## M. Sc. COMPUTER SCIENCE

**Syllabus**

**(Modified Syllabus for the II Year 2023-2024)**

**Program Code: CSEE**



**DEPARTMENT OF COMPUTER SCIENCE**

**Bharathiar University**

**(A State University, Accredited with “A“ Grade by NAAC and 13th Rank among Indian Universities by MHRD-NIRF)**

## Coimbatore 641 046, INDIA

**BHARATHIAR UNIVERSITY : : COIMBATORE 641046**

**DEPARTMENT OF COMPUTER SCIENCE**

**(Effective from the academic Year 2023-2024)**

MISSION

* Creating and disseminating world-class knowledge in the global context
* Equip students with knowledge of up-to-date technological developments to take part in the global software industry
* Promote state of art interdisciplinary 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 apply 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 2023-2024)*

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| **Course Code** | **Title of the Course** | **Credits** | **Hours** | | **Maximum Marks** | | |
| **Theory** | **Practical** | **CIA** | **ESE** | **Total** |
| **FIRST SEMESTER** | | | | | | | |
| 23CS1C1 | Advanced Operating System | 4 | 4 | - | 25 | 75 | 100 |
| 23CS1C2 | Data Structures and Algorithms | 4 | 2 | 4 | 25 | 75 | 100 |
| 23CS1C3 | Advanced Java Programming | 4 | 2 | 4 | 25 | 75 | 100 |
| 23CS1C4 | Python Programming | 4 | 2 | 4 | 25 | 75 | 100 |
| 23CS1C5 | Mathematical Foundations of Computer Science | 4 | 4 | - | 25 | 75 | 100 |
| 23CS1EX | Elective – I | 4 | 4 | - | 25 | 75 | 100 |
| Basics of Research | Industry Literacy | 1 |  |  | 25 |  | 25 |
|  | General Supportive - I | 2 |  |  | 12 | 38 | 50 |
|  | Job Oriented Course | 2 |  |  |  |  | 50 |
| **Total** | | **29** |  |  |  |  | **725** |
| **SECOND SEMESTER** | | | | | | | |
| 23CS2C1 | Linux Programming | 4 | 2 | 4 | 25 | 75 | 100 |
| 23CS2C2 | Compiler Design | 4 | 4 | - | 25 | 75 | 100 |
| 23CS2C3 | Internet of Things | 4 | 4 | - | 25 | 75 | 100 |
| 23CS2C4 | Data Mining Techniques and Tools | 4 | 2 | 4 | 25 | 75 | 100 |
| 23CS2C5 | Database Administration and Management | 4 | 2 | 4 | 25 | 75 | 100 |
| 23CS2EX | Elective - II | 4 | 4 | - | 25 | 75 | 100 |
| Basics of Research | Literature Survey | 1 |  |  | 25 |  | 25 |
|  | General Supportive - II | 2 |  |  | 12 | 38 | 50 |
|  | Job Oriented Course | 2 |  |  |  |  | 50 |
|  | Value Added Course | 2 |  |  |  |  | 50 |
| **Total** | | **31** |  |  |  |  | **775** |
| **THIRD SEMESTER** | | | | | | | |
| **23CS3C1** | **Visual Programming** | **4** | **2** | **4** | **25** | **75** | **100** |
| 23CS3C2 | Software Project Management | 4 | 4 | - | 25 | 75 | 100 |
| **23CS3C3** | **Cloud Computing** | **4** | **2** | **4** | **25** | **75** | **100** |
| 23CS3C4 | Big Data Analytics | 4 | 2 | 4 | 25 | 75 | 100 |
| **23CS3C5** | **Wireless Networks** | **4** | **4** | **-** | **25** | **75** | **100** |
| 23CS3EX | Elective - III | 4 | 4 | - | 25 | 75 | 100 |
| Basics of Research | Gap Analysis | 1 |  |  | 25 |  | 25 |
|  | General Supportive - III | 2 | 2 | - | 12 | 38 | 50 |
|  | Value Added Course | 2 |  |  |  |  | 50 |
| **Total** | | **29** |  |  |  |  | **725** |
| **FOURTH SEMESTER** | | | | | | | |
|  | Project Work | 9 |  |  | 135 | 90 | 225 |
| **Total** | | 9 |  |  |  |  |  |
| **Grand Total** | | **98** |  |  |  |  |  |

**Online Course**

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

\*Swayam – Mooc online course shall be for duration of atleast 4 weeks with atleast 2 credits.

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

beginning of fourth semester)

**Elective Papers**

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| **Sem** | **Elective** | **Group1 with Suggested Code** | **Group2 with Suggested Code** | **Group3 with Suggested Code** |
| **I** | Elective - I | 23CS1E1/ Information Security | 23CS1E2/ Artificial Intelligence | 23CS1E3/ Business  Intelligence |
| **II** | Elective - II | 23CS2E1/ Data Privacy and Security | 23CS2E2/ Machine Learning Techniques | 23CS2E3/ Health Care Analytics |
| **III** | Elective - III | 23CS3E1/ Cyber Security | 23CS3E2/ Deep Learning Techniques | 23CS3E3/ Social Media Analytics |

**Supportive Papers**

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| **Suggested Code** | **Sem** | **Title of the paper** | **Hrs** | **Credits** | **Marks** |
| 23CSS01 | I/II/III | Windows and MS Word | 2 | 2 | 50 |
| 23CSS02 | Internet and HTML Programming | 2 | 2 | 50 |
| 23CSS03 | Relational Database Management System | 2 | 2 | 50 |
| 23CSS04 | Object Oriented Programming | 2 | 2 | 50 |
| 23CSS05 | Software Engineering | 2 | 2 | 50 |
| 23CSS06 | Multimedia Systems | 2 | 2 | 50 |

**List of Job Oriented/Value Added Course**

1. Mobile Application Development
2. Smart Applications with Internet of Things
3. Remote Sensing and GIS
4. Cyber Security and Digital Forensics

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| **Course code** | | | | **23CS3C1** | | **VISUAL PROGRAMMING** | | | **L** | | | **T** | | | **P** | **C** |
| **Core/Elective/Supportive** | | | | | | **CORE** | | | **2** | | | **0** | | | **4** | **4** |
| **Pre-requisite** | | | | | | Basics of VB language and ASP | | | **Syllabus Version** | | | | | **2023-2024** | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | |
| The main objectives of this course are to:   1. Provide in depth knowledge on VB.NET and ASP.NET to students and making 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. | | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | |
| On the successful completion of the course, student 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, constructor, overloading, inheritance, polymorphism, interface, array, 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, ASP.NET page directives and, To build the application using Web server Controls, Validation Server Controls, Rich Web Controls, Custom Controls, Collections and Lists. | | | | | | | | | | K1/K2 | | | |
| 4 | | | Understand ADO.NET and to 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 | | | | | | | | | | | | | | | | |
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|  | | | | | **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 | | | | | | | | | | | | | | | |
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| **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 | | | | | | | | | | | | | | |
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| **Course Designed By: Dr. R. Porkodi** | | | | | | | | | | | | | | | | |

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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

**VISUAL PROGRAMMING - LAB**

**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 sorted list collection with 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 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 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 OLEDB name space in ADO.Net.

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| **Course code** | | | **23CS3C3** | **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** | | | **2023-2024** | | |
| **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 of the data in the cloud | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | | | | | | |
| 1 | | Articulate the main concepts, and 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 exposed in broad approaches to 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 | | | | | | | | | | | | | |
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| **Unit:6** | | | **Introduction to Industry 5.0** | | **02 hours** | | | | | | | | |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops | | | | | | | | | | | | | |
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|  | | | **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

**CLOUD COMPUTING – LAB**

**List of Programs**

1. Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs.
3. Install Google App Engine. Create hello world app and other simple web applications using Python/java
4. Use the GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Study and implementation of infrastructure as a service
9. Study Amazon EC2/Microsoft Azure/Google Cloud Platform

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| **Course Code** | | | **23CS3C5** | **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** | | | | **22 - 23** | |
| **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 | | | | | | | | | | |
|  | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | |
| On the successful completion of the course, students will be able to: | | | | | | | | | | |
| 1 | | Understand the basic WSN technology and supporting protocols, with emphasis placed on the standardization of 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, and 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. | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:3** | | | **Wireless Personal Area Networks** | | | **12 hours** | | | | |
| 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