

**Department of Computer Science and Engineering**  
**V Semester**  
**Scheme and Syllabus**

Sl. No.	Subject Code	Subjects	Hrs/Week			C	CIE	SEE	Total
			L	T	P				
1.	UCS551C	Analysis and Design of Algorithms	3	0	2	4	50	50	100
2.	UCS552C	Finite Automata & Formal Languages	2	2	0	3	50	50	100
3.	UCS553C	Data Communications	4	0	0	4	50	50	100
4.	UCS557C	Web Technologies	2	2	0	3	50	50	100
5.	UCS065E	Elective- I Python Application Programming	3	0	0	3	50	50	100
6.	UCS632N	Open Elective I Artificial Intelligence and Robotics	3	0	0	3	50	50	100
	UCS659N	<b>Python Application Programming</b>							
7.	UCS555L	Operating Systems Lab	0	0	2	1	50	50	100
8.	UCS558L	Web Programming Lab	0	0	2	1	50	50	100
9.	UHS002N	Advanced Quantitative Aptitude and Soft Skills	0	2	0	1	50	50	100
		Total	17	06	06	23	450	450	900

B.E (COMPUTER SCIENCE AND ENGINEERING)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – V			
Analysis And Design Of Algorithms			
Course Code:	UCS551C	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	04	Hours	52
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>Analyze the asymptotic performance of algorithms.</li> <li>Have insight into the basics of various algorithmic design techniques.</li> <li>To develop proficiency in algorithmic approaches of Brute Force, Divide and Conquer, Decrease and conquer, Greedy and Dynamic programming.</li> </ul>			
UNIT I (13 hours)			
<p><b>Introduction:</b> Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures.</p> <p><b>Fundamentals of the Analysis of Algorithm Efficiency:</b> Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms, Example – Fibonacci Numbers.</p> <p><b>Brute Force:</b> Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search.</p>			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> Remembering,	L3 –Applying L4-Analysis	
UNITII(13 hours)			
<p><b>Divide and Conquer:</b> Merge sort, Quicksort, Binary Search, Binary tree traversals and related properties, Multiplication of large integers and Strassen’s Matrix Multiplication.</p> <p><b>Decrease and Conquer:</b> Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting, Algorithms for Generating Combinatorial Objects.</p>			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> Remembering,	L3 –Applying L4-Analysis	
UNIT III (13 hours)			
<p><b>Transform and Conquer:</b> Presorting, Balanced Search Trees, Heaps and Heapsort, Problem Reduction <b>Space and Time Tradeoffs:</b> Sorting by Counting, Input Enhancement in String Matching , Hashing, B-Trees <b>Dynamic Programming:</b> Computing a Binomial Coefficient, Warshall’s and Floyd’s Algorithms, Optimal Binary Search Trees. The Knapsack Problem and Memory Functions.</p>			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> Remembering,	L3 –Applying L4-Analysis	
UNITIV (13 hours)			
<p><b>Greedy Technique:</b> Prim’s Algorithm, Kruskal’s Algorithm, Dijkstra’s Algorithm, Huffman Trees.</p> <p><b>Limitations of Algorithm Power:</b> Lower-Bound Arguments, Decision Trees, Problems Coping with the Limitations of Algorithm Power: Backtracking, Branch-and-Bound,</p>			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> Remembering,	L3 –Applying L4-Analysis	

**Course outcomes:**

At the end of the course the student will be able to:

- Analyze the asymptotic performance of algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Implement the algorithms to ascertain their working.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>				
1	Introduction to The Design & Analysis of Algorithms	AnanyLevitin	Pearson Education.	3 <sup>rd</sup> Edition, 2017
<b>Reference Books</b>				
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein	PHI	2 <sup>nd</sup> Edition,
2	Computer Algorithms	Horowitz E., Sahni S., Rajasekaran S.,	Galgotia Publications	2001
<b>Web links and Video Lectures:</b>				
1. <a href="https://nptel.ac.in/courses/106/106/106106131/">https://nptel.ac.in/courses/106/106/106106131/</a>				
2. <a href="https://www.classcentral.com/course/swayam-design-and-analysis-of-algorithms-3984">https://www.classcentral.com/course/swayam-design-and-analysis-of-algorithms-3984</a>				
3. VTU EDUSAT PROGRAMME – 20				

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>No</b>	<b>Programme Outcomes Course Outcomes</b>															
<b>The students will be able to:</b>																
1	Analyze the asymptotic performance of algorithms	2	3	3		1							2		3	3
2	Demonstrate a familiarity with major algorithms and data structures.	2	3	3	2	3									2	
3	Implement the algorithms to ascertain their working.	2	2	3	2	3							3		3	2
4	Apply important algorithmic design paradigms and methods of analysis	2	2	3	3	2									2	
5	Synthesize efficient algorithms in common engineering design situations.	2	2	3	2									3	1	2

<b>B.E (COMPUTER SCIENCE AND ENGINEERING)</b> <b>Outcome Based Education (OBE) and Choice Based Credit System (CBCS)</b> <b>SEMESTER – V</b>			
<b>Finite Automata and Formal Languages</b>			
Course Code	UCS552C	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	03	Hours	52(26L+26T)
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• To have an insight into the basic principles of computation including automata, grammars, and Turing machines</li> <li>• To develop the proficiency in theoretical foundations of Computer Science.</li> <li>• To apply the learnt concepts in Compiler Design and other System software.</li> </ul>			
<b>Unit 1 (6+6 hours)</b>			
<b>Introduction To Theory of Computation:</b> Three basic concepts; some applications.			
<b>Finite Automata:</b> Deterministic Finite Acceptors; Nondeterministic Finite Acceptors; Equivalence of deterministic and Nondeterministic Finite Acceptors; Reduction of the number of states in Finite Automata			
<b>Revised Bloom’s Taxonomy Level</b>	L1: Remembering, L2: Understanding, L3: Applying		
<b>UNITII (7+7 hours)</b>			
<b>Regular Languages and Regular Grammars:</b> Regular expressions; Connection between Regular Expression and Regular Languages; Regular Grammars.			
<b>Properties of Regular Languages:</b> Closure Properties of Regular Languages; Elementary Questions about Regular Languages; Identifying Nonregular Languages.			
<b>Revised Bloom’s Taxonomy Level</b>	L1: Remembering, L2: Understanding, L3: Applying, L4: Analyzing		
<b>UNITII (6+6 hours)</b>			
<b>Context-Free Languages:</b> Context-Free Grammars; Parsing and Ambiguity;			
<b>Simplification of Context-Free Grammars and Normal Forms:</b> Methods of Transforming Grammars; Two Important Normal Forms			
<b>Revised Bloom’s Taxonomy Level</b>	L1: Remembering, L2: Understanding, L3: Applying, L4: Analyzing		
<b>UNIT IV (7+6 hours)</b>			
<b>Pushdown Automata:</b> Nondeterministic Pushdown Automata; Pushdown Automata and Context-Free Languages; Deterministic Pushdown Automata and Deterministic Context-Free Languages			
<b>Turing Machines:</b> The Standard Turing Machine, Turing Machine with More Complex Storage: Multitape and Multidimensional Turing Machines			
<b>Revised Bloom’s Taxonomy Level</b>	L1: Remembering, L2: Understanding, L3: Applying, L4: Analyzing		
<b>Course outcomes:</b>			
At the end of the course the student will be able to:			
<ul style="list-style-type: none"> <li>• Demonstrate a fundamental knowledge of the core concepts in automata theory and formal languages.</li> <li>• Prove the properties of languages, grammars and automata with formal mathematical methods;</li> <li>• Analyze the closure properties of regular and context-free languages.</li> <li>• Design finite automata, pushdown automata, Turing machines for solving language pattern recognition</li> </ul>			

problems.

- Apply mathematical and formal techniques for solving problems in Computer Science.

