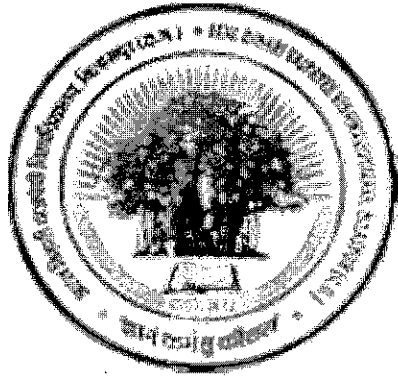


**Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)**



**Scheme and Syllabus**

**Of**

**MSc-(Computer Science)(3<sup>rd</sup> and 4<sup>th</sup> sem.)**

**Program Code: MSCCSR104**

**Semester system for affiliated college**

**(As per LOCF and credit system)**

**w.e.f. 2024-2025**

**As approved AC and EC meeting held on 16.08.2023 and 18.04.2023 respectively**

# अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

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Website :www.bilaspuruniversity.ac.in

## Scheme of M.Sc. (Computer Science) under Semester System Program Code: MSCCSR104

| Semester        | Course Code                       | Subject Name                                    | Credit    |           |           | Total Credit | Marks |     |             |     |
|-----------------|-----------------------------------|---|-----------|-----------|-----------|--------------|-------|-----|-------------|-----|
|                 |                                   |   | L         | T         | P         |              | ESE   | IA  | Total       |     |
|                 |                                   |   |           |           |           |              |       |     | Max         | Min |
| <b>Third</b>    | CST301                            | Theory of Computation and Compiler Design       | 3         | 1         | -         | 4            | 80    | 20  | 100         | 36  |
|                 | CST302                            | Python Programming                              | 3         | 1         | -         | 4            | 80    | 20  | 100         | 36  |
|                 | CST303                            | Web Technology                                  | 3         | 1         | -         | 4            | 80    | 20  | 100         | 36  |
|                 | CST304                            | Elective-II: Soft Computing                     | 3         | 1         | -         | 4            | 80    | 20  | 100         | 36  |
|                 | CST305                            | Elective-II: Current Trends and Techniques      |           |           |           |              |       |     |             |     |
|                 | CST306                            | Elective-II: Data Science                       |           |           |           |              |       |     |             |     |
|                 | CSP301                            | Lab 5: Programming in Python                    | -         | -         | 2         | 2            | -     | -   | 100         | 36  |
|                 | CSP302                            | Lab 6: Web Technology                           | -         | -         | 2         | 2            | -     | -   | 100         | 36  |
| <b>Subtotal</b> |                                   |   | <b>12</b> | <b>4</b>  | <b>4</b>  | <b>20</b>    | -     | -   | <b>600</b>  |     |
| <b>Fourth</b>   | CST401                            | Artificial Intelligence and Machine Learning    | 3         | 1         | -         | 4            | 80    | 20  | 100         | 36  |
|                 | CST402                            | Analysis and Design of Algorithm                | 3         | 1         | -         | 4            | 80    | 20  | 100         | 36  |
|                 | CST403                            | Elective- III: Data Mining and Data Warehousing | 3         | 1         | -         | 4            | 80    | 20  | 100         | 36  |
|                 | CST404                            | Elective- III: Mobile Application Development   |           |           |           |              |       |     |             |     |
| CST405          | Elective- III: Big Data Analytics |   |           |           |           |              |       |     |             |     |
| CSP401          | Major Project                     | -   | -         | 8         | 8         |              |       | 300 | 108         |     |
| <b>Subtotal</b> |                                   |   | <b>9</b>  | <b>3</b>  | <b>8</b>  | <b>20</b>    | -     | -   | <b>600</b>  |     |
| <b>Total</b>    |                                   |   | <b>45</b> | <b>15</b> | <b>20</b> | <b>80</b>    | -     | -   | <b>2400</b> |     |

**Note:** Students have to opt one paper from the pool of Elective-I of 2<sup>nd</sup> Semester, one paper from the pool of Elective-II of 3<sup>rd</sup> Semester and one paper from the pool of Elective-III of 4<sup>th</sup> Semester.

**Abbreviations used:**

**ESE:** End Semester Exam

**IA:** Internal Assessment





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| Part A: Introduction  |                                |  |                       |
|-----------------------|--------------------------------|--|-----------------------|
| Program: M.Sc. (C.S.) |                                | Semester: Third  | Year: II              |
| w.e.f.: 2024-2025     |                                |  |                       |
| 1.                    | Course Code                    | CST301   |                       |
| 2.                    | Course Title                   | Theory of Computation and Compiler Design  |                       |
| 3.                    | Course Type                    | Theory   |                       |
| 4.                    | Pre-requisite (if any)         | No   |                       |
| 5.                    | Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Define machine models formally.</li><li>• Understand finite automata.</li><li>• Develop understanding of regular languages.</li><li>• Describe Turing machines.</li><li>• Synthesizes finite automata with specific properties.</li><li>• Applies transformation between multiple representations of finite automata.</li><li>• Construct PDA and Turing machines for the given set of languages</li><li>• Build the lexical and Syntax analyzer phases of compiler</li></ul> |                       |
| 6.                    | Credit Value                   | Theory: 4  |                       |
| 7.                    | Total Marks                    | Internal Marks: 20<br>External Marks: 80   | Min Passing Marks: 36 |

| Part B: Content of the Course |  |             |
|-------------------------------|--|-------------|
| Unit                          | Topics   | Total Hours |
| I.                            | <b>Introduction and overview:</b> Fundamentals: Formal Languages, Strings, Alphabets, Languages, Chomsky Hierarchy of Languages.<br><b>Finite Automata:</b> Introduction to Finite State machine, Acceptance of strings and languages, Deterministic finite automaton (DFA) and Non-deterministic finite automaton (NFA), Equivalence of NFA and DFA – Equivalence of NDFAs with and without $\epsilon$ -moves, Minimization of finite automata, Equivalence between two DFA's, Finite automata with output – Moore and Mealy machines, conversion of Moore to Mealy and Mealy to Moore  | 12          |
| II.                           | <b>Regular Languages:</b> Regular expressions, Identity rules, Conversion of a given regular expression into a finite automaton, Conversion of finite automata into a regular expression, Pumping lemma for regular sets, Closure properties of regular sets (proofs not required).<br><b>Context Free Grammars:</b> Context free grammars and languages, Derivation trees, Leftmost and rightmost derivation of strings and Sentential forms, Ambiguity, left recursion and left factoring in context free grammars, Minimization of context free grammars, Normal forms for context free Grammars, Chomsky normal form, Greibach normal form, Pumping Lemma for Context free Languages, Closure and decision properties of context free languages. | 12          |

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|      |   |    |
|------|---|----|
| III. | <b>Pushdown Automata:</b> Introduction to Pushdown automata, Acceptance of context free languages, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of context free grammars and pushdown automata, Inter-conversion (Proofs not required).<br><b>Turing Machine:</b> Introduction to Turing Machine, Design of Turing machines, Types of Turing Machines.            | 12 |
| IV.  | <b>Introduction To Compiling:</b> Overview of Compilers, Phases of a Compiler.<br><b>Lexical Analysis:</b> The Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A language for specifying Lexical Analyzers(LEX). <b>Syntax Analysis:</b> The role of the Parser, First and Follow, Predictive Parsing, LR Parsers-SLR, Canonical LR, LALR, Parser Generator(YACC). | 12 |
| V.   | <b>Syntax-Directed Translation:</b> Syntax-Directed Definition, S-Attributed SDD, L-Attributed SDD, Translation Schemes. Intermediate Code Generation: Intermediate Languages- Graphical Representations, Three address code, Implementations.  | 12 |

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Introduction to Automata Theory, Language and Computation J.E.Hopcroft, R.Motwani J.D.Ullman, Pearson Education.
2. Theory of Computer Science (Automata, Languages and Computation)", K.L.P. Mishra, N. Chandrasekaran, PHI.
3. Alfred Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers- Principles
4. Techniques and Tool, 2ndEdition, Pearson Education India, 2013

### Reference Books:

1. Introduction to languages and Theory of Computation, John Martin, McGraw Hill.
2. Principles of Compiler Design, V.Raghavan, 1<sup>st</sup> Edition, Mc Graw Hill Education ,2017.
3. Elements of the Theory of Computation, H.R.Lewis & C.H. Papadimitriou, P.H.I.
4. Introduction to Computer Theory, D.A.Cohen (J.Wiley).

