | | | |
| **RMI overview – RMI architecture – Steps to create an RMI application – Defining remote interfaces – Implementing remote classes – Binding to RMI registry – Client-server communication using stubs and skeletons – Example demonstrating RMI method invocation. Introduction to JDBC – JDBC architecture – Loading drivers and establishing connection – Executing SQL queries using Statement and PreparedStatement – Retrieving and processing ResultSet – Using CallableStatement for stored procedures – Handling exceptions and transactions – Example demonstrating database access using JDBC.** | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **JAVA for Web Technologies** | | | **12-- hours** | | | | | | | | |
| Client Side Programming – Overview of client-side technologies – Form design using HTML and CSS – Client-side validation using JavaScript – Content structuring using XML – Adding interactivity with AJAX. Server Side Programming – Overview of web servers – Handling HTTP requests and responses – Database access using server-side scripts – Session management using cookies and HttpSession. | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **ReactJS** | | | | | | | **18-- hours** | | | | |
| Overview of full-stack architecture – Introduction to RESTful APIs and HTTP communication – Building server-side logic using Node.js and Express – Handling HTTP requests and responses using Express middleware – Data exchange and processing using JSON – Database operations using MongoDB or SQL with Sequelize – Designing dynamic user interfaces using ReactJS – Component-based frontend development and routing – Consuming REST APIs using Fetch or Axios – Managing client-side state using React Context, Redux, services – Handling CORS and API integration – Implementing authentication and session management using cookies and JWT. | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Java Enterprise Frameworks (Spring, Hibernate, Struts)** | | **9-- hours** | | | | | | | | | |
| Hibernate: Introduction to Hibernate – Advantages of Hibernate – Hibernate Architecture – Mapping classes to database tables – Using annotations and HQL – Example demonstrating Hibernate integration. Spring Framework: Overview of Spring – Core concepts of IoC and DI – Spring Bean lifecycle – Introduction to Spring MVC – Integration with Hibernate. | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | **Contemporary Issues** | | **2 hours** | | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | | | |
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|  | | | | **Total Lecture hours** | | **60-- hours** | | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | | | |
| 1 | Herbert Schildt - JAVA 2 ( The Complete Reference)- Ninth Edition, TMH, 2014 | | | | | | | | | | | | | | |
| 2 | Jim Keogh, “The Complete Reference J2EE, Tata McGraw-Hill, 2002. | | | | | | | | | | | | | | |
| 3 | H. M.Deitel, P. J. Deitel, S. E. Santry , Advanced Java 2 Platform HOW TO PROGRAM, Prentice Hall | | | | | | | | | | | | | | |
| 4 | Gutman, David. Fullstack Node.js: The Complete Guide to Building Production Apps with Node.js. Edited by Nate Murray, Fullstack.io, 2019. | | | | | | | | | | | | | | |
| 5 | Mastering Full-Stack React Web Development. Packt Publishing, 2017. | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | |
| 1 | Brian Cole, Robert Eckstein, James Elliott, Marc Loy, David Wood, Java Swing, O’Reilly Publishers, second edition, 2002 | | | | | | | | | | | | | | |
| 2 | Patrick Naughton, “The Java Hand Book, Tata McGraw Hill, 1996. | | | | | | | | | | | | | | |
| 3 | Kogent Solutionss, Java Server Programming Java Ee5 Black Book,Dreamtech Press, 2008 | | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | |
| 1 | | <https://www.tutorialspoint.com/javascript> | | | | | | | | | | | | | |
| 2 | | <https://www.tutorialspoint.com/java_xml> | | | | | | | | | | | | | |
| 3 | | https://www.tutorialspoint.com/ajax | | | | | | | | | | | | | |
| 4 | | <https://www.w3schools.com/> | | | | | | | | | | | | | |
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| Course Designed By: Dr. K. Geetha | | | | | | | | | | | | | | | |

**List of Programs:**

1. Create a student information form using JComboBox and JList.
2. Create a menu-driven application using JMenu and JMenuItem with event handling for options like Open, Exit, and About
3. Design a basic AWT form that uses Swing components for input and display with simple event handling
4. Design a simple login form with username and password fields and validate input using ActionListener
5. Create a basic Swing window using JFrame and add components.
6. Create a simple RMI application to perform addition of two numbers using remote method invocation.
7. Implement an RMI-based client-server program where the server provides student details based on a student ID.
8. Design a JDBC program to connect to a database and retrieve all records from a table using Statement.
9. Write a JDBC application to insert and update employee details using PreparedStatement.
10. Create a JDBC program to call a stored procedure using CallableStatement and handle exceptions properly.
11. **Design a student registration form using HTML and style it using CSS.**
12. **Implement client-side validation using JavaScript to check empty fields and email format in a form.**
13. **Create an AJAX-based application to fetch and display data from a server without reloading the page.**
14. **Develop a server-side script to handle form submission, store data in a database, and manage user session using HttpSession.**
15. Create a basic backend API that performs CRUD operations
16. Build a simple React app that fetches data from the API**.**
17. **Design a ReactJS frontend to display the list of products and add new entries through a form.**
18. Add login and registration functionality to the app with secure JWT-based authentication.
19. **Develop a simple Hibernate application to perform CRUD operations on a student table using annotations and HQL.**
20. **Create a Spring application that demonstrates Dependency Injection (DI) using annotations and XML-based** configuration**.**

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **M** | **M** | **S** | **L** | **S** | **L** | **S** |
| **CO2** | **S** | **S** | **S** | **M** | **M** | **S** | **S** | **S** | **S** | **S** |
| **CO3** | **S** | **S** | **S** | **L** | **L** | **M** | **S** | **S** | **S** | **S** |
| **CO4** | **S** | **S** | **S** | **M** | **S** | **S** | **S** | **M** | **S** | **M** |
| **CO5** | **S** | **S** | **S** | **L** | **M** | **S** | **S** | **S** | **S** | **S** |
| **CO6** | **S** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** |
| **CO7** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **M** | **S** | **M** |
| **CO8** | **S** | **S** | **M** | **M** | **M** | **M** | **S** | **S** | **L** | **S** |

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

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| **Course code** | | | | **25CS1C4** | | **PYTHON PROGRAMMING** | | | **L** | | | | **T** | **P** | | **C** |
| **Core/Elective/Supportive** | | | | | | **CORE** | | | **2** | | | | **0** | **4** | | **4** |
| **Pre-requisite** | | | | | | Comprehensive knowledge and understanding of the basic components of Python programming language. | | | **Syllabus Version** | | | | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide in depth knowledge about the basic concepts of Python programming. 2. To discuss the principle of algorithm design to most high level programming languages.   3. To design real life situational problems and think creatively about solutions of them. | | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | | |
| 1 | | | Develop python programs for core python and data types using objects and functions. Develop python programs for list and control statements  and understand the different loops such as “for”, “while”and “do-while” | | | | | | | | | K3 / K6 | | | | |
| 2 | | | Apply the Mapping and the Dictionary technique for the given problem. Implement File Objects and Object-Oriented Programming using python | | | | | | | | | K3 / K4 | | | | |
| 3 | | | Explain about the functions and packages involved in modules | | | | | | | | | K1 / K2 | | | | |
| 4 | | | Manage Errors and Exceptions and summarize the Network Programming. Be exposed to advanced applications such as Internet Client Programming and GUI Programming | | | | | | | | | K2 / K3/ K4 | | | | |
| 5 | | | Explain the basic concepts and need for Graph databases. Create databases and retrieve records using Neo4j. Provide the information about data visualization and its need. | | | | | | | | | K2 / K4/ K5 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | | |
| **Unit:1** | | | | | **Core Python** | | | | | | **10 hours** | | | | | |
| Introduction-features-Comparative Study-Comments-Variables and Assignments. Python Objects: Standard types-Built-in-type Internal type-Standard type operator and Built-in functions-Categorizing standard type Unsupported type. Numbers: Introduction- Integer-Floating Point-Complex numbers-Operators-Built-in and factory functions. Sequences- Strings-Strings and Operator-String only operator- Built-in-Functions-Built-in-Methods-String Features-Unicode. | | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | | **List** | | | | | **12 hours** | | | | | | |
| List-Operators-Built-in-Functions-Built-in-Methods-Features of List. Tuple: Introduction Operators and Built-in-Functions-Features of tuples-Copying Python Objects and shallow and deep copies. Mapping type: Dictionaries- mapping type Operators-Built-in and Factory Functions-Built-in- Methods- Dictionary Keys. Set type: Introduction Operators-Built-in Function-Built-in Methods--Conditional and looping statement. | | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | | **File** | | | **12 hours** | | | | | | | | |
| File Objects- Built in Functions-Methods-Attributes-Standard files-Command line Argument-File System-File Execution-Persistent Storage Modules. Object-Oriented Programming: Classes and Instance- Binding and Method Invocation-Static Methods and Class methods-Inheritance. Modules: Modules and Files-Namespace-Importing Modules- Features-Built-in Functions-Packages. | | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | | **Errors and Exceptions** | | | **12 hours** | | | | | | | | |
| Exceptions in python-Detecting and Handling Exceptions- Context Management-Raising Exception-Assertions. Regular Expression: Introduction-Special Symbols and characters-Regexes and Python Examples of Regexes. Network Programming: Introduction-Socket. | | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | | **Internet Client Programming** | | **12 hours** | | | | | | | | | |
| Transferring files-Email. Multi-threaded Programming: Threads and Processes- Global Interpreter Lock-Thread Module- Threading Module. GUI Programming: Introduction-Tkinter and Python. DB Programming: Introduction-Python DB- API-Object Relational Managers (ORM). | | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | | **Industry 4.0** | | **2 hours** | | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | | | | |
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|  | | | | | **Total Lecture hours** | | **60 hours** | | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | | | | |
| 1 | Aditya Kanetkar, Let Us Python,bpb publications,2020 | | | | | | | | | | | | | | | |
| 2 | Harsh Bhasin,Python for Beginners, New Age International (P) Ltd Publishers,2018 | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | | |
| 1 | Al Sweigart,Automate the Boring Stuff with Python: Practical Programming for Total Beginners, 2015 | | | | | | | | | | | | | | | |
| 2 | Martin C. Brown,Python The Complete Reference | | | | | | | | | | | | | | | |
| 3 | O'Reilly Media,Learning Python, 5th Edition Fifth Edition, 2013 | | | | | | | | | | | | | | | |
| 4 | Beazley David, Python Essential Reference, Pearson Education (US),2009 | | | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | | |
| 1 | | <https://swayam.gov.in/nd1_noc19_cs59/preview> | | | | | | | | | | | | | | |
| 2 | | <https://www.python.org/> | | | | | | | | | | | | | | |
| 3 | | <https://www.tutorialspoint.com/python/index.htm> | | | | | | | | | | | | | | |
| 4 | | <https://nptel.ac.in/courses/106/106/106106182/> | | | | | | | | | | | | | | |
| 5 | | <https://www.w3schools.com/python/> | | | | | | | | | | | | | | |
| Course Designed By: **Dr. D.NAPOLEON** | | | | | | | | | | | | | | | | |

**List of Programs**

1. Write a program to demonstrate different number data types in python
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing substring from a given string.
4. Write a python script to print the current date in following format “Sun

May 29 02:26:23 IST 2017”

1. Write a python program to create, append and remove lists in python.
2. Write a program to demonstrate working with tuples in python
3. Write a python program to find largest of three numbers.
4. Write a python program to convert temperature to and from Celsius to Fahrenheit.
5. Write a python program to construct the following pattern using nested for loop.
6. Write a python program to print prim numbers less than 20.
7. Write a python program to find factorial of a number using recursion.
8. Write a python program to that accepts length of three sides of a triangle as

inputs. The program should indicate whether or not the triangle is a rightangled triangle (use Pythagorean theorem).

1. Write a python program to define a module to find Fibonacci Numbers and

import the module to another program.

1. Write a python program to define a module and import a specific function

in that module to another program.

1. Write a program that inputs a text file. The program should print all of the

unique words in the file in alphabetical order.

1. Write a Python class to convert an integer to a roman numeral.
2. Write a Python class to implement pow(x, n).
3. Write a Python class to reverse a string word by word.
4. Write a python program to print a number is positive/negative using if-else.Write a python Program to read a number and display corresponding day using if\_elif\_else?Write a python program to check whether the given string is palindrome or not.
5. Write a Python program to remove the “i” th occurrence of the given word in a list where words repeat.
6. Write a program to count frequency of characters in a given file.
7. Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.
8. -Write function to compute GCD, LCM of two numbers.

**Mapping with programme outcomes:**

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

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

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| **Course code** | | | | **25CS1C5** | | **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | | **CORE** | **4** | | **4** | | **0** | **4** |
| **Pre-requisite** | | | | | | Higher secondary level of mathematics and statistics | **Syllabus Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Introduce the basic mathematical terminologies required to understand the various designing concepts, storage methods and to improve the skill of logical thinking for solving different kinds of problems. 2. Give exposure in matrices, theory and applications of Set theory, probability, and Mathematical Logic. Automata theory helps the learner to use it in practical applications of computer science. | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | Understand Matrix operations, determinant of a matrix, its properties and where it can be incorporated in computer applications | | | | | K2/K3/K4 | | | | |
| 2 | | | To introduce the basic of theory of sets, functions and relations and its applications | | | | | K2/K3/K4 | | | | |
| 3 | | | Understand and apply experiments, events, space; to understand Bayse;s Thorem | | | | | K2/K3/K4 | | | | |
| 4 | | | Understand FA, NFA,DFA, Conversion of NFA to DFA, Derivation trees and it applications | | | | | K2/K3/K4 | | | | |
| 5 | | | Understand mathematical Logic to translate natural language sentences into symbolic form, construction of truth table and verification of tautology or contradiction | | | | | K2/K3/K4 | | | | |
| 6 | | | Understand Numerical Methods and to derive appropriate numerical methods to solve algebraic and transcendental equations | | | | | K2/K3/K4 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | |
| **Unit:1** | | | | | **Matrices, Determinants, Set Theory and Relations & Functions** | | | **12 hours** | | | | |
| Matrices: Types of Matrices - Matrix Operations - Inverse of a Matrix - Properties of Determinants - Eigen Values - Cayley-Hamilton Theorem. Set Theory: Basic Set Operations - Relations and Functions – Relation Matrices - Principle of Mathematical Induction. | | | | | | | | | | | | |
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| **Unit:2** | | | | | **Introduction to Probability** | | | **12 hours** | | | | |
| Sample Space and Events - Axioms of Probability - Conditional Probability – Independence of Events - Bayes Theorem. Regression and Correlation : Introduction – Linear Regression – Method of Least Squares – Normal Regression Analysis – Normal Correlation Analysis. | | | | | | | | | | | | |
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| **Unit:3** | | | | | **Grammars and Languages** | | | **11 hours** | | | | |
| Context Free Grammars – Introduction – Context Free Grammars – Derivation Trees. Finite Automata: Finite State Systems – Basic Definitions – Non Deterministic Finite Automata. | | | | | | | | | | | | |
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| **Unit:4** | | | | | **Mathematical Logic** | | | **12 hours** | | | | |
| Statements and Notations – Connectives – Consistency of Premises and Indirect Method of Proof – Automatic Theorem Proving. | | | | | | | | | | | | |
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| **Unit:5** | | | | | **Numerical Methods** | | | **11 hours** | | | | |
| Finding Roots : Bisection Method - Regula–Falsi Method - Newton–RaphsonMethod. Solution of Simultaneous Linear Equations: Gaussian Elimination - Gauss-Seidal Method. Numerical Integration: Trapezoidal Rule - Simpson s Rule. | | | | | | | | | | | | |
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| **Unit:6** | | | | | **Contemporary Issues** | | | **2 hours** | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | |
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|  | | | | | **Total Lecture hours** | | | **60 hours** | | | | |
| **Text Books** | | | | | | | | | | | | |
| 1 | M. K. Venkataraman, “Engineering Mathematics, Volume II, National Publishing Company. | | | | | | | | | | | |
| 2 | John E. Freunds, Irwin Miller, Marylees Miller, “Mathematical Statistics, Pearson Education, Sixth Edition | | | | | | | | | | | |
| 3 | T.T. Soong,” Fundamentals of Probability and Statistics for Engineers” John Wiley & Sons Ltd. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | Peter Linz, “An Introduction to Formal Languages and Automata, Jones & Bartlett Learning, Fifth Edition, 2011. | | | | | | | | | | | |
| 2 | Tremblay and Manohar, “Discrete Mathematical Structures with Applications to Computer Science , Tata McGraw-Hill. | | | | | | | | | | | |
| 3 | S.S. Sastry, “Introductory Methods of Numerical analysis, PHI Learning Private Limited, Fifth Edition, 2012 | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | | https://www.math.hmc.edu/calculus/tutorials/matrixalgebra/ | | | | | | | | | | |
| 2 | | https://www.tutorialspoint.com/automata\_theory/index.htm | | | | | | | | | | |
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| Course Designed By: Dr. K. Geetha | | | | | | | | | | | | |

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| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| CO1 | S | S | S | M | L | S | S | S | S | M |
| CO3 | S | S | S | M | L | S | S | S | S | M |
| CO3 | S | S | S | M | M | L | S | L | S | M |
| CO4 | S | S | S | M | M | S | L | S | S | M |
| CO5 | S | S | S | M | M | L | S | S | L | M |
| CO6 | S | S | S | M | M | S | S | S | S | M |

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

SEMESTER - II

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| **Course code** | | | | **25CS2C1** | **LINUX PROGRAMMING** | | | **L** | | | **T** | | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **CORE** | | | **2** | | | **0** | | | **4** | **4** |
| **Pre-requisite** | | | | | Fundamentals of Operating systems and basics of C language. | | | **Syllabus Version** | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Provide the strong foundation to students on open source Linux operating system basics, system calls and library. 2. Enrich their knowledge on handling processes, threads, signals and synchronization. 3. Train the students to equip their knowledge in Inter-process communications and networking using pipes, named pipes, shared memory, message queue, semaphore and TCP and UDP sockets. | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | | Understand about Unix and Linux history, Unix architecture, GNU, Free software foundation, Distributions, Work with files and directories. | | | | | | | | | K1/K2 | | | |
| 2 | | | Create simple shell scripts, work with files using shell scripts and understand system calls and library functions and create applications using c language. | | | | | | | | | K2/K3 | | | |
| 3 | | | Understand about processes, process structure, Analyze the process states, process controls and process relationships and zombie process | | | | | | | | | K2/K4/K3 | | | |
| 4 | | | Exploring the concepts of signals and threads and illustrate the use of signals and threads and also examine the use of inter-process communication facilities in Linux such as pipes, named pipes and message queues. | | | | | | | | | K2/K3/K4/K6 | | | |
| 5 | | | Design and develop the client/server applications using shared memory with semaphores and also understand sockets and create network based applications using TCP and UDP sockets. | | | | | | | | | K3/K2/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | **Introduction to UNIX and Linux** | | | | | | **12 hours** | | | | | |
| History-Architecture of UNIX operating system- Features of UNIX- Basic commands- Working with files and directories- Commands- File types- File access processes permissions redirection-filters- What is Linux?- Distributions- The GNU Project and the Free Software Foundation | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | **Shell Programming in Linux and System Calls and Library** | | | | | **12 hours** | | | | | | |
| VI editor- Shell syntax- variables- conditions and control structures- command execution- simple programs- System calls and library: Read- Write- File and record locking- Adjusting the position of file I/O- Lseek- Close- File creation- Creation of special files- Changing directory, root, owner, mode- stat and fstat | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **Processes and Signals** | | | **12 hours** | | | | | | | | |
| Introduction of process- Process structure- Process states- Process termination- command line arguments- Process control- Process identifiers- Process relationships- Zombie process- Signals: Sending signals- Signal sets- Threads: Synchronization- Thread attributes- Cancelling Threads | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **Inter Process Communication** | | | **12 hours** | | | | | | | | |
| Communication between related processes - popen() and pclose()- Pipes- Communication between unrelated processes - Named pipes (FIFO)- Message queues- Semaphores, Synchronization- Shared Memory- Developing Client-Server applications using IPC | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Sockets** | | **10 hours** | | | | | | | | | |
| Introduction to Sockets –Types of socket - Socket Connections- TCP sockets- TCP echo client server- UDP sockets- UDP echo client server- Socket options | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | **Contemporary Issues** | | **2 hours** | | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | | | |
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|  | | | | **Total Lecture hours** | | **60 hours** | | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | |
| 1 | Petersen and Richard, LINUX: The Complete Reference, Sixth edition, McGraw Hill, 2007. | | | | | | | | | | | | | | |
| 2 | Richard Stones, Neil Matthew, Beginning Linux Programming, Fourth edition, Wiley, 2008. | | | | | | | | | | | | | | |
| 3 | W. Richard Stevens, Bill Fenner, Andrew Rudoff, UNIX Network Programming, Vol. 1, The Sockets Networking API, Third Edition, Pearson education, Nov 2003. | | | | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | | | | |
| 1 | Richard Blum, Linux Command Line and Shell Scripting Bible, Wiley Publishing, Inc., Indianapolis, Indiana, 2008. | | | | | | | | | | | | | | |
| 2 | Sean Walton, Linux Socket Programming, Sams Publisher, I edition, 2001. | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | |
| 1 | | https://www.tutorialspoint.com/unix | | | | | | | | | | | | | |
| 2 | | <https://lecturenotes.in/subject/455/linux-programming-lp> | | | | | | | | | | | | | |
| 3 | | https://linuxconfig.org/linux-command-line-tutorial | | | | | | | | | | | | | |
| 4 | | https://www.guru99.com/unix-linux-tutorial.html | | | | | | | | | | | | | |
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| Course Designed By: Dr. R. Porkodi | | | | | | | | | | | | | | | |

**List of Programs**

1. Write a shell program to check whether the given file is an ordinary file or directory file. If it is an ordinary file do the following
2. Check for read permission, if it has read permission then display the contents of it.
3. Check for write permission, if it has write permission then update its content.
4. Write a menu driven shell program with the following options
   1. Count no. of lines, words and characters in the given file
   2. Count no. of users currently working in the UNIX operating system
   3. Identify the current working directory
   4. Display the first 10 lines from the given file
   5. Identify the current user
   6. Check whether the given user has logged in or not
   7. Sort the input file which contains only numbers
   8. Count no. of times the given pattern occurred in the given file
5. Write a shell program to send a mail to multiple users using command line Arguments (send mails to at least 5 users)
6. Write a shell program to implement multiple patterns searching in the given file. Inputs are taken from command line.(Use at least 5 patterns)
7. Write a program to explore the given directory content( scanning of directory)
8. Write a program to create the child process using fork () system call. See that the parent should wait until the completion of the child process and display the exit code of the child process.
9. Write a program to create two child processes with different counts of display statements using fork () system call. See that whether the parent process is waiting until the completion of the two child processes.
10. Write a program that illustrates how to handle Ctl+c interrupt during the execution of the program using signal system call and sigaction function.
11. Write a program that illustrates how parent process sends sigalarm signal to child process during the execution of the program.
12. Write a program that illustrates how does write and read operations are handled in pipes using pipe system call.
13. Write a program that illustrates how does write and read operations are handled in pipes using popen and pclose functions.
14. Write a program to create client-server application that illustrates the use of named pipes/FIFOs.
15. Write a program to create client-server application that illustrates the use of shared memory
16. Write a program to create client-server application that illustrates the use of Message queue.