SI No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>				
1	Introduction to Formal Languages and Automata	Peter Linz	Jones and Bartlett Student Edition	6 <sup>th</sup> Edition, 2016
<b>Reference Books</b>				
1	Introduction to Automata Theory, Languages, and Computation,	Hopcroft, Motwani, and Ullman	Pearson Education India	3rd Edition, 2014
2	Introduction to the Theory of Computation	Michael Sipser	Cengage Learning	3rd Edition, 2012
3	Theory of Computer Sciences	Korral	McGraw-Hill	11 <sup>th</sup> Edition, 2010
4	Automata, Computability and Complexity: Theory and Applications	E Rich	Pearson Education India	1 Edition, 2012
5	Introduction to languages and the theory of computation.	Martin, John C	McGraw-Hill	4th Edition, 2013
6	Theory of Computer Science	K L P Mishra, N Chandrasekaran	PHI Learning Pvt. Ltd.	3rd Edition, 2012
7	Elements of the Theory of Computation	H. R. Lewis, C. H. Papadimitriou	Pearson Education Asia	2nd Edition ,2001
Web links and Video Lectures: 1. <a href="http://nptel.ac.in/courses.php?disciplineID=111">http://nptel.ac.in/courses.php?disciplineID=111</a> 2. <a href="http://www.class-central.com/subject/math(MOOCs)">http://www.class-central.com/subject/math(MOOCs)</a> 3. <a href="http://academicearth.org/">http://academicearth.org/</a> 4. VTU EDUSAT PROGRAMME – 20				

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>No</b>	<b>Programme Outcomes Course Outcomes</b>														
<b>The students will be able to:</b>															
1	Demonstrate a fundamental knowledge of the core concepts in automata theory and formal languages.	2	3	3	3									3	1
2	Prove the properties of languages, grammars and automata with formal mathematical methods.	3	2	2	3										2
3	Analyze the closure properties of regular and context-free languages.	1	3	3	2	1								3	
4	Design finite automata, pushdown automata, Turing machines for solving language pattern recognition problems.	3	2	3	2	2									3
5	Apply mathematical and formal techniques for solving problems in Computer Science.	1	2	1	3	3									2

**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**  
**SEMESTER – V**

**Data Communications**

Course Code	UCS553C	CIE Marks	50
Teaching Hours/Week (L:T:P)	(4:0:0)	SEE Marks	50
Credits	04	Hours	52

**Course objectives:**

- Have insight into the fundamental concepts of Data Communication.
- Develop proficiency in Computer Networking concepts.

**UNIT I (13 hours)**

**Introduction:** Data Communications; Networks; the Internet; Protocols and Standards.

**Network Models:** Layered tasks; The OSI Model, Layers in the OSI model; TCP/IP Protocol Suite, Addressing.

**Data and Signals:** Analog and digital signals; Periodic Analog Signals, Digital Signals, Transmission impairment; Data rate limits; Performance.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**UNIT II (13 hours)**

**Digital Transmission, Analog Transmission and Multiplexing:** Digital-to-Digital conversion; Analog-to-Digital conversion: PCM; Transmission modes, Digital - to - Analog conversion; Analog - to - Analog conversion Multiplexing.  
**Transmission Media:** Guided media, unguided media: Wireless.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**UNIT III (13 hours)**

**Error Detection and Correction: Introduction** to Error Detection and Correction; Block Coding; Linear Block Codes Cyclic codes, Checksum. **Data Link Control:** Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels; HDLC; Point-to-point Protocol.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**UNIT IV (13 hours)**

**Multiple Accesses:** Random Access; Controlled Access; Channelization. Ethernet: IEEE standards; Standard Ethernet and changes in the standard; Fast Ethernet; Gigabit Ethernet. **Wireless LANs and Connection of LANs:** IEEE 802.11; Bluetooth. Connecting devices; Backbone Networks, Virtual LANs.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**Course Outcomes:**

At the end of the course the student will be able to:

- Identifying various design parameters, and their influence on node/link utilization and performance.
- Explain the concept of Data Communication and networks, layered architecture and their applications.
- Apply the concepts of Digital Transmission, Analog Transmission and Multiplexing.
- Analyze MAC layer protocols and LAN technologies
- Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.



SI No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>				
1	Data Communications and Networking.	Behrouz A. Forouzan	Tata McGraw-Hill	4 <sup>th</sup> Edition, 2017
<b>Reference Books</b>				
1	Communication Networks - Fundamental Concepts and Key	Alberto Leon-Garcia and	Tata McGraw-Hill	2 <sup>nd</sup> Edition,2004
2	Data and Computer Communication.	William Stallings	Pearson Education	8 <sup>th</sup> Edition,2007
3	Computer Networks A Systems.	Larry L.	Elsevier	4 <sup>th</sup> Edition,2007
4	Computer and Communication Networks	Nader F. Mir	Pearson Education	2 <sup>nd</sup> Edition,2007
<b>Web links and Video Lectures:</b>				
1. <a href="https://nptel.ac.in/courses/106/105/106105082/">https://nptel.ac.in/courses/106/105/106105082/</a>				
2. <a href="http://www.nptelvideos.in/2012/11/data-communication.html">http://www.nptelvideos.in/2012/11/data-communication.html</a>				
3. <a href="http://www.nptelvideos.com/course.php?id=399">http://www.nptelvideos.com/course.php?id=399</a>				

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>No</b>	<b>Programme Outcomes Course Outcomes</b>															
<b>The students will be able to:</b>																
1	Identifying various design parameters, and their influence on node/link utilization and performance	3	3	3	3	2		2					2	3	2	1
2	Explain the concept of Data Communication and networks, layered architecture and their applications.	0	3	3	3	3	1	3					2	3	2	3
3	Apply the concepts of Digital Transmission, Analog Transmission and multiplexing	1	3	3	3	1	1	2					2	3	2	3
4	Analyze MAC layer protocols and LAN technologies	1	1	3	1	1	1					1		1		
5	Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction	1	1	3	1	1	1									1

**B.E (COMPUTER SCIENCE AND ENGINEERING)**

**Web Technologies**

Course Code:	<b>UCS557C</b>	CIE Marks	50
Teaching Hours/Week (L:T:P)	<b>(2:2:0)</b>	SEE Marks	50
Credits	03	Hours	40

**Course objectives:**

This course will enable students to

- Have insight into World Wide, HTML/XHTML, Java Script, PHP.
- Have proficiency in design of web applications which will work with database.

**Unit -1 (10 Hours)**

**Fundamentals:** A Brief Introduction to the Internet, The World Wide Web, Web Browsers, Webservers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, The Hypertext Transfer Protocol, Security, The WebProgrammer's Toolbox.

**Introduction to HTML/XHTML:** Origins and Evolution of HTML and XHTML, Basic Syntax, Standard HTML DocumentStructure, Basic Text Markup, Images, Hypertext Links, Lists; Tables, Forms :The Audio Element, The Video Element, Organization Elements, The Time Element, Syntactic Differences between HTML and XHTML.

**Cascading Stylesheets:** Introduction, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property-Value Forms, Font Properties, List Properties, Alignment of Text, Color: The Box Model, Background Images, The span and divTags , Conflict Resolution.

**L<sub>1</sub> – L<sub>2</sub> – Understanding.**

**Unit II (10 Hours)**

**The Basics of JavaScript:** Overview of JavaScript, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives, Operations and Expressions, Screen Output and Keyboard Input, Control, Statements, Object Creation and Modification Arrays, Functions, An Example, Constructors, PatternMatching Using Regular Expressions, Another Example.

**JavaScript and HTML Documents:** The JavaScript Execution Environment, The Document Object Model, Element Access in JavaScript, Events and Event Handling. Handling Events from Body Elements, Handling Events from Button Elements Handling Events from Textbox and Password, Elements: The DOM 2 Event Model, The canvas Element, The navigator Object, DOM Tree Traversal and Modification.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> –Remembering, L <sub>2</sub> – <b>Understanding</b> , L <sub>3</sub> –Applying, L <sub>4</sub> -Analyzing
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**Unit III (10 Hours)**

**Dynamic Documents with JavaScript:** Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

**Angular JS :** Basics of AngularJS, Introduction to MVC architecture.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> –Remembering, L <sub>2</sub> – <b>Understanding</b> , L <sub>3</sub> –Applying , L <sub>4</sub> -Analyzing
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**Unit IV (10 Hours)**

**Introduction to XML:** Introduction, Uses of XML, The Syntax of XML, XML Document Structure, Namespaces, XML Schemas, Displaying Raw XML Documents, Displaying XML Documents with CSS, XSLT Stylesheets, XML Processors, Webservices.