### E-Resources:

1. <https://www.udacity.com/course/compilers-theory-and-practice--ud168>
2. [https://swayam.gov.in/nd1\\_noc19\\_cs79/preview](https://swayam.gov.in/nd1_noc19_cs79/preview)
3. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==>

*[Handwritten signatures and initials]*





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(4)

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2. **Dr. Amit Kumar Saxena** - Member  
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Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
3. **Mr. Anil Rathore** - Member *Present line*  
Asst. Prof., Dept. of Computer Science  
K.N. College, Korba (C.G.)
4. **Dr. Tarun Dhar Diwan** - Member  
Asst. Prof., Dept. of IT  
Govt. E.R.R. PG Science College, Bilaspur (C.G.)
5. **Mr. Kaushal Banjare** -Member *Kaushal*  
Asst. Prof., Dept. of Computer Application  
Govt. J.P.Verma PG Arts and Commerce College, Bilaspur (C.G.)
6. **Dr. Rashmi Gupta** -Member *Rashmi*  
Asst. Prof., Department of Computer Science and Application  
Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)
7. **Mr. Vivek Tiwari** - Member   
Asst. Prof., Dept. of Computer Application  
Govt. E.R.R. PG Science College, Bilaspur (C.G.)
8. **Mrs. Gargee Shukla** -Member *A*  
Asst. Prof., Dept. of Computer Science  
Govt. Bilasa Girls PG College, Bilaspur (C.G.)
9. **Dr. Manu Sood** - Member  
Prof., Dept. of Computer Science  
Himachal Pradesh University, Shimla (Himachal Pradesh)  
(Approved Online)



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| Part A: Introduction  |                                |   |                      |
|-----------------------|--------------------------------|---|----------------------|
| Program: M.Sc. (C.S.) |                                | Semester: Third   | Year: II             |
| w.e.f.:2024-2025      |                                |   |                      |
| 1.                    | Course Code                    | CST302  |                      |
| 2.                    | Course Title                   | PYTHON PROGRAMMING  |                      |
| 3.                    | Course Type                    | Theory  |                      |
| 4.                    | Pre-requisite (if any)         |   |                      |
| 5.                    | Course Learning Outcomes (CLO) | <b>At the end of this course, Students will be able to:</b> <ul style="list-style-type: none"><li>• Define the structure and components of a Python program.</li><li>• Demonstrate proficiency in handling of loops and creation of functions. Identify the methods to create and manipulate lists, tuples and dictionaries.</li><li>• Discover the commonly used operations involving regular expressions and file systems.</li><li>• Determine the need for scraping websites and working with CSV, JSON and other file formats.</li><li>• Interpret the concepts of Object-Oriented Programming as used in Python.</li></ul> |                      |
| 6.                    | Credit Value                   | Theory: 4   |                      |
| 7.                    | Total Marks                    | Internal Marks: 20<br>External Marks: 80  | Min Passing Marks:36 |

| Part B: Content of the Course |  |             |
|-------------------------------|--|-------------|
| Unit                          | Topics   | Total Hours |
| I.                            | <b>Introduction to Python:</b> Installing Python, basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types. operators (Arithmetic operator, Relational Operator, Logical or Boolean operator, Assignment. Operator, Ternary operator, Bit wise operator, Increment or Decrement operator) and expressions; comments in the program; understanding error messages. | 12          |
| II.                           | <b>Creating Python Programs:</b> Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.) Function: Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.  | 12          |
| III.                          | <b>Strings and Text Files:</b> Manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated). String Manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers.   | 12          |

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|     |  |    |
|-----|--|----|
| IV. | <b>Lists, Tuples and Dictionaries:</b> Basic list operators, replacing, inserting, removing an element; searching and sorting lists; Accessing tuples, Operations, Working, Functions and Methods, dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. | 12 |
| V.  | <b>Modules:</b> Importing module, Math module, Random module, Packages, Composition Exception Handling: Exception, Exception Handling, Except clause, Try, Finally clause, User Defined Exceptions.  | 12 |

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: Learning with Python, 2012.
3. Kenneth A. Lambert, Fundamentals of Python.
4. James Payne, Beginning Python using Python 2.6 and Python 3.

### Reference Books:

1. Mark Lutz, Learning Python,
2. Tony Gaddis, Starting Out With Python.

### E Resources:

1. <https://www.coursera.org/learn/python>
2. <https://www.udacity.com/course/introduction-to-python--ud1110>
3. <https://www.udemy.com/course/pythonforbeginnersintro/>

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| 3. | <b>Mr. Anil Rathore</b><br>Asst. Prof., Dept. of Computer Science<br>K.N. College, Korba (C.G.)   | - Member                      | <i>Present online</i> |
| 4. | <b>Dr. Tarun Dhar Diwan</b><br>Asst. Prof., Dept. of IT<br>Govt. E.R.R. PG Science College, Bilaspur (C.G.)                                     | - Member                      |                       |
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| 8. | <b>Mrs. Gargee Shukla</b><br>Asst. Prof., Dept. of Computer Science<br>Govt. Bilasa Girls PG College, Bilaspur (C.G.)                           | -Member                       |                       |
| 9. | <b>Dr. Manu Sood</b><br>Prof., Dept. of Computer Science<br>Himachal Pradesh University, Shimla (Himachal Pradesh)                              | - Member<br>(Approved Online) |                       |





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| Part A: Introduction              |  |                      |                  |
|-----------------------------------|--|----------------------|------------------|
| Program: M.Sc. (CS)               | Semester: Third  | Year: II             | w.e.f.:2024-2025 |
| 1. Course Code                    | CST303   |                      |                  |
| 2. Course Title                   | Web Technology   |                      |                  |
| 3. Course Type                    | Theory   |                      |                  |
| 4. Pre-requisite (if any)         | No   |                      |                  |
| 5. Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>Analyze a web page and identify its elements and attributes.</li><li>Create web pages using HTML, CSS, JAVASCRIPT, XHTML</li><li>Build dynamic web pages using JavaScript (Client side programming).</li><li>Create XML documents and Schemas.</li><li>Build interactive web applications using, PHP, AJAX.</li><li>Learn Web Hosting and Deployment.</li></ul> |                      |                  |
| 6. Credit Value                   | Theory :4  |                      |                  |
| 7. Total Marks                    | Internal Marks: 20<br>External Marks: 80   | Min Passing Marks:36 |                  |

| Part B: Content of the Course |   |             |
|-------------------------------|---|-------------|
| Unit                          | Topics  | Total Hours |
| I.                            | <b>Introduction</b> :Introduction to web, Introduction to Internet, WWW, Web Browsers, Web Servers, URL, Multipurpose Internet Mail Extensions, protocols governing the web, web development strategies, Web Design Principles and Web site structure ,Web applications, Introduction to Web Publishing: Introduction, Domain name and hierarchy, Domain Name Registration .  | 12          |
| II.                           | <b>HTML</b> : Introduction, Basic formatting tags: heading, paragraph, line break, bold, italic, underline, superscript, subscript, font and image. Different attributes like align, color, bgcolor, font face, border, size. Navigation Links using anchor tag: internal, external, mail and image links, Link to different web pages and sections. Lists: ordered, unordered and definition, Table tag, HTML Form controls: form, text, password, text area, button, checkbox, radio button, select box, hidden controls, Frameset and frames. Basics of DHTML , XML. | 12          |
| III.                          | <b>Scripting Languages</b> : Usefulness of Style Sheets, Creating Style sheets, Classes and Pseudo Classes, CSS Tags, Background, Font, Text, Position etc. JavaScript: Overview, Syntax & Conventions, Variables, Expression, Branching & Looping, Function, Array, Objects, Events & Document Object model, Alerts, prompts and conforms.   | 12          |

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|     |   |    |
|-----|---|----|
| IV. | <b>PHP:</b> Introduction to PHP, Server side scripting, Role of Web Server software, including files, comments, variables and scope, echo and print, Operators: Logical, Comparison and Conditional operators, Branching statements, Loops, break and continue PHP functions. Passing information between pages, HTTP GET and POST method, String functions: strlen, strpos, strstr, strcmp, substr, str_replace, string case, Array constructs: array(), list() and foreach(), PHP advanced functions: Header, Session, Cookie, Object Oriented Programming using PHP: class, object, constructor, destructor and inheritance. | 12 |
| V.  | <b>Web Hosting and Deployment:</b> Introduction to Webhosting, <b>WordPress :</b> Introduction to CMS And WordPress Why CMS Advantages and Disadvantages of CMS, WordPress Installation, User Administration, WordPress Themes, Working with Widgets Working with Menu for Website. Web Deployment, XAMPP, Configuring DHCP, IIS and DNS Server.  | 12 |

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Xavier, C, "Web Technology and Design", New Age International.
2. Ivan Bayross, "HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
3. Ramesh Bangia, "Internet and Web Design", New Age International.
4. Ullman, "PHP for the Web: Visual Quick Start Guide", Pearson Education.
5. Jim Converse & Joyce Park, "PHP & MySQL Bible", Wiley India Publication
6. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

### Reference Books:

1. "Internet and Internet Engineering", Daniel Minoli, TMH.
2. Chuckmusiano & Bill Kenndy, O'Reilly, "HTML The Definite Guide"
3. Joseph Schmuller, Dynamic HTML, BPB, 2000.
4. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.

### E-Resources:

1. [https://onlinecourses.swayam2.ac.in/aic20\\_sp11/preview](https://onlinecourses.swayam2.ac.in/aic20_sp11/preview)
2. [https://www.coursera.org/learn/introduction-to-web-development-with-html-css-javascript?action=enroll&adgroupid=154709125594&adposition=&campaignid=20395923513&creativeid=667061327480&device=c&devicemodel=&gclid=Cj0KCCQjw2qKmBhCfARIsAFy8buKxIYam7tWtPzSQ46fXKZcqBmupu3gKrwgxmSmbwdtKTLNiZCkYtqg\\_aAm7JEALw\\_wcB&hide\\_mobile\\_promo&keyword=&matchtype=&network=g&specialization=ibm-full-stack-cloud-developer&utm\\_campaign=B2C\\_INDIA\\_ibm-full-stack-cloud-developer\\_ibm\\_FTCOF\\_professional-certificates\\_arte-agency&utm\\_medium=sem&utm\\_source=](https://www.coursera.org/learn/introduction-to-web-development-with-html-css-javascript?action=enroll&adgroupid=154709125594&adposition=&campaignid=20395923513&creativeid=667061327480&device=c&devicemodel=&gclid=Cj0KCCQjw2qKmBhCfARIsAFy8buKxIYam7tWtPzSQ46fXKZcqBmupu3gKrwgxmSmbwdtKTLNiZCkYtqg_aAm7JEALw_wcB&hide_mobile_promo&keyword=&matchtype=&network=g&specialization=ibm-full-stack-cloud-developer&utm_campaign=B2C_INDIA_ibm-full-stack-cloud-developer_ibm_FTCOF_professional-certificates_arte-agency&utm_medium=sem&utm_source=)
3. [https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp\\_content/S000007CS/P001071/M017403/ET/1473335362etext-Module6.pdf](https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000007CS/P001071/M017403/ET/1473335362etext-Module6.pdf)

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| <p>9. <b>Dr. Manu Sood</b><br/>         Prof., Dept. of Computer Science<br/>         Himachal Pradesh University, Shimla (Himachal Pradesh)</p>                              | <p>- Member<br/>         (Approved Online)</p>  |



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| Part A: Introduction |                                |   |                       |                   |
|----------------------|--------------------------------|---|-----------------------|-------------------|
| Program: M.Sc. (CS)  |                                | Semester: III   | Year: II              | w.e.f.: 2024-2025 |
| 1.                   | Course Code                    | CST304  |                       |                   |
| 2.                   | Course Title                   | Elective-II: Soft Computing   |                       |                   |
| 3.                   | Course Type                    | Theory  |                       |                   |
| 4.                   | Pre-requisite (if any)         | Proficiency with algorithms and programming skills in python, MATLAB etc.   |                       |                   |
| 5.                   | Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>Analyze and appreciate the applications which can use fuzzy logic.</li><li>Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).</li><li>Students would understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications</li><li>Ability to appreciate the importance of optimizations and its use in computer engineering fields and other domains.</li><li>To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.</li></ul> |                       |                   |
| 6.                   | Credit Value                   | 4   |                       |                   |
| 7.                   | Total Marks                    | Internal Marks: 20<br>External Marks: 80  | Min Passing Marks: 36 |                   |

| Part B: Content of the Course |  |             |
|-------------------------------|--|-------------|
| Unit                          | Topics   | Total Hours |
| I.                            | <b>Introduction:</b> What is soft computing? Difference between Soft and Hard Computing, various types of soft computing techniques, Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Classification, Clustering, Bayesian Networks, Probabilistic reasoning, Different tools of soft computing and its comparison, Area of application.  | 12          |
| II.                           | <b>Artificial Neural Network (ANN):</b> Architecture, Introduction, Evolution of Neural Network, Biological Neural Network vs ANN, Basic Model of ANN, Different types of ANN, Single layer Perceptron, Solving XOR problem, Activation function, Linear separability, Supervised and unsupervised learning, perceptron learning, delta learning, Feed-forward and Feedback networks, Error Back Propagation Network (EBPN), Associative memories and its types, Hopfield Network, Kohenenself-organizing Map. | 12          |

*[Handwritten signatures and initials]*



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|      |   |    |
|------|---|----|
| III. | <b>Fuzzy Logic:</b> Introduction to Classical Sets and Fuzzy Sets, Membership Function, properties and operations of classical set and Fuzzy set, $\alpha$ -cuts, Properties of $\alpha$ -cuts, Linguistic Variables, Membership function, Classical relation and Fuzzy Relation and its properties and operations, Defuzzification and its methods, Fuzzy rule base. | 12 |
| IV.  | <b>Genetic Algorithm:</b> What is Optimization?, Introduction, Application, GA operators: selection, crossover and mutation ,different techniques of selection, crossover and mutation, different types of chromosomes, Application of GA.  | 12 |
| V.   | <b>Hybrid Soft Computing:</b> Design of Neuro-Fuzzy model like ANFIS, Neuro-Genetic, Fuzzy-Genetic Neuro-Fuzzy-Genetic model, MATLAB environment for soft computing.  | 12 |

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Principles of soft computing . S.N. Shivanandan and S.N Deepa . Wiley publication. Wiley India Edition.
2. Neural network and Learning Machines, Simon Haykin, Pearson Education, 2011.

### Reference Books:

1. Artificial Neural Networks. Robert J. Scholkoff, McGraw Hill Education( India) Pvt. Limited.1997.
2. Neural Networks and Fuzzv Svstems. A dynamical Svstems Approach to Machine Learning, Bart Kosko, PHI learning private limited.
3. Neural Networks. Fuzzv Logic and Genetic Algorithm: Synthesis and Applications. S. Rakasekaran. G.A. ViiavalakshmiPai, PHI learning private limited, 14th Edition. 2003.
4. Neural Networks and Fuzzv Logic. K. Vinoth Kumar, R. Saravana Kumar. S. K. Kataraiia and Sons publication.
5. Artificial Neural Networks, B.Yegnanarayana Prentice Halll of India (P) Limited.
6. Introduction to Artificial Neural Svstems, Jacek M. Zurada, Jaico Publication House.
7. Fuzzv Svts. Uncertainty and Information. G. J. Klir and T.A. Folger. PHI learning private limited. Publisher- Pearson 3Edition 1999.

### E-Resources:

1. [https://onlinecourses.nptel.ac.in/noc20\\_cs17/preview](https://onlinecourses.nptel.ac.in/noc20_cs17/preview)
2. <http://vlabs.iitkgp.ernet.in/scte/index.html>
3. <http://vlabs.iitkgp.ac.in/vlt/project.html#>

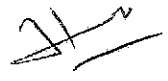






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| Part A: Introduction              |  |                      |                  |
|-----------------------------------|--|----------------------|------------------|
| Program: M.Sc. (CS)               | Semester: Third  | Year: II             | w.e.f.:2024-2025 |
| 1. Course Code                    | CST305   |                      |                  |
| 2. Course Title                   | Elective-II: Current Trends and Techniques   |                      |                  |
| 3. Course Type                    | Theory   |                      |                  |
| 4. Pre-requisite (if any)         | Nil  |                      |                  |
| 5. Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Learn how the Internet Of Things Works</li><li>• Describe how Natural Language Processing can be done.</li><li>• Understand the Concepts of Cloud Computing</li><li>• Describe Fog computing. and Ambient Intelligence.</li><li>• Develop clear understanding of Deep computing</li></ul> |                      |                  |
| 6. Credit Value                   | Theory: 4  |                      |                  |
| 7. Total Marks                    | Internal Marks: 20<br>External Marks: 80   | Min Passing Marks:36 |                  |

| Part B: Content of the Course |  |             |
|-------------------------------|--|-------------|
| Unit                          | Topics   | Total Hours |
| I.                            | <b>Fundamentals of IoT:</b> Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, Overview of IoT components and IoT Communication Technologies, Challenges in IOT. | 12          |
| II.                           | <b>Applications of IoT:</b> Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.  | 12          |
| III.                          | <b>Introduction to NLP:</b> Definition of NLP, Difficulty in NLP, History of NLP, Pros and Cons of NLP, Components of NLP, Applications of NLP, NLP pipeline, Phases of NLP, NLP APIs, NLP Libraries.  | 12          |
| IV.                           | <b>BIG Data:</b> Data Storage and Analysis - Characteristics of Big Data - Big Data Analytics - Typical Analytical, Advantages Of Big Data Processing, Challenges Of Traditional Databases, Big Data Benefits Over Traditional Database, Challenges And Risks In BigData, Big Data Technologies, Tools To Use Big Data                                       | 12          |



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|    |   |    |
|----|---|----|
|    | Concepts, Applications of Big Data, BigData And Data Warehouse- OLTP And OLAP, Architecture – Requirement for new analytical architecture – Challenges in Big Data Analytics – Need of big data frameworks.   |    |
| V. | <b>Cloud Computing:</b> Cloud Computing services models and features in Saas, Paas and Iaas; Service oriented architecture and web services; Features of cloud computing architectures and simple case studies, Virtualization- Characteristic features, Taxonomy Hypervisor, Virtualization and Cloud Computing, Pros and Cons of Cloud Computing, Technology Examples/Case Studies, Fog and Deep computing, Ambient Intelligence. | 12 |

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Distributed and Cloud Computing, Kaittwang Geoffrey C.Fox and Jack J Dongra, Elsevier India 2012.
2. Mastering Cloud Computing- Raj Kumar Buyya, Christian Vecchiola and S TanuraiSelvi, TMH, 2012.
3. Beowulf Cluster Computing with Linux, William Gropp, Ewing Lusk, Thomas Sterling, MIT Press, 2003
4. Big Data, Black Book: by DT Editorial Services .
5. Internet of Things (IoT) by Dr Kamlesh Lakhwani Dr Hemant Kumar Gianey, Joseph Kofi Wireko Kamal Kant Hiran
6. An introduction to natural language processing, computational linguistics, and speech recognition. Daniel Jurafsky & James H. Martin.

### Reference Books:

1. Cloud Computing, John W. Ritting House and James F Ramsome, CRC Press, 2012
2. Enterprise Cloud Computing, GautamShroff, Cambridge University Press, 2012.
3. Christopher D. Manning and Hinrich Schütze. 1999. Foundations of Statistical Natural Language Processing. Cambridge, MA: MIT Press.
4. Designing the Internet of Things Adrian McEwen, Hakim Cassimally, Wiley Publishers
5. Big Data: Concepts, Technology and Architecture Balamarugan Balusamy, Nandhini Abirami R, Seifedine Kadry and Amir Gandomi, Wiley Publishers

### E-Resources:

1. [https://onlinecourses.nptel.ac.in/noc23\\_cs112/preview](https://onlinecourses.nptel.ac.in/noc23_cs112/preview)
2. <https://archive.nptel.ac.in/courses/106/105/106105166/>
3. [https://onlinecourses.swayam2.ac.in/arp19\\_ap52/preview](https://onlinecourses.swayam2.ac.in/arp19_ap52/preview)
4. [https://onlinecourses.nptel.ac.in/noc19\\_cs65/preview](https://onlinecourses.nptel.ac.in/noc19_cs65/preview)
4. <https://www.udemy.com/course/internet-of-things-iot-fundamentals/>
5. <https://www.coursera.org/learn/iot?specialization=iot>
6. <https://www.udemy.com/course/learn-big-data-basics/>
7. <https://www.coursera.org/learn/big-data-introduction>
8. <https://www.coursera.org/learn/big-data-introduction?specialization=big-data>
9. [https://onlinecourses.nptel.ac.in/noc21\\_cs14/preview](https://onlinecourses.nptel.ac.in/noc21_cs14/preview)
10. [https://onlinecourses.nptel.ac.in/noc19\\_cs56/preview](https://onlinecourses.nptel.ac.in/noc19_cs56/preview)










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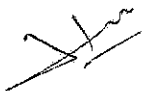




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| Part A: Introduction |                                |  |                        |                  |
|----------------------|--------------------------------|--|------------------------|------------------|
| Program: M.Sc. (CS)  |                                | Semester: III  | Year: II               | w.e.f.:2024-2025 |
| 1.                   | Course Code                    | CST306   |                        |                  |
| 2.                   | Course Title                   | Elective-II: Introduction to Data Science  |                        |                  |
| 3.                   | Course Type                    | Theory   |                        |                  |
| 4.                   | Pre-requisite (if any)         | Basic knowledge of programming and database management system  |                        |                  |
| 5.                   | Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Describe about Data Science and the skill sets needed to be a data scientist.</li><li>• Explain in basic terms, what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.</li><li>• Use R to carry out basic statistical modeling and analysis.</li><li>• Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA.</li><li>• Employ cutting edge tools and technologies to analyze Big Data.</li></ul> |                        |                  |
| 6.                   | Credit Value                   | Theory: 4  |                        |                  |
| 7.                   | Total Marks                    | Internal Marks: 20   | Min Passing Marks : 36 |                  |
|                      |                                | External Marks: 80   |                        |                  |

| Part B: Content of the Course |  |             |
|-------------------------------|--|-------------|
| Unit                          | Topics   | Total Hours |
| I.                            | <b>Data Scientist's Tool Box:</b> Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software, version control, mark down, git, Git Hub, R, and R Studio.   | 12          |
| II.                           | <b>R Programming Basics:</b> Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling.  | 12          |
| III.                          | <b>Getting and Cleaning Data:</b> Obtaining data from the web, from APIs, from databases and from colleagues in various formats. Basics of data cleaning and making data—tidy.   | 12          |
| IV.                           | <b>Exploratory Data Analysis:</b> Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to Visualize high-dimensional data. | 12          |

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|    |   |    |
|----|---|----|
| V. | <b>Reproducible Research:</b> Concepts and tools behind reporting modern data analyses in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others. | 12 |
|----|---|----|

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Book:

1. Rachel Schutt, Cathy O'Neil, Doing Data Science: Straight Talk from the Frontline by Schroff O'Reilly, 2013.
2. Foster Provost, Tom Fawcett, Data Science for Business What You Need to Know About Data Mining and Data-Analytic Thinking by O'Reilly, 2013.
3. John W. Foreman, Data Smart: Using data Science to Transform Information into Insight by John Wiley & Sons, 2013.

### Reference Books:

1. Ian Ayres, Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart 1st Edition by Bantam, 2007.5. Eric Seigel, Predictive Analytics: The Power to Predict who Will Click, Buy, Lie, or Die, 1st Edition, by Wiley, 2013
2. Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python, Second Edition by Peter Bruce

### E Resources:

1. [https://onlinecourses.nptel.ac.in/noc19\\_cs60/preview](https://onlinecourses.nptel.ac.in/noc19_cs60/preview)
2. [https://onlinecourses.swayam2.ac.in/imb23\\_mg64/preview](https://onlinecourses.swayam2.ac.in/imb23_mg64/preview)
3. <https://www.coursera.org/learn/what-is-datascience?specialization=ibm-data-science>

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| Part A: Introduction.             |   |                       |                   |
|-----------------------------------|---|-----------------------|-------------------|
| Program: M.Sc. (CS)               | Semester: III   | Year: II              | w.e.f.: 2024-2025 |
| 1. Course Code                    | CSP301  |                       |                   |
| 2. Course Title                   | Lab-5: Programming in Python  |                       |                   |
| 3. Course Type                    | Practical   |                       |                   |
| 4. Pre-requisite (if any)         | Theoretical knowledge of Python   |                       |                   |
| 5. Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Learn the Numbers, Math functions, Strings, List in Python.</li><li>• Learn the tuples and dictionaries in Python.</li><li>• Demonstrate proficiency in handling of loops and creation of functions.</li><li>• Identify the methods to create and manipulate lists, tuples and dictionaries.</li><li>• Express different Decision Making statements and Functions.</li></ul> |                       |                   |
| 6. Credit Value                   | 2   |                       |                   |
| 7. Total Marks                    | External Marks: 100   | Min Passing Marks: 36 |                   |

| Part B: Content of the Course   |   |
|---------------------------------|---|
| Total Hours: 60                 |   |
| <b>Tentative Practical List</b> | <b>Note:</b> This is tentative list; the teachers concern can add more program as per requirement. <ol style="list-style-type: none"><li>1. Python program to find the union of two lists.</li><li>2. Python program to find the intersection of two lists.</li><li>3. Using for loop, print a table of Celsius/Fahrenheit equivalences. Let c be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.</li><li>4. Using while loop, produce a table of sines, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).</li><li>5. Write a program that reads an integer value and prints —leap year! or —not a leap year!.</li><li>6. Write a program that takes a positive integer n and then produces n lines of output shown as follows.<br/>For example, enter a size: 5<br/>*<br/>**<br/>***<br/>****<br/>*****</li><li>7. Write a function that takes an integer _n' as input and calculates the value of <math>1 + 1/1! + 1/2! + 1/3! + \dots + 1/n!</math></li><li>8. Write a function that takes an integer input and calculates the factorial of that number.</li><li>9. Write a function that takes a string input and checks if it's a palindrome or not.</li><li>10. Write a list function to convert a string into a list, as in list ('abc') gives [a, b, c].</li></ol> |



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11. Write a program to generate Fibonacci series.
12. Write a program to check whether the input number is even or odd.
13. Write a program to compare three numbers and print the largest one.
14. Write a program to print factors of a given number.
15. Write a method to calculate GCD of two numbers.
16. Write a program to create Stack Class and implement all its methods. (Use Lists).
17. Write a program to create Queue Class and implement all its methods. (Use Lists)
18. Write a program to implement linear and binary search on lists.
19. Write a program to sort a list using insertion sort and bubble sort.
20. Write a python program to remove the 'I' th occurrence of the given word in a list where words repeat.
21. Python program to count the occurrences of each word in a given string sentence.
22. Python program to check if a substring is present in a given string.
23. Python program to map two lists into a dictionary.
24. Python program to count the frequency of words appearing in a string using a dictionary.
25. Python program to create a dictionary with key as first character and value as words starting with that character.
26. Python program to find the length of a list using recursion.
27. Python program to read a file and capitalize the first letter of every word in the file.
28. Python program to read the contents of a file in reverse order.
29. Python program to create a class in which one method accepts a string from the user and another prints it.
30. Study and Implementation of Database, Structured Query Language and database connectivity.

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### E-RESOURCES:

#### Text Books:

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: Learning with Python, 2012.
3. Kenneth A. Lambert, Fundamentals of Python.
4. James Payne, Beginning Python using Python 2.6 and Python 3.

#### Reference Books:

1. Mark Lutz, Learning Python.
2. Tony Gaddis, Starting Out With Python.

#### E Resources:

1. <https://www.coursera.org/learn/python>
2. <https://www.udacity.com/course/introduction-to-python--ud1110>
3. <https://www.udemy.com/course/pythonforbeginnersintro/>

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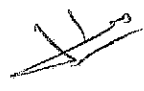




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Prof., Dept. of Computer Science  
Himachal Pradesh University, Shimla (Himachal Pradesh)  
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| Part A: Introduction              |  |                      |                   |
|-----------------------------------|--|----------------------|-------------------|
| Program: M.Sc. (CS)               | Semester: III  | Year: II             | w.e.f.: 2024-2025 |
| 1. Course Code                    | CSP302   |                      |                   |
| 2. Course Title                   | LAB 6: Web Technology  |                      |                   |
| 3. Course Type                    | Practical  |                      |                   |
| 4. Pre-requisite (if any)         | Theoretical knowledge of Web Technology  |                      |                   |
| 5. Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>Analyse a web page and identify its elements and attributes.</li><li>Create web pages using HTML, CSS, JAVASCRIPT, XHTML</li><li>Build dynamic web pages using JavaScript (Client side programming).</li><li>Create XML documents and Schemas.</li><li>Build interactive web applications using, PHP, AJAX.</li><li>Learn to work with CMS.</li></ul> |                      |                   |
| 6. Credit Value                   | 2  |                      |                   |
| 7. Total Marks                    | External Marks: 100  | Min Passing Marks:36 |                   |

| Part B: Content of the Course |  |             |             |           |           |       |              |             |             |        |     |      |         |         |      |            |     |
|-------------------------------|--|-------------|-------------|-----------|-----------|-------|--------------|-------------|-------------|--------|-----|------|---------|---------|------|------------|-----|
| Total Hours: 60               |  |             |             |           |           |       |              |             |             |        |     |      |         |         |      |            |     |
| Tentative Practical List      | <p><b>Note:</b> This is tentative list; the teachers concern can add more program as per requirement.</p> <p style="text-align: center;"><b>HTML</b></p> <ol style="list-style-type: none"><li>Write an HTML program to create the following table:<table border="1" style="margin-left: auto; margin-right: auto;"><thead><tr><th>Class</th><th>Subject 1</th><th>Subject 2</th><th>Subject 3</th></tr></thead><tbody><tr><td>BCA-I</td><td>Visual Basic</td><td>PC Software</td><td>Electronics</td></tr><tr><td>BCA-II</td><td>C++</td><td>DBMS</td><td>English</td></tr><tr><td>BCA-III</td><td>Java</td><td>Multimedia</td><td>CSA</td></tr></tbody></table></li><li>Write an HTML program to create the following lists:<ul style="list-style-type: none"><li>C</li><li>C++</li><li>Fortran</li><li>COBOL</li></ul></li><li>Write an HTML program to create the following lists:<ol style="list-style-type: none"><li>Java</li><li>Visual Basic</li><li>Basic</li><li>COBOL</li></ol></li><li>Write an HTML program to demonstrate hyper linking between two web pages.</li><li>Create a marquee &amp; also insert an image.</li><li>Write an HTML program to create frame in HTML with 3 columns (width= 30%, 30%, 40%).</li><li>Write an HTML program to create a webpage with a blue background and print the following text with white background.</li></ol> | Class       | Subject 1   | Subject 2 | Subject 3 | BCA-I | Visual Basic | PC Software | Electronics | BCA-II | C++ | DBMS | English | BCA-III | Java | Multimedia | CSA |
| Class                         | Subject 1  | Subject 2   | Subject 3   |           |           |       |              |             |             |        |     |      |         |         |      |            |     |
| BCA-I                         | Visual Basic   | PC Software | Electronics |           |           |       |              |             |             |        |     |      |         |         |      |            |     |
| BCA-II                        | C++  | DBMS        | English     |           |           |       |              |             |             |        |     |      |         |         |      |            |     |
| BCA-III                       | Java   | Multimedia  | CSA         |           |           |       |              |             |             |        |     |      |         |         |      |            |     |

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8. Write an HTML program to create the following table:

| Course             | OC | BC | MB | SC/ST | Total     |
|--------------------|----|----|----|-------|-----------|
| Computer Science   | 9  | 18 | 5  | 5     | 37        |
| Commerce           | 14 | 25 | 6  | 5     | 50        |
| <b>Grand Total</b> |    |    |    |       | <b>87</b> |

9. Write an HTML program to create the following table:

| Maruti     |       | Tata    |       | Ford  |       |
|------------|-------|---------|-------|-------|-------|
| Model      | Price | Model   | Price | Model | Price |
| Maruti 800 | 2 Lac | Sumo    | 2 Lac | Icon  | 5 Lac |
| Omni       | 3 Lac | Scorpio | 3 Lac | Gen   | 2 Lac |

10. Write an HTML program to create the following table:

| University |          |       |
|------------|----------|-------|
| Name       | Roll No. | Class |
| Rahul      | 40       | BCA-I |
| Preeti     | 85       | BCA-I |
| Priya      | 74       | BCA-I |
| Richa      | 95       | BCA-I |

11. Write an HTML program to create the following table:

| Students Record |         |       |
|-----------------|---------|-------|
| Name            | Subject | Marks |
| Arun            | Java    | 70    |
|                 | C       | 80    |
| Ashish          | Java    | 75    |
|                 | C       | 69    |

12. Write an HTML program to create the following table and also insert an image in the webpage.

| Subject          | Max | Min | Obtain |
|------------------|-----|-----|--------|
| Java             | 100 | 33  | 75     |
| Multimedia       | 100 | 33  | 70     |
| Operating System | 100 | 33  | 68     |
| C++              | 100 | 33  | 73     |

13. Write an HTML program to create the following table:

|                 |            |            |               |
|-----------------|------------|------------|---------------|
| <b>Name</b>     | Rahul      |            |               |
| <b>Roll No.</b> | 101        |            |               |
| <b>Subject</b>  | <b>Max</b> | <b>Min</b> | <b>Obtain</b> |
| Java            | 100        | 33         | 75            |
| Multimedia      | 100        | 33         | 70            |

14. Write an HTML program to create a form as the following:

Enter Name:

Enter Roll No

Enter Age:

Enter DOB:

15. Write an HTML program to create the following webpage with

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background and the following text:

16. Write an HTML program to create the following form:

User Name :

Password :

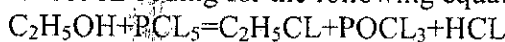
When user types characters in a password field. The browser displays asterisks or bullets, instead of character.

17. Write a HTML Program to create Student Registration Form

18. Write a HTML Program to create Contact Form

19. Write a HTML Program to insert Audio & Video in HTML

20. Write the HTML coding for the following equations:



21. Write the HTML code to display the following:

- Actors
  - Bruce Wills
  - Gerand Butler
  - Vin Diesel
  - Bradd Pitt
  - Paul Walker
  - Jason Statham
- Actress
  - Julia Roberts
  - Angelina Jolie
  - Kate Wins let
  - Cameron Diaz

22. Write the HTML code to display the following:

1. Cricket Players

A. Batsman

- i. Sachin Tendulkar
- ii. Rahul Dravid
- iii. VirendraSehwag

B. Bowlers

- i. Kumble
- ii. Zaheer Khan
- iii. Balaji

C. Spinner

- i. Harbhajan
- ii. RavindraJadeja
- iii. Kartik

## JavaScript

1. Create a script using for loop to prime number between 1 and 50.
2. Write a script to get the largest value in an array.
3. Write a function to calculate the factorial of a number (a non-negative integer).
4. Write a script to demonstrate data validation.
5. Write a program to print date using JavaScript.
6. Write a program to Sum and Multiply two numbers using Javascript.



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## DHTML

1. Create a web page which shows the changes of header dynamically.
2. Create a webpage which explains the use of relative positioning.
3. Display an alert box to alert the x and y coordinates of the cursor.

## PHP

1. Create a script using for loop to all integers between 0 and 30 and display the total.
2. Create a script to construct the following pattern, using nested for loop exercises.
3. Write a PHP script to get the largest key in an array.
4. Write a function to calculate the factorial of a number (a non-negative integer).
5. Write a PHP script to check string for palindrome.

## WordPress and Server Configuration

1. Working with Widgets Working with Menu for Website using Wordpress.
2. Installing and Configuring XAMPP.
3. Configuring DHCP Server.
4. Configuring IIS Server.
5. Configuring DNS Server.

## Part C - Learning Resource

### Text Books, Reference Books, E-Resources

#### Text Book:

1. "Fundamentals of Data Structures", Horowitz and Sahani, Computer Science Press, 1978
2. Data structure Through C, G. S. Baluja, Dhanpat Rai And Co.

#### Reference Books:

1. "Data Structures and Algorithms in C++", Michael T. Goodrich, Wiley, 2007
2. "Data structures and Algorithms", Aefred V. Aho, Jhon E. Joperoft and J.E. Ullman.
3. "An Introduction to Data Structures with Applications", Jean Paul Trembley and Paul Sorenson, TMH, International Student Edition, 1985
4. "Data Structures and Program Design in C", R. Kurse, Leung & Tondo, 2<sup>nd</sup> Edition, PHI publication

#### E-Resources:

1. [https://onlinecourses.swayam2.ac.in/aic20\\_sp11/preview](https://onlinecourses.swayam2.ac.in/aic20_sp11/preview)
2. [https://www.coursera.org/learn/introduction-to-web-development-with-html-css-javascript?action=enroll&adgroupid=154709125594&adposition=&campaignid=20395923513&creativeid=667061327480&device=c&devicemodel=&gclid=Cj0KCCQjw2qKMBhCfARIsAFy8buKxIYam7tWtPzSQ46fXKZcqBmupu3gKrwgxmSmbwdtKTLNiZCkYtqgaAm7JEALw\\_wcB&hide\\_mobile\\_promo&keyword=&matchtype=&network=g&specialization=ibm-full-stack-cloud-developer&utm\\_campaign=B2C\\_INDIA\\_ibm-full-stack-cloud-developer\\_ibm\\_FTCOF\\_professional-certificates\\_arte-agency&utm\\_medium=sem&utm\\_source=](https://www.coursera.org/learn/introduction-to-web-development-with-html-css-javascript?action=enroll&adgroupid=154709125594&adposition=&campaignid=20395923513&creativeid=667061327480&device=c&devicemodel=&gclid=Cj0KCCQjw2qKMBhCfARIsAFy8buKxIYam7tWtPzSQ46fXKZcqBmupu3gKrwgxmSmbwdtKTLNiZCkYtqgaAm7JEALw_wcB&hide_mobile_promo&keyword=&matchtype=&network=g&specialization=ibm-full-stack-cloud-developer&utm_campaign=B2C_INDIA_ibm-full-stack-cloud-developer_ibm_FTCOF_professional-certificates_arte-agency&utm_medium=sem&utm_source=)
3. [https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp\\_content/S000007CS/P001071/M017403/ET/1473335362etext-Module6.pdf](https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000007CS/P001071/M017403/ET/1473335362etext-Module6.pdf)

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| 2. <b>Dr. Amit Kumar Saxena</b><br>Prof., Dept. of Computer Science and IT<br>Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)                       | - Member                      |                |
| 3. <b>Mr. Anil Rathore</b><br>Asst. Prof., Dept. of Computer Science<br>K.N. College, Korba (C.G.)   | - Member                      | Present online |
| 4. <b>Dr. Tarun Dhar Diwan</b><br>Asst. Prof., Dept. of IT<br>Govt. E.R.R. PG Science College, Bilaspur (C.G.)                                     | - Member                      |                |
| 5. <b>Mr. Kaushal Banjare</b><br>Asst. Prof., Dept. of Computer Application<br>Govt. J.P.Verma PG Arts and Commerce College, Bilaspur (C.G.)       | -Member                       |                |
| 6. <b>Dr. Rashmi Gupta</b><br>Asst. Prof., Department of Computer Science and Application<br>Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.) | -Member                       |                |
| 7. <b>Mr. Vivek Tiwari</b><br>Asst. Prof., Dept. of Computer Application<br>Govt. E.R.R. PG Science College, Bilaspur (C.G.)                       | - Member                      |                |
| 8. <b>Mrs. Gargee Shukla</b><br>Asst. Prof., Dept. of Computer Science<br>Govt. Bilasa Girls PG College, Bilaspur (C.G.)                           | -Member                       |                |
| 9. <b>Dr. Manu Sood</b><br>Prof., Dept. of Computer Science<br>Himachal Pradesh University, Shimla (Himachal Pradesh)                              | - Member<br>(Approved Online) |                |



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| Part A: Introduction              |  |                      |                  |
|-----------------------------------|--|----------------------|------------------|
| Program: M.Sc. (CS)               | Semester: Forth  | Year: II             | w.e.f.:2024-2025 |
| 1. Course Code                    | CST401   |                      |                  |
| 2. Course Title                   | Artificial Intelligence & Machine Learning   |                      |                  |
| 3. Course Type                    | Theory   |                      |                  |
| 4. Pre-requisite (if any)         | A sound knowledge of basic mathematics concepts, statistics, linear algebra, programming languages, and data modeling  |                      |                  |
| 5. Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand a wide variety of learning algorithms.</li> <li>• Develop an understanding on how to evaluate models generated from data.</li> <li>• Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.</li> <li>• Apply ML algorithms in various domains.</li> <li>• Simulate real world problems using ML techniques.</li> <li>• Apply deep learning techniques for computer vision.</li> </ul> |                      |                  |
| 6. Credit Value                   | Theory: 4  |                      |                  |
| 7. Total Marks                    | Internal Marks: 20   | Min Passing Marks:36 |                  |
|                                   | External Marks: 80   |                      |                  |

| Part B: Content of the Course |   |             |
|-------------------------------|---|-------------|
| Unit                          | Topics  | Total Hours |
| I.                            | <b>Introduction:</b> Overview of Artificial Intelligence (AI), Foundations of A.I., History of AI, Areas and state of the art in A.I., Knowledge: Introduction, Knowledge Based system, Knowledge representation techniques.  | 12          |
| II.                           | <b>Searching Techniques:</b> Problem solving as state space search, production system, control strategies and problem characteristics, Search techniques: Breadth First search, Depth-first search, Hill-climbing, Heuristics search, Best-First search, greedy method, A* algorithm.   | 12          |
| III.                          | <b>Machine Learning:</b> What is Machine learning, Types of machine learning, Statistical learning: background and general methods, Bayesian network, decision trees, supervised learning: linear regression, artificial neural network, Back propagation network, support vector machine, radial basis function network, unsupervised learning: types of clustering, K-means clustering, hierarchical clustering, self organization map, reinforcement learning. | 12          |
| IV.                           | <b>Machine Learning Model:</b> Measuring classification accuracy, data preprocessing, feature selection and generation, dimensionality reduction: Principal component analysis (PCA), training, testing and validation data sets, ensemble methods: Bagging and boosting.   | 12          |

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|    |   |    |
|----|---|----|
| V. | <b>Application of ML and Deep Learning:</b> Applying ML to solve real world problems in various domains like financial forecasting, classification problems, clustering, Natural language processing (NLP), health care, image classification etc. Introduction to deep learning, Convolutional Neural Network (CNN), Long Short Term Memory (LSTM), solving computer vision and other problems through deep learning techniques. | 12 |
|----|---|----|

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Artificial Intelligence and machine learning, Vinod Chandra S.S., Anand Hareendrn S., PHI learning private Ltd.
2. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson, PHI Publication.
3. Artificial Intelligence, Elaine Rich and Kevin Knight TMH publication.
4. Machine learning, Anuradha Srinivas araghavan, Vincy Joseph, Wiley publication, India , 2019 edition.

### Reference Books:

1. Introduction to Machine Learning with python A guide for data scientists, Andreas, C. Muller & Sarah Guido, O'Reilly.
2. Applications of Mathematical Modeling , Machine Learning and Intelligent Computing for Industrial Development By Madhu Jain Dinesh K. Sharma, Rakhee Kulshreshta and H.S. Hota, CRC Press.
3. Understanding machine learning: From theory to algorithms, shaishalev-shwartz, shai ben-david, Cambridge University press.
4. Machine learning, Tom M. Mitchell, McGraw Hill, Indian Edition.

### E-Resources:

1. [https://www.youtube.com/watch?v=whSKA8aO6xQ&list=PLyqSpQzTE6M-SISTunGRBRiZk7opYBf\\_K&index=3](https://www.youtube.com/watch?v=whSKA8aO6xQ&list=PLyqSpQzTE6M-SISTunGRBRiZk7opYBf_K&index=3)
2. [http://www.hpc.iitkgp.ac.in/pdfs/AI\\_HPC.pdf](http://www.hpc.iitkgp.ac.in/pdfs/AI_HPC.pdf)
3. <https://nthu-datalab.github.io/ml/>
4. [https://www.tensorflow.org/resources/learn-ml?gclid=CjwKCAjw\\_ISWBhBkEiwAdqxb9hljIi5hnqF0Cq2Fgy\\_JEWiD\\_uZbxtetr\\_BFUF\\_QztAELk8d2q3P\\_BoCodMQAvD\\_BwE](https://www.tensorflow.org/resources/learn-ml?gclid=CjwKCAjw_ISWBhBkEiwAdqxb9hljIi5hnqF0Cq2Fgy_JEWiD_uZbxtetr_BFUF_QztAELk8d2q3P_BoCodMQAvD_BwE)
5. Deep Learning Resource From Coursera : <https://www.coursera.org/specializations/deep-learning>
6. <https://www.coursera.org/learn/machine-learning-introduction-for-everyone>

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| 3. | <b>Mr. Anil Rathore</b><br>Asst. Prof., Dept. of Computer Science<br>K.N. College, Korba (C.G.)   | - Member                      | Present online |
| 4. | <b>Dr. Tarun Dhar Diwan</b><br>Asst. Prof., Dept. of IT<br>Govt. E.R.R. PG Science College, Bilaspur (C.G.)                                     | - Member                      |                |
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| 6. | <b>Dr. Rashmi Gupta</b><br>Asst. Prof., Department of Computer Science and Application<br>Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.) | -Member                       |                |
| 7. | <b>Mr. Vivek Tiwari</b><br>Asst. Prof., Dept. of Computer Application<br>Govt. E.R.R. PG Science College, Bilaspur (C.G.)                       | - Member                      |                |
| 8. | <b>Mrs. Gargee Shukla</b><br>Asst. Prof., Dept. of Computer Science<br>Govt. Bilasa Girls PG College, Bilaspur (C.G.)                           | -Member                       |                |
| 9. | <b>Dr. Manu Sood</b><br>Prof., Dept. of Computer Science<br>Himachal Pradesh University, Shimla (Himachal Pradesh)                              | - Member<br>(Approved Online) |                |



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| Part A: Introduction  |                                |   |                       |
|-----------------------|--------------------------------|---|-----------------------|
| Program: M.Sc. (C.S.) | Semester: Forth                | Year: II  | w.e.f. 2024-2025      |
| 1.                    | Course Code                    | CST402  |                       |
| 2.                    | Course Title                   | Analysis and Design of Algorithm  |                       |
| 3.                    | Course Type                    | Theory  |                       |
| 4.                    | Pre-requisite (if any)         | Basic knowledge of programming concepts   |                       |
| 5.                    | Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Apply knowledge of computing and mathematics to algorithm design.</li><li>• Analyze a problem and identify the computing requirements appropriate for its solution;</li><li>• Design, implement, and evaluate an algorithm to meet desired needs.</li><li>• Apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices.</li><li>• An ability to apply design and development principles in the construction of software systems of varying complexity.</li><li>• An ability to function effectively as a member of a team in order to accomplish a common goal.</li><li>• Recognition of the need for and an ability to engage in continuing professional development.</li><li>• An ability to use current techniques, skills, and tools necessary for computing practice.</li></ul> |                       |
| 6.                    | Credit Value                   | Theory: 4   |                       |
| 7.                    | Total Marks                    | Internal Marks: 20<br>External Marks: 80  | Min Passing Marks: 36 |

| Part B: Content of the Course |   |             |
|-------------------------------|---|-------------|
| Unit                          | Topics  | Total Hours |
| I.                            | <b>Introduction of Algorithm</b> , Analysis of algorithms, asymptotic notations, Standard notations and common functions, Recurrence solution: Substitution method, iteration method and the master method, algorithm design techniques: basic. | 12          |
| II.                           | <b>Divide and Conquer</b> : Binary search, Min-Max Problem, merge sort, quick sort, and Matrix Multiplication.<br><b>Introduction to NP-Completeness</b> : The class P and NP, Polynomial reduction, NP Completeness Problem, NP-Hard Problems. | 12          |

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|------|--|----|
| III. | <b>Graph Algorithms:</b> Undirected Graph, Directed Graph, Traversing Graphs, Representation of graphs, Breadth-first search, Depth-first search, strongly connected components, topological sort.<br><b>String Matching:</b> Introduction, The naïve string matching algorithm, Rabin-Karp algorithm, String Matching with finite automata. | 12 |
| IV.  | <b>Greedy Method:</b> Knapsack problem, Huffman codes, job sequencing with deadlines, Minimum Spanning trees: Prim's and Kruskal's algorithms, Single Source Shortest path: Dijkstra's algorithm and Bellman Ford algorithms.  | 12 |
| V.   | <b>Dynamic Programming:</b> 0/1 Knapsack problem, all Pair's shortest paths: Warshal's and Floyd's algorithms, Single source shortest paths, Backtracking, Branch and Bound: Travelling Salesman Problem.  | 12 |

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. "Introduction to Algorithms", Thomas H. Cormen et al., PHI.
2. "Fundamentals of computer algorithms", Ellis Horowitz, Sartraj Sahni and Rajasekaran, Galgotia.

### Reference Books:

1. "Design Methods and Analysis of Algorithms", Prof S.K.Basu, BHU. PHI.
2. "Data Structures, Algorithms and Applications in C++", Sahni, TMH.
3. "Design and analysis of computer algorithms", Aho A.V, Hopcroft, J.E. Ullman, Addison-wesley.
4. "Fundamentals of Algorithmics", Brassard and Bratley, PHI.
5. "Data Structure in C", Andrew S.Tanenbaum, PHI.

### E-Resources:

1. [https://onlinecourses.nptel.ac.in/noc19\\_cs47/preview](https://onlinecourses.nptel.ac.in/noc19_cs47/preview)
2. <https://www.coursera.org/learn/analysis-of-algorithms>
3. <https://www.edx.org/learn/computer-programming/stanford-university-algorithms-design-and-analysis>

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


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- Member  
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| Part A: Introduction              |   |                      |                  |
|-----------------------------------|---|----------------------|------------------|
| Program: M.Sc. (CS)               | Semester: IV  | Year: II             | w.e.f.:2024-2025 |
| 1. Course Code                    | CST403  |                      |                  |
| 2. Course Title                   | ELECTIVE III: Data Mining & Data warehousing  |                      |                  |
| 3. Course Type                    | Theory  |                      |                  |
| 4. Pre-requisite (if any)         | Basic knowledge of statistics, mathematics and RDBMS  |                      |                  |
| 5. Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Store voluminous data for online processing.</li><li>• Preprocess the data for mining applications.</li><li>• Apply the association rules for mining the data.</li><li>• Design and deploy appropriate classification techniques.</li><li>• Cluster the high dimensional data for better organization of the data.</li><li>• Evaluate various mining techniques on complex data objects.</li></ul> |                      |                  |
| 6. Credit Value                   | Theory: 4   |                      |                  |
| 7. Total Marks                    | Internal Marks: 20<br>External Marks: 80  | Min Passing Marks:36 |                  |

| Part B: Content of the Course |  |             |
|-------------------------------|--|-------------|
| Unit                          | Topics   | Total Hours |
| I.                            | <b>Introduction:</b> What is data mining?, Why it is important?, Mining on what kind of data, Data mining Functionalities, steps of data mining, Knowledge discovery.  | 12          |
| II.                           | <b>Data Warehouse:</b> Meaning, definition, OLTP vs. OLAP, Data warehouse architecture, Three Tier Architecture Data warehouse architecture, Data cube and OLAP technology.  | 12          |
| III.                          | <b>Association Rule:</b> Basic concept, Frequent item set mining: Apriori algorithm etc., Mining various kind of association rules: Mining Multilevel association rules, Mining multidimensional association rules.  | 12          |
| IV.                           | <b>Classification and Prediction:</b> What is classification and prediction, Decision tree algorithms: CART, ID3 C4.5, CHAID, Bayesian classification, Rule based classification, Classification by backpropogation, Support vector machine, Association classification and other classification methods. Prediction using Regression and Neural Network methods, Accuracy measures, Ensemble methods. | 12          |

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|----|---|----|
| V. | <b>Cluster Analysis:</b> What is cluster analysis?, Partitioning method, Hierarchical methods, Experiments with python data mining tools for model development, data preprocessing, feature selection for Financial data, health care data etc. | 12 |
|----|---|----|

| Part C - Learning Resource   |  |
|--|--|
| Text Books, Reference Books, E-Resources   |  |
| <b>Text Books:</b>   |  |
| 1. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishes (Elsevier, 2nd edition), 2006.  |  |
| 2. Data mining techniques, Arun K Pujari, Universities Press (India) private limited, 2007.  |  |
| <b>Reference Books:</b>  |  |
| 1. Data Mining Methods for Knowledge Discovery , Cios, Pedrycz, Swiniarski, Kluwer Academic Publishers, London - 1998. Core JAVA for beginners, Rashmi Kanta Das, Vikas Publication.   |  |
| 2. Data Mining, Data Warehousing and OLAP. Gajendra Sharma, S.K. Kateria and Sons, 2010.   |  |
| <b>E-Resources:</b>  |  |
| 1. <a href="https://onlinecourses.swayam2.ac.in/cec19_cs01/preview">https://onlinecourses.swayam2.ac.in/cec19_cs01/preview</a>   |  |
| 2. <a href="https://docs.oracle.com/database/121/DWHSYG/concept.htm#DWHSYG-GUID-452FBA23-6976-4590-AA41-1369647AD14D">https://docs.oracle.com/database/121/DWHSYG/concept.htm#DWHSYG-GUID-452FBA23-6976-4590-AA41-1369647AD14D</a>   |  |
| 3. <a href="https://www.edx.org/course/data-mining-and-knowledge-discovery?index=product&amp;objectID=course-742ebc04-732e-4133-b674-41124c0df79b&amp;webview=false&amp;campaign=Data+Mining+and+Knowledge+Discovery&amp;source=edX&amp;product_category=course&amp;placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fdata-mining">https://www.edx.org/course/data-mining-and-knowledge-discovery?index=product&amp;objectID=course-742ebc04-732e-4133-b674-41124c0df79b&amp;webview=false&amp;campaign=Data+Mining+and+Knowledge+Discovery&amp;source=edX&amp;product_category=course&amp;placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fdata-mining</a> |  |
| 4. <a href="https://onlinecourses.nptel.ac.in/noc21_cs06/preview">https://onlinecourses.nptel.ac.in/noc21_cs06/preview</a>   |  |

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| Part A: Introduction |                                |  |                      |
|----------------------|--------------------------------|--|----------------------|
| Program: M.Sc. (CS)  |                                | Semester: IV   | Year: II             |
| w.e.f.:2024-2025     |                                |  |                      |
| 1.                   | Course Code                    | CST404   |                      |
| 2.                   | Course Title                   | ELECTIVE- III: MOBILE APPLICATION DEVELOPMENT  |                      |
| 3.                   | Course Type                    | Theory   |                      |
| 4.                   | Pre-requisite (if any)         | -  |                      |
| 5.                   | Course Learning Outcomes (CLO) | <p><b>At the end of this course, Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Apply general programming knowledge in the field of developing mobile applications.</li> <li>• Understand the specific requirements, possibilities and challenges when developing for a mobile context.</li> <li>• Interact between user interface and underlying application.</li> <li>• Plan and carry out a design work including developing a prototype that can be evaluated with a specified user group.</li> <li>• Reflect over possibilities and demands in collaborative software development.</li> </ul> |                      |
| 6.                   | Credit Value                   | Theory: 4  |                      |
| 7.                   | Total Marks                    | Internal Marks: 20<br>External Marks: 80   | Min Passing Marks:36 |

| Part B: Content of the Course |   |             |
|-------------------------------|---|-------------|
| Unit                          | Topics  | Total Hours |
| I.                            | <b>Introduction to Mobile Applications:</b> History of Android, Android Features, Android Versions, Fundamentals: Basic Building blocks, Activities, Services, Broadcast Receivers & Content providers; UI Components: Views & notifications.   | 12          |
| II.                           | <b>Android Development:</b> Java, Android Studio, Eclipse, Virtualization APIs. Android tools: Debugging with DDMS, Android File system, Working with emulator and smart devices; A Basic Android Application, Deployment. Android Activities: The Activity Lifecycle, Lifecycle methods, Creating Activity; Intents, Intent Filters, Activity stack. | 12          |
| III.                          | <b>Basic UI Design:</b> Styles & Themes Form widgets, Text Fields, Layouts: RelativeLayout, TableLayout, FrameLayout, LinearLayout, Nested layouts (dip,dp.sip,sp versus px), styles.xml, drawable resources for shapes, gradients(selectors), Style attribute in layout file, Alert Dialogs & Toast, Time and Date, Images and media.                | 12          |

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|-----|---|----|
| IV. | <b>Android User Interface:</b> Menus: Option menu, context menu, pop-up menu; Lists and Notifications: creation and display. Input Controls: Buttons, Text Fields, Checkboxes, alert dialogs, Spinners, rating bar, progress bar, Android Threads and Thread handlers. Files, Content Providers, and Databases.   | 12 |
| V.  | <b>Messaging and Location-Based Services:</b> Sending SMS Messages Programmatically, Getting Feedback after Sending the Message Sending SMS Messages Using Intent Receiving, sending email. Introduction to location-based service, configuring the Android Emulator for Location-Based Services, Geocoding and Map-Based Activities; Introduction to App Deployment and Testing: Doodlz app, Tip calculator app. Weather viewer app. | 12 |

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 3<sup>rd</sup> edition, 2017.
2. Rajiv Ramnath, Roger Crawfis, and Paolo Sivilotti, Android SDK 3 for Dummies, Wiley.

### Reference Books:

1. Android Programming with Kotlin for Beginners by John Horton : "Internet and Internet Engineering", Daniel Minoli, TMH.
2. Android 9 Development Cookbook Author Name: Rick Boyer Publisher: Packt Publishing Latest Edition: 3rd edition

### E-Resources:

1. [https://www.udemy.com/course/learn-android-application-development-y/?utm\\_source=adwords&utm\\_medium=udemyads&utm\\_campaign=DSA\\_Catchall\\_la.E\\_N\\_cc.INDIA&utm\\_content=deal4584&utm\\_term=.\\_ag\\_82569850245.\\_ad\\_533220805577.\\_kw\\_.de\\_c\\_dm\\_.pl\\_.ti\\_dsa-406594358574.\\_li\\_9179839|\\_pd\\_.&matchtype=&gclid=Cj0KCQjwib2mBhDWARIsAPZUn\\_mtjIDJOdtj7qB2lyWYvjT8K3BJ8JU8H4erT4C5jBBUW7b86AOOy34aAjuQEALw\\_wcB](https://www.udemy.com/course/learn-android-application-development-y/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_la.E_N_cc.INDIA&utm_content=deal4584&utm_term=._ag_82569850245._ad_533220805577._kw_.de_c_dm_.pl_.ti_dsa-406594358574._li_9179839|_pd_.&matchtype=&gclid=Cj0KCQjwib2mBhDWARIsAPZUn_mtjIDJOdtj7qB2lyWYvjT8K3BJ8JU8H4erT4C5jBBUW7b86AOOy34aAjuQEALw_wcB)
2. <https://www.coursera.org/specializations/android-app-development>

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| Part A: Introduction |                                |   |                      |                  |
|----------------------|--------------------------------|---|----------------------|------------------|
| Program: M.Sc. (CS)  |                                | Semester: IV  | Year: IV             | w.e.f.:2024-2025 |
| 8.                   | Course Code                    | CST405  |                      |                  |
| 9.                   | Course Title                   | ELECTIVE- III: BIG DATA ANALYTICS   |                      |                  |
| 10.                  | Course Type                    | Theory  |                      |                  |
| 11.                  | Pre-requisite (if any)         | -   |                      |                  |
| 12.                  | Course Learning Outcomes (CLO) | <b>At the end of course, Students will be able to</b> <ul style="list-style-type: none"><li>• Understand fundamentals of Big Data analytics. Investigate Hadoop framework and Hadoop Distributed File system.</li><li>• Demonstrate the Map Reduce programming model to process the big data along with Hadoop tools.</li><li>• Analyze web contents and social networks to provide analytics with relevant visualization tools.</li><li>• Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.</li></ul> |                      |                  |
| 13.                  | Credit Value                   | Theory: 4   |                      |                  |
| 14.                  | Total Marks                    | Internal Marks: 20<br>External Marks: 80  | Min Passing Marks:36 |                  |

| Part B: Content of the Course |  |             |
|-------------------------------|--|-------------|
| Unit                          | Topics   | Total Hours |
| I.                            | <b>Introduction to Big Data:</b> Big Data and its importance, Characteristics of Big Data, What Comes Under Big Data, Who's Generating Big Data, Challenges in Handling Big Data, How Big Data Impact on IT, Big Data Analytics, Big data applications, Future of Big Data, Risks of Big Data. | 12          |
| II.                           | <b>Introduction to Hadoop:</b> Introduction to Hadoop, Hadoop Architecture, Design Principles of Hadoop. Advantages of Hadoop, Hadoop Storage: Hadoop Distributed File System (HDFS), Properties of HDFS. Name Node, Secondary Name Node, Data Node, Goals of HDFS, Hadoop vs. Other Systems.  | 12          |
| III.                          | <b>Hadoop Mapreduce:</b> Hadoop Map Reduce, Map Reduce paradigm, Resource manager, Node manager, Partitioner, combiner.  | 12          |
| IV.                           | <b>YARN:</b> Introduction to YARN, YARN Framework, Classic Map Reduce VS YARN, Schedulers: FIFO, Fair, Capacity.   | 12          |
| V.                            | <b>Hadoop Ecosystem:</b> Spark, Hive, HBase, Pig, Sqoop, Oozie.  | 12          |

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## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Professional Hadoop Solutions, Boris Iubinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, 2015.
2. Understanding Big data, Chris Eaton, Dirk deRoos et al., McGraw Hill, 2012.
3. Big Data Analytics with R and Hadoop, Vignesh Prajapati, Packt Publishing 2013.
4. Oracle Big Data Handbook, Tom Plunkett, Brian Macdonald et al, Oracle Press, 2014.

### Reference Books:

1. HADOOP: The definitive Guide, Tom White, O Reilly 2012.
2. Big Data and Business analytics, Jay Liebowitz, CRC press, 2013.
3. Oracle Big Data Handbook, Tom Plunkett, Brian Macdonald et al, Oracle Press, 2014

### E-Resources:

1. <https://www.coursera.org/learn/big-data-introduction>
2. <https://www.udemy.com/course/learn-big-data-basics/>
3. <https://www.coursera.org/learn/big-data-introduction?specialization=big-data>

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A signature that looks like "Kesh" below it.  
A checkmark to the left of the "Kesh" signature.








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| Part A: Introduction |                                |  |                |
|----------------------|--------------------------------|--|----------------|
| Program: M.Sc. (CS)  |                                | Semester: IV   | Year: II       |
| w.e.f.:2024-2025     |                                |  |                |
| 1.                   | Course Code                    | CSP401   |                |
| 2.                   | Course Title                   | Major Project  |                |
| 3.                   | Course Type                    | Practical  |                |
| 4.                   | Pre-requisite (if any)         | Programming and research knowledge as per project  |                |
| 5.                   | Course Learning Outcomes (CLO) | At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Demonstrate a sound technical knowledge of their selected project topic.</li><li>• Undertake identification, formulation and solution.</li><li>• Design engineering solutions to complex problems utilizing systems approach.</li><li>• Communicate with the community at large in written and oral forms.</li><li>• Demonstrate the knowledge, skills and attitudes of a professional.</li></ul> |                |
| 6.                   | Credit Value                   | 8  |                |
| 7.                   | Total Marks                    | Max. Marks: 300  | Min Marks: 108 |

## Part B: Important Guidelines for Major Project

Total Lectures: 30 /Total Hours: 60

A project report has to be submitted as per the rules described below:

- 1. Number of Copies:** The student should submit One hard bound copy of the Project Report with one RW/CD/DVD.
- 2. No of students:** Every student has to submit separate project.
- 3. Acceptance / Rejection of Project Report:** The student must submit a project report to the Head of Department/Project Guide for approval. The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission.
- 4. Format of the Project Report :** The student must adhere strictly to the following format for the submission of the Project Report
  - I. Paper:** The report shall be typed on white paper, A4 size or continuous computer stationary bond, for the final submission. The report to be submitted to the University must be original and subsequent copies may be photocopied on any paper.
  - II. Typing:** The typing shall be of standard letter size, double-spaced and on one side of the paper only, using black ribbons and black carbons.
  - III. Margins:** The typing must be done in the following margins  
Left ----- 35mm, Right ----- 20mm  
Top ----- 35mm, Bottom ----- 20mm

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- IV. Binding:** The Report shall be Rexene bound in black. Plastic, spiral bound Project Reports not be accepted.
- V. Front Cover:** The front cover should contain the following details:  
**TOP:** The title in block capitals of 6mm to 15mm letters.  
**CENTER:** Full name in block capitals of 6mm to 10mm letters.  
**BOTTOM:** Name of the University, year of submission- all in block capitals of 6mm to 10mm letters on separate lines with proper spacing and centring.
- VI. Blank Sheets:** At the beginning and end of the report, two white blank bound papers should be provided, one for the purpose of binding and other to be left blank.
5. **Abstract:** Every report should have an abstract following the Institute's Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters, section, subsection etc.
6. **Certificates etc:** The report should contain the following:
- Certificate from Company
  - Institute Certificate: Successful completion of project by competent authority.
  - Acknowledgment
  - List of Figures
  - Tables
  - Nomenclature and Abbreviations
7. **Contents of the Project Report:** The project report must contain following in form of chapter, however student may include any other relevant chapter(s):
- Company Profile:** This chapter should highlight the company details. This would be chapter 1 and should include the main stream activity of the company, the product line of the company and the details of the department where the student has carried out his/her project work. This should not exceed two pages or 800 words.
  - Introduction to the project:** This chapter shall highlight the purpose of project work, it will also define the chapters to be followed in the Project Report.
  - Scope of work:** Brief scope of the project work done
  - Existing System and Need for proposed System:** If there is some system already in use, then give brief detail of it in order to help to understand the enhancements carried out by the student in the existing system.
  - Operating Environment:** Hardware and Software required and used.
  - Proposed System:** Which may contain following:
    - Objectives to be fulfilled:** clearly define the objective(s) of the system.
    - User Requirements:** State the requirements of the use in an unambiguous manner.
    - Requirements Determination Techniques and Systems Analysis**

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**Methods Employed:** Use the formal methods to describe the requirements of the use like Fact Finding Methods, Decision Analysis, Data Flow Analysis etc.

d. **Prototyping:** If the prototypes has been developed prior to the detailed design, then give details of the prototype.

e. **System Feature:** Which includes as follows:

- Module specifications
- D.F.D. and ER
- System flow charts
- Data Dictionary
- Structure charts
- Database /File layouts
- Design of Input Design of Output screens and reports
- User Interfaces
- Design of Control Procedures

8. **Testing procedures and Implementation phase**

9. **Problems encountered, Drawbacks and Limitations**

10. **Proposed Enhancements/ Future enhancement**

11. **Conclusions**

12. **Bibliography**

**Annexure**

## Part C - Learning Resources

Text Books, Reference Books and E-Resources

As per project topic.

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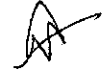
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