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

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

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| **Course Code** | | | **25CS2C2** | **COMPILER DESIGN** | | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | **CORE** | | | **4** | | **0** | | **0** | **4** |
| **Pre-requisite** | | | | Basic knowledge on computational theory (Automata and Grammar). | | | **Syllabus Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| At the end of the course, the student should be able to do:   * Parsing techniques and different levels of translation. * Apply the various optimization techniques. * Use the different compiler construction tools | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | Remember the different phases of a compiler and the principles behind each phase. | | | | | | K1/K2 | | | | |
| 2 | | Understand the concepts of regular expressions, automata and apply the same to implement lexical analyzer using LEX tool. | | | | | | K1/K2/K3 | | | | |
| 3 | | Understand the concepts of context free grammars and able to know the LR parsers and various methods to generate intermediate code. | | | | | | K2/K3/K4 | | | | |
| 4 | | Analyze semantic rules into a parser that performs attribution while parsing. | | | | | | K1/K3 | | | | |
| 5 | | Understand how the code is optimized and the target code is generated. | | | | | | K3 /K5 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Unit:1** | | | **Introduction to Compilers** | | | | **8 hours** | | | | | |
| Translators-Compilation and Interpretation-Language processors –The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases Compiler Construction Tools – Programming Language basics. | | | | | | | | | | | | |
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| **Unit:2** | | | **Lexical Analysis** | | | | **10 hours** | | | | | |
| Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions Converting Regular Expression to DFA- Minimization of DFA Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language. | | | | | | | | | | | | |
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| **Unit:3** | | | **Syntax Analysis** | | | **18 hours** | | | | | | |
| Need and Role of the Parser-Context Free Grammars –Top Down Parsing –General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table –Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language. | | | | | | | | | | | | |
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| **Unit:4** | | | **Syntax Directed Translation & Run Time Environment** | | | **13 hours** | | | | | | |
| Syntax directed Definitions Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator – Type Systems-Specification of a simple type checker Equivalence of Type Expressions-Type Conversions – Run-Time Environment: Source Language Issues Storage Organization-Storage Allocation Parameter Passing-Symbol Tables-Dynamic Storage Allocation. | | | | | | | | | | | | |
| **Unit:5** | | | **Code Optimization and Code Generation** | | | **9 hours** | | | | | | |
| Optimization-DAG Optimization of Basic Blocks-Global Data Flow Analysis Efficient Data Flow Algorithms Issues in Design of a Code Generator – A Simple Code Generator Algorithm. | | | | | | | | | | | | | |
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| **Unit:6** | | | **Applications and Case Studies** | | **2 hours** | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | |
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|  | | | **Total Lecture hours** | | **60 hours** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, “Compilers – Principles, Techniques and Tools”, Edition, Pearson Education, 2014. | | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | | |
| 1 | Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers an imprint of Elsevier 2014 | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1. | [**http://nptel.ac.in/downloads/106108113/**](http://nptel.ac.in/downloads/106108113/) | | | | | | | | | | | | |
| 2. | <https://www.intel.com/content/dam/www/programmable/us/en/pdfs/literature/hb/hls/ug-hls.pdf> | | | | | | | | | | | | |
| 3. | <https://hal.archives-ouvertes.fr/hal-02423363/file/hal-hls-arith-v2.pdf> | | | | | | | | | | | | |
| Course Designed By: Dr.P.B.Pankajavalli | | | | | | | | | | | | | |

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

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

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| **Course Code** | | | **25CS2C3** | **INTERNET OF THINGS** | | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | **CORE** | | | **4** | | **0** | | **0** | **4** |
| **Pre-requisite** | | | | Basic knowledge on Sensors, Network Reference Model | | | **Syllabus Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are:  1. To understand the fundamentals of Internet of Things  2. To learn about the basics of IoT protocols  3. To apply the concept of Internet of Things in the real world scenario. | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | Understand the basics of IoT and its characteristics | | | | | | K1/K2 | | | | |
| 2 | | Analyze the building blocks of IoT from physical and logical context | | | | | | K2/K4 | | | | |
| 3 | | Apply the functionality of various architectures and protocols of IoT | | | | | | K2/K3 | | | | |
| 4 | | Analyze the importance of Web of Things and Cloud of Things | | | | | | K1/K4 | | | | |
| 5 | | Analyze the applications of IoT in various domains and analyze the real-world design constraints | | | | | | K3/K4/K5 | | | | |
| 6 | | Create a low-cost embedded system | | | | | | K2/K3/K5/K6 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | |
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| **Unit:1** | | | **Wireless Networks Introduction** | | | | **12 hours** | | | | | |
| **Fundamentals of IoT and Design Methodology**  Introduction to Internet of Things: Definition & Characteristics of IoT-Physical Design of IoT- Logical Design of IoT-IoT Enabling Technologies- IoT Levels & Deployment Templates- Four Pillars of IoT.  IoT and M2M: Introduction- M2M- Difference between IoT and M2M – SDN and NFV for IoT. IoT Platforms Design Methodology: Introduction- IoT Design Methodology. | | | | | | | | | | | | |
| **Unit:2** | | | **Architecture** | | | | **12 hours** | | | | | |
| IoT Architecture: M2M High-Level ETSI Architecture - OGC Architecture - IoT Reference Model - Domain Model - Information Model - Functional Model - Communication Model – IoT Reference Architecture. | | | | | | | | | | | | |
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| **Unit:3** | | | **Internet of Things Protocols and Standards** | | | **12 hours** | | | | | | |
| Introduction- IoT Ecosystem -IoT Data Link Protocol-Network Layer Routing Protocols- Network Layer Encapsulation Protocols- Session Layer Protocols- Transport Layer Protocols- IoT Management Protocol- Security in IoT Protocols-IoT Challenges | | | | | | | | | | | | |
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| **Unit:4** | | | **Web of Things and Cloud 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. | | | | | | | | | | | | |
| **Unit:5** | | | **Industry 4.0** | | | **10 hours** | | | | | | |
| Introduction- IIoT, Industry 4.0 – IIoT architecture – IIoT Connectivity- Standardization of IIoT - Opportunities – Challenges. | | | | | | | | | | | | | |
| **Unit:6** | | | **Applications and Case Studies** | | **2 hours** | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | |
|  | | | **Total Lecture hours** | | **60 hours** | | | | | | | | |
| **TextBooks** | | | | | | | | | | | | | |
| 1 | Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015. | | | | | | | | | | | | |
| 2 | Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Hwaiyu Geng, “Internet of Things and Data Analytics Handbook”, John Wiley & Sons, 2017. | | | | | | | | | | | | |
| 2 | Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2015. | | | | | | | | | | | | |
| 3 | HYPERLINK "https://www.wiley.com/en-us/search?pq=%7Crelevance%7Cauthor%3AQusay+F.+Hassan" Qusay F. Hassan . (2018). Internet of Things A to Z: Technologies and Applications. Wiley-IEEE Press. | | | | | | | | | | | | |
| 4 | 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 | http://nptel.ac.in/courses/106105166/ | | | | | | | | | | | | |
| 2 | <https://www.edx.org/course/iot-networks-protocols-curtinx-iot3x> | | | | | | | | | | | | |
| 3 | <https://www.coursera.org/learn/iot> | | | | | | | | | | | | |
| 4 | Emiliano Sisinn, Abusayeed Saifullah, Song Han, Ulf Jennehag, Mikael Gidlund, Industrial Internet of Things: Challenges, Opportunities, and Directions, IEEE Transactions on Industrial Informatics, April 2018 | | | | | | | | | | | | |
| Course Designed By: Dr.P.B.Pankajavalli | | | | | | | | | | | | | |

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| **COs** | | | | **PO1** | | | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | | **PO9** | | | | | | **PO10** | | | |
| **CO1** | | | | S | | | L | M | L | L | L | L | L | | L | | | | | | L | | | |
| **CO2** | | | | M | | | L | L | M | L | M | L | L | | L | | | | | | M | | | |
| **CO3** | | | | L | | | M | L | L | S | M | M | L | | L | | | | | | L | | | |
| **CO4** | | | | M | | | L | M | M | L | M | L | M | | L | | | | | | M | | | |
| **CO5** | | | | M | | | L | M | S | L | L | L | L | | L | | | | | | S | | | |
| **CO6** | | | | L | | | M | S | M | L | L | L | L | | L | | | | | | L | | | |
|  | | | |  | | |  |  |  |  |  |  |  | |  | | | | | |  | | | |
| **Course code** | | | | | | **25CS2C4** | | | **DATA MINING TECHNIQUES AND TOOLS** | | | | | | | | **L** | | | | **T** | | **P** | | **C** | |
| **Core** | | | | | | | | |  | | | | | | | | **2** | | | | **6** | | **4** | | **4** | |
| **Pre-requisite** | | | | | | | | | Fundamentals of Database management | | | | | | | | **Syllabus Version** | | | | | | | **2025-2026** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To understand the concepts of data mining, KDD process, issues and applications. 2. To know the working of different data mining techniques and its uses. 3. To learn the usage of data mining tools WEKA and R. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | | | Understand about data mining basics, issues and the working principle of classification technique. | | | | | | | | | | | | | | | | K2 | | | | | | |
| 2 | | | | Analyze the working of different clustering algorithms. | | | | | | | | | | | | | | | | K2/K3/K4 | | | | | | |
| 3 | | | | Understand the basic concepts of Association Rule Mining and evaluate the working of various Association Rule Mining algorithms | | | | | | | | | | | | | | | | K2/K3/K4 | | | | | | |
| 4 | | | | Understand the difference between Web mining, Text mining and Sequence mining. | | | | | | | | | | | | | | | | K2/K3/K4 | | | | | | |
| 5 | | | | Understand and analyze the working of WEKA and R Tools | | | | | | | | | | | | | | | | K2/K3/K4 | | | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | | | | **Data Mining** | | | | | | | | | | | | **10 hours** | | | | | | | |
| Introduction – Definitions - KDD vs. Data Mining – Data Mining Techniques – Issues and Challenges in Data Mining – Data Mining Application Areas. Classification Technique: Introduction – Decision Trees: Tree Construction Principle - Decision Tree Construction Algorithm – CART – ID3 – Rainforest –CLOUDS. | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | | | | **Clustering Techniques** | | | | | | | | | | | **12 hours** | | | | | | | | |
| Clustering Paradigms – Partitioning Algorithm - K-Means – K-Medoid Algorithms – CLARA – Hierarchical Clustering - DBSCAN – BIRCH – Categorical Clustering Algorithms – STIRR - Other Techniques. Introduction to Neural Networks - Learning in Neural Networks – Unsupervised Learning - Genetic Algorithm. | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | | | | **Association Rules** | | | | | | | | | | | | | | | **15 hours** | | | | |
| Concepts - Methods to Discover Association Rules - Apriori Algorithm – Partition Algorithm - Dynamic Item Set Counting Algorithm - FP-Tree Growth Algorithm - Incremental Algorithm - Generalized Association Rule. | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | | | | **Web mining** | | | | | | | | | | | | | | | **10 hours** | | | | |
| Basic Concepts – Web Content Mining – Web Structure Mining – Web Usage Mining – Text Mining: Text Clustering - Sequence Mining: The GSP Algorithm – SPADE. | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | | | | **Tools** | | | | | | | | **11 hours** | | | | | | | | | | | |
| Tools: Need for Data Mining Tools - Introduction to WEKA – The Explorer – The Experimenter – Classification – Regression – Clustering - Nearest Neighbor - Introduction to R - Data Types-Variables Operators - Decision Making - Loop Control – Function – Strings - Vectors - Lists-Matrices – Arrays – Factors - Data Frames – Packages - Charts and graphs - Statistics. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Unit:6** | | | | | | | **Contemporary Issues** | | | | | | | | **2 hours** | | | | | | | | | | | |
| Discussion on Case Study - Expert Lectures - Online Seminars – Webinars – Workshops. | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | **Total Lecture hours** | | | | | | | | **60 hours** | | | | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | Arun K. Pujari, Data Mining Techniques, Third Edition, Universities Press (India) Limited. Hyderabad, 2009 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | Margaret H. Dunham, Data Mining Introductory and Advanced Topics, Pearson Education 2004. | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques. Elsevier, 2011. | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | Norman Matloff, “The Art of R Programming a Tour of Statistical Software Design”,  William Pollock, 2011. | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | Emmanuel Paradis, “R for Beginners”, Institutes Sciences Evolution, 2005. | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | Pieter Adriaans, DolfZantinge, Data Mining, Addison Wesley, 2008 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | Jaiwei Han and MichelineKamber, Data Mining Concepts and Techniques, MorganKaufmann Publishers, 2011, 3rd Edition. | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | Dr. Matthew A. North, “Data Mining for the Masses”, A Global Text Project Book, 18 August 2012 | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | Roger D. Peng, “R Programming for Data Science”, Lean Publishing, 2015 | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | | <https://swayam.gov.in/nd2_cec20_cs12/preview> | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | https://onlinecourses.nptel.ac.in/noc19\_ma33/preview | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | | <https://www.futurelearn.com/courses/data-mining-with-weka> | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | https://onlinecourses.nptel.ac.in/noc21\_cs06/preview | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | https://www.coursera.org/specializations/data-mining | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | https://www.mygreatlearning.com/academy/learn-for-free/courses/data-mining1 | | | | | | | | | | | | | | | | | | | | | | | |
| Course Designed By: **Dr. S. Vijayarani** | | | | | | | | | | | | | | | | | | | | | | | | | | |

**List of Programs**

**I. WEKA**

1. Installation of WEKA Tool
2. Creating new ARFF File
3. Preprocessing
4. Classification – Simple CART, Decision Tree, J48, Random Forest, ID3
5. Clustering – K-means, Hierarchical, DBSCAN
6. Association Rule Mining – Apriori, FP-Growth

**II. R**

1. Installation of R and packages in R
2. Basic Programs – Data Types, Built-in Functions, Operators, Conditional Statements, Looping Statements, Vectors, Matrix, Factors, Data Frames, Lists
3. Classification – Decision Tree, Random Forest, Naïve Bayes
4. Clustering – K-Means, K-Medoids, CLARA, Hierarchical
5. Association Rule Mining – Apriori

**Mapping with programme outcomes:**

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

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

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| **Course Code** | | | **25CS2C5** | **DATABASE ADMINISTRATION AND MANAGEMENT** | | | **L** | | **T** | **P** | | **C** |
| **Core/Elective/Supportive** | | | | **CORE** | | | 2 | | 0 | 4 | | 4 |
| **Pre-requisite** | | | | Knowledge on Programming Logics and Data Storage Systems | | | **Syllabus Version** | | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are:  To teach the basic database concepts, applications, data models, schemas and instances.  To demonstrate the use of constraints and relational algebra operations.  To describe the basics of SQL and construct queries using SQL.  To demonstrate the basic concepts of transaction processing and concurrency control.  To emphasize the importance of normalization in databases.  To learn the concepts of distributed database management system | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | Demonstrate the basic elements of a relational database management system. | | | | | | K1/K2/K3 | | | | |
| 2 | | Build and manipulate relational database using Structured Query Language. | | | | | | K1/K2/K3/K4 | | | | |
| 3 | | Apply normalization on database design to eliminate anomalies | | | | | | K2/K4/K5/K6 | | | | |
| 4 | | Analyze the issues in transaction processing and concurrency control | | | | | | K3/K4/K5 | | | | |
| 5 | | Design and create Distributed database applications | | | | | | K2/K3/K6 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Unit:1** | | | **INTRODUCTION TO DATABASE SYSTEM** | | | | **11 Hours** | | | | | |
| Introduction to Database Management Systems, Purpose of Database Systems, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys. | | | | | | | | | | | | |
| **Unit:2** | | | **STRUCTURED AND RELATIONAL QUERY LANGUAGES** | | | | **12 Hours** | | | | | |
| SQL Overview: Data Types and Literals, DDL, DML, DCL, TCL. Data Definitions, Basic Structure Operations, Additional Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-Queries. Modifications of Database: Deletion, Insertion and Updates. Joins Expressions, Views, Transactions. Relational Integrity: Domain, Referential Integrities, Enterprise Constraints. Data Types and Schemas, Authorizations, Functions and Procedures, Triggers. Relational Algebra, Tuple relational Calculus, Design Process, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables. | | | | | | | | | | | | |
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| **Unit:3** | | | **NORMALIZATION** | | | **11hours** | | | | | | |
| Relational Database Design Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF. | | | | | | | | | | | | |
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| **Unit:4** | | | **TRANSACTION PROCESSING AND SECURITY** | | | **12 hours** | | | | | | |
| Advanced transaction processing and recovery: Defining a transaction in DBMS-Defining a concurrent transaction in DBMS- Serializability and Recoverability- Enhanced lock-based and timestamp-based Concepts-Multiple granularity-Multi version schemes-optimistic concurrency control Techniques-Deadlock Handling-Recovery in DBMS-write Ahead logging protocol-Advanced recovery techniques-Use of SQL in recovery -RAID. Data security: Data security issues - Discretionary access control- Mandatory access control- Role based access control- SQL injection - Statistical databases- Introduction to flow control | | | | | | | | | | | | |
| **Unit: 5** | | | **DISTRIBUTED DATABASE MANAGEMENT SYSTEM** | | | **12 hours** | | | | | | |
| Distributed Database Management Systems: The Evolution of Distributed Database Management Systems -DDBMS Advantages and Disadvantages -Distributed Processing and Databases - Characteristics of Distributed DBMS -DDBMS Components -Levels of Data and Process Distribution -Distribution Transparency -Transaction Transparency-Distributed Database Design - Client/Server vs. DDBMS – Case Study | | | | | | | | | | | | | |
| **Unit: 6** | | | **CONTEMPORARY ISSUES** | | **2 hours** | | | | | | | | |
| Online Courses, Webinars and Case studies | | | | | | | | | | | | | |
|  | | | **Total Lecture hours** | | **60 hours** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | |
| 1 | Abraham Silberchatz, Henry K.Forth, Sudharshan, Database System Concepts, 7th edition, McGraw Hill, 2020 | | | | | | | | | | | | |
| 2 | Rini Chakrabarti, Shilbadra Dasgupta, Subhash K. Shinde, Advanced Database Management System”, KLSI, Dreamtech press, 2014. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”,Seventh Edition, Pearson Education, 2016. | | | | | | | | | | | | |
| 2 | Bipin C Desai, “An introduction to Database Systems”, Galgotia Publications, 2015. | | | | | | | | | | | | |
| 3 | Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill, Third Edition 2004. | | | | | | | | | | | | |
| 4 | Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006. | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | <https://www.futurelearn.com/courses/introduction-to-databases-and-sql> | | | | | | | | | | | | |
| 2 | <https://alison.com/courses/diploma-in-databases-and-t-sql-revised/content> | | | | | | | | | | | | |
| 3 | <https://onlinecourses.nptel.ac.in/noc20_cs60/preview> | | | | | | | | | | | | |
| Course Designed By: Dr. D.RAMYACHITRA | | | | | | | | | | | | | |