**Introduction to PHP:** Origins and Uses of PHP, Overview of PHP, General Syntactic Characteristics, Primitives, Operations, and Expressions, Output, Control Statements, Arrays, Functions, Pattern Matching, Form Handling, Cookies, Session Tracking. **Database Access through the Web:** Database Access with PHP and MySQL

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> –Remembering, L <sub>2</sub> – <b>Understanding</b> , L <sub>3</sub> –Applying, L <sub>4</sub> -Analyzing
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**Course outcomes:**

At the end of the course the student will be able to:

- Explain the basics of World Wide Web.
- Implement web concepts using different tools likeHTML/XHTML/CSS/JavaScript/XML/XSLT/jQuery /AngularJS.
- Design web applications using client-side Java Scripts.
- Implement web applications using server –side PHP.
- Develop web application for real world problem

SI No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Text Book</b>				
1	Programming the World Wide Web	Robert W. Sebesta	Pearson Education	8 <sup>th</sup> Edition, 201
<b>References</b>				
1	Learning PHP, MySQL & JavaScript	Robin Nixon	O'Reilly Publications	5 <sup>th</sup> Edition, 2015
2	Internet & World Wide Web How to program	M. Deitel, P.J.Deitel, A. B. Goldberg	Pearson Education / PHI	3 <sup>rd</sup> Edition, 2004
3	Web Programming Building Internet Applications	Chris Bates	Wiley India	3rd Edition, 2006
<b>Web links and Video Lectures:</b>				
<ul style="list-style-type: none"> <li>• <a href="http://www.w3schools.com">http://www.w3schools.com</a></li> <li>• <a href="http://nptel.iitm.ac.in">http://nptel.iitm.ac.in</a>.</li> <li>• <a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133013293957857288672_sha red/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133013293957857288672_sha red/overview</a></li> </ul>				

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
<b>N</b>	<b>Programme Outcomes</b>															
<b>o</b>	<b>Course Outcomes</b>															
<b>The students will be able to:</b>																
1	Explain the basics of World Wide Web.	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
2	Implement web concepts using different tools like HTML/XHTML/CSS/JavaScript/XML/XSLT/jQuery/AngularJS	2	3	3	3	1	-	-	-	-	-	-	2	2	1	1
3	Design web applications using client-side Java Scripts.	2	3	3	2	1	1	-	1	-	-	-	3	2	2	2
4	Implement web applications using server – side PHP.	2	3	3	2	1	1	-	1	-	-	-	3	2	2	2
5	Develop web application for real world problem.	2	3	3	3	1	1	1	1	-	-	-	3	2	2	2

Python Application Programming			
Course Code	UCS065E	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Hours	40
<b>Course objectives:</b> <ul style="list-style-type: none"> <li>To acquire programming skills in core Python.</li> <li>To acquire Object Orientation Skills in Python</li> <li>To develop the skill of designing Graphical user Interfaces and networking in Python</li> <li>To develop the ability to write database applications in python</li> </ul>			
<b>Unit 1 (10 hours)</b>			
<b>Datatypes in python:</b> comments in python, Docstrings, How python sees variables, Datatypes in python, Sequences in python, Literals in python, Determining the data type of a variable, Identifiers and reserved words, Naming conventions in python <b>Operators in Python:</b> Operator, operator precedence and associativity, Mathematical functions <b>Input and Output:</b> Output statements, Input statements, Command Line arguments <b>Control Statements</b> <b>Strings and Characters</b>			
Revised Bloom's Taxonomy Level	L1- Remembering, L2- Understanding, L3-Apply, L4-Analyze		
<b>UNIT II (10 hours)</b>			
<b>Functions:</b> Defining a function, calling a function, Returning Results from a function, Returning multiple values from a function, Formal and actual arguments, local and global variables, passing a group of elements to a function, recursive functions, the special variable <code>__name__</code> <b>Lists and tuples: lists, tuple</b> <b>Dictionaries</b> <b>Exceptions:</b> exceptions, exception handling, types of exceptions, user defined exceptions <b>Files in python:</b> files, types of files in python, opening a file, closing a file, working with text files containing strings, working with binary files, pickle in python			
Bloom's Taxonomy Level	L1- Remembering, L2- Understanding, L3-Apply, L4-Analyze, L5-Evaluate		
<b>UNIT III (10 hours)</b>			
<b>Regular Expressions in python</b> <b>Object Oriented Programming:</b> Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism <b>Networking in python</b>			
Bloom's Taxonomy Level	L1- Remembering, L2- Understanding, L3-Apply, L4-Analyze, L5-Evaluate		
<b>UNIT IV (10 hours)</b>			
<b>Threads</b> <b>Graphical user Interfaces</b> <b>How to work with Database:</b> How to use SQLite Manager to work with a database, how to use python to work with database			
Bloom's Taxonomy Level	L1- Remembering, L2- Understanding, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create		

**Course Outcomes:**

At the end of the course, students are able to:

- Explain syntax and semantics of different statements and functions in Python.
- Demonstrate the use of strings, files, lists, dictionaries, and tuples in simple applications.
- Write simple applications using regular expressions, multiple threads.
- Build simple database applications with GUI.
- Analyze the given problem and select appropriate data types and modules to develop the solution.

Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>			
Core Python Programming	Dr. R.Nageswar Rao	Dreamtech press	2 <sup>nd</sup> Edition 2018
Chapter Numbers:3,4,5,6,8,9,10,11,16,17,18,21,22,23,24			
Introduction to Python Programming	Gowrishankar S. Veena A.	CRC Press Taylor & Francis Group	1 <sup>st</sup> Edition 2019
Chapter Number: <b>11</b>			
Python Programming	Michael Urban and Joel Murach	Mike Murach Elizabeth Drake	1 <sup>st</sup> Edition,2016
Chapter Number: <b>17</b>			
<b>Reference Books</b>			
Learning Python		Cyberplus Publication	1 edition 17 May 2017
Core Python Applications Programming	Wesley J. Chun	Pearson Education India,	Third Edition, 2015.
Python Programming for the Absolute Beginner	Michael Dawson	Delmar Cengage Learning	3rd edition (1 January 2010)
Python Programming using problem solving approach	Reema Thareja	Oxford university press,	1 <sup>st</sup> Edition 2017
Python for Everybody: Exploring Data Using Python 3	Charles R. Severance	CreateSpace Independent Publishing Platform	1st Edition, 2016.
Web links and Video Lecture:			
1. <a href="http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf">http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf</a>			
2. <a href="https://www.python.org/">https://www.python.org/</a>			
3. <a href="https://www.pdfdrive.com/introduction-to-python-programming-d176341873.html">https://www.pdfdrive.com/introduction-to-python-programming-d176341873.html</a>			
4. <a href="https://www.pdfdrive.com/python-programming-for-the-absolute-beginner-e34494394.html">https://www.pdfdrive.com/python-programming-for-the-absolute-beginner-e34494394.html</a>			
5. <a href="https://edubookpdf.com/programming/murachs-python-programming.html">https://edubookpdf.com/programming/murachs-python-programming.html</a>			

- 6. <https://www.youtube.com/watch?v=rfscVS0vtbw>
- 7. <https://www.youtube.com/watch?v=vaysJAMDaZw>
- 8. <https://www.youtube.com/playlist?list=PLS1QuIW01RIaJECMeUT4LFwJ-ghgoSH6n>
- 9. [https://www.youtube.com/playlist?list=PL6gx4CwI9DGAcbMi1sH6oAMk4JHw91mC\\_](https://www.youtube.com/playlist?list=PL6gx4CwI9DGAcbMi1sH6oAMk4JHw91mC_)
- 10. <https://www.youtube.com/playlist?list=PLTTTcaxrixZSh3TyvoEoTTbEHyS4c6Su7>

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>No</b>	<b>Programme Outcomes</b>														
	<b>Course Outcomes</b>														
<b>The students will be able to:</b>															
1	Explain syntax and semantics of Python programming structure	1	2	2		1								2	
2	Demonstrate the use of strings, files, lists, dictionaries and tuples in simple applications	2	3	3		1								3	1
3	Write simple applications using regular expressions, multiple threads	3	3	3		1								3	1
4	Build database applications with GUI	3	3	3		1								3	1
5	Analyze the given problem and select appropriate data types and modules to develop the solution.	2	3	1		1								3	1

B.E (SCIENCE AND COMPUTER ENGINEERING)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
OPEN ELECTIVE			
Python Application Programming			
Course Code	UCS659N	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Hours	40
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• Have insight into programming skills in python</li> <li>• Have profiecence in designing simple python applications</li> </ul>			
<b>UNIT 1 (10 hours)</b>			
<p><b>Datatypes in python:</b> Comments in python, How python sees variables, Datatypes in python, bool Datatype, Literals in python, Determining the data type of a variable, Identifiers and reserved words, Naming conventions in python</p> <p><b>Operators in Python:</b> Operator, operator precedence and associativity, Mathematical functions</p> <p><b>Input and Output:</b> Output statements, Input statements</p> <p><b>Control Statements:</b> Control statements</p>			
Revised Bloom's Taxonomy Level	L1- Remembering, L2- Understanding,L3-Apply, L4-Analyze		
<b>UNIT II (10 hours)</b>			
<p><b>Strings and Characters:</b></p> <p><b>Lists and tuples:</b> lists,tuple</p> <p><b>Dictionaries :</b>Operations on dictionaries, dictionary methods, using for loop with dictionaries, converting lists into dictionary, converting strings into dictionary, ordered dictionaries</p>			
Revised Bloom's Taxonomy Level	L1- Remembering, L2- Understanding,L3-Apply, L4-Analyze, L5-Evaluate		
<b>UNIT III (10 hours)</b>			
<p><b>Functions:</b> Defining a function, calling a function, Returning Results from a function, Returning multiple values from a function, Formal and actual arguments, local and global variables, passing a group of elements to a function, recursive functions ,the special variable <code>__name__</code></p> <p><b>Files in python:</b> files, types of files in python, opening a file, closing a file, working with text files containing strings, working with binary files</p> <p><b>Regular Expressions in python:</b> Regular expressions, using regular expressions on files</p>			
Revised Bloom's Taxonomy Level	L1-Remembering, L2- Understanding,L3-Apply, L4-Analyze, L5-Evaluate		
<b>UNIT IV (10 hours)</b>			
<p><b>Graphical user Interfaces:</b> GUI in python, the root window, working with container, canvas, frame, widgets</p> <p><b>Graphics The Pizza Panic Game:</b> Introducing the pizza panic game, Introducing pygame and livewires packages, Creating graphics window, setting background image, setting background image, understanding the graphics coordinate system, displaying sprite, displaying sprite, displaying text, displaying message, moving sprites, dealing with screen boundaries, handling mouse input, detecting collisions, back to the pizza panic game</p>			
Revised Bloom's Taxonomy Level	L1- Remembering, L2- Understanding,L3-Apply, L4- Analyze, L5-Evaluate,L6-Create		



**Course Outcomes:**

At the end of the course, students are able to:

- Explain syntax and semantics of Python programming structure
- Demonstrate the use of strings, files, lists, dictionaries, set and tuples in simple applications.
- Write simple applications using regular expressions ,files, dictionaries etc.
- Build applications with GUI and simple games
- Analyze the given problem and select appropriate data types and modules to develop the solution.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>				
1	Core Python Programming	Dr. R.Nageswawa Rao	Dreamtech press	2 <sup>nd</sup> Edition 2018
Chapter Numbers:3,4,5,6,8,9,10,11,17,18,22				
2	Python Programming for the Absolute Beginner	Michael Dawson	Course Technology, a part of Cengage Learning	3 <sup>rd</sup> Edition,2010
Chapter Number:11				
<b>Reference Books</b>				
1.	Learning Python		Cyberplus Publication	1 edition 17 May 2017
2.	Core Python Applications Programming	Wesley J. Chun	Pearson Education India,	Third Edition, 2015.
3.	Introduction to Python Programming	Gowrishankar S. Veena A.	CRC Press Taylor & Francis Group	1 <sup>st</sup> Edition 2019
4.	Python Programming using problem solving approach	Reema Thareja	Oxford university press,	1 <sup>st</sup> Edition 2017
5.	Python for Everybody: Exploring Data Using Python 3	Charles R. Severance	CreateSpace Independent Publishing Platform	1st Edition, 2016.
6.	Python Programming	Michael Urban and Joel Murach	Mike Murach Elizabeth Drake	1 <sup>st</sup> Edition,2016

Web links and Video Lecture:

- [http://do1.drchuck.com/pythonlearn/EN\\_us/pythonlearn.pdf](http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf)
- <https://www.python.org/>
- <https://www.pdfdrive.com/introduction-to-python-programming-d176341873.html>
- <https://www.pdfdrive.com/python-programming-for-the-absolute-beginner-e34494394.html>
- <https://edubookpdf.com/programming/murachs-python-programming.html>
- <https://www.youtube.com/watch?v=rfscVS0vtbw>
- <https://www.youtube.com/watch?v=vaysJAMDaZw>

- <https://www.youtube.com/playlist?list=PLS1QuIWo1RlaJECMeUT4LFwJ-ghgoSH6n>
- [https://www.youtube.com/playlist?list=PL6gx4CwI9DGAcbMi1sH6oAMk4JHw91mC\\_](https://www.youtube.com/playlist?list=PL6gx4CwI9DGAcbMi1sH6oAMk4JHw91mC_)
- <https://www.youtube.com/playlist?list=PLTTTcaxrixZSh3TyvoEoTTbEHyS4c6Su7>

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>No Course Outcomes</b>	<b>Programme Outcomes</b>															
	<b>The students will be able to:</b>															
1	Explain syntax and semantics of Python programming structure	1	2	2		1								2		
2	Demonstrate the use of strings, files, lists, dictionaries and tuples in simple applications	2	3	3		1								3	1	1
3	Write simple applications using regular expressions, files, dictionaries etc.	3	3	3		1								3	1	1
4	Build applications with GUI and simple games	3	3	3		1								3	1	3
5	Analyze the given problem and select appropriate data types and modules to develop the solution.	2	3	1		1								3	1	1

<b>ARTIFICIAL INTELLIGENCE AND ROBOTICS</b>			
Course Code	UCS632N	CIE Marks	50
Teaching Hours / Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Hours	40
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>To have insight into the fundamentals of Artificial Intelligence (AI) and Robotics that includes the various peculiar search strategies for AI, Programming the Robots and Controlling Autonomous Robots etc.</li> <li>To have proficiency in developing the techniques to solve real world problems unconventionally with optimality.</li> </ul>			
<b>UNIT - I (10 hours)</b>			
<p><b>1. Introduction to AI:</b> The AI Problems, Underlying assumptions, AI technique, Level of the model, Criteria for success (1.1 to 1.5 from Rich and Knight)</p> <p><b>2. Problems:</b> Problem spaces and search Problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search problems, additional problems (2.1 to 2.6 from Rich and Knight)</p>			
<b>Revised Bloom's Taxonomy Level</b>	<i>L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding</i>		
<b>UNIT- II (10 hours)</b>			
<p><b>3. Search and control Strategies:</b> Introduction, Generate and Test, Hill Climbing, Simulated annealing (3.1, 3.2 from Rich and Knight)</p> <p><b>4. Expert systems Architectures :</b> Introduction, Rule-Based System Architectures, Nonproduction System Architectures, Dealing with Uncertainty, Knowledge Acquisition and Validation (15.1 to 15.6 from Dan W. Patterson)</p>			
<b>Revised Bloom's Taxonomy Level</b>	<i>L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding, L<sub>3</sub> – Applying, L<sub>4</sub> – Analysing</i>		
<b>UNIT- III (10 hours)</b>			
<p><b>5. Introduction to Robotics:</b> The Seven Criteria of Defining a Robot, Robot Categories, Sensors, Actuators, End Effectors, Controllers, Scenario, Giving the robot instructions. (Chapter 1 from Cameron Hughes)</p> <p><b>6. Robot Vocabularies and RSVP:</b> Additional Effort, Actions, The Autonomous Robot's ROLL Model, RSVP (Robot Scenario Visual Planning): Mapping the Scenario, Pseudocode and Flowcharting RSVP. (Chapter 2 and 3 from Cameron Hughes)</p>			
<b>Revised Bloom's Taxonomy Level</b>	<i>L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding, L<sub>3</sub> – Applying</i>		
<b>UNIT- IV (10 hours)</b>			
<p><b>7. Actual Capabilities of Robot:</b> The Reality Check for the Microcontroller, Sensor Reality Check, Determine Your Robot's Sensor, Limitations, Actuators End-Effectors Reality Check. (Chapter 4 from Cameron Hughes)</p> <p><b>8. Sensors:</b> Types of Sensors, Sensor Interfacing with Microcontrollers, Attributes of Sensors, Sensor Calibration. (Chapter 5 from Cameron Hughes)</p>			
<b>Revised Bloom's Taxonomy Level</b>	<i>L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding, L<sub>3</sub> – Applying, L<sub>4</sub> – Analysing, L<sub>5</sub> – Evaluating,</i>		

<b>Course outcomes:</b>				
At the end of the course the student will be able to:				
CO1: Explain the fundamentals of artificial intelligence, robotics and expert systems.				
CO2: Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.				
CO3: Apply the suitable algorithms to solve AI problems				
CO4: Solve problem using problem decomposition and planning				
CO5: Design smart system using different informed search / uninformed search or heuristic approaches				
<b>SI No</b>				
<b>Title of the Book</b>				
<b>Name of the Author/s</b>				
<b>Name of the Publisher</b>				
<b>Edition and Year</b>				
<b>Textbook</b>				
1	Artificial Intelligence	Elaine Rich, Kevin Knight and Shivashankar B. Nair	TMH Education (P) Ltd., New Delhi	3 <sup>rd</sup> Edition, 2010
2	Introduction to Artificial Intelligence and Expert Systems	Dan W. Patterson	Prentice Hall of India, Private Ltd., New Delhi	1 <sup>st</sup> Edition, 2015
3	Robot Programming: A Guide to Controlling Autonomous Robots	Cameron Hughes Tracey Hughes	Pearson Education	1 <sup>st</sup> Edition, 2016
<b>Reference Books</b>				
1	Artificial Intelligence: A modern approach	Stuart Russell and Peter Norvig	Pearson Education, India	3 <sup>rd</sup> Edition, 2016
2	Artificial Intelligence	Saroj Kaushik	Cengage Learning India	1 <sup>st</sup> Edition, 2011
3	Introduction to AI Robotics	Robin R. Murphy	MIT Press	1 <sup>st</sup> Edition, 2000
4	Introduction to Robotics	Saha S. K.	TMH Publications	1 <sup>st</sup> Edition, 2008
<b>Web links and Video Lectures:</b>				
1. <a href="https://nptel.ac.in/courses/106105077">https://nptel.ac.in/courses/106105077</a>				
2. <a href="https://nptel.ac.in/courses/106106126">https://nptel.ac.in/courses/106106126</a>				
3. <a href="https://aima.cs.berkeley.edu">https://aima.cs.berkeley.edu</a>				
4. <a href="https://ai.berkeley.edu/project_overview.html">https://ai.berkeley.edu/project_overview.html</a> (for Practical's)				

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	2	-	1	-	-	-	-	-	-	-
CO2	-	2	-	1	-	-	-	-	-	-	-	-
CO3	1	2	3	2	-	-	-	-	-	-	-	2
CO4	3	3		2	3	-	-	-	-	-	-	2
CO5	3	3	3	3	2	-	-	-	-	-	-	3

**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**  
**SEMESTER – V**

**Operating System Laboratory**

<b>Course Code</b>	<b>UCS555L</b>	<b>CIE Marks</b>	<b>50</b>
<b>Teaching Hours/Week (L:T:P)</b>	<b>0:0:2</b>	<b>SEE Marks</b>	<b>50</b>
<b>Credits</b>	<b>01</b>	<b>Exam Hours</b>	<b>03</b>

**Course objectives:**

- To have insights into design and implementation of resource management policies of operating systems.
- To have proficiency in concurrent programming.

**Assignment list**

1. Implementation of scheduling policies

2. Implementation of memory allocation techniques.

3. Developing solutions for deadlock problems.

4. Implementation of page replacement policies.

5. Developing concurrent applications using processes (Petersons algorithm).

6. Demonstration of synchronization using semaphores.

7. Implementation of Unix like shell commands.

8. Developing concurrent applications using Threads.

**Course Outcomes:**

At the end of the course the student should be able

- Simulate and demonstrate different functionalities of operating system
- Implement Unix like Shell commands.
- Develop simple applications using concurrent programming.

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

Sl.No	Program Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	Course out comes															
1	Simulate and demonstrate different functionalities of operating system	2	2	2										3		3
2	Implement Unix like Shell commands.	2	2	2										3		3
3	Develop simple applications using concurrent programming	2	3	3		1								3	1	3

B.E (Computer Science and Engineering)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER -V			
Web Programming Lab			
Course Code	UCS558L	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03
<p><b>Course Objectives:</b> At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>• Create Static web pages</li> <li>• Validate the fields of HTML elements using Java Script and Angular JS</li> <li>• Learn database connectivity to database applications</li> </ul>			
QNO.	Assignment list		
1	<p>Design the following static web pages required for online book store.</p> <ol style="list-style-type: none"> <li><b>1. Home page:</b> -the static home page must contain three pages</li> <li><b>2. Top frame:</b> -logo and college name and links to homepage, login page, registration Page,catalogue page and cart page</li> <li><b>3. Left frame:</b> -at least four links for navigation which will display the catalogue ofRespective links</li> <li><b>4. Right frame:</b> -the pages to links in the left frame must be loaded here initially it Containsthe description of the website</li> </ol>		
2	<p>Design the following static web pages required for online book store.</p> <ol style="list-style-type: none"> <li><b>1. Home page:</b> - the static home page must contain three pages</li> <li><b>2. Top frame:</b> - logo and college name and links to homepage, login page, registration Page, catalogue page and cart page</li> <li><b>3. Left frame:</b> - at least four links for navigation which will display the catalogue of Respective links</li> </ol>		

	<p><b>4. Right frame:</b> - the pages to links in the left frame must be loaded here initially it Contains the description of the website</p> <p><b>5. Registration page</b> and</p> <p><b>6. Cart page</b></p>
3	<p>Write a java script to validate the following fields in a registration page</p> <ol style="list-style-type: none"> <li><b>Name</b> (should contains alphabets and the length should not be less than 6 characters)</li> <li><b>Password</b> (should not be less than 6 characters)</li> <li><b>E-mail</b> (should not contain invalid addresses)</li> </ol>
4	<p>Design a web page using CSS which includes the following:</p> <ol style="list-style-type: none"> <li>Use different font styles</li> <li>Set background image for both the page and single elements on page.</li> <li>Control the repetition of image with background-repeat property</li> <li>Define style for links as a: link, a:active, a:hover, a:visited</li> <li>Add customized cursors for links.</li> <li>Work with layers.</li> </ol>
5	<p>Write an XML file which displays the book details that includes the following:</p> <ol style="list-style-type: none"> <li>Title of book</li> <li>Author name</li> <li>Edition</li> <li>Price</li> </ol> <p>Write a DTD to validate the above XML file and display the details in a table (to do this use XSL).</p>
6	<p>Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click. The color should also be changed if we change the color in the "property window".</p>
7	<p>Programs on Angular JavaScript</p>
8	<p><b>User Authentication</b></p> <p>Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.</p> <ol style="list-style-type: none"> <li>Create a Cookie and add these four user ID's and passwords to this Cookie.</li> <li>Read the user id and passwords entered in the Login form (week1) and authenticate with</li> </ol>



	<p>the values (user id and passwords) available in the cookies.</p> <p>If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display “You are not an authenticated user”</p>
9	<p>Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form). Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.</p>
10	<p>Write a PHP which does the following job: Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user’s name and password from the database (similar to week8 instead of cookies).</p>
11	<p>Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Modify your catalogue page (week 2) in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP</p>
12	<p>Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Modify your catalogue page (week 2) in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP</p>
<p><b>Course Outcomes:</b></p> <p>At the end of the course the student should be able</p> <ul style="list-style-type: none"> <li>• Create and manage static web pages for given scenario</li> <li>• Design web applications using client-side Java Scripts</li> <li>• Write XML/XSLT and jQuery programs</li> <li>• Implement web applications using server –side PHP programming and database connectivity</li> <li>• Develop web applications with sessions</li> </ul>	

	<p><b>Text Books</b></p> <p>1. "Programming the World Wide Web", Robert W. Sebesta, Pearson Education 8th Edition, 2014</p> <p><b>Reference Books</b></p> <p>1. "Learning PHP, MySQL &amp; JavaScript", Robin Nixon. May 2018, 5<sup>th</sup> edition, O'Reilly Media, Inc. ISBN:9781491978917</p>
	<p><b>Web Links</b></p>
	<ul style="list-style-type: none"> <li>• <a href="https://www.w3schools.com">https://www.w3schools.com</a></li> <li>• <a href="https://infyspringboard.onwingspan.com">https://infyspringboard.onwingspan.com</a></li> <li>• <a href="http://lms.vtu.ac.in/moodle">http://lms.vtu.ac.in/moodle</a></li> </ul>

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

Programme Outcomes Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>The students will be able to:</b>															
Create Static web pages.	1	2	3	3	2	1	-	1	-	-	-	3	1	2	1
Validate the fields of HTML elements using Java Script and Angular JS	2	3	3	3	1	-	-	-	-	-	-	-	2	3	2
Learn database connectivity to database applications.	1	2	3	3	3	-	-	-	-	-	-	-	2	3	3

**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**  
**SEMESTER – V**

**Advanced Quantitative Aptitude And Soft Skills**

Course Code:	<b>UHS002N</b>	CIE Marks	50
Teaching Hours/Week (L:T:P)	<b>(0:2:0)</b>	SEE Marks	50
Credits	01	Hours	40

**Course objectives:**

This course will enable students to

- To develop and augment the written communication skills
- To develop a deep sense of analysis towards solving a problem
- To fine-tune the quantitative, data analysis and interpretation skills

**Unit -1 (4 Hours)**

**Mathematical Ability:** Averages, Percentages, Profit Loss, Interest, Time & Work

**Revised Bloom's Taxonomy Level**      L<sub>1</sub> – Remembering L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying, L<sub>4</sub>-Analysing

**Unit II (4 Hours)**

**Analytical Ability:** Analytical Puzzles, Data Analysis, Para-jumbles and miscellaneous questions

**Revised Bloom's Taxonomy Level**      L<sub>1</sub> – Remembering L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying, L<sub>4</sub>-Analysing

**Unit III (4 Hours)**

**Group Discussions & Written Communication:** Zero GD, Parameters of Evaluation, Introduction and Conclusion, Mock GDs, Introduction to Business Communication

**Revised Bloom's Taxonomy Level**      L<sub>1</sub> – Remembering L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying, L<sub>4</sub>-Analysing

**Unit IV (3 Hours)**

**Written English:** Error Detection & Correction, Letter/Email Writing

**Revised Bloom's Taxonomy Level**      L<sub>1</sub> – Remembering L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying, L<sub>4</sub>-Analysing

**Course Outcomes:**

- learnt the role of verbal and non-verbal communication and enhanced his/her ability to speak in public or to an audience
- learnt the techniques to augment his/her verbal ability
- enhanced his/her written communication and learnt techniques to augment them further
- understood analysis of the given problem and learnt to develop a method for solving it
- enhanced and augmented his/her ability to work with quantitative aptitude

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

Sl. No	Course Outcomes	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
		1	2	3	4	5	6	7	8	9	10	11	12	O1	O2	O3
<b>The students will be able to:</b>																
1	learnt the role of verbal and non-verbal communication and enhanced his/her ability to speak in public or to an audience											3	2			
2	learnt the techniques to augment his/her verbal ability											3	2			
3	enhanced his/her written communication and learnt techniques to augment them further											3	1			
4	understood analysis of the given problem and learnt to develop a method for solving it		3										2			
5	enhanced and augmented his/her ability to work with quantitative aptitude		3										2			

**VI Semester  
Scheme and Syllabus**

Sl. No	Subject Code	Subjects	Hrs/Week			C	CIE	SEE	Total
			L	T	P				
1.	UCS651C	Computer Networks	2	2	0	3	50	50	100
2.	UCS655C	Compiler Design	2	2	0	3	50	50	100
3.	UCS653C	Software Engineering	2	2	0	3	50	50	100
4.	<b>UCS072E</b>	Elective II User Interface Design	3	0	0	3	50	50	100
5.	UCS634N	Open Elective II Internet Of Things and Applications	3	0	0	3	50	50	100
6.	UCS657H	Management and Entrepreneurship	1	2	0	2	50	50	100
7.	UCS658L	Computer Networks Lab	0	0	2	1	50	50	100
8.	UHS003N	Career planning and Professional Skills	0	2	0	1	50	50	100
9.	UCS659P	Mini Project	0	0	4	2	50	50	100
			13	10	6	21	450	450	900

<b>B.E (COMPUTER SCIENCE AND ENGINEERING)</b>			
<b>Outcome Based Education (OBE) and Choice Based Credit System (CBCS)</b>			
<b>SEMESTER – VI</b>			
<b>COMPUTER NETWORKS</b>			
Course Code	UCS651C	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	03	Hours	48
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>• Have insight into the basic taxonomy and terminology of the computer networking area.</li> <li>• Develop proficiency in specific areas of networking such as the design and maintenance of individual networks.</li> </ul>			
<b>Unit 1 (10 hours)</b>			
<b>Network Layer:</b> IPv4 Addresses, IPv6 Addresses. Internetworking, Packet format of IPv4 and IPv6, Transition from IPv4 to IPv6. Address Mapping, ICMP, Delivery, Forwarding, Unicast Routing Protocols.			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> :Understanding, L <sub>3</sub> ,:Applying, L <sub>4</sub> : Analyzing		
<b>UNIT II (10 hours)</b>			
<b>Transport Layer:</b> Process-to-Process Delivery, UDP, TCP, and SCTP. Data traffic, Congestion, Congestion Control, Two Examples, Quality of Service, Techniques to improve QoS, QoS in Switched Networks.			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> ,:Applying, L <sub>4</sub> : Analyzing		
<b>UNIT- III (10 hours)</b>			
<b>Application Layer:</b> Name Space, Domain Name Space, Distribution of Name Space, DNS In The Internet, Resolution. DNS Messages. Remote Logging, Electronic Mail, File Transfer. Architecture of WWW, Web Documents, HTTP.			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> ,:Applying, L <sub>4</sub> : Analyzing		
<b>UNIT IV (10 hours)</b>			
<b>Network Management and Security:</b> Network Management System. Digitizing Audio and Video, Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Introduction to Cryptography, Symmetric-Key Cryptography, Asymmetric-key Cryptography.			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> ,:Applying, L <sub>4</sub> : Analyzing		
<b>Course Outcomes</b>			

At the end of the course the student will be able to:

- Explain the fundamental concepts of Computer Networks.
- Analyze different network protocols.
- Apply techniques for efficient handling of Computer Networks
- Formulate Routing and Congestion Control Algorithms.
- Implement Application Layer and Network Security protocols

SI No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>				
1	Data Communications and Networking.	Behrouz A. Forouzan	Tata McGraw-Hill	4 <sup>th</sup> Edition, 2017
<b>Reference Books</b>				
1	Computer Networking-A top-down approach featuring the	James F. Kurose, Keith W. Ross	Pearson Education	3 <sup>rd</sup> Edition, 2018
2	Data and Computer Communication	William Stallings	Pearson Education	8 <sup>th</sup> Edition, 2016
3	Computer Networks A Systems Approach	Larry L. Peterson and Bruce S. David	Elsevier	4 <sup>th</sup> Edition, 2017
4	Communication Networks	Garcia Leon And Widjaja	Tata Mcgraw-Hill,.	15 <sup>th</sup> Edition, 2019
<b>Web links and Video Lectures:</b>				
1. <a href="http://nptel.vtu.ac.in/econtent/CSE.php">http://nptel.vtu.ac.in/econtent/CSE.php</a> 2. <a href="https://nptel.ac.in/courses/106/105/106105081/">https://nptel.ac.in/courses/106/105/106105081/</a> 3. <a href="https://nptel.ac.in/courses/106/106/106106091/">https://nptel.ac.in/courses/106/106/106106091/</a> 4. <a href="http://nptel.vtu.ac.in/econtent/courses/CSE/CS64/index.php">http://nptel.vtu.ac.in/econtent/courses/CSE/CS64/index.php</a> .				

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
No	<del>Programme Outcomes</del> Course Outcomes															
<b>The students will be able to:</b>																
1	Explain the fundamental concepts of Computer Networks.	1	2											1		
2	Analyze flow control, congestion control and QoS of the network for reliable data transfer.	1	3	1	2	1								3		
3	Apply techniques for efficient handling of Computer Networks.	2	2	3	1			1	2					1	2	3
4	Analyze the functions of network layer and transport layer in networking.	1	3	1	3	1								3		
5	Describe Application Layer and Network Security protocols.	1	2	3	2		3	1	1					1	2	2



**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System**  
**(CBCS) SEMESTER – VI**

**Software Engineering**

Course Code	<b>UCS653C</b>	CIE Marks	50
Teaching Hours /Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	03	Hours	52

**Course objectives:**

- To have insight in the core principles and practices of software engineering for systematic development of non-trivial software systems.
- To have proficiency in the design, development, validation, testing and managing of the software systems for its overall efficiency.

**UNIT I (13 hours)**

**Overview:** Introduction: FAQ's about software engineering, Professional and ethical responsibility. **Socio-Technical systems:** Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

**Critical Systems, Software Processes:** **Critical Systems:** A simple safety-critical system; System dependability; Availability and reliability. **Software Processes:** Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering.

**Revised Bloom's Taxonomy Level**     *L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding, L<sub>4</sub> – Analysing*

**UNIT II (13 hours)**

**Requirements:** Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; The software requirements document. **Requirements Engineering Processes:** Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

**System Models:** System Models: Context models; Behavioral models; Data models; Object models; Structured methods. **Software Design:** Architectural Design, System organization; Modular decomposition styles; Control styles.

**Revised Bloom's Taxonomy Level**     *L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding, L<sub>3</sub> – Applying, L<sub>4</sub> – Analysing*

**UNIT III (13 hours)**

**OBJECT-ORIENTED DESIGN:** An Object-Oriented design process; Design evolution, **Development:** Rapid Software Development: Agile methods; Extreme programming; Rapid application development.

**Software Evolution:** Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution. **Verification And Validation:** Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.

**Revised Bloom's Taxonomy Level**     *L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding, L<sub>3</sub> – Applying, L<sub>4</sub> – Analysing*

**UNIT IV (13 hours)**

**Software Testing:** System testing; Component testing; Test case design; Test automation. **Project Management:** Project Management: Management activities; Project planning; Project scheduling; Risk management. **Managing People:** Managing groups; The People Capability Maturity Model; **Software Cost Estimation:** Productivity. **Designing And Documenting Software Architecture:** Architecture in the life cycle; designing the architecture; Forming the team structure; Creating a skeletal system.

<b>Revised Bloom's Taxonomy Level</b>	<b>L<sub>1</sub> – Remembering, L<sub>2</sub> – Understanding, L<sub>3</sub> – Applying, L<sub>4</sub> – Analysing</b>			
Course Outcomes:				
At the end of the course the student should be able to:				
<ul style="list-style-type: none"> <li>• Explain the existing concepts, models and techniques used in the software development.</li> <li>• Write software requirement specification based on the formal specifications for software systems.</li> <li>• Design and develop different components of the software product using standard models.</li> <li>• Verify and validate the individual components and the whole software product using different testing tools.</li> <li>• Demonstrate the management of people, project and software quality during the software development.</li> </ul>				
<hr/>				
<b>Sl No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
<b>Textbooks</b>				
1	Software Engineering	Ian Somerville	Pearson Education	8 <sup>th</sup> Edition, 2007
2	Software Architecture in Practice	Len Bass, Paul Clements, Rick Kazman	Pearson Education	2 <sup>nd</sup> Edition, 2003
<b>Reference Books</b>				
1	Software Engineering: A Practitioners Approach	Roger S. Pressman	McGraw-Hill	6 <sup>th</sup> /7 <sup>th</sup> Edition, 2007
2	Software Engineering Theory and Practice	Shari Lawrence Pfleeger, Joanne M. Atlee	Pearson Education	3 <sup>rd</sup> Edition, 2006
3	Software Engineering Principles and Practice	Waman S Jawadekar	Tata McGraw-Hill	1 <sup>st</sup> Edition, 2004
4	Software Engineering	Ian Somerville	Pearson Education	10 <sup>th</sup> Edition, 2018
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<b>Web links and Video Lectures:</b>				
5. <a href="http://nptel.ac.in/courses/106/101/106101061/">http://nptel.ac.in/courses/106/101/106101061/</a>				
6. <a href="http://nptel.ac.in/courses/106/105/106105087/">http://nptel.ac.in/courses/106/105/106105087/</a>				
7. <a href="http://nptel.ac.in/courses/106/105/106105182/">http://nptel.ac.in/courses/106/105/106105182/</a>				
8. <a href="http://uml.org">http://uml.org</a>				
9. VTU EDUSAT PROGRAMME				
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**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
<b>No</b>	<b>Programme Outcomes Course Outcomes</b>															
<b>The students will be able to:</b>																
1	Explain the existing concepts, models and techniques used in the software development.		2	1	2				1			3		1	3	2
2	Write software requirement specification based on the formal specifications for software systems.		3	2	2				1			3		1	3	2
3	Design and develop different components of the software product using standard models		3	3	2				1			3		1	3	2
4	Verify and validate the individual components and the whole software product using different testing tools		1	2	2				1			3		1	3	2
5	Demonstrate the management of people, project, and software quality during the software development		2	2	2				1			3		1	3	2

**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**  
**SEMESTER – VI**

**Management And Entrepreneurship**

Course Code	<b>UCS657H</b>	CIE Marks	50
Teaching Hours /Week (L:T:P)	(1:2:0)	SEE Marks	50
Credits	02	Hours	32

**Course objectives:**

- To have insight into the fundamentals of management and entrepreneurship that includes the different types, roles and functions played by the managers / entrepreneurs at different levels etc.
- To have proficiency in managing the activities effectively and efficiently and to be a successful entrepreneur.

**UNIT I (8 hours)**

**Nature and Functions of Management:** Importance, Definition, Functions and Levels of Management, Roles of a manager, Managerial Skills, Management & Administration, Management - a science or an art or a profession.

**Development of Management Thought:** Early Management Approaches- Scientific, Administrative, and Bureaucracy. Modern Approaches - Quantitative, Systems and Contingency Approaches.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> :Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**UNIT II (8 hours)**

**Planning:** Nature, Importance, Forms, Steps in planning, Limitations of planning, Making planning effective.

**Decision Making:** Meaning, Types, Steps in Rational Decision Making, Environments of Decision making, Common Difficulties in Decision making.

**Organization:** Meaning, Process of Organizing, Span of Management, Principles of Organizing, Organization Structure, Committees, Teams.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> :Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**UNIT III (8 hours)**

**Coordination:** Distinction between coordination and cooperation, Need for coordination, Requisites for excellent coordination, Types, Techniques, Difficulty of coordination.

**Staffing:** Importance and Need for Proper Staffing, Manpower Planning, Recruitment, Selection, Placement.

**Direction and Supervision:** Requirements of effective direction, Giving orders, Motivation: Meaning and Nature of Motivation.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> :Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**UNIT IV (8 hours)**

**Entrepreneurship:** Introduction, Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneur, Entrepreneurship, Role of Entrepreneurs in Economic Development, Entrepreneurship in India, Barriers of Entrepreneurship.

**Preparation Of Project:** Meaning of Project, Project Identification, Project Selection, Project Report: Need, Significance and Contents, Project Formulation, Project Appraisal, Identification of Business Opportunities, Feasibility Studies: Technical, Financial, Market and Social.

<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> : Remembering, L <sub>2</sub> : Understanding, L <sub>3</sub> :Applying, L <sub>4</sub> : Analyzing
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**Course outcomes:**

At the end of the course the student will be able to:

- Understand the nature and functions of management managerial skills.
- Analyze effective planning and decision making knowledge to diagnose and to build effective organizational groups/teams.
- Understand the complexities associated with management of human resources in the organizations and motivate to carry out assigned tasks.
- Understand the fundamentals of entrepreneurship and its development process.
- Apply the knowledge of project preparation and feasibility studies to create new projects.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>				
1.	Principles of Management	P. C. Tripathi, P.N. Reddy	Tata McGraw Hill	4 <sup>th</sup> Edition, 2012
2.	Management & Entrepreneurship	N. V. R Naidu & T. Krisna Rao	Wiley	1 <sup>st</sup> Edition, 2019
<b>Reference Books</b>				
1.	Management Fundamentals -Concepts, Application, Skill Development	Robert Lusier	Thomson/South- Western	5 <sup>th</sup> Edition, 2012
2.	Entrepreneurship Development	S. S. Khanka	S. Chand & Co. New Delhi.	1 <sup>st</sup> Revised Edition, 1999
3.	Management	Stephen Robbins	Pearson Education/PHI	17 <sup>th</sup> Edition, 2003
4.	Dynamics of Entrepreneurial Development & Management	Vasant Desai	Himalaya Publishing House	4 <sup>th</sup> Edition, 2001

**Web links and Video Lectures:**

- <https://nptel.ac.in/courses/110/106/110106145/>
- <https://nptel.ac.in/courses/110/105/110105146/>
- <https://nptel.ac.in/courses/110/105/110105147/>
- <https://nptel.ac.in/courses/110/106/110106141/>
- <https://nptel.ac.in/courses/110/106/110106134/>

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>No</b>	<b>Programme Outcomes Course Outcomes</b>															
<b>The students will be able to:</b>																
1	Understand the nature and functions of management managerial skills.						3	2				2	2	3		
2	Analyze effective planning and decision-making knowledge to build effective organizational groups/teams.							2		2		3	1	2		
3	Understand the complexities associated with management of human resources in the organizations and motivate to carry out assigned tasks.									1	3	3	2	2		
4	Understand the fundamentals of entrepreneurship and its development process.		2	2			3						3	1		
5	Apply the knowledge of project preparation and feasibility studies to create new projects.			2	2							1	2	1		

<b>B.E (COMPUTER SCIENCE AND ENGINEERING)</b> <b>Outcome Based Education (OBE) and Choice Based Credit System (CBCS)</b> <b>SEMESTER – VI</b>			
<b>Compiler Design</b>			
Course Code:	UCS655C	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	03	Hours	48
<b>Course objectives:</b> <ul style="list-style-type: none"> <li>To understand the basic principles of compiler design, its various constituent parts, algorithms and data structures required to be used in the compiler.</li> <li>To provide the skills needed for building compilers for various situations that one may encounter in a career in Computer Science.</li> </ul>			
<b>Unit 1 (6 hours of Lecture + 6 hours of Tutorial)</b>			
<b>Introduction, lexical analysis:</b> Language processors; The structure of a Compiler; Grouping of Phases into Passes, Compiler Construction Tools, Applications of Compiler Technology  <b>Lexical analysis:</b> The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens. Lexical Analyzer generator  <b>Syntax analysis – 1:</b> Introduction; Context-free Grammars; Writing a Grammar; Top-down Parsing.			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> –Remembering, L <sub>2</sub> – Understanding. L <sub>3</sub> –Applying L <sub>4</sub> -Analysis, L <sub>5</sub> -Design		
<b>UNIT II (6 hours of Lecture + 6 hours of Tutorial)</b>			
<b>Syntax analysis – 2:</b> Bottom-up Parsing; Introduction to LR Parsing: Simple LR, Using Ambiguous Grammars, Parser Generators.  <b>Syntax-directed translation:</b> Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax-directed translation schemes.			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> –Remembering, L <sub>2</sub> – Understanding. L <sub>3</sub> –Applying L <sub>4</sub> -Analysis, L <sub>5</sub> -Design		
<b>UNIT III (6 hours of Lecture + 6 hours of Tutorial)</b>			
<b>Intermediate Code Generation:</b> Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Type checking; Control flow; Backpatching.			
<b>Revised Bloom’s Taxonomy Level</b>	L <sub>1</sub> –Remembering, L <sub>2</sub> – Understanding. L <sub>3</sub> –Applying L <sub>4</sub> -Analysis, L <sub>5</sub> -Design		
<b>UNIT IV (6 hours of Lecture + 6 hours of Tutorial)</b>			
<b>Run-Time Environments:</b> Storage Organization; Stack allocation of space, Access to non-local data on the stack; Heap management ( <b>SELF-STUDY</b> );			

<b>Code Generation:</b> Issues in the design of Code Generator; The Target language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks, sample code generation				
<b>Revised Bloom's Taxonomy Level</b>		L <sub>1</sub> –Remembering,L <sub>2</sub> – Understanding.L <sub>3</sub> –Applying L <sub>4</sub> - Analysis, L <sub>5</sub> -Design, L <sub>6</sub> -Create		
<b>Course outcomes:</b>				
At the end of the course student should be able to				
<ul style="list-style-type: none"> <li>• Demonstrate the understanding of different phases of Compilation</li> <li>• Express programming language tokens using regular expressions, and language constructs using Context free grammar.</li> <li>• Construct Lexical Analyzer , parser/parsing tables and Syntax directed translationschemes for simple inputs</li> <li>• Generate intermediate code for statements in high level language</li> <li>• Apply optimization techniques to intermediate code and generate machine code forhigh level language program</li> </ul>				
<b>Sl No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
<b>Textbooks</b>				
<b>1</b>	<b>Compilers- Principles, Techniques and Tools</b>	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman	2nd Edition, Addison-Wesley.	2007
<b>Reference Books</b>				
<b>1</b>	<b>Crafting a Compiler with C</b>	Charles N. Fischer, Richard J. leBlanc, Jr,	Pearson Education	1991
<b>2</b>	<b>Modern Compiler Implementation in C</b>	Andrew W Apple,	Cambridge University Press.	<b>1998</b>
<b>3</b>	<b>Compiler Construction Principles &amp; Practice</b>	Kenneth C Louden	Thomson Education.	<b>1997</b>
<b>4</b>	<b>Lex &amp;Yacc</b>	John Levine, Doug Brown, Tony Mason	O'Reilly Media 2nd Edition	1992
<b>Web links and Video Lectures:</b>				
NPTEL course on Principles of Compiler Design : <a href="https://nptel.ac.in/courses/106/108/106108113/">https://nptel.ac.in/courses/106/108/106108113/</a>				
3. VTU EDUSAT PROGRAMME – 20				



**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes(PO) and Programme Specific Outcomes (PSO)**

Compiler Design: UCS752C		PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O 2	PS O3
<b>No</b>	<b>Programme Outcomes Course Outcomes</b>															
<b>The students will be able to:</b>																
1	Demonstrate the understanding of different phases of Compilation	1	1													
2	Express programming language tokens using regular expressions, and language constructs using Context free grammar.	1	3	3										3		3
3	Construct Lexical Analyser , parser/parsing tables and Syntax directed translation schemes for simple inputs		3	3									1	3		3
4	Generate intermediate code for statements in high level language		3	3									1	3		3
5	Apply optimization techniques to intermediate code and generate machine code for high level language program		3	3									1	3		3

**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**  
**Elective Course**

**USER INTERFACE DESIGN**

Course Code	<b>UCS072E</b>	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3-0-0)	SEE Marks	50
Credits	03	Hours	40

**Course Objectives:**

- To study the concept of menus, windows, interfaces
- To study about business functions
- To study the characteristics and components of windows and the various controls for the windows.
- To study about various problems in windows design with color, text, graphics
- To study the testing methods

**Bloom's Taxonomy Level**

L1- Remembering, L2-*Understanding*,L3-Apply, L4-Analyze,

**UNIT I ( 10 Hrs)**

The User Interface-Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design

**Revised Bloom's Taxonomy Level**

L1- Remembering, L2-*Understanding*,L3-Apply, L4-Analyze

**UNIT II (10 Hrs.)**

The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards.

**Revised Bloom's Taxonomy Level**

L1- Remembering, L2-*Understanding*,L3-Apply, L4-Analyze

**UNIT III (10 Hrs.)**

System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.

**Revised Bloom's Taxonomy Level**

L1- Remembering, L2-*Understanding*,L3-Apply, L4-Analyze

**UNIT IV (10 Hrs.)**

Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls. Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests.

<b>Revised Bloom's Taxonomy Level</b>	L1- Remembering, L2- <i>Understanding</i> ,L3-Apply, L4-Analyze,			
Course Outcomes:				
<ul style="list-style-type: none"> <li>• Create Graphic Design artworks of your own.</li> <li>• Explain the functionality of different design related software</li> <li>• Use learned skills to solve problems of various layouts</li> <li>• Test own's skill and knowledge for a better workflow</li> <li>• Select best output and what works for a particular given project</li> </ul>				
<b>Sl No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
<b>TEXT BOOKS</b>				
1	The Essential Guide to User Interface Design: An Introduction to GUI Design	Wilbert O. Galitz	John Wiley & Sons	Third Edition, 2007.
<b>REFERENCE BOOKS</b>				
1	Design the User Interface	Ben Sheiderman	Pearson Education	1998
2	The Essential of User Interface Design	Alan Cooper	Wiley- Dream Tech Ltd.,	2002
<b>Web links and Video Lectures:</b>				
<a href="https://archive.nptel.ac.in/courses/124/107/124107008/">https://archive.nptel.ac.in/courses/124/107/124107008/</a>				

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	<b>Programme Outcomes</b>															
	<b>Course Outcomes</b>															
1	Create Graphic Design artworks of your own	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-
2	Explain the functionality of different design related software	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-
3	Use learned skills to solve problems of various layouts	1	1	1	-	-	-	-	-	-	-	-	1	1	-	-
4	Test own's skill and knowledge for a better workflow	1	1	1	-	-	-	-	-	-	-	-	1	1	-	-
5	Select best output and what works for a particular given project	1	1	1	-	-	-	-	-	-	-	-	1	1	-	-

**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**  
**SEMESTER – VI**

**Career Planning And Professional Skills**

Course Code:	<b>UHS003N</b>	CIE Marks	50
Teaching Hours/Week (L:T:P)	<b>(0:2:0)</b>	SEE Marks	50
Credits	01	Hours	40

**Course objectives:**

This course will enable students to

- To enhance the ability to think and reason critically
- To augment the student’s attention to detail and problem-solving skills in basic computations
- To successfully handle personal interviews and enhance public speaking skills

**Unit -1 (10 Hours)**

**Reasoning Ability:** Boolean Logic, Cryptarithms, Critical Reasoning, Verbal and Non-Verbal

**Revised Bloom’s Taxonomy Level** Remembering, L3 –Applying , L4-Analysing  
**Unit II (10 Hours)**

**Written & Spoken English:** Reading Comprehension, Sentence Completion, Recap of sounds and stress, Pausing and Rhythm

**Revised Bloom’s Taxonomy Level** Remembering, L3 –Applying , L4-Analysing  
**Unit III (10 Hours)**

**Mathematical Thinking:** Taking time to Work with Distances, Permutations, Probability, Data Sufficiency

**Revised Bloom’s Taxonomy Level** Remembering, L3 –Applying , L4-Analysing  
**Unit IV (10 Hours)**

**Interview Skills:** Mock GDs, Résumé Writing, FAQs in HR Interviews, Interview Etiquette, Team & Leadership Skills

**Revised Bloom’s Taxonomy Level** Remembering, L3 –Applying , L4-Analysing

**Course outcomes:**

At the end of the course the student will be able to:

- learnt to handle personal interviews successfully
- enhanced the usage and understanding of the various structures in the English Language
- augmented his/her leadership and team workmanship skills
- understood analysis of the given problem and learnt to develop a method for solving it
- enhanced and augmented his/her ability to work with quantitative problems

				Edition and Year
Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	
<b>Text Book</b>				
1	Logical Ability Book 1	Innovations Unlimited Training Services	Padmashree Printers	
2	Number Math Book 3	Innovations Unlimited Training Services	Padmashree Printers	
3	Grammar & Comprehension Book 3	Innovations Unlimited Training Services	Padmashree Printers	
<b>References</b>				
1	A Modern Approach to Verbal and Non – Verbal Reasoning	