**List of Programs (Queries to be written in Oracle, MySQL and MS SQL)**

1. Creation of database for the following and writing queries for information retrieval
2. Employee details
3. Student details
4. Hospital management
5. Railway reservation
6. Hostel management
7. Performing DML queries on the database
8. Implementation of views and synonyms
9. Implementation of indexes, joins and subqueries
10. Pl/SQL block for implementation of control statements
11. PL/SQL block for implementation of exceptions
12. Implementation of cursor
13. Creation of procedures
14. Creation of functions
15. Creation of triggers

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

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

SEMESTER - III

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| **Course code** | | | | **25CS3C1** | | **C# and .NET TECHNOLOGY** | | | **L** | | | **T** | | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | | **CORE** | | | **2** | | | **0** | | | **4** | **4** |
| **Pre-requisite** | | | | | | Basics of VB language and ASP | | | **Syllabus Version** | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Provide in-depth knowledge on VB.NET and ASP.NET to students and help them to develop dynamic web applications, websites using VB and C# object-oriented way of programming an elegant way using window controls and web controls. 2. Train the students to enrich their knowledge in ASP.NET user controls, custom controls, data management with ADO.NET. 3. Provide knowledge in developing LINQ-related applications and also in developing AJAX application and ASP.NET web services. | | | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | | | | | | | | | | |
| 1 | | | Understand about .NET framework, .NET features, common language runtime, .NET framework libraries, and the Visual Studio Integrated Development Environment and Programming in C# | | | | | | | | | | K1/K2 | | | |
| 2 | | | Write a console application using classes and objects, constructors, overloading, inheritance, polymorphism, interfaces, arrays, exceptions, delegates, and events in C# and VB Scirpts. Create window applications using window controls, Menus and graphics in VB and C#. | | | | | | | | | | K2/K3/K6 | | | |
| 3 | | | Understand the ASP.NET features, including ASP.NET page directives, to build an application using Web server Controls, Validation Server Controls, rich web controls, Custom Controls, Collections, and Lists. | | | | | | | | | | K1/K2 | | | |
| 4 | | | Understand ADO.NET and develop the application using  ADO.NET with VB.NET and ASP.NET, and also LINQ queries. | | | | | | | | | | K2/K3/K4/K6 | | | |
| 5 | | | Building ASP.NET 3.5 Enterprise Applications using ASP.NET Ajax applications and ASP.NET web services. | | | | | | | | | | K2/K3/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | | **Introduction to .NET and C#** | | | | | | **10 hours** | | | | | |
| The .NET Framework – Benefits of .NET - Common Language Runtime – Features of CLR - Compilation and MSIL – The .NET Framework libraries – The Visual Studio Integrated Development Environment – Introduction to C#: Basics of C# - Data types - variable declarations – Implicit & Explicit type casting – Branching and Looping. | | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | | **Introduction to VB.NET and Object Oriented Concepts in C#.NET & VB.NET** | | | | | **13 hours** | | | | | | |
| Introduction to VB.NET – VB.NET fundamentals – Branching and Looping Statements - Object Oriented Programming in C#.NET and VB.NET: Objects and Functions – Encapsulation – Inheritance - Constructors – Overloading - Inheritance and Polymorphism – Exception - Delegates and Events Arrays – Strings – Exceptions. | | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | | **Building Windows Applications and Deployments** | | | **10 hours** | | | | | | | | |
| Building Windows Applications – Creating a Windows Applications using window controls - Windows Forms, Text Boxes, Rich Text boxes, Labels, and link labels – Buttons, Check boxes, Radio buttons, Panels and Group Boxes, List Boxes, Checked List boxes, Combo boxes and Picture boxes, Scroll bars – Calendar control, Timer control – Handling Menus – Dialog boxes – Deploying an Application – Graphics. | | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | | **Basics of ASP.NET, Types of Controls and Collections** | | | **12 hours** | | | | | | | | |
| ASP.NET Basics: Features of ASP.NET – ASP.NET page directives - Building Forms with Web server Controls – Validation Server Controls - Rich Web Controls - Custom Controls – Collections and Lists. | | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | | **ADO.NET and Web Services** | | **13-- hours** | | | | | | | | | |
| Data Management with ADO.NET - Introducing ADO.NET - ADO.NET features - Using SQL Server with VB.NET – Using SQL Server with ASP.NET – LINQ queries – Building ASP.NET 3.5 Enterprise Applications: Developing ASP.NET Ajax applications – ASP.NET web services. | | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | | **Contemporary Issues** | | **2 hours** | | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
|  | | | | | **Total Lecture hours** | | **60 hours** | | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | | |
| 1 | Bill Evjen, Scott Hanselman, Devin Rader, Professional ASP.NET 4 in C# and VB I Edition, 2010, Wiley Publishing, Inc. | | | | | | | | | | | | | | | |
| 2 | Steven Holzner, Visual Basic.NET Programming Black Book, 2005 Edition, Paraglyph press USA&Dreamtech Press, India. | | | | | | | | | | | | | | | |
| 3 | KoGENT Solutions Inc., ASP.NET 3.5 (Covers C# and VB 2008 codes) Black Book, Platinum Edition, Dreamtech press, 2010 | | | | | | | | | | | | | | | |
| 4 | Jesse Liberty, Programming C#, Fourth Edition, Building .NET Applications with C#, O'Reilly Media publication, 2005 | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | | |
| 1 | Jonas Fagerberg, ASP.NET Core 1.1 Web API For Beginners: How To Build a Web API, The Tactical Guide Book, CSharpSchool.com, 2017. | | | | | | | | | | | | | | | |
| 2 | Jesse Liberty, Programming Visual Basic.NET 2003, Second Edition, O Reilly, Shroff Publishers and Distributors Pvt. Ltd. . | | | | | | | | | | | | | | | |
| 3 | Andrew Troelsen, „C# and the .NET Platform‟, A Press, 2001. | | | | | | | | | | | | | | | |
| 4 | Bill Evjen, JasonBeres, et al. Visual Basic.NET Programming Bible, 2002 Edition, IDG books India (p) Ltd. | | | | | | | | | | | | | | | |
| 5 | Mridula Parihar et al., ASP.NET Bible, 2002 Edition, Hungry Minds Inc, New York, USA. | | | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | | |
| 1 | | <https://www.w3schools.com/asp/> | | | | | | | | | | | | | | |
| 2 | | <https://www.tutorialspoint.com/vb.net> | | | | | | | | | | | | | | |
| 3 | | https://www.tutorialspoint.com/ASP.net | | | | | | | | | | | | | | |
| **Course Designed By: Dr. R. Porkodi** | | | | | | | | | | | | | | | | |

**List of Programs**

**C#.NET**

1. Create a window-based application to manipulate string operations using the String class.
2. Create a window-based application to perform various array operations using the Array class.
3. Create a window-based application to implement a sorted list collection with the necessary functions.
4. Create a window-based application to illustrate how LINQ operations are done in data objects.

**VB.NET & ADO.NET**

1. Create a window-based application to illustrate how to send mail through any Windows application.
2. Create a Window form with all necessary controls for obtaining students' details, including 3 subject marks. The total and average of obtained marks should be calculated by calling class library functions totcal( ) and averagecal( ).
3. Develop a data-centric VB.NET application using the SQLClient namespace and perform the following operations.
4. Create the file
5. Insert file records
6. Display the file
7. Delete the records from the file
8. Update the records in the file
9. Searching for records in the file
10. Develop a data-centric VB.NET application and navigate the records using ADO.NET.

**ASP.NET & ADO.NET**

1. Create a web application to prepare the monthly scheduler for an organization using calendar control in ASP.NET.
2. Develop a web application to create and display flash news and banner advertisements that may scroll on any web page using Rich Web Controls.
3. Develop data centric VB.Net application using the OLEDB namespace and perform the following operations.
4. Create the file
5. Insert file records
6. Display the file
7. Delete the records from the file
8. Update the records in the file
9. Searching of records in the file
10. Develop a data-centric VB.NET application and navigate the records using the OLEDB namespace in ADO.Net.

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

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

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| **Course code** | | | | **25CS3C2** | **SOFTWARE PROJECT MANAGEMENT** | | | **L** | | | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **CORE** | | | **4** | | | | **0** | | **0** | **4** |
| **Pre-requisite** | | | | | Fundamentals of Software Project Management | | | **Syllabus Version** | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide in depth knowledge about the basic concepts of software project management, project planning and Step Wise framework in project planning 2. To discuss the Project planning, cost benefit 3. To inculcate continual training and learning to improve group working | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | | Understand the fundamentals of Software Project Management | | | | | | | | K2/ K4 | | | | |
| 2 | | | Identify the Project Evaluation Methods and different Process Models | | | | | | | | K2/ K4 | | | | |
| 3 | | | Explore the fundamentals of Software Effort Estimation | | | | | | | | K2/ K4 | | | | |
| 4 | | | Analyze the need for Risk Management and the related concepts. | | | | | | | | K2/ K4 | | | | |
| 5 | | | Know the various types of contracts and agile management | | | | | | | | K2/ K4 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | **Introduction** | | | | | | **10 hours** | | | | | |
| Software Project Management -Software Project Versus Other Project –Requirement Specification –Information and Control in Organization –Introduction to step wise Project Planning –Select –Identify Scope and Objectives -Identify Project Infrastructure –Analyse -Project Characteristics –Products and Activities –Estimate Effort for each Activity –Identify Activity Risks –Allocate Resources -Review / Publicize Plan –Execute Plan and Lower Levels of Planning. | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | **Project Evaluation** | | | | | **12 hours** | | | | | | |
| Introduction –Strategic Assessment –Technical Assessment –Cost Benefit Analysis –Cash Flow Forecasting –Cost Benefit Evaluation Techniques –Risk Evaluation –Selection of an Appropriate Project App roach –Choosing Technologies –Choice of Process Models –Structured Methods –Rap id Application Development –Waterfall Model –V-Process Model –Spiral Model –Software Prototyping –Ways of Categorizing Prototypes –Tools –Incremental Delivery –Selection Process Model | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **Software Effort Estimation** | | | **15 hours** | | | | | | | | |
| Introduction –Problem s with Over and Under Estimates –Basis for Software Estimating –Software Effort Estimation Technique –Albrecht Function Point Analysis –Function Points –Object Points –Procedural Code Oriented Approach –COCOMO –Activity Planning –Project Schedules -Projects and activities –Sequencing and Scheduling Activities –Network Planning Models –Formulating a Network Planning –Adding Time Dimension –Forward Pass –Backward Pas s –Identifying the Critical Path –Activity Float -Shortening Project Duration –Identifying Critical Activities –Precedence Networks. | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **Risk Management** | | | **10 hours** | | | | | | | | |
| Introduction –Nature of Risk Man aging Identification –Analysis –Reducing –Evaluating –Z values –Resource Allocation –Nature of Resources –Requirements –Scheduling –Critical Paths –Counting the Cost –Resource Schedule –Cost Schedule –Scheduling Sequence –Monitoring and Control –Creating the Frame Work -Collecting the Data –Visualizing the Progress –Cost Monitoring –Prioritizing Monitoring –Change Control | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Managing Contracts and Agile Project Management** | | **11 hours** | | | | | | | | | |
| Introduction –Types of Contract –Stages in Contract Placement –Terms of Contract –Contract Management –Acceptance –Managing People and Organizing Teams –Organizational Behavior Background –Selecting the Right Person for the Job –Instruction in the Best Methods –Motivation –Decision Making –Leadership – Organizational Structures. **Introduction to Agile:** Agile principles, benefits over traditional models – Scrum roles, events, and artifacts – Crystal and DSDM frameworks – Sprint planning, estimation techniques – Tools (JIRA, Trello, Azure DevOps, Rally) – Agile culture, collaboration and case studies from industry. | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | **Contemporary Issues** | | **2 hours** | | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **60 hours** | | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | | | |
| 1 | Bob Hughes (Author), Mike Cotterell (Author), Rajib Mall (Author)- 2 October 2017 | | | | | | | | | | | | | | |
| 2 | Software Engineering Project Management, Richard Thayers 2nd Edition 2014 | | | | | | | | | | | | | | |
| 3 | Effective Software Project Management, Robert K. Wysocki - 2010 | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | |
| 1 | Walker Royce, “Software Project Management , Addition Wesley. | | | | | | | | | | | | | | |
| 2 | DerrelInce, H. Sharp and M. Woodman, “Introduction to Software Project Management and Quality Assurance , Tata McGraw Hill, 1995 | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | |
| 1 | | <https://nptel.ac.in/courses/106/105/106105218/> | | | | | | | | | | | | | |
| 2 | | <https://swayam.gov.in/nd1_noc19_cs70/preview> | | | | | | | | | | | | | |
| 3 | | <https://freevideolectures.com/course/4071/nptel-software-project-management> | | | | | | | | | | | | | |
| 4 | | <https://www.nptelvideos.com/video.php?id=918> | | | | | | | | | | | | | |
| 5 | | <https://www.classcentral.com/course/swayam-software-project-management-14294> | | | | | | | | | | | | | |
| 6 | | <https://www.w3schools.in/sdlc-tutorial/software-development-life-cycle-sdlc/> | | | | | | | | | | | | | |
| Course Designed By: **Dr. D. NAPOLEON** | | | | | | | | | | | | | | | |

Mapping with programme outcomes:

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

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

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| **Course code** | | | **25CS3C3** | **CLOUD COMPUTING** | | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | **CORE** | | | **2** | | **0** | | **4** | **4** |
| **Pre-requisite** | | | | Basic knowledge on software system specifically on operating system | | | **Syllabus Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are to:  1.Understand the different concepts of cloud computing and its services  2.Store and retrieve the data from cloud and can provide the security to the data in cloud | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | Articulate the main concepts, key technologies of cloud computing in terms of strengths, limitations and applications. | | | | | | K1 | | | | |
| 2 | | Categorize the architecture and infrastructure of cloud computing such as IaaS and SaaS | | | | | | K1/K3 | | | | |
| 3 | | Explain the concept of virtual machines and virtualization | | | | | | K3/K4 | | | | |
| 4 | | Apply suitable storage algorithms in cloud computing | | | | | | K3 | | | | |
| 5 | | Be expose in broad approaches of migrating into a cloud and mobile cloud computing | | | | | | K2/K3/K4 | | | | |
| 6 | | Describe about the data security concepts in cloud computing | | | | | | K2/K6 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Unit:1** | | | **Introduction** | | | | **12 hours** | | | | | |
| Introduction: Cloud Computing Basics: Cloud Computing Overview - Applications of cloud computing - Intranets and the cloud – First movers in the cloud - Benefits - limitations of cloud computing – Security Concerns – Cloud Computing Services – Salesforce.com | | | | | | | | | | | | |
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| **Unit:2** | | | **Cloud Computing Technology** | | | | **12 hours** | | | | | |
| Hardware and Infrastructure – Clients – Security – Network – Services - Cloud Storage – Standards – Cloud Computing at work: Software as a Service – Software Plus Services – Developing Applications | | | | | | | | | | | | |
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| **Unit:3** | | | **Virtual Machines and Virtualization** | | | | **12 hours** | | | | | |
| Introduction - Understanding Virtualization - History of Virtualization – Leveraging Blade Servers – Server Virtualization – Desktop Virtualization – Virtual Networks – Data Storage Virtualization. Data Storage in Cloud: Evolution of Network Storage – Cloud based data Storage – Advantages and disadvantages of Cloud based data storage- Cloud based Backup systems - File Systems – Cloud based Block Storage | | | | | | | | | | | | |
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| **Unit:4** | | | **Migrating into a Cloud** | | | | **12 hours** | | | | | |
| Introduction – Broad approaches of Migrating into cloud – The Seven Step Models of Migrating into a Cloud. Mobile Cloud Computing: Evolution of Mobile Computing – Mobile Cloud EcoSystem – Mobile Players | | | | | | | | | | | | |
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| **Unit:5** | | | **Data security in cloud** | | | **10 hours** | | | | | | |
| Introduction – Current state of data security – Homo sapiens and Digital Information – Cloud Computing and Data security Risk – Cloud Computing and Identity – The Cloud, Digital Identity and Data Security- Content Level Security- Pros and Cons | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Unit:6** | | | **Introduction to Industry 5.0** | | **02 hours** | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
|  | | | **Total Lecture hours** | | **60 hours** | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | |
| 1 | Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “ Cloud Computing: A Practical Approach”, McGraw Hill | | | | | | | | | | | | |
| 2 | Kris Jamsa, “ Cloud Computing” Jones and Barlett Student Edition 2014 | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | RajkumarByya, James Broberg, AndrzejGoscinski, “ Cloud Computing Prnciples and Paradigms”, Wiley & sons | | | | | | | | | | | | |
| 2 | E-Resources | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | <https://swayam.gov.in/nd1_noc20_cs55/> | | | | | | | | | | | | |
| 2 | <https://nptel.ac.in/courses/106/105/106105223/> | | | | | | | | | | | | |
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| **Course Designed By: Dr.E.Chandra** | | | | | | | | | | | | | |

**Mapping with Programme Outcomes**

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| **COS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **S** | **M** | **L** | **L** | **M** | **L** | **L** | **S** | **S** |
| **CO2** | **M** | **M** | **M** | **M** | **M** | **M** | **L** | **S** | **S** | **S** |
| **CO3** | **S** | **S** | **M** | **M** | **M** | **M** | **M** | **S** | **M** | **L** |
| **CO4** | **S** | **S** | **S** | **S** | **L** | **S** | **M** | **S** | **M** | **M** |
| **CO5** | **S** | **S** | **M** | **S** | **L** | **S** | **M** | **M** | **S** | **S** |
| **CO6** | **S** | **S** | **L** | **S** | **S** | **S** | **S** | **M** | **S** | **M** |

S- Strong; M-Medium; L-Low

**List of programs for practical Lab:**

1. To simulate a basic cloud environment with one datacenter, one VM, and one cloudlet.
2. To simulate a cloud environment with multiple VMs and multiple cloudlets.
3. To implement and observe time-shared VM scheduling policy.
4. Implement and observe space-shared VM scheduling policy.
5. To simulate and analyze the cost of creating VMs in a cloud environment.
6. To evaluate how task length affects cloudlet execution time.
7. To simulate energy-aware resource allocation in CloudSim.
8. To simulate cloud infrastructure with multiple datacenters.
9. To simulate cloudlet failure and handling strategies.
10. To simulate VM migration in response to load balancing.
11. To simulate cloudlet execution based on priority.
12. To simulate VMs with varying processing powers (MIPS).
13. To statically bind specific cloudlets to selected VMs.
14. To simulate network latencies using CloudSim.
15. To compare different broker policies (e.g., BestFit, RoundRobin).

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| **Course code** | | | | **25CS3C4** | | **BIG DATA ANALYTICS** | | | **L** | | | | **T** | **P** | | **C** |
| **Core/Elective/Supportive** | | | | | | **CORE** | | | **2** | | | | **0** | **4** | | **4** |
| **Pre-requisite** | | | | | | Fundamentals of Database management and Data Mining | | | **Syllabus Version** | | | | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide in depth knowledge about the basic concepts of Big Data, characteristics and industry examples. 2. To discuss the Hadoop framework, HDFS and MapReduce. 3. To inculcate HBase, Cassandra, HiveQL, Pig, and Neo4j data models. | | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | | |
| 1 | | | Understand about basics of Big Data, Technologies and Applications in various domains. | | | | | | | | | K2 | | | | |
| 2 | | | Understand the foundations of Hadoop andHadoopDistributed File System. Design of HDFS and file-based data structures. | | | | | | | | | K2/K3/K4 | | | | |
| 3 | | | Analyze the working of Map Reduce and YARN for job scheduling. | | | | | | | | | K2/K3/K4 | | | | |
| 4 | | | Evaluate the need and fundamentals of HBase. Apply the Cassandra data model for different applications. Understand the basic commands in HiveQL, Pig and Pig Latin. | | | | | | | | | K2/K3/K4 | | | | |
| 5 | | | Analyze the basic concepts and need for Graph databases, create databases and retrieve records using Neo4j. Understand the data visualization and its need. | | | | | | | | | K2/K3/K4 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | | **Introduction to Big Data** | | | | | | **10 hours** | | | | | |
| Introduction: What is big data – why big data – convergence of key trends - unstructured data – industry examples of big data – Web analytics - big data and marketing – fraud and big data - risk and big data – credit risk management – big data and algorithmic trading - big data and healthcare – big data in medicine – advertising and big data – big data technologies - cloud and big data– mobile business intelligence – crowd sourcing analytics. | | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | | **Hadoop** | | | | | **12 hours** | | | | | | |
| History of Hadoop - The Hadoop Distributed File System – components of Hadoop - Analyzing the Data with Hadoop - Design of HDFS – HDFS concepts - Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures. | | | | | | | | | | | | | | | | |
| **Unit:3** | | | | | **MapReduce** | | | **15 hours** | | | | | | | | |
| MapReduce: MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution –MapReduce types – input formats – output formats. | | | | | | | | | | | | | | | | |
| **Unit:4** | | | | | **Hadoop Eco System** | | | **10 hours** | | | | | | | | |
| HBase – data model and implementations – HBase clients – HBase examples. Cassandra – Cassandra data model –Cassandra examples – Cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation –HiveQL queries-case study. | | | | | | | | | | | | | | | | |
| **Unit:5** | | | | | **Graph Databases** | | **11 hours** | | | | | | | | | |
| Introduction - Neo4J - Key concept and characteristics -Modeling data for neo4j - Importing data into neo4j - visualizations - neo4j - Cypher Query Language –data visualization. | | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | | **Contemporary Issues** | | **2 hours** | | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | | | | |
|  | | | | | **Total Lecture hours** | | **60 hours** | | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | | | | |
| 1 | Tom White, “Hadoop: The Definitive Guide”, Fourth Edition, O′Reilly Publishers, 2012. | | | | | | | | | | | | | | | |
| 2 | Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013. | | | | | | | | | | | | | | | |
| 3 | Rik Van Bruggen, “Learning Neo4j”, Second Edition, PacktPubishers, 2014. | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | | |
| 1 | Andreas Francois Vermeulen, Ankurgupta, Cindy Gross, David Kjerrumgaard and Scott Shaw, “Practical Hive: A Guide to Hadoop’s Data Warehouse System”, Apress Media publishers, 2016 | | | | | | | | | | | | | | | |
| 2 | Eric Lubow and Russell Baradberry, Practical Cassandra: A Developer’s Approach, Addison Wesley publishers, 2014. | | | | | | | | | | | | | | | |
| 3 | Dirk deRoos, Paul Zikopoulos, Bruce Brown, Roman B. Melnyk,RafaelCoss, “Hadoop For Dummies”, John Wiley & Sons publishers, 2014 | | | | | | | | | | | | | | | |
| 4 | Hunger, Michael, and Oliver Gierke. Good Relationships: The Spring Data Neo4j Guide Book. C4Media, 2012. | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | | |
| 1 | | <https://nptel.ac.in/courses/106/104/106104189/> | | | | | | | | | | | | | | |
| 2 | | <http://statweb.stanford.edu/~tibs/ElemStatLearn/> | | | | | | | | | | | | | | |
| 3 | | <https://www.edureka.co/blog/big-data-tutorial> | | | | | | | | | | | | | | |
| 4 | | <https://www.coursera.org/learn/big-data-introduction> | | | | | | | | | | | | | | |
| 5 | | <https://cognitiveclass.ai/courses/what-is-big-data> | | | | | | | | | | | | | | |
| 6 | | <https://www.tutorialspoint.com/hbase/index.htm> | | | | | | | | | | | | | | |
| 7 | | https://www.guru99.com/hive-query-language-built-operators-functions.html | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| Course Designed By: **Dr. S. Vijayarani** | | | | | | | | | | | | | | | | |

**Mapping with programme outcomes:**

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

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

List of Programs

1. Installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as adding files and directories, retrieving files, and deleting files.
3. Data Manipulation Using HiveQL

To practice data manipulation operations in Hive using HiveQL: INSERT, UPDATE, ALTER, TRUNCATE, and DELETE.

1. Hive Join Operations

Perform the following HiveQL join operations and display the result: Inner Join, Left Outer Join, Right Outer Join, Full Outer Join

1. Implementation of Partitioning and Bucketing in Hive
2. Loading and Filtering Data in Apache Pig (load, display, join, filter, and group)
3. Aggregation and Sorting Using Apache Pig (Load, Distinct, Average (GROUP + AVG), Sort, Display)
4. Complete CRUD Operations in HBase Using HBase Shell

To perform table creation, data insertion, retrieval, updating, deletion, and scanning in HBase using HBase Shell

1. Managing HBase Table Metadata and Structure

To perform various administrative operations in HBase, including checking for table existence, listing tables, altering table schema, enabling/disabling tables, and truncating data.

1. Modeling a University Academic Network Using Neo4j

To model an academic environment using Neo4j, where people (students and professors) are linked to their departments and courses. Create and query the graph using Cypher.

1. Maintaining Product Information Using Cassandra (keyspaces and tables- INSERT, UPDATE, DELETE, and SELECT, filtering with WHERE)
2. MapReduce for Word Count using Python
3. MapReduce to Analyze Student Marks using Python

Write a MapReduce Python program to perform the following operations:

1. Calculate the average mark of each student across all subjects.
2. Identify the highest mark each student has obtained.
3. Identify the lowest mark each student has obtained.
4. Filter and list students whose average mark is above 80.

ELECTIVE PAPERS

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| **Course code** | | | | **25CS1E1** | **INFORMATION SECURITY** | | | | | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **ELECTIVE** | | | | | **4** | **0** | **0** | **4** |
| **Pre-requisite** | | | | | Knowledge in the field of computers and Internet | | | | | **Syllabus Version** | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Inculcate the student knowledge in information security. 2. To familiarize them about possible threats and vulnerabilities to the system. 3. Enhance their skill in handling risks and ability to advise an individuals seeking protection to their data. | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | |
| 1 | | | Understand Information Security, the various phases of the security systems development life cycle and the issues facing by software developers | | | | | | | | | K2 | |
| 2 | | | Understand the functions of and relationships among laws, regulations, and professional organizations in information security and to differentiate between laws and ethics | | | | | | | | | K2 | |
| 3 | | | Understand risk identification, risk management and risk control  Analyze risks based on probability of occurrence  Understand the existing conceptual frameworks for evaluating risk controls  Do benefit analysis | | | | | | | | | K2/K4 | |
| 4 | | | Understand information security blueprint, identify its major components  Understand how an organization institutionalizes its policies, standards, and practices using education, training, and awareness programs  Understand what contingency planning is and how it relates to incident response planning, disaster recovery planning, and business continuity plans | | | | | | | | | K2 | |
| 5 | | | Understand role of access control in computerized information systems, and to identify and discuss widely-used authentication factors  Understand and the use of virtual private networks | | | | | | | | | K2/K3 | |
| 6 | | | Understand the basic principles of cryptography and the most popular cryptographic tools  Analyze the nature and execution of the dominant methods of attack used against cryptosystems | | | | | | | | | K2/K3/K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Unit:1** | | | | **Introduction to Information Security** | | | | | **12-- hours** | | | | |
| History, What is Security, CNSS Security Model, Components of an Information System, Balancing Information Security and Access, The Systems Development Life Cycle, The Security Systems Development Life Cycle. Communities of interest-Need for security: Threats, Attacks. | | | | | | | | | | | | | |
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| **Unit:2** | | | | **Legal, Ethical and Professional Issues** | | | | **12-- hours** | | | | | |
| Law and Ethics in Information Security, International Laws and Legal Bodies, Ethics and Information Security, Codes of Ethics and Professional Organizations Risk Management: An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control Strategies, Selecting a Risk Control Strategy. | | | | | | | | | | | | | |
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| **Unit:3** | | | | **Planning for Security** | | | **11-- hours** | | | | | | |
| Information Security Policy, Standards and Practices, The Information Security Blueprint, Security Education, Training and Awareness Program, Continuity Strategies. | | | | | | | | | | | | | |
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| **Unit:4** | | | | **Security Technology** | | | **11-- hours** | | | | | | |
| Firewalls and VPNs- Intrusion Detection and Prevention Systems, Honeypots, Honeynets and padded cell systems -Scanning and Analysis Tools- bio metric access control. | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Cryptography** | | **12-- hours** | | | | | | | |
| Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for secured communication-Attacks on Cryptosystems. | | | | | | | | | | | | | |
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| **Unit:6** | | | | **Contemporary Issues** | | **2 hours** | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | |
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|  | | | | **Total Lecture hours** | | **60-- hours** | | | | | | | |
| **Text Books** | | | | | | | | | | | | | |
| 1 | Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, 4th Edition, Course Technology, Cengage Learning. | | | | | | | | | | | | |
| 2 | William Stallings, Cryptography and Network Security, Pearson Education, 2000. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Nina Godbole, Information Systems Security, Wiley-2009 | | | | | | | | | | | | |
| 2 | Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2008. | | | | | | | | | | | | |
| 3 | Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw- Hill, | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | |
| 1 | | https://www.coursera.org/learn/information-security-data | | | | | | | | | | | |
| 2 | | <https://nptel.ac.in/courses> | | | | | | | | | | | |
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| Course Designed By:Dr. K. Geetha | | | | | | | | | | | | | |

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| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **M** | **M** | **M** | **S** | **S** | **S** | **S** | **S** |
| **CO2** | **S** | **S** | **M** | **M** | **M** | **S** | **L** | **S** | **S** | **S** |
| **CO3** | **S** | **S** | **M** | **S** | M | **M** | **S** | **S** | **S** | **M** |
| **CO4** | **S** | **L** | **M** | **M** | **M** | **S** | **S** | **S** | **S** | **S** |
| **CO5** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO6** | **S** | **M** | **S** | **M** | **M** | **S** | **L** | **S** | **S** | **M** |

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

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| **Course Code** | | **25CS1E2** | **ARTIFICIAL INTELLIGENCE** | **L** | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | **Elective** | **4** | | **0** | **0** | **4** |
| **Pre-Requisite** | | | Basic knowledge on understanding and analyzing the problems strategies. | **Syllabus Version** | | | **2025-26** | |
| **Course Objective:** | | | | | | | | |
| The main objectives of this course are:   1. To inculcate the knowledge on approaching and solving the problems using intelligent approach. 2. To provide depth understanding on knowledge representation, inference and learning. 3. To understand the control strategies in planning and production system. 4. To motivate the students to develop models for AI with Expert systems for real world problems. | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Understand the AI foundations, problem-solving strategies using agents and search strategies | | | | K1/K2 | | | |
| 2 | Present the search strategies for complex environment, game playing and different knowledge representations. | | | | K1/K2 | | | |
| 3 | Provide knowledge on knowledge reasoning and planning, handling uncertainty and knowledge inference methods. | | | | K2/K4 | | | |
| 4 | Understand the production control strategies and algorithms for planning. | | | | K2/K3/K4 | | | |
| 5 | Design and Implement expert systems by building the knowledge base and the inferencing engine. | | | | K3/K4/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | |
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| **Unit:1** | **PROBLEM SOLVING** | | | | **10** | | | |
| Introduction to AI- Foundations of AI – Risks and benefits of AI - Agents and Environments – Structure of Agents - Uninformed Search Strategies- Informed Search Strategies- Heuristic functions - Local Search Algorithm. | | | | | | | | |
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| **Unit:2** | **SEARCH IN COMPLEX ENVIRONMENT, GAMES AND KNOWLEDGE REPRESENTATION** | | | | **12** | | | |
| Introduction to Game Playing-Alpha Beta Pruning- Constraint Satisfaction Problems - Knowledge Representation using First order logic- Knowledge Engineering in First Order Logic-Proportional vs First Order Logic. | | | | | | | | |
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| **Unit:3** | **KNOWLEDGE REASONING AND PLANNING** | | | | **13** | | | |
| Inference- Forward and Backward Chaining-Unification-Uncertainty-Inference in Bayesian Network – Inference in Temporal models – Hidden Markov Models – Kalman Filters – Dynamic Bayesian Networks – Combining Beliefs and desires under uncertainty – Decision Networks. | | | | | | | | |
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| **Unit:4** | **PRODUCTION SYSTEM AND PLANNING** | | | | **13** | | | |
| Introduction to Production system-control strategies-Rete Algorithm-Planning-STRIPS- Planning with state space search-Partial Order Planning-Planning Graphs-Planning, acting in the real world. | | | | | | | | |
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| **Unit:5** | **EXPERT SYSTEM** | | | | **12** | | | |
| Expert System- Architecture and Roles of Expert System-Typical Expert System-MYCIN- XOON-DART Case Study-Construction of simple reflex agent with sensor and actuator using Arduino. | | | | | | | | |
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| **Total Lectures** | | | | | **60** | | | |
| **Text Books** | | | | | | | | |
| 1 | Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, 3rd Edition, Pearson Education / Prentice Hall of India, 2010. | | | | | | | |
| 2 | Joseph C. Giarratano, Gary D. Riley,” Expert Systems: Principles and Programming”,4th Edition, 2015. | | | | | | | |
| **Reference Books** | | | | | | | | |
| 1 | Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000. | | | | | | | |
| 2 | Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill- 2008. | | | | | | | |
| 3 | W. Patterson, ‘Introduction to Artificial Intelligence and Expert Systems’, Prentice Hall of India, 2007 | | | | | | | |
| 4 | Prateek Joshi, “Artificial Intelligence with Python”, Packt Publishing, 2017. | | | | | | | |
|  | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | <https://onlinecourses.swayam2.ac.in/cec21_cs08/preview> | | | | | | | |
| 2 | <https://www.tutorialspoint.com/artificial_intelligence/index.htm> | | | | | | | |
| 3 | <https://www.coursera.org/learn/introduction-to-ai> | | | | | | | |
| 4 | <https://www.udacity.com/course/intro-to-artificial-intelligence--cs271> | | | | | | | |
| Course Designed By: **Dr.R.Porkodi** | | | | | | | | |

Mapping with programme outcomes:

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| **COS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| CO1 | **S** | **S** | **L** | **M** | **M** | **L** | **L** | **L** | **M** | **M** |
| CO2 | **S** | S | **M** | **M** | **M** | **M** | **M** | **M** | **M** | **M** |
| CO3 | **S** | **S** | **M** | **M** | **M** | **M** | **M** | **M** | **M** | **L** |
| CO4 | **S** | **S** | **M** | M | **M** | **M** | **L** | **L** | **M** | **L** |
| CO5 | **S** | **S** | **M** | **M** | **M** | **L** | **L** | **M** | **M** | **L** |

S- Strong; M-Medium; L-Low

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| **Course Code** | | **25CS1E3** | **BUSINESS INTELLIGENCE** | **L** | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | **Elective** | **4** | | **0** | **0** | **4** |
| **Pre-Requisite** | | | No pre-requisite | **Syllabus Version** | | | **2025-26** | |
| **Course Objective:** | | | | | | | | |
| The main objectives of this course are:   1. To gain knowledge on business intelligence system, life cycle and techniques used in it. 2. To become familiar with the knowledge delivery and modeling aspects. 3. To learn how to use and apply machine learning models to solve the business problems. | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Understand the concepts of Business Intelligence cycle to take the correct decision at right time. | | | | K1/K2/K4 | | | |
| 2 | Demonstrate various Business knowledge representations and reporting features. | | | | K2/K3/K4 | | | |
| 3 | Identification of good operating practices in business environments. | | | | K3/K4 | | | |
| 4 | Demonstrates the Business Intelligence models in logistics and production domain. | | | | K3/K4/K5 | | | |
| 5 | Communicate technologies going to rule the future of Business Intelligence. | | | | K3/K4 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | |
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| **Unit:1** | **INTRODUCTION** | | | | **10** | | | |
| Business Intelligence: Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence. | | | | | | | | |
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| **Unit:2** | **BUSINESS INTELLIGENCE KNOWLEDGE DELIVERY** | | | | **13** | | | |
| Knowledge Delivery: The business intelligence user types, Standard reports, Interactive Analysis and Adhoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message. | | | | | | | | |
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| **Unit:3** | **ANALYSING EFFICIENCY** | | | | **12** | | | |
| Efficiency: Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis. | | | | | | | | |
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| **Unit:4** | **BUSINESS INTELLIGENCE APPLICATIONS** | | | | **13** | | | |
| Business Intelligence Applications: Marketing models – Logistic and Production models – Case studies. | | | | | | | | |
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| **Unit:5** | **FUTURE OF BUSINESS INTELLIGENCE** | | | | **12** | | | |
| Future of Business Intelligence: Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology. | | | | | | | | |
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| **Total Lectures** | | | | | **60** | | | |
| **Text Books** | | | | | | | | |
| 1 | Efraim Turban, Ramesh Sharda, Dursun Delen, “Decision Support and Business Intelligence Systems”, 9th Edition, Pearson 2013. | | | | | | | |
| **Reference Books** | | | | | | | | |
| 1 | Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, | | | | | | | |
| 2 | David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager‟s Guide”, Second Edition, 2012. | | | | | | | |
| 3 | Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw-Hill, 2007. | | | | | | | |
| 4 | Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009 | | | | | | | |
|  | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | <https://www.classcentral.com/course/swayam-business-analytics-for-management-decision-10050> | | | | | | | |
| 2 | <https://www.coursera.org/specializations/business-analytics> | | | | | | | |
| 3 | <https://www.udacity.com/course/business-analytics-nanodegree--nd098> | | | | | | | |
| 4 | <https://www.tutorialspoint.com/business_analysis/business_analysis_quick_guide.htm> | | | | | | | |
| Course Designed By: **Dr.R.Porkodi** | | | | | | | | |

Mapping with programme outcomes:

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| **COS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| CO1 | **S** | **S** | **L** | **S** | **M** | **L** | **L** | **L** | **M** | **M** |
| CO2 | **S** | S | **M** | **M** | **M** | **M** | **L** | **M** | **S** | **S** |
| CO3 | **S** | **S** | **M** | **S** | **M** | **M** | **L** | **L** | **M** | **S** |
| CO4 | **S** | **S** | **S** | **S** | **M** | **M** | **L** | **L** | **S** | **S** |
| CO5 | **S** | **L** | **S** | **S** | **M** | **L** | **L** | **M** | **S** | **S** |

S- Strong; M-Medium; L-Low

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| **Course Code** | | | **25CS3C5** | **WIRELESS NETWORKS** | | | **L** | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | **CORE** | | | **4** | | **0** | **0** | **4** |
| **Pre-requisite** | | | | To introduce the students to state of the art wireless network conventions and models | | | **Syllabus Version** | | | **2025 - 2026** | |
| **Course Objectives:** | | | | | | | | | | | |
| The main objectives of this course are to:  1. Learn state-of-the-art wireless technologies and the fundamental principles of electromagnetic wave propagation, and the parameters that dictate its performance.  2. Acquire knowledge in routing protocols for wireless networks.  3. Explore and understand the basic network performance metrics for evaluating and maintaining Quality of Service (QoS) in broadband mobile and wireless communication systems.  4. Comprehend the time synchronization, localization, energy management in wireless sensor network | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | Understand the basic WSN technology and supporting protocols, with emphasis place on standardization basic sensor systems and provide a survey of sensor technology. | | | | | | K1/K2 | | | |
| 2 | | Understand the medium access control protocols and address physical layer issues. | | | | | | K2/K4 | | | |
| 3 | | Evaluate key routing protocols for sensor networks and main design issues. | | | | | | K2/K5 | | | |
| 4 | | Analyze transport layer protocols for sensor networks, and design requirements. | | | | | | K2/K3/K4 | | | |
| 5 | | Understand the Sensor management, sensor network middleware, operating systems. | | | | | | K2/K3/K4 | | | |
| 6 | | Create and analyze low-power devices equipped with sensing, computation, and wireless communication capabilities. | | | | | | K4/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | | **Wireless Networks Introduction** | | | | **10 hours** | | | | |
| Evolution of wireless networks – Challenges - Transmission fundamentals: Analog and digital data transmission - Transmission media - Modulation techniques for wireless systems - Multiple access for wireless systems - Performance increasing techniques for wireless networks. | | | | | | | | | | | |
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| **Unit:2** | | | **Wireless LAN** | | | | **12 hours** | | | | |
| Introduction to Wireless LANs – WLAN Equipment, Topologies, Technologies, IEEE 802.11 WLAN – Architecture and Services - Physical Layer - MAC Sub Layer –MAC Management Sub Layer, Other IEEE 802.11 Standards. | | | | | | | | | | | |
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| **Unit:3** | | | **Wireless Personal Area Networks** | | | **12hours** | | | | | |
| Introduction – Bluetooth: Architecture - Protocol Stack - Physical Connection – Mac mechanism – Frame format – Connection management –Low Rate and High Rate WPAN, ZigBee Technology IEEE 802.15.4: Components – Network topologies – PHY – MAC. | | | | | | | | | | | |
| **Unit:4** | | | **Ad-hoc Wireless Networks** | | | **12 hours** | | | | | |
| Introduction**-** Characteristics of Adhoc Networks - Classifications of MAC Protocols: Connection Based protocols, Reservation Mechanism - Table driven Routing protocols: DSDV, WRP - On Demand routing protocols: DSR,AODV,TORA –Routing Protocol with Efficient Flooding Mechanism: OLSR - Hierarchical routing protocols – CBRP, FSR. | | | | | | | | | | | |
| **Unit:5** | | | W**ireless Sensor Networks** | | | **12 hours** | | | | | |
| Introduction - Challenges for wireless sensor networks - Comparison of sensor network with ad-hoc network - Single node architecture: Hardware components - Energy consumption of sensor nodes - Network architecture: Sensor network scenarios - Design principles – Operating systems. | | | | | | | | | | | |
| **Unit:6** | | | **Case Studies** | | **2 hours** | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | |
|  | | | **Total Lecture hours** | | **60 hours** | | | | | | |
| **Text Books** | | | | | | | | | | | |
| 1 | Nicopolitidis P, “Wireless Networks”, John Wiley and Sons, New York, 2010. | | | | | | | | | | |
| 2 | Vijay K Garg, Wireless Communication and Networking, Morgan Kaufmann Publishers 2010. | | | | | | | | | | |
| 3 | Siva Ram Murthy C.,Manoj B S, “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall, 2012. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | Holger Karl and Andreas Willig, “Protocol and Architecture for Wireless Sensor Networks”, John Willey Publication, 2011. | | | | | | | | | | |
| 2 | Kaveh Pahlavan, “Principles of wireless networks”, Prentice-Hall of India, 2013. | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | <https://www.te.com/usa-en/industries/sensor-solutions/insights/sensors-sleep-apnea-white-paper.html> | | | | | | | | | | |
| 2 | <https://www.bluetooth.com/blog/smart-building-use-cases/> | | | | | | | | | | |
| 3 | <https://wballiance.com/wp-content/uploads/2019/03/Case-Study_VAST-Networks-Mobile-Data-Offload.pdf> | | | | | | | | | | |
| 4 | https://www.postscapes.com/agtech/#case-studies | | | | | | | | | | |
| **Course Designed By: Dr.P.B.Pankajavalli** | | | | | | | | | | | |

**Mapping with programme outcomes:**

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| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **L** | **L** | **M** | **S** | **L** | **L** | **M** | **M** | **L** |
| **CO2** | **S** | **L** | **L** | **L** | **S** | **L** | **L** | **L** | **L** | **M** |
| **CO3** | **S** | **M** | **L** | **L** | **S** | **M** | **L** | **L** | **M** | **M** |
| **CO4** | **S** | **M** | **S** | **L** | **M** | **L** | **M** | **M** | **M** | **L** |
| **CO5** | **S** | **S** | **M** | **L** | **M** | **L** | **M** | **L** | **M** | **S** |
| **CO6** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

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

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| **Course code** | | | | | | **25CS2E2** | | | **MACHINE LEARNING TECHNIQUES** | | | | | | **L** | | | | **T** | | **P** | **C** | |
| **Core/Elective/Supportive** | | | | | | | | | **ELECTIVE** | | | | | | 2 | | | | 0 | | 4 | 4 | |
| **Pre-requisite** | | | | | | | | | Basic knowledge on mathematics, statistics and good analytical skills | | | | | | **Syllabus**  **Version** | | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | | | |
| The main objectives of this course are to:  1. Introduce the concepts of machine learning  2. Understand supervised and unsupervised learning algorithms  3. Gain knowledge on evaluation of the performance of the machine learning techniques  4. Learn about the advanced learning techniques | | | | | | | | | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | | Analyze and apply the machine learning concepts for different problems | | | | | | | | | | | | | | | | | | K3/K4 | | |
| 2 | | | Understand and implement the supervised learning algorithms | | | | | | | | | | | | | | | | | | K1/K2 | | |
| 3 | | | Apply the clustering algorithms for various problems | | | | | | | | | | | | | | | | | | K3 | | |
| 4 | | | Evaluate and test the performance of the learning algorithms | | | | | | | | | | | | | | | | | | K5 | | |
| 5 | | | Design and create a learning model for real time applications | | | | | | | | | | | | | | | | | | K6 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | | | **INTRODUCTION** | | | | | | | | | | | | **9 hours** | | | | | |
| Introduction – Definition of learning systems – Goals and applications of Machine Learning – Types of Machine Learning – Machine Learning process – Hypothesis space and Version space | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | | | **SUPERVISED LEARNING** | | | | | | | | | | | | **12 hours** | | | | | |
| Linear models for Regression – Linear models for Classification – Decision Tree Learning – Bayesian Learning – Naïve Bayes – Ensemble Methods – Bagging – Boosting – Support Vector Machines. | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | | | **EVALUATION** | | | | | | | | | | | | | **11 hours** | | | | |
| Performance Evaluation metrics – ROC Curves – Validation methods – Bias-variance decomposition – Model complexity | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | | | **UNSUPERVISED LEARNING** | | | | | | | | | | | | | **12 hours** | | | | |
| Clustering – K-means – K-mode- K-median – Hierarchical clustering – DBSCAN – Principal Component Analysis – Independent Component Analysis | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | | | **ADVANCED LEARNING** | | | | | | | | | | | | | **14 hours** | | | | |
| Sampling – Basic sampling methods – Monte Carlo – Gibbs Sampling – Computational Learning theory – Reinforcement learning – Markov Decision Processes. | | | | | | | | | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | | **Contemporary Issues** | | | | | | | | | | | | **2 hours** | | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | | | | | | | | | | | | | |
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|  | | | | | **Total Lecture hours** | | | | | | | | | | | | **60 hours** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | Tom Mitchell, “Machine Learning, McGraw-Hill, UK, 2017 | | | | | | | | | | | | | | | | | | | | | |
| 2 | | Ethem Alpaydin, “Introduction to machine learning”, MIT Press, Third Edition, 2014. | | | | | | | | | | | | | | | | | | | | | |
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| **Reference Books** | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Chapman and Hall, CRC Press, Second Edition, 2014. | | | | | | | | | | | | | | | | | | | | | |
| 2 | | Shalev-Shwartz, Shai, Shai Ben-David, Understanding Machine Learning: From theory to algorithms, Cambridge University Press, 2014. | | | | | | | | | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | <https://onlinecourses.nptel.ac.in/noc20_cs29/preview> | | | | | | | | | | | | | | | | | | | | | |
| 2 | | <https://www.coursera.org/learn/machine-learning> | | | | | | | | | | | | | | | | | | | | | |
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| Course Designed By:**Dr.D.RAMYACHITRA** | | | | | | | | | | | | | | | | | | | | | | | |
| **Mapping with Programme Outcomes** | | | | | | | | | | | | | | | | | | | | | |
| **COs** | | | **PO1** | | | **PO2** | **PO3** | | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | | **PO9** | | | | **PO10** | | |
| **CO1** | | | S | | | S | L | | M | S | L | L | L | | M | | | | S | | |
| **CO2** | | | S | | | S | M | | M | S | M | L | M | | L | | | | S | | |
| **CO3** | | | S | | | S | S | | S | M | M | M | L | | L | | | | S | | |
| **CO4** | | | S | | | S | S | | M | S | L | L | M | | M | | | | S | | |
| **CO5** | | | S | | | S | S | | S | S | L | M | L | | M | | | | S | | |

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

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| **Course Code** | | **25CS2E3** | **HEALTH CARE ANALYTICS** | **L** | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | **Elective** | **4** | | **0** | **0** | **4** |
| **Pre-Requisite** | | | Fundamentals of Data mining | **Syllabus Version** | | | **2025-26** | |
| **Course Objective:** | | | | | | | | |
| The main objectives of this course are:   1. To understand the various formats of electronic health care information and its challenges. 2. To learn depth knowledge on the techniques used to analyse health care data. 3. To understand the various analytical methods on processing healthcare data and privacy preservation of health care data. | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Understand the different formats of healthcare data, resources and its challenges while processing it. | | | | K1/K2 | | | |
| 2 | Analysis of healthcare data from various data sources like imaging, sensing, signalling and genomic data. | | | | K2/K3/K4 | | | |
| 3 | Apply analytics in natural language clinical text, biomedical literature and social media text for decision making in healthcare services. | | | | K3/K5 | | | |
| 4 | Apply clinical predictive models to healthcare data to provide health outcomes in relevant populations of interest. | | | | K3/K4 | | | |
| 5 | Understand and apply the relevant data analytic models to build decision support systems for healthcare domain. | | | | K3/K4/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | |
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| **Unit:1** | **INTRODUCTION TO HEALTHCARE ANALYSIS** | | | | **10** | | | |
| Introduction to Healthcare Data Analytics- Applications and practical systems for Healthcare – Resources for healthcare data analytics - Electronic Health Records - Components of HER - Coding Systems - Benefits of EHR- Barrier to Adopting HER Challenges- Phenotyping Algorithms. | | | | | | | | |
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| **Unit:2** | **HEALTHCARE DATA SOURCES AND ANALYSIS** | | | | **12** | | | |
| Biomedical Image Analysis: Imaging Modalities – Object detection – Segmentation - Mining of Sensor Data in Healthcare: Challenges – Sensor data mining applications – Nonclinical healthcare applications – Biomedical Signal Analysis- Genomic Data Analysis for Personalized Medicine – Types of computational genomics. | | | | | | | | |
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| **Unit:3** | **HEALTH CARE ANALYTICS** | | | | **13** | | | |
| Natural Language Processing and Data Mining for Clinical Text- Challenges in processing in clinical reports – Clinical applications - Mining the Biomedical literature – Named entity recognition and extraction - Social Media Analytics for Healthcare – analytics on public health research. | | | | | | | | |
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| **Unit:4** | **ADVANCED DATA ANALYTICS ON HEALTHCARE** | | | | **13** | | | |
| Advanced Data Analytics for Healthcare: Review of Clinical Prediction Models- Temporal Data Mining for Healthcare Data- Visual Analytics for Healthcare- Predictive Models for Integrating Clinical and Genomic Data- Information Retrieval for Healthcare- Privacy-Preserving Data Publishing Methods in Healthcare. | | | | | | | | |
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| **Unit:5** | **CASE STUDIES: HEALTHCARE APPLICATIONS** | | | | **12** | | | |
| Applications: Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer-Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data. | | | | | | | | |
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| **Total Lectures** | | | | | **60** | | | |
| **Text Books** | | | | | | | | |
| 1 | Chandan K.Reddy, Charu C. Aggarwal, “Health Care data Analysis”, First edition, CRC, 2015. | | | | | | | |
| 2 | Vikas Kumar, “Health Care Analysis Made Simple”, Packt Publishing, 2018. | | | | | | | |
| **Reference Books** | | | | | | | | |
| 1 | Nilanjan Dey, Amira Ashour, Simon James Fong, Chintan Bhatl, “Health Care Data Analysis and Management, First Edition, Academic Press, 2018. | | | | | | | |
| 2 | Hui Jang, Eva K.Lee, “HealthCare Analysis : From Data to Knowledge to Healthcare Improvement”, First Edition, Wiley, 2016. | | | | | | | |
| 3 | Kulkarni, Siarry, Singh, Abraham, Zhang, Zomaya, Baki, “Big Data Analytics in HealthCare”, Springer, 2020. | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | <https://www.coursera.org/courses?query=healthcare%20analytics> | | | | | | | |
| 2 | <https://onlinecourses.nptel.ac.in/noc22_hs40/preview> | | | | | | | |
| 3 | <https://www.udacity.com/course/health-informatics-in-the-cloud--ud809> | | | | | | | |
| Course Designed By: **Dr.R.Porkodi** | | | | | | | | |

Mapping with programme outcomes:

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| **COS** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| CO1 | **S** | **S** | **L** | **S** | **M** | **L** | **L** | **L** | **M** | **M** |
| CO2 | **S** | S | **M** | **M** | **M** | **M** | **L** | **M** | **S** | **S** |
| CO3 | **S** | **S** | **M** | **S** | **M** | **M** | **L** | **L** | **M** | **S** |
| CO4 | **S** | **S** | **S** | **S** | **M** | **M** | **L** | **L** | **S** | **S** |
| CO5 | **S** | **S** | **S** | **S** | **M** | **L** | **L** | **M** | **S** | **S** |

S- Strong; M-Medium; L-Low

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| **Course code** | | | | **25CS3E1** | | **CYBER SECURITY** | | | **L** | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | |  | | | **4** | | | | **0** | **0** | **4** |
| **Pre-requisite** | | | | | | Basic knowledge about information, networking concepts | | | **Syllabus Version** | | | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To understand the importance of data privacy and security. 2. To learn the basics of cyber security. 3. To study the security objectives and guidance. 4. To know the security policies and cyber management issues | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
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| 1 | | | Understand the basic concepts of cyber security. Analyze the necessity of data privacy-preserving methods | | | | | | | | | K1 / K4 | | | |
| 2 | | | Understand the cyberspace and law. Analyze the need for cyber forensic. | | | | | | | | | K2/K3/K5 | | | |
| 3 | | | Remember the security threats and vulnerabilities on data. | | | | | | | | | K2 / K3 | | | |
| 4 | | | Apply the crypto algorithms over data to avoid the cyber theft. | | | | | | | | | K1/K5/K6 | | | |
| 5 | | | Assess the risk management and cost-benefit analysis. | | | | | | | | | K5/K4/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | | **Introduction** | | | | | | **10 hours** | | | | |
| Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E-commerce – Counter Measures - Challenges. | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | | **Cyberspace and the Law & Cyber Forensics** | | | | | **12 hours** | | | | | |
| Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing. | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | | **Security Threats and Vulnerabilities** | | | **12 hours** | | | | | | | |
| Virus - Trojan - Rootkits - Backdoors – Botnets - Man in the middle attack - Dos and DDos - Replay attack - Spoofing - Spam - Phishing - privilege escalation - DNS poisoning - Brute force - Dictionary attack - Cross-site scripting - SQL injection - Zero-day attack - Session hijacking - Vulnerability scanning vs Port Scanning - Honeypots - Banner grabbing - Social Engineering. | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | | **Cryptographic Techniques** | | | **12 hours** | | | | | | | |
| Symmetric key cryptographic techniques: Introduction to Stream cipher, Block cipher: DES, AES, IDEA Asymmetric key cryptographic techniques: principles, RSA, ElGamal, Elliptic Curve cryptography, Key distribution and Key exchange protocols. | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | | **Risk Analysis & Risk Management** | | **12 hours** | | | | | | | | |
| Risk Analysis Process - Asset Definition - Threat Identification - Determine Probability of Occurrence - Determine the Impact of the Threat - Controls Recommended - Risk Mitigation - Control Types/Categories - Cost/Benefit Analysis. | | | | | | | | | | | | | | | |
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| **Unit:6** | | | | | **Contemporary Issues** | | **2 hours** | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | | | |
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|  | | | | | **Total Lecture hours** | | **60 hours** | | | | | | | | |
| **Text Books** | | | | | | | | | | | | | | | |
| 1 | Cryptography and Network security, William Stallings, Pearson Education, 7th Edition, 2016. | | | | | | | | | | | | | | |
| 2 | Cyber Security, Understanding cybercrimes, computer forensics and legal perspectives, Nina Godbole,Sunit Belapure, Wiley Publications, Reprint 2016. | | | | | | | | | | | | | | |
| 3 | Jennifer L, Bayuk J, Heale P, Rohmeyer, Marcus Sachs, Jeffrey Schmidt and Joseph Weiss “Cyber Security Policy Guidebook”, John Wiley & Sons ,2012. | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | |
| 1 | Rick Howard, “Cyber Security Essentials”, Auerbach Publications, 2011. | | | | | | | | | | | | | | |
| 2 | Cryptography and Network security, Behrouz A. Forouzan, Debdeep Mukhopadhyay, Mcgraw Hill Education, 2nd Edition, 2011 | | | | | | | | | | | | | | |
| 3 | Dan Shoemaker, “Cyber security The Essential Body of Knowledge”, Cengage Learning, 2011 | | | | | | | | | | | | | | |
| 4 | Richard A, Clarke, Robert Knake, “Cyber war: The Next Threat to National Security & What to Do About It”, Ecco, 2010. | | | | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | | | | |
| 1 | | https:// nptel.ac.in/courses/106106129 | | | | | | | | | | | | | |
| 2 | | https:// nptel.ac.in/courses/106105031 | | | | | | | | | | | | | |
| 3 | | <https://www.coursera.org/specializations/intro-cyber-security> | | | | | | | | | | | | | |
| 4 | | <https://www.coursera.org/learn/cybersecurity-for-everyone> | | | | | | | | | | | | | |
| 5 | | <https://www.edx.org/learn/cybersecurity> | | | | | | | | | | | | | |
| 6 | | https://www.udemy.com/topic/cyber-security/ | | | | | | | | | | | | | |
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| Course Designed By: **Dr. R. Porkodi** | | | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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

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| **Course code** | | | **25CS3E2** | **DEEP LEARNING TECHNIQUES** | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | **ELECTIVE** | | 2 | | 0 | | 4 | 4 |
| **Pre-requisite** | | | | Basic knowledge on mathematics, statistics and machine learning concepts | | **Syllabus**  **Version** | | | | 2025-26 | |
| **Course Objectives:** | | | | | | | | | | | |
| The main objectives of this course are to:  1. Understand the principles of neural networks  2. Understand the basic concepts of deep learning  3. Understand and implement the architectures of deep learning.  4. Familiarize with the applications of deep learning | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | Understand the deep learning concepts and apply for different problems | | | | | | | K2/K3 | | |
| 2 | | Design and apply Convolutional and Recurrent Neural Networks | | | | | | | K1/K3 | | |
| 3 | | Understand and evaluate different deep learning architectures | | | | | | | K2/K5 | | |
| 4 | | Design and create deep learning applications | | | | | | | K6 | | |
| 5 | | Analyze the role of deep learning models in image processing | | | | | | | K4 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | | **BASICS OF NEURAL NETWORKS** | | **9 hours** | | | | | | |
| Basics of neural networks - Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks. | | | | | | | | | | | |
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| **Unit:2** | | | **INTRODUCTION TO DEEP LEARNING** | | **12 hours** | | | | | | |
| Introduction to deep learning - Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout. | | | | | | | | | | | |
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| **Unit:3** | | | **CONVOLUTIONAL & RECURRENT NEURAL NETWORK** | | | | **11 hours** | | | | |
| Convolutional neural networks - Kernel Filters – Multiple Filters - CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning - Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, LSTM, RNN applications | | | | | | | | | | | |
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| **Unit:4** | | | **DEEP LEARNING ARCHITECTURES** | | | | **12 hours** | | | | |
| LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising – Contractive- Variational Autoencoders – Adversarial Generative Networks – Autoencoder and DBM | | | | | | | | | | | |
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| **Unit:5** | | | **APPLICATIONS OF DEEP LEARNING** | | | | **14 hours** | | | | |
| Applications of deep learning - Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision | | | | | | | | | | | |
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| **Unit:6** | | | **Contemporary Issues** | | | | **2 hours** | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | | |
|  | | | **Total Lecture hours** | | | | **60 hours** | | | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | | | Ian Good Fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017. | | | | | | | | |
| 2 | | | Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016. | | | | | | | | |
|  | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018. | | | | | | | | | | |
| 2 | Phil Kim, “Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress , 2017. | | | | | | | | | | |
| 3 | Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018. | | | | | | | | | | |
| 4 | Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018. | | | | | | | | | | |
| 5 | Joshua F. Wiley, “R Deep Learning Essentials”, Packt Publications, 2016. | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | <https://onlinecourses.nptel.ac.in/noc20_cs11/preview> | | | | | | | | | | |
| 2 | <https://www.coursera.org/specializations/deep-learning> | | | | | | | | | | |
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| Course Designed By: **Dr.D.RAMYACHITRA** | | | | | | | | | | | |

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

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

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| **Course Code** | | | **25CS3E3** | **SOCIAL MEDIA ANALYTICS** | | | **L** | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | **ELECTIVE** | | | 4 | | 0 | 0 | 4 |
| **Pre-requisite** | | | | Foundations of Data Science  Big data framework | | | **Syllabus Version** | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide an overview of common text mining and social media data analytic activities. 2. To understand the complexities of processing text and network data from different data sources. 3. To enable students to solve complex real-world problems for recommendation systems. 4. To enable the learners to develop skills required for analyzing the effectiveness of social media for business purposes. 5. To familiarize the learners with the concept of social media analytics and understand its significance. 6. To familiarize the learners with the tools of social media analytics. | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | Understand the terminologies, metaphors and perspectives of social media analytics | | | | | | K1/K2 | | | |
| 2 | | Apply a wide range of classification, clustering, estimation and prediction algorithms on Textual data. | | | | | | K3/K4 | | | |
| 3 | | Perform social network analysis to identify important social actors, subgroups and network properties in social media sites. | | | | | | K2/K4 | | | |
| 4 | | Apply state of the art web mining tools and libraries on realistic data sets as a basis for business decisions and applications. | | | | | | K2/K3/K4 | | | |
| 5 | | Provide solutions to the emerging problems with social media such as behavior analytics and Recommendation systems | | | | | | K2/K3/K4 | | | |
| 6 | | Design new ontology-based solutions for opinion extraction, sentiment classification and data summarization problems. | | | | | | K2/K3/K4/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | |
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| **Unit:1** | | | **Foundation for Social Media Analytics** | | | | **7 hours** | | | | |
| Foundation for Analytics: – Digital Gap – Social Media Data Sources – Defining Social Media Data –Data Sources – Estimated vs. Factual Data Sources – Data Gathering in Social Media Analytics. From Data to Insights: Actionable Analytics – Focus on objective – Plan to shape data to insights –Choosing a good analytics tool – Data Aggregation calculations and display – Data display – Social-Media and Big data – Potential Challenges. Data Identification: Professional networking sites - social sites – information sharing sites – micro blogging sites – blogs /wikis. | | | | | | | | | | | |
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| **Unit:2** | | | **Social Media Analytics Types, Tools and Social Network Landscape** | | | | **8 hours** | | | | |
| Analytics in social media: Types of analytics. Dedicated Vs. Hybrid Tools – Dedicated tools – Hybrid tools – Data Integration Tools – Best Setup. Social Network Landscape: Concept and UX on social networks – Interactivity of social network –Content flow on social network – Interaction Pattern between users – Social-Media as a two-way channel. | | | | | | | | | | | |
| **Unit:3** | | | **Analytic Process and Metrics** | | | **10 hours** | | | | | |
| Analytics Process: Analysis – Insight – Investigation beyond social analytics – Shaping a method –analysis cycle – Community Activity – Resources – Attention span – Dynamic cycles – Short Periods –Long Periods – Analyst Mindset – Instinctive Analyst. Metrics: Introduction – Default and custom metrics – Metrics Categories – Graph Types – Metric Capabilities – Metrics and Strategy – Estimated Metrics – Metrics and Tactics. | | | | | | | | | | | |
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| **Unit:4** | | | **Semantic Web and Social Network Analysis** | | | **9 hours** | | | | | |
| Introduction to Semantic Web: Limitations of current Web, Development of Semantic Web, Emergence of the Social Web. Social Network analysis: Development of Social Network Analysis -Key concepts and measures in network analysis. Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks. | | | | | | | | | | | |
| **Unit:5** | | | **Semantic Web and Ontology** | | | **11 hours** | | | | | |
| Knowledge representation on the Semantic web: Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language. | | | | | | | | | | | | |
| **Unit:6** | | | **Contemporary Issues** | | **2 hours** | | | | | | | |
| Online Courses, Webinars and Case studies | | | | | | | | | | | | |
|  | | | **Total Lecture hours** | | **60 hours** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Alex Goncalves, “Social Media Analytics Strategy - Using Data to Optimize Business Performance”, Alex Goncalves, APress 2017. | | | | | | | | | | | |
| 2 | Peter Mika, “Social Networks and the Semantic Web”, First Edition, Springer 2007. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | Ganis, Kohirkar (2016). Social media Analytics, IBM Press PTG, 1st Edition. | | | | | | | | | | | |
| 2 | Nancy Flynn (2012). The Social Media Hand book Policies, and Best Practices, Wiley. | | | | | | | | | | | |
| 3 | Guandong Xu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking –Techniques and applications”, First Edition Springer, 2011. | | | | | | | | | | | |
| 4 | Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008. | | | | | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | | |
| 1 | https://www.coursera.org/learn/social-media-data-analytics | | | | | | | | | | | |
| 2 | https://www.classcentral.com/course/social-media-analytics-introduction-6916 | | | | | | | | | | | |
| 3 | https://und.edu/academics/online/enroll-anytime/comm499.html | | | | | | | | | | | |
| Course Designed By: Dr. P.B.Pankajavalli | | | | | | | | | | | | |

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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 | L | M | M | M |
| **CO2** | S | S | S | S | M | L | M | M | S | S |
| **CO3** | S | S | S | S | S | M | M | M | S | S |
| **CO4** | S | S | S | S | S | M | M | M | S | S |
| **CO5** | S | S | S | S | M | M | M | S | S | S |
| **CO6** | S | S | S | S | S | M | M | S | S | S |

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

Supportive Courses

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| **Course code** | | | **25CSS01** | | **WINDOWS AND MS WORD** | | | **L** | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **SUPPORTIVE** | | | **2** | | | | **0** | **0** | **2** |
| **Pre-requisite** | | | | | Knowledge in Basics of Computer | | | **Syllabus Version** | | | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide in depth knowledge about the basic concepts of operating system 2. To discuss the file operations and document creation 3. To inculcate knowledge on office tools and techniques, graphics and toolbars | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | Understand the basics of operating system and various menus | | | | | | | | | K2/K3 | | | |
| 2 | | Learn the windows operation and file management | | | | | | | | | K2/K3/K4 | | | |
| 3 | | Understand and learn the document creation | | | | | | | | | K2/K3 | | | |
| 4 | | Analyze the usage various tools and macros | | | | | | | | | K3/K4 | | | |
| 5 | | Create and evaluate the reports generated | | | | | | | | | K5/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
| **Unit:1** | | | | **Introduction** | | | | | | **5 hours** | | | | |
| Getting started –about OS – types of OS – mouse handling – Windows | | | | | | | | | | | | | | |
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| **Unit:2** | | | | **File operations** | | | | | **6 hours** | | | | | |
| Office User Interface – Creating, Saving, Closing and Opening Office files, Working with files | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **Document creation and Customization** | | | **6 hours** | | | | | | | |
| Creating and Editing Documents – Formatting and Customizing Documents. | | | | | | | | | | | | | | |
| **Unit:4** | | | | **Graphics and toolbars** | | | **8 hours** | | | | | | | |
| Tabs – tables and sorting – graphics – templates writer tools – macros – keyboard shortcuts – means – custom toolbars. | | | | | | | | | | | | | | |
| **Unit:5** | | | | **Report Writing** | | **5 hours** | | | | | | | | |
| Collaborating with others and Working with reports | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **30 hours** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | Randy Nordell, Microsoft Office 365: In Practice, 2019 Edition | | | | | | | | | | | | | |
| 2 | Joan Lambert and Curtis Frye, Microsoft Office 2016 Step By Step, Microsoft Press, 2015. | | | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | | | |
| 1 | Woody Leonhard, Microsoft office 2000, Que 1999. | | | | | | | | | | | | | |
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| Course Designed By: **Dr. D.Ramyachitra** | | | | | | | | | | | | | | |

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| **Course Code** | | | **25CSS02** | **INTERNET AND HTML PROGRAMMING** | | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/Supportive** | | | | **SUPPORTIVE** | | | **2** | | **0** | | **0** | **2** |
| **Pre-requisite** | | | | Basic knowledge in Computer Science | | | **Syllabus Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| The main objectives of this course are:  1. To understand the fundamentals of Internet and WWW  2. To learn about the basics of internet services  3. To develop basic web pages using HTML | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | Remember the basic concepts of Internet and its connectivity. | | | | | | K1/K2 | | | | |
| 2 | | Understand the concepts of World wide web | | | | | | K1/K2 | | | | |
| 3 | | Gain knowledge on internet services, its address and basic understanding on HTML | | | | | | K2/K3 | | | | |
| 4 | | Understand and apply html tag for web page creation. | | | | | | K1/K3 | | | | |
| 5 | | Create tables, forms and frames in HTML. | | | | | | K3 /K4 /K5 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; | | | | | | | | | | | | |
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| **Unit:1** | | | **Introduction to Internet** | | | | **5 hours** | | | | | |
| Internet Basics –Origin Of Internet – Arpanet - Gateway- Internet Service Providers- Servers- Modems - Dialup Networking - Web Browsers- Routers . | | | | | | | | | | | | |
| **Unit:2** | | | **The World Wide Web** | | | | **5 hours** | | | | | |
| Introduction to World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Applications, Websites – Home Pages –URL - Search Engines. | | | | | | | | | | | | |
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| **Unit:3** | | | **Internet Services & HTML** | | | **10 hours** | | | | | | |
| Electronic Mail- FTP- Newsgroups- TCP/IP- DNS - IP addressing- Classification of IP address- History of HTML - Structure of HTML document - Switching between Editor and Browser- Paragraph and Line Break Tags - Adding Comments. | | | | | | | | | | | | |
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| **Unit:4** | | | HTML Tags : | | | **10 hours** | | | | | | |
| Formatting Text - Ordered List - Unordered List Tag - Creating Links using text and images. Tables: Tables: Creating Columns and Rows- Adding a Border- Adding Column Headings - Adding Spacing and Padding - Adding a Caption - Setting the Table Width and Height. | | | | | | | | | | | | |
| **Unit:5** | | | HTML Frames & Forms | | | **10 hours** | | | | | | |
| Frames : Percentage dimensions - Relative dimensions - Creating two rows Frames - Creating two columns frames - Creating two rows and the second row containing two columns. Forms: Form Tag- Method – Action - Input Tag - Type Attribute: Check box, Hidden, Image, Radio, Reset, Submit, Text. | | | | | | | | | | | | |
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|  | | | **Total Lecture hours** | | **30 hours** | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Hohn Levine and Margaret Levine , “Internet for Dummies “, Wiley, 14th Edition. | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | |
| 2 | John Duckett, “Beginning Web Programming with HTML, XHTML, CSS & JavaScript”, Wiley DreamTech Second Edition. | | | | | | | | | | | |
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| **Related Online Contents** | | | | | | | | | | | | |
| 1. | https://ncert.nic.in/textbook/pdf/kect107.pdf | | | | | | | | | | | |
| 2. | https://ftms.edu.my/v2/wp-content/uploads/2019/02/csca0101\_ch09.pdf | | | | | | | | | | | |
| Course Designed By: Dr.P.B.Pankajavalli | | | | | | | | | | | | |

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| **Course code** | | | **25CSS03** | | **RELATIONAL DATABASE MANAGEMENT SYSTEMS** | | | **L** | | | | **T** | **P** | | **C** |
| **Core/Elective/Supportive** | | | | | **SUPPORTIVE** | | | **2** | | | | **0** | **0** | | **2** |
| **Pre-requisite** | | | | | Knowledge in Basics of Computer | | | **Syllabus Version** | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide in depth knowledge about the basic concepts database systems 2. To discuss the database models and relational database 3. To inculcate knowledge on normalization and query processing | | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | Understand the basics of database systems and transaction management | | | | | | | | | K2/K3 | | | | |
| 2 | | Learn different database models | | | | | | | | | K2/K3/K4 | | | | |
| 3 | | Understand and learn the structure of relational databases | | | | | | | | | K2/K3 | | | | |
| 4 | | Analyze the application of normalization to tables | | | | | | | | | K3/K4 | | | | |
| 5 | | Create and evaluate the queries for the applications | | | | | | | | | K5/K6 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | |
| **Unit:1** | | | | **Introduction to Database Systems** | | | | | | **5 hours** | | | | | |
| Introduction – purpose of database system data models – database languages – Transaction management – Storage management – DBA – database users – system structure | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | **Database Models** | | | | | **6 hours** | | | | | | |
| E-R model – Hierarchical model – Network Model. | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **Relational Database** | | | **6 hours** | | | | | | | | |
| Structure of Relational databases – Relational Commercial Languages SQL – Integrity Constraints. | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **Normalization** | | | **8 hours** | | | | | | | | |
| Normalization – Indexing and Hashing | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Query Processing** | | **5 hours** | | | | | | | | | |
| Query Processing – Concurrency Control – Security | | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **30 hours** | | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | |
| 1 | Abraham Silberchatz, Henry K.Forth, Sudharshan, Database system Concepts, McGraw Hill, 7th Edition, 2020. | | | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | | | | |
| 1 | Navethe/Elmasri,” Fundamentals of Database Systems”, Addition Wesley, Sixth Edition, 2010. | | | | | | | | | | | | | | |
| Course Designed By: **Dr. D.Ramyachitra** | | | | | | | | | | | | | | | |
| **Course code** | | | **25CSS04** | | **OBJECT ORIENTED PROGRAMMING** | | | **L** | | | | **T** | **P** | **C** | |
| **Core/Elective/Supportive** | | | | | **SUPPORTIVE** | | | **2** | | | | **0** | **0** | **2** | |
| **Pre-requisite** | | | | | Knowledge in Basics of Computer | | | **Syllabus Version** | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide knowledge on introductory concepts on object oriented programming 2. To discuss the control statements, classes and the characteristics of object oriented programming 3. To inculcate knowledge on files and exception handling | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | Understand the basics of object oriented programming | | | | | | | | | K2/K3 | | | | |
| 2 | | Learn different control statements and objects and classes | | | | | | | | | K2/K3/K4 | | | | |
| 3 | | Understand and learn the characteristics of object oriented programming | | | | | | | | | K2/K3 | | | | |
| 4 | | Understand the application of files and templates | | | | | | | | | K2/K3 | | | | |
| 5 | | Analyze the concepts, evaluate and create object oriented programs | | | | | | | | | K4/K5/K6 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | **Introduction to Object Oriented Programming** | | | | | | **5 hours** | | | | | |
| Drawback of structured programming – object oriented language characteristics and fundamentals – programming basics | | | | | | | | | | | | | | | |
| **Unit:2** | | | | **Control Statements and Classes** | | | | | **6 hours** | | | | | | |
| Loops, decisions – structures and functions – object and classes. | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **OOPs Characteristics** | | | **6 hours** | | | | | | | | |
| Overloading – Inheritance – Polymorphism | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **Files and Templates** | | | **8 hours** | | | | | | | | |
| Files – Streams – Templates | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Exception and String Handling** | | **5 hours** | | | | | | | | | |
| Exception handling – String handling | | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **30 hours** | | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | |
| 1 | Strongstrup, “The C++ Programming Languages”, Addison Wesley, 4th Edition, 2013 | | | | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | | | | |
| 1 | Robert Lafore, “Object Oriented Programming in Turbo C++,” Galgotha publications Ltd , 2001. | | | | | | | | | | | | | | |
| Course Designed By: **Dr. D.Ramyachitra** | | | | | | | | | | | | | | | |
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| **Course code** | | | **25CSS05** | | **SOFTWARE ENGINEERING** | | | **L** | | | | **T** | **P** | **C** | |
| **Core/Elective/Supportive** | | | | | **SUPPORTIVE** | | | **2** | | | | **0** | **0** | **2** | |
| **Pre-requisite** | | | | | Knowledge in Basics of Computer | | | **Syllabus Version** | | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide knowledge on introductory concepts on Software Engineering 2. To discuss system analysis and design methods 3. To inculcate knowledge on software testing | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | | |
| 1 | | Understand the basics of software engineering | | | | | | | | | K2/K3 | | | | |
| 2 | | Learn requirement analysis and data modeling | | | | | | | | | K2/K3/K4 | | | | |
| 3 | | Understand the design concepts and modular design | | | | | | | | | K2/K3 | | | | |
| 4 | | Understand the application of design methods for real time systems | | | | | | | | | K2/K3 | | | | |
| 5 | | Analyze the analysis, design and testing concepts, evaluate and create software products | | | | | | | | | K4/K5/K6 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | | |
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| **Unit:1** | | | | **Introduction to Software Engineering** | | | | | | **5 hours** | | | | | |
| Introductions: Evolving role of software – Software characteristics, components and its applications – Generic view of software engineering – Software process models. | | | | | | | | | | | | | | | |
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| **Unit:2** | | | | **System Analysis** | | | | | **6 hours** | | | | | | |
| Systems Analysis: Requirements analysis – Analysis principles – Prototyping Software requirement specification – Data modeling, functional modeling and behavioral modeling | | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **System Design** | | | **6 hours** | | | | | | | | |
| Design concepts: Design and software quality, Design concepts: Abstraction, refinement, modularity, and software architecture control hierarchy structural partitioning and information hiding, Effective modular design: functional independence, cohesion and coupling – design documentation. | | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **Design Methods** | | | **8 hours** | | | | | | | | |
| Design Methods: Data design – Architectural design process: transform mapping and transaction mapping – interface design – procedural design. Design for Real – Time Systems: System considerations -– Real time systems – analysis and simulation of real time systems. | | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Software Testing** | | **5 hours** | | | | | | | | | |
| Software Testing Methods: Software testing fundamentals. White box testing: basis path testing and control structure testing – black box testing – testing for specialized environments. Software Testing Strategies: A strategic approach to software testing – unit testing – Integration testing – Validation testing-– System Testing. | | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **30 hours** | | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | |
| 1 | Roger.S.Pressman, Software Engineering: A Practitioners Approach, Tata McGraw Hill, 2014. | | | | | | | | | | | | | | |
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| Course Designed By: **Dr. D.Ramyachitra** | | | | | | | | | | | | | | | |

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| **Course code** | | | **25CSS06** | | **MULTIMEDIA SYSTEMS** | | | **L** | | | | **T** | **P** | **C** |
| **Core/Elective/Supportive** | | | | | **SUPPORTIVE** | | | **2** | | | | **0** | **0** | **2** |
| **Pre-requisite** | | | | | Knowledge in Basics of Computer | | | **Syllabus Version** | | | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | | | | |
| The main objectives of this course are:   1. To provide knowledge on introductory concepts on multimedia 2. To discuss about sound and graphics in multimedia systems. 3. To inculcate knowledge on operations on video, animation and special visual effects. | | | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | | | |
| 1 | | Understand the basics of Multimedia systems | | | | | | | | | K2/K3 | | | |
| 2 | | Learn sound, editing sound files and graphics | | | | | | | | | K2/K3/K4 | | | |
| 3 | | Understand and learn the video concepts and digital filters | | | | | | | | | K2/K3 | | | |
| 4 | | Understand the application of animation tools | | | | | | | | | K2/K3 | | | |
| 5 | | Analyze, evaluate and create systems using special visual effects | | | | | | | | | K4/K5/K6 | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | | | | |
| **Unit:1** | | | | **Introduction to Multimedia** | | | | | | **5 hours** | | | | |
| Introduction to Multimedia PCs – Components of Multimedia – Multimedia Tools | | | | | | | | | | | | | | |
| **Unit:2** | | | | **Sound and Graphics** | | | | | **6 hours** | | | | | |
| Digital Sound - Editing and Mixing Sound Files – MIDI Creation – Tracking Procedure – Interactive and Non-Interactive Graphics | | | | | | | | | | | | | | |
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| **Unit:3** | | | | **Video Concepts** | | | **6 hours** | | | | | | | |
| Digital Image Concepts - Video Capturing – Scanning Images – Digital Filters – Morphing and Warping | | | | | | | | | | | | | | |
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| **Unit:4** | | | | **Animation** | | | **8 hours** | | | | | | | |
| Two dimensional and Three-dimensional animation – Animation tools | | | | | | | | | | | | | | |
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| **Unit:5** | | | | **Imaging Special Visual Effects** | | **5 hours** | | | | | | | | |
| Bitmap – Brushes – Dissolve – Hotspot Editor - Scrolling | | | | | | | | | | | | | | |
|  | | | | **Total Lecture hours** | | **30 hours** | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | |
| 1 | TayVaughan, Multimedia Making it Work, Tata McGrawHill Publishing Company, Eigth Edition, 2011. | | | | | | | | | | | | | |
| 2. | Kaliyaperumal Karthikeyan, Introduction to Multimedia System, Lambert Academic Publishing, 2011. | | | | | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | | | | | | |
| 1 | Parag Havaldar, Gerald Medioni, Multimedia Systems, Cengage Learning, 2011 | | | | | | | | | | | | | |
| 2 | S.K.Bansal , Multimedia Systems, Aph Publishing Corporation, 2011. | | | | | | | | | | | | | |
| Course Designed By: **Dr. D.Ramyachitra** | | | | | | | | | | | | | | |

JOB ORIENTED

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VALUE ADDED COURSES

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| **Job Oriented Course - DATA ANALYSIS USING EXCEL** | | | | | | | | |
| **Name of the Department** | | | | | **Computer Science** | | | |
| **Name of the Faculty Member i/c**  **with Complete Address with Phone and**  **E-mail** | | | | | Dr. S. Vijayarani  Assistant Professor  Department of Computer Science  Bharathiar University, Coimbatore – 641 046  [vijayarani@buc.edu.in](mailto:vijayarani@buc.edu.in) | | | |
| **Inter / Intra Department Course** | | | | | **Intra Department Course** | | | |
| **Duration of the Course** | | | | | **30 Hours** | | | |
| **Eligibility** | | | | | U.G. in Computer Science / Computer  Applications / Information Technology or its  equivalent | | | |
| **Number of Candidates to be Admitted** | | | | | **30** | | | |
| **Mode of the Course** | | | | | **Both Regular and Online** | | | |
| **Collaboration if any with Companies**  (if Yes, Full Address of the Company Address ,  Name of the Contact Person, Phone, e-mail etc.) | | | | | **---** | | | |
| **Registration Procedure** | | | | |  | | | |
| **Job Opportunities:** | | | | |  | | | |
| * Data Analyst * Data Scientist | | | | | | | | |
| The main objectives of this course are:   1. To understand the basics of the analysis process in Excel 2. To remember the various components and their functions in the Excel worksheet 3. To learn about advanced formulas creation and charts preparation 4. To implement different kinds of data analysis tasks 5. To handle pivot tables and macros | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | | |
| 1 | | | Understand the need for MS-Excel and the working of various components | | | | | K1/K2/K4 |
| 2 | | | Experiment with the given data by using different functions, ranges and formulas | | | | | K2/K3/K4 |
| 3 | | | Evaluate the data analysis results and visualize them by using charts | | | | | K4/K5/K6 |
| 4 | | | Analyze the pivot tables and the different spreadsheet tools | | | | | K4/K5 |
| 5 | | | Create the macros and applied them for analytical tasks | | | | | K4 / K6 |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | |
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| **Course Content** | | | | **Lecture / Practical / Project / Internship** | | | | |
| **DATA ANALYSIS USING EXCEL (30 Hours, 2 Credits)** | | | | | | | | |
| **Module 1** | | | | **Introduction to Excel:** About Excel & Microsoft, Uses of Excel, Excel software, Spreadsheet window pane, Title Bar, Menu Bar, Standard Toolbar, Formatting Toolbar, the Ribbon, File Tab and Backstage View, Formula Bar, Workbook Window, Status Bar, Task Pane, Workbook & sheets | | 3 Hours | | |
| **Module 2** | | | | **Columns & Rows:**  Selecting Columns & Rows, Changing Column Width & Row Height, Autofitting Columns & Rows, Hiding/Unhiding Columns & Rows, Inserting & Deleting Columns & Rows, Cell, Address of a cell, Components of a cell – Format, value, formula, Use of paste and paste special | | | 3 Hours | |
| **Module 3** | | | | **Functionality Using Ranges:** Using Ranges, Selecting Ranges, Entering Information into a Range, Using AutoFill | | | 2 Hours | |
| **Module 4** | | | | **Creating Formulas:** Using Formulas, Formula Functions – Sum, Average, if, Count, max, min, Proper, Upper, Lower, Using AutoSum | | | 4 Hours | |
| **Module 5** | | | | **Advance Formulas:** Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim | | | 3 Hours | |
| **Module 6** | | | | **Spreadsheet Charts:**  Creating Charts, Different types of charts, Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table | | | 4 Hours | |
| **Module 7** | | | | **Data Analysis:** Sorting, Filter, Text to Column, Data Validation | | | 3 Hours | |
| **Module 8** | | | | **PivotTables:**  Creating PivotTables, Manipulating a PivotTable, Using the PivotTable Toolbar, Changing Data Field, Properties, displaying a PivotChart, Setting PivotTable Options. Adding Subtotals to PivotTables | | | 3 Hours | |
| **Module 9** | | | | **Spreadsheet Tools:** Moving between Spreadsheets, Selecting Multiple Spreadsheets, Inserting and Deleting Spreadsheets Renaming Spreadsheets, Splitting the Screen, Freezing Panes, Copying and Pasting Data between Spreadsheets, Hiding, Protecting worksheets | | | 3 Hours | |
| **Module 10** | | | | **Making Macros:** Recording Macros, Running Macros, Deleting Macros | | | 2 Hours | |
| **Text Books** | | | | | | | | |
| 1 | Hector Guerrero, Excel Data Analysis Modeling and Simulation, Second Edition, Springer, 2019 | | | | | | | |
| 2 | Berk & Carey, Data Analysis with Microsoft Excel, Brooks / Cole Cengage Learning, 2010 | | | | | | | |
| 3 | Ash Narayan Sah, Data Analysis using Microsoft Excel, Excel Books, 2009 | | | | | | | |
|  | | | | | | | | |
| **Reference Books** | | | | | | | | |
| 1 | Stephen Nelson and Elizabeth C.Nelson, Excel Data Analysis for Dummies, 3rd Edition, John Wiley & Sons, Inc., 2016 | | | | | | | |
| 2 | Paul McDefries, Microsoft Excel Data Analysis for Dummies, John Wiley & Sons, Inc., 2019 | | | | | | | |
|  | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | | https://www.coursera.org/learn/excel-data-analysis | | | | | | |
| 2 | | https://www.datacamp.com/courses/data-analysis-in-excel | | | | | | |
| 3 | | https://online.rice.edu/courses/excel-data-analysis | | | | | | |
| 4 | | https://www.tutorialspoint.com/excel\_data\_analysis/index.htm | | | | | | |
| 5 | | https://www.excel-easy.com/data-analysis.html | | | | | | |

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| **Job Oriented Course - POWER BI FOR DATA ANALYTICS** | | | | | | | | |
| **Name of the Department** | | | | | **Computer Science** | | | |
| **Name of the Faculty Member i/c**  **with Complete Address with Phone and**  **E-mail** | | | | | Dr. S. Vijayarani  Assistant Professor  Department of Computer Science  Bharathiar University, Coimbatore – 641 046  [vijayarani@buc.edu.in](mailto:vijayarani@buc.edu.in) | | | |
| **Inter / Intra Department Course** | | | | | **Intra Department Course** | | | |
| **Duration of the Course** | | | | | **30 Hours** | | | |
| **Eligibility** | | | | | U.G. in Computer Science / Computer  Applications / Information Technology or its  equivalent | | | |
| **Number of Candidates to be Admitted** | | | | | **40** | | | |
| **Mode of the Course** | | | | | **Both Regular and Online** | | | |
| **Collaboration if any with Companies**  (if Yes, Full Address of the Company Address ,  Name of the Contact Person, Phone, e-mail etc.) | | | | | **---** | | | |
| **Registration Procedure** | | | | |  | | | |
| **Job Opportunities:** | | | | |  | | | |
| * Data Analyst * Data Scientist | | | | | | | | |
| The main objectives of this course are:  To understand the key concepts of business intelligence and the Power BI ecosystem   1. To perform different operations by using the data 2. To learn about the creation of data models and final reports 3. To understand the use of dashboards, apps and security 4. To conduct the business data analysis tasks | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | | |
| 1 | | | Understand the key concepts of business intelligence and Power BI Desktop | | | | | K1/K2 |
| 2 | | | Perform data transformation tasks and create the data models | | | | | K3 / K6 |
| 3 | | | Apply advanced visualization and create the reports | | | | | K3/K4/K6 |
| 4 | | | Create the dashboards and apps | | | | | K4/K5/K6 |
| 5 | | | Use data gateways and refreshing datasets. | | | | | K3/K4/K5 |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | |
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| **Course Content** | | | | **Lecture / Practical / Project / Internship** | | | | |
| **POWER BI FOR DATA ANALYTICS (30 Hours, 2 Credits)** | | | | | | | | |
| **Module 1** | | | | **Introduction to Power BI:** Key concepts of business intelligence, The Power BI ecosystem, Power BI Licensing, Power BI Desktop and Service | | 3 Hours | | |
| **Module 2** | | | | **Power BI Desktop:** Downloading and installing Power BI Desktop, Touring the Desktop, generating data, Creating Visualizations | | | 3 Hours | |
| **Module 3** | | | | **Connecting and Shaping Data:** Getting data, transforming data, Merging, Copying and Appending Queries, Verifying and Loading data | | | 2 Hours | |
| **Module 4** | | | | **Creating Data Models and Calculations:** Creating a data model, creating calculations, checking and troubleshooting calculations | | | 4 Hours | |
| **Module 5** | | | | **Unlocking Insights:** Segmenting data, Using report navigation features, Advanced visualization techniques | | | 3 Hours | |
| **Module 6** | | | | **Creating the final report:**  Preparing the final report, creating the final report pages, Finishing up | | | 4 Hours | |
| **Module 7** | | | | **The Service:** Getting an account, Introducing the Service, Publishing and Sharing | | | 3 Hours | |
| **Module 8** | | | | **Using Reports in the Service:**  Viewing reports, exporting reports, embedding reports, Editing and creating reports | | | 3 Hours | |
| **Module 9** | | | | **Understanding Dashboards, Apps and Security:** Understanding dashboards, understanding apps, Understanding security and permissions | | | 3 Hours | |
| **Module 10** | | | | **Data Gateways and Refreshing Datasets:** Installing and using data gateways, Refreshing datasets | | | 2 Hours | |
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| **Text Books** | | | | | | | | |
| 1 | Greg Deckler Learn Power BI - A beginner's guide to developing interactive business intelligence solutions using Microsoft Power BI, Packt Publishing, 2019 | | | | | | | |
|  | | | | | | | | |
| **Reference Books** | | | | | | | | |
| 1 | Alberto Ferrari and Marco Russo, Introducing Microsoft Power BI, Microsoft Press, 2016 | | | | | | | |
| 2 | Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, Brett Powell, Microsoft Power BI Complete Reference- Bring your data to life with the powerful features of Microsoft  Power BI, Packt Publishing, 2018 | | | | | | | |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | |
| 1 | | https://powerbi.microsoft.com/en-us/learning/ | | | | | | |
| 2 | | https://www.udemy.com/topic/microsoft-power-bi/ | | | | | | |
| 3 | | https://www.simplilearn.com/power-bi-certification-training-course | | | | | | |
| 4 | | https://intellipaat.com/power-bi-training/ | | | | | | |
| 5 | | https://www.tutorialspoint.com/power\_bi/index.htm | | | | | | |
| 6 | | https://www.javatpoint.com/power-bi | | | | | | |
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| **Job Oriented Course -** **MOBILE APPLICATION DEVELOPMENT** | | | | | | | |
| **Name of the Department** | | | | | | **Computer Science** | |
| **Name of the Faculty Member i/c**  **With Complete Address with Phone and e-mail** | | | | | | **Dr. R. Porkodi**  **Associate Professor**  **Department of Computer Science**  **Bharathiar University**  **Coimbatore – 46**  **0422-2428349**  **porkodi\_r76@buc.edu.in** | |
| **Inter / Intra Department Course** | | | | | | **Intra Department Course** | |
| **Duration of the Course** | | | | | | **30 Hours** | |
| **Eligibility** | | | | | | U.G. in Computer Science/Computer Applications/Information Technology or its equivalent | |
| **Number of Candidates to be Admitted** | | | | | | **40** | |
| **Mode of the Course** | | | | | | **Both Regular and Online** | |
| **Collaboration if any with Companies**  (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | **---** | |
| **Registration Procedure** | | | | | |  | |
| **Job Opportunities:** | | | | | | | |
| * To become mobile app developer in Retail, healthcare sector, Travel and tourism industry, Entertainment industry, Financial services and Media organizations. | | | | | | | |
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| **The objectives of the Course are:** | | | | | | | |
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| 1 | | | Provides a comprehensive overview and focuses on developing multiplatform mobile applications using the Web skills. | | | | |
| 2 | | | Strengthen the skills of students in learning hybrid application framework to develop and target multiple mobile platforms with a single codebase. | | | | |
| 3 | | | Enrich the knowledge of students in Ionic one of fastest growing mobile application framework. | | | | |
| 4 | | |  | | | | |
| **Course Outcomes:** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | | | Understand the basics of mobile devices, app store, development environments, characteristics, history of mobile application frameworks. | | | | |
| 2 | | | Understand the mobile application frameworks and setting up java, eclipse, android development components. Creating user interface design for mobile applications and managing application data. | | | | |
| 3 | | | Understanding the enterprise requirements and testing methodologies for mobile applications. | | | | |
| 4 | | | Understanding the hybrid mobile app development frameworks: CSS3, HTML 5, Iconic, Angular JS, Node.JS and developing the hybrid mobile applications | | | | |
| 5 | | | Understanding the mobile app deployment process, Usage of Sqlite, mongo DB and Mysql and IBM BlueMix. | | | | |
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| **Course Content** | | | | | Lecture / Practical / Project / Internship | | |
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| **Module 1** | | | | Introduction to Mobile Devices: Introduction - Mobile vs. Desktop devices - App Store, Google Play, Windows Store - Development environments - PhoneGAP | | | **3 hours** |
| **Module 2** | | | | Native vs. web applications - Mobile Connectivity Evolution - Characteristics of mobile applications - History of mobile application frameworks | | | **3 hours** |
| **Module 3** | | | | Application models of mobile application frameworks - Setting up an android development environment: setting up java, eclipse, android development components, verify the development environment | | | **3 hours** |
| **Module 4** | | | | User interface design for mobile applications - Managing application data | | | **3 hours** |
| **Module 5** | | | | Addressing enterprise requirements in mobile applications: performance, scalability, modifiability, availability, and security | | | **3 hours** |
| **Module 6** | | | | Testing methodologies for mobile applications - Publishing, deployment, maintenance and management | | | **3 hours** |
| **Module 7** | | | | Hybrid Mobile App Development Frameworks: Introduction to CSS3.HTML5 - Full-Stack Web Development | | | **3 hours** |
| **Module 8** | | | | Hybrid Mobile App Development: Ionic and AngularJS - node.JS | | | **3 hours** |
| **Module 9** | | | | APP deployment: Angular ui-router and Resolve - Using Local Storage(Sqlite) -Databases - mongoDB, MySQL | | | **3 hours** |
| **Module 10** | | | | Ionic Adding Platforms - Building and Deploying the App - Hybrid Mobile Development and IBM BlueMix | | | **3 hours** |
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| **Text Book(s)** | | | | | | | |
| 1 | Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 3rd edition, 2017. | | | | | | |
| 2 | Rajiv Ramnath, Roger Crawfis, and Paolo Sivilotti, Android SDK 3 for Dummies, Wiley. | | | | | | |
| 3 | Brian Fling, Mobile Design and Development, O’Reilly Media, Inc., 2009. | | | | | | |
|  | | | | | | | |
| **Reference Book(s)** | | | | | | | |
| 1 | Maximiliano Firtman, Programming the Mobile Web, O’Reilly Media, Inc., 2nd ed., 2013. | | | | | | |
|  | | | | | | | |
| **Related Online Contents** | | | | | | | |
| 1 | | <https://developer.android.com/> | | | | | |
| 2 | | <https://www.w3schools.in/category/android-tutorial/> | | | | | |
| 3 | | <https://www.tutorialspoint.com/android/index.htm> | | | | | |
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| **Job Oriented Course - SMART APPLICATIONS WITH INTERNET OF THINGS** | | | | | | | | | |
| **Name of the Department** | | | | | | | **Computer Science** | | |
| **Name of the Faculty Member i/c**  **With Complete Address with Phone and e-mail** | | | | | | | Dr.P.B.Pankajavalli  Assistant Professor  Dept. of Computer Science  Bharathiar University, Coimbatore  Phone : 2428603, pankajavalli@buc.edu.in | | |
| **Inter / Intra Department Course** | | | | | | | Intra Department Course | | |
| **Duration of the Course** | | | | | | | 30 Hours | | |
| **Eligibility** | | | | | | | U.G. in Computer Science/Computer Applications/Information Technology or its equivalent | | |
| **Number of Candidates to be Admitted** | | | | | | | 40 | | |
| **Mode of the Course** | | | | | | | **Both Regular and Online** | | |
| **Collaboration if any with Companies**  (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | | **No** | | |
| **Registration Procedure** | | | | | | |  | | |
| **Job Opportunities:** | | | | | | | | | |
| Hardware and device development, Sensor networking professionals | | | | | | | | | |
| IoT cloud engineer, Product Manager | | | | | | | | | |
| **The objectives of the Course are:** | | | | | | | | | |
| The main objectives of this course are to: | | | | | | | | | |
| 1 | | | To understand the concept of sensors and microcontrollers | | | | | | |
| 2 | | | To remember basic syntax in C programming | | | | | | |
| 3 | | | To apply sensor on microcontrollers | | | | | | |
| 4 | | | To understand the interfacing of cloud with sensors | | | | | | |
| 5 | | | To evaluate and visualize the data in the cloud | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| 1 | | | | Understand the basics of sensors and sensor networks | | | | K2/K3 | |
| 2 | | | | Create basic arduino code and to gain knowledge on built in code | | | | K1/K2/K4 | |
| 3 | | | | Develop small IoT prototype using different sensors. | | | | K3/K4 | |
| 4 | | | | Explore the usage of buzzers, motors, relays and LED lights | | | | K3/K4 | |
| 5 | | | | Deploy interface with cloud and to visualize data | | | | K2/K3/K5 | |
| **K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5- Create** | | | | | | | | | |
| **Course Content** | | | | | | **Lecture / Practical** / Project / Internship | | | |
| **Smart Applications with Internet of Things (30 Hours, 2 credits)** | | | | | | | | | |
| **Module 1** | | | | | Anatomy of Sensors Networks – Topology of Sensor Network – Type of Sensor Nodes – Sensors- Sensors measures | | | | **2 hours** |
| **Module 2** | | | | | Analog Sensors- Digital Sensors – Storing senor data – Examples | | | | **2 hours** |
| **Module 3** | | | | | Understanding the Arduino board – Arduino Board types- Virtronics Simulator for Arduino- Tinkercad -Arduino IDE - Installing and Setting up the Arduino IDE - Connecting the Arduino IDE with devices | | | | **3 hours** |
| **Module 4** | | | | | Program Structure in C - Basic Syntax - Data Types / Variables / Constants - Operators, Conditional Statements and Loops -Functions, Array and Pointers - Strings and I/O - Arduino C Library functions - Working with Arduino inbuilt examples. | | | | **4 hours** |
| **Module 5** | | | | | Understanding Sensors and Devices - Understanding basic electronic components and power elements - Understanding the Inputs from Sensors - Working with Temperature Sensors, Ultrasound Sensor, Humidity sensor, Motion Sensor | | | | **3 hours** |
| **Module 6** | | | | | Working with IR Sensor - Working with Proximity Sensor - Working with Photo Diode - Working with Accelerometer and vibration sensor - Introduction to Raspberry Pi. | | | | **3 hours** |
| **Module 7** | | | | | Understanding the Outputs - Activating LED Lights - Activating Relays - Activating Buzzer | | | | **3 hours** |
| **Module 8** | | | | | Running DC Motors - Running - Stepper Motors and Servo Motors | | | | **3 hours** |
| **Module 9** | | | | | Introduction to cloud – Thingspeak IoT Analytics Platform – API key – Thingspeak login – API Key Process | | | | **3 hours** |
| **Module 10** | | | | | ESP8266 WI-FI Module – Installation of ESP8266 board package to Arduino IDE – Circuit Diagram – Graph visualization – Introduction to Adafruit, Bolt, Blynk, and ​IFTTT | | | | **4 hours** |
|  | | | | |  | | | |  |
| **Text Book(s)** | | | | | | | | | |
| 1 | Michael Margolis, “Arduino Cookbook” 2nd Edition, O'Reilly Media, 2011. | | | | | | | | |
| 2 | Charles Bell, “Beginning Sensor Networks with Arduino and Raspberry Pi”, 1st Edition, Technology in Action, 2013. | | | | | | | | |
|  | | | | | | | | | |
| **Reference Book(s)** | | | | | | | | | |
| 1 | Arvind Ravulavaru, Enterprise Internet of Things Handbook: Build end-to-end IoT solutions using popular IoT platforms, Packt Publishing Limited, 2018. | | | | | | | | |
|  | | | | | | | | | |
| **Related Online Contents** | | | | | | | | | |
| 1 | | <https://electronics-project-hub.com/send-data-to-thingspeak-using-esp8266/> | | | | | | | |
| 2 | | <https://virtronics.com.au/Simulator-for-Arduino.html> | | | | | | | |
| 3 | | <https://www.instructables.com/id/ESP8266-to-IFTTT-Using-Arduino-IDE/> | | | | | | | |
| Course Designed by: Dr.P.B.Pankajavalli | | | | | | | | | |

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| **Job-Oriented Course -** **DevOps** | | | | | | | |
| **Name of the Department** | | | | | | **Computer Science** | |
| **Name of the Faculty Member i/c**  **With Complete Address with Phone and e-mail** | | | | | | **Dr. S. Vijayarani**  **Associate Professor**  **Department of Computer Science**  **Bharathiar University**  **Coimbatore – 46**  **0422-2428353**  **vijayarani@buc.edu.in** | |
| **Inter / Intra Department Course** | | | | | | **Intra Department Course** | |
| **Duration of the Course** | | | | | | **30 Hours** | |
| **Eligibility** | | | | | | **U.G. in Computer Science/Computer Applications/Information Technology or its equivalent** | |
| **Number of Candidates to be Admitted** | | | | | | **40** | |
| **Mode of the Course** | | | | | | **Both Regular and Online** | |
| **Collaboration if any with Companies**  (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | **---** | |
| **Registration Procedure** | | | | | |  | |
| **Job Opportunities:** | | | | | | | |
| * This course prepares students for roles such as DevOps Engineer, Site Reliability Engineer, and Build & Release Engineer. * Graduates will be able to automate software development, streamline deployments, and manage cloud infrastructure using DevOps tools and practices. | | | | | | | |
|  | | | | | | | |
| **The objectives of the Course are:** | | | | | | | |
|  | | | | | | | |
| 1 | | | To introduce the core principles and practices of DevOps methodology. | | | | |
| 2 | | | To provide hands-on knowledge of continuous integration and continuous deployment tools. | | | | |
| 3 | | | To build knowledge of automation, infrastructure as code, and containerization. | | | | |
| 4 | | | To understand the role of DevOps in cloud platforms and agile development. | | | | |
| **Course Outcomes:** | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | |
| 1 | | | Understand the DevOps culture, practices, and their impact on the software development life cycle. | | | | |
| 2 | | | Implement continuous integration/continuous deployment (CI/CD) pipelines. | | | | |
| 3 | | | Utilize popular DevOps tools, including Git, Jenkins, Docker, and Kubernetes. | | | | |
| 4 | | | Automate infrastructure provisioning using tools like Ansible or Terraform. | | | | |
| 5 | | | Apply DevOps practices in cloud platforms like AWS or Azure. | | | | |
|  | | |  | | | | |
| **Course Content** | | | | | Lecture / Practical / Project / Internship | | |
|  | | | | | | | |
| **Module 1** | | | | Introduction to DevOps – History, Principles, Benefits, DevOps Lifecycle | | | **3 hours** |
| **Module 2** | | | | Agile and Scrum Overview – Relationship with DevOps | | | **3 hours** |
| **Module 3** | | | | Version Control using Git and GitHub | | | **3 hours** |
| **Module 4** | | | | Continuous Integration using Jenkins – Pipelines and Build Automation | | | **3 hours** |
| **Module 5** | | | | Configuration Management using Ansible or Chef | | | **3 hours** |
| **Module 6** | | | | Containerization with Docker – Docker Images, Dockerfile | | | **3 hours** |
| **Module 7** | | | | Orchestration using Kubernetes – Pods, Services, Deployments | | | **3 hours** |
| **Module 8** | | | | Monitoring & Logging – Prometheus, Grafana, ELK Stack | | | **3 hours** |
| **Module 9** | | | | Infrastructure as Code using Terraform – Basics and Examples | | | **3 hours** |
| **Module 10** | | | | DevOps on Cloud – AWS DevOps Services Overview | | | **3 hours** |
| **Total** | | | |  | | | **30 hours** |
| **Text Book(s)** | | | | | | | |
| 1 | Len Bass, Ingo Weber, Liming Zhu, DevOps: A Software Architect's Perspective, Addison-Wesley, 2015. | | | | | | |
| 2 | Gene Kim, Patrick Debois, John Willis, Jez Humble, The DevOps Handbook, IT Revolution Press, 2016. | | | | | | |
|  | | | | | | | |
| **Reference Book(s)** | | | | | | | |
| 1 | Stephen Fleming, DevOps Handbook for Beginners, 2019. | | | | | | |
| 2 | Viktor Farcic, The DevOps 2.0 Toolkit, Packt Publishing, 2016. | | | | | | |
| 3 | Rajesh S. R., Getting Started with DevOps, Packt Publishing, 2017. | | | | | | |
|  | | | | | | | |
| **Related Online Contents** | | | | | | | |
| 1 | | <https://www.edx.org/learn/devops> | | | | | |
| 2 | | <https://www.coursera.org/specializations/devops> | | | | | |
| 3 | | <https://www.tutorialspoint.com/devops/index.htm> | | | | | |
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| **Value Added Course - SOFTWARE TESTING TOOLS** | | | | | | | |
| **Name of the Department** | | | | | | **Computer Science** | |
| **Name of the Faculty Member i/c**  **With Complete Address with Phone and e-mail** | | | | | | **Dr.K. Geetha**  Assistant Professor  Department of Computer Science Bharathiar University Coimbatore – 641 046.  Phone **: 9965497121**  E mail **: geetha.k@buc.edu.in** | |
| **Inter / Intra Department Course** | | | | | | **Intra Department Course** | |
| **Duration of the Course** | | | | | | **30 Hours** | |
| **Eligibility** | | | | | | U.G. in Computer Science/Computer Applications/Information Technology or its  equivalent | |
| **Number of Candidates to be Admitted** | | | | | | 40 | |
| **Registration Procedure** | | | | | |  | |
| **Job Opportunities:** Opportunities available in IT sectors | | | | | | | |
|  | | | | | | | |
| **The objectives of the Course are:** | | | | | | | |
| The main objectives of this course are to: | | | | | | | |
| 1 | | Inculcate the knowledge on the fundamentals of security | | | | | |
| 2 | | Present the different types of software testing, | | | | | |
| 3 | | Learn the different types of errors | | | | | |
| 4 | | Examine the tools for Software Testing | | | | | |
| 5 | | Testing few test cases using tool | | | | | |
|  | | | | |  | | |
| **Course Content** | | | | | Lecture / Practical / Project / Internship | | |
| **Expected Course Outcomes** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | | | Understand and Remember the basic concepts of Software Testing | | | | K1/K2 |
| 2 | | | Understand and Remember the types of testing | | | | K1/K4 |
| 3 | | | Analyze the types of errors | | | | K2/K4 |
| 4 | | | Analyze and developing test cases | | | | K2/K4/K6 |
| 5 | | | Experimenting test cases using testing tools available as open source | | | | K3/K4/K5 |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | |
| **Module 1** | | | | Introduction to Software Testing and Terminology | | | **2 hours** |
| **Module 2** | | | | Types of Testing | | | **2 hours** |
| **Module 3** | | | | Types of errors | | | **2 hours** |
| **Module 4** | | | | Penetration testing and security | | | **2 hours** |
| **Module 5** | | | | Types of Hacking | | | **2 hours** |
| **Module 6** | | | | Developing test cases | | | **4hours** |
| **Module 7** | | | | Unit testing - test cases | | | **4 hours** |
| **Module 8** | | | | Functional testing with test cases | | | **4 hours** |
| **Module 9** | | | | Security testing with test cases | | | **4 hours** |
| **Module 10** | | | | Penetration testing with test cases | | | **4 hours** |
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| **Text Book(s)** | | | | | | | |
| 1 | Software Testing- A Craftsman’s Approach, Paul C. Jorgensen, Fourth Edition, CRC Press, 2014 | | | | | | |
| 2 | Penetration Testing- A Hands-On Introduction to Hacking, by Georgia Weidman, No Starch Press, USA, 2014 | | | | | | |
|  | | | | | | | |
| **Related Online Contents** | | | | | | | |
| 1 | https://www.tutorialspoint.com/software\_testing/index.htm | | | | | | |
| 2 | https://www.geeksforgeeks.org/software-testing-basics/ | | | | | | |

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| **Value Added Course -**  **CYBER SECURITY AND DIGITAL FORENSICS** | | | | | | | |
| **Name of the Department** | | | | | | **Department of Computer Science** | |
| **Name of the Faculty Member i/c**  **With Complete Address with Phone and e-mail** | | | | | | **Dr. R. Porkodi**  **Associate Professor**  **Department of Computer Science**  **Bharathiar University**  **Coimbatore – 46**  **0422-2428349**  **porkodi\_r76@buc.edu.in** | |
| **Inter / Intra Department Course** | | | | | | **Intra Department Course** | |
| **Duration of the Course** | | | | | | **30 hrs** | |
| **Eligibility** | | | | | |  | |
| **Number of Candidates to be Admitted** | | | | | | **40** | |
| **Mode of the Course** | | | | | | **Both Regular and Online** | |
| **Collaboration if any with Companies**  (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | **---** | |
| **Registration Procedure** | | | | | |  | |
| **Job Opportunities:** | | | | | | | |
| * To become cyber security expert to identify IT breaches, vulnerabilities and threats facing companies in today’s digital world. | | | | | | | |
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| **The objectives of the Course are:** | | | | | | | |
|  | | | | | | | |
| 1 | | | To learn the impact of Cyber security risk in an Ethical, Social, and Professional Manner | | | | |
| 2 | | | To provide knowledge on data acquisition methods, tools, collecting, preserving and seizing of various digital evidences. | | | | |
| 3 | | | To understand the security services for email | | | | |
| **Course Outcomes:** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | | | Understand the basics of cyber space, ethical hacking and attacks in cyber world. | | | | |
| 2 | | | Understand unauthorized access to digital devices and cyber psychology. | | | | |
| 3 | | | Study of Collection of evidences, preservation and forensic analysis. | | | | |
| 4 | | | Describe the digital forensics software and hardware, tools, technologies, and practices in forensics. | | | | |
| 5 | | | Understanding the email tracking, IP tracking, cracking of passwords and forensic analysis of different artifacts. | | | | |
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| **Course Content** | | | | | Lecture / Practical / Project / Internship | | |
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| **Module 1** | | | | Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Traditional Problems associated with Computer Crimes, brief history of the internet, contaminants and destruction of data, unauthorized access. | | | **3 hrs** |
| **Module 2** | | | | Computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet. | | | **3 hrs** |
| **Module 3** | | | | Introduction to Digital forensics, Forensic software and handling, forensic hardware and handling. Forensic analysis and its advanced tools, forensic technology and practices. | | | **3 hrs** |
| **Module 4** | | | | Biometrics: face, iris and fingerprint recognition, Audio-video evidence collection, Preservation and Forensic Analysis. | | | **3 hrs** |
| **Module 5** | | | | Investigation Tools, e-discovery, EDRM Models, digital evidence collection and preservation. | | | **3 hrs** |
| **Module 6** | | | | Email investigation, email tracking, IP tracking, email recovery, | | | **3 hrs** |
| **Module 7** | | | | search and seizure of computer systems, password cracking. | | | **3 hrs** |
| **Module 8** | | | | Forensic Analysis of OS artifact, Internet Artifacts, File System Artifacts, Registry Artifacts, Application Artifacts. | | | **3 hrs** |
| **Module 9** | | | | Report Writing, Mobile Forensic- identification, collection and preservation of mobile evidences. | | | **3 hrs** |
| **Module 10** | | | | Social media analysis, data retrieval, Email analysis from mobile phones. | | | **3 hrs** |
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| **Book(s) for Study** | | | | | | | |
| 1 | M.T.Britz, Computer Forensics and Cyber Crime, Pearson Education, 2012. | | | | | | |
| 2 | Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2009. | | | | | | |
| 3 | BehrouzA.Forouzan, Cryptography & Network Security, Tata McGraw Hill, India, New Delhi, 2009. | | | | | | |
|  | | | | | | | |
| **Book(s) for reference** | | | | | | | |
| 1 | Bruce Schneier, Applied Cryptography, John Wiley & Sons, New York, 2004. | | | | | | |
| 2 | William Stallings, Cryptography and Network Security, Prentice Hall, New Delhi, 2006. | | | | | | |
| 3 | Neal Krawetz, Introduction to Network Security, Thomson Learning, Boston, 2007. | | | | | | |
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| **Related Online Contents** | | | | | | | |
| 1 | | https://www.w3schools.com › cybersecurity | | | | | |
| 2 | | https://www.javatpoint.com/cyber-security-tutorial | | | | | |
| 3 | | https://www.tutorialspoint.com/python\_digital\_forensics | | | | | |
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| **Value Added Course - REMOTE SENSING AND GIS** | | | | | | | |
| **Name of the Department** | | | | | | **Computer Science** | |
| **Name of the Faculty Member i/c**  **With Complete Address with Phone and e-mail** | | | | | | **Dr.D.Napoleon**  Assistant Professor  Department of Computer Science  Bharathiar University  Coimbatore – 641 046.  Phone **: 9655162717**  E mail **: mekaranapoleon@yahoo.co.in** | |
| **Inter / Intra Department Course** | | | | | | **Intra Department Course** | |
| **Duration of the Course** | | | | | | **30 Hours** | |
| **Eligibility** | | | | | | U.G. in Computer Science/Computer Applications/Information Technology or its equivalent | |
| **Number of Candidates to be Admitted** | | | | | | 40 | |
| **Registration Procedure** | | | | | |  | |
| **Job Opportunities: GIS Analysts/Sr. GIS Analyst,** **GIS Engineer, Senior GIS Executive,** **Sr. Modeling Analyst** | | | | | | | |
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| **The objectives of the Course are:** | | | | | | | |
| The main objectives of this course are to: | | | | | | | |
| 1 | | | Explain the basics of geographic information systems (GIS) and related areas such as geodesy and remote sensing | | | | |
| 2 | | | Select and acquire both primary and secondary spatial data for use in GIS | | | | |
| 3 | | | Manage, and analyze digital data in raster and vector formats | | | | |
| 4 | | | Describe how common analytical methods and techniques work | | | | |
| 5 | | | Create and present a GIS project. | | | | |
| **Course Content** | | | | | Lecture / Practical / Project / Internship | | |
| **Expected Course Outcomes** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
|  | | | | | | | |
| **1.** | | | | Understand and Remember the basic concepts of remote sensing | | | K1/K2 |
| **2.** | | | | Understand and Remember the functionalities of GIS-Photogrammetry | | | K1/K2 |
| **3.** | | | | Analyze the Statistical Concepts based on the Images | | | K2/K4 |
| **4.** | | | | Analyze and Evaluate the case studies | | | K3/K4/k5 |
| **5.** | | | | Create and analyze environmental Monitoring and Assessment | | | K2/K4/K6 |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | |
| **Module 1** | | | | Fundamentals & Physics of Remote Sensing- Platforms and Sensors-Fundamentals of Geographic Information System-Digital Cartography-Photogrammetry-Surveying and Global Positioning System | | | **2 hours** |
| **Module 2** | | | | Fundamentals of GIS-Photogrammetry, Surveying& GPS-Information Extraction from Satellite Images-Thermal and Microwave Remote Sensing-Hyper spectral Remote Sensing | | | **2 hours** |
| **Module 3** | | | | GIS Data Analysis-Geodesy-Fundamental Statistical Concepts-Geo-statistics & Statistical applications in GIS | | | **4 hours** |
| **Module 4** | | | | Advance Remote Sensing: Data Processing & Applications-Fundamental Statistical Concepts & Geo-Statistics | | | **4 hours** |
| **Module 5** | | | | Application of Geo-informatics-Spatial decision support system | | | **6 hours** |
| **Module 6** | | | | Fundamental of Research-Research Methodology and Project Management | | | **6 hours** |
| **Module 7** | | | | Application of Geo-Informatics and Spatial Decision Support System | | | **4 hours** |
| **Module 8** | | | | Generation of Case Studies(Compulsory Field study) | | | **4 hours** |
| **Module 9** | | | | Environmental Monitoring and Assessment- QGIS Customization Using Python | | | **4 hours** |
| **Module 10** | | | | Customization of Geospatial Tools-GIS Customization Using ArcGIS | | | **4 hours** |
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| **Text Book(s)** | | | | | | | |
| 1 | George Joseph and C Jeganathan, Fundamentals of Remote Sensing,3rd Edition, January 2018 | | | | | | |
| 2 | Lillesand , Kiefer, Chipman ,Remote Sensing and Image Interpretation, 6th Edition, January 2011 | | | | | | |
| 3 | Basudeb Bhatta, Remote Sensing and GIS, 2nd Edition, August 2011 | | | | | | |
|  |  | | | | | | |
| **Related Online Contents** | | | | | | | |
| 1 | | https://onlinecourses.nptel.ac.in/noc19\_ce41/preview | | | | | |
| 2 | | <https://www.coursera.org/lecture/spatial-analysis-satellite-imagery-in-a-gis/what-is-remote-sensing-27nfo> | | | | | |
| 3 | | https://gisgeography.com/remote-sensing-earth-observation-guide/ | | | | | |
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| **Value Added Course -**  **Digital Marketing** | | | | | | | |
| **Name of the Department** | | | | | | **Department of Computer Science** | |
| **Name of the Faculty Member i/c**  **With Complete Address with Phone and e-mail** | | | | | | **Dr. D. Napoleon**  **Associate Professor**  **Department of Computer Science**  **Bharathiar University**  **Coimbatore – 46**  **napoleon@buc.edu.in** | |
| **Inter / Intra Department Course** | | | | | | **Intra-Department Course** | |
| **Duration of the Course** | | | | | | **30 hrs** | |
| **Eligibility** | | | | | | **U.G. in Computer Science/Computer Applications/Information Technology or its equivalent** | |
| **Number of Candidates to be Admitted** | | | | | | **40** | |
| **Mode of the Course** | | | | | | **Both Regular and Online** | |
| **Collaboration if any with Companies**  (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.) | | | | | | **---** | |
| **Registration Procedure** | | | | | |  | |
| **Job Opportunities:** | | | | | | | |
| * To become a skilled digital marketer capable of handling real-time digital campaigns. * To support businesses in leveraging digital platforms for lead generation, branding, and customer engagement. * To work as SEO analysts, content strategists, social media managers, or digital marketing consultants. | | | | | | | |
|  | | | | | | | |
| **The objectives of the Course are:** | | | | | | | |
|  | | | | | | | |
| 1 | | | To understand the fundamentals and evolution of digital marketing. | | | | |
| 2 | | | To explore digital marketing strategies and tools used in the industry. | | | | |
| 3 | | | To apply techniques like SEO, PPC, email marketing, affiliate marketing, and mobile marketing. | | | | |
| **Course Outcomes:** | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | |
| 1 | | | Understand the digital marketing landscape, concepts, and digital consumer behavior. | | | | |
| 2 | | | Design effective digital marketing strategies using segmentation and targeted messaging. | | | | |
| 3 | | | Apply SEO, PPC, social media, and content marketing practices. | | | | |
| 4 | | | Utilize display advertising models and programmatic marketing tools. | | | | |
| 5 | | | Analyze marketing campaigns using web analytics and optimize digital performance. | | | | |
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| **Course Content** | | | | | Lecture / Practical / Project / Internship | | |
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| **Module 1** | | | | **Fundamentals of Digital Marketing**: Significance, Traditional vs. Digital, Evolution of Digital Marketing, Key Drivers, Digital Consumers & Communities. | | | **4 hrs** |
| **Module 2** | | | | |  | | --- | | **Digital Marketing Strategy**: Indian digital user trends, Consumer decision journey, POEM Framework (Paid, Owned, Earned Media), Segmenting & Customizing Messages, Skills Required in Digital Marketing, Drafting a Digital Marketing Plan. | | | | **4 hrs** |
| **Module 3** | | | | **Digital Marketing Techniques**: Terminologies, Pay-per-click (PPC), Online Marketing through Social Media, Social Media Marketing (SMM), SEO Techniques, Google Webmasters, Google Analytics Overview, Affiliate Marketing, Email & Mobile Marketing. | | | **4 hrs** |
| **Module 4** | | | | **Display Advertising**: Buying Models, Display Ad Terminology, Ad Tools & Formats, Ad Placement Techniques, Programmatic Advertising. | | | **3 hrs** |
| **Module 5** | | | | **Analytics and Optimization**: Channel Attribution, AdWords, Email, Mobile, Social Media Analytics, Web Analytics, Changing Strategy Based on Insights, Latest Trends in Digital Marketing. | | | **4 hrs** |
| **Module 6** | | | | **Hands-on Practice**: Using Digital Marketing Tools – SEO Auditing, Google Ads, Facebook Ads Manager, Content Planning with Trello, Using Google Analytics Dashboards. | | | **4 hrs** |
| **Module 7** | | | | |  | | --- | | **Mini Project / Case Study**: Students will create a campaign strategy for a hypothetical or real business using what they have learned. | | | | **4 hrs** |
| **Module 8** | | | | **Expert Interaction / Webinar / Guest Lecture**: Industry expert session on digital campaign management or social media trends. | | | **3 hrs** |
| **Total** | | | |  | | | **30hrs** |
| **Book(s) for Study** | | | | | | | |
| 1 | Deepak Kanakaraju, Digital Marketing for Beginners, 2020. | | | | | | |
| 2 | Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0: Moving from Traditional to Digital, Wiley, 2016. | | | | | | |
| 3 | Seema Gupta, Digital Marketing, McGraw Hill Education, 2017. | | | | | | |
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| **Book(s) for reference** | | | | | | | |
| 1 | Ryan Deiss & Russ Henneberry, Digital Marketing for Dummies, Wiley, 2020. | | | | | | |
| 2 | Damian Ryan, Understanding Digital Marketing, Kogan Page, 2020. | | | | | | |
| 3 | Dave Chaffey & Fiona Ellis-Chadwick, Digital Marketing, Pearson Education, 2019. | | | | | | |
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| **Related Online Contents** | | | | | | | |
| 1 | | https://www.coursera.org/specializations/digital-marketing | | | | | |
| 2 | | https://learndigital.withgoogle.com/digitalgarage | | | | | |
| 3 | | https://www.hubspot.com/courses | | | | | |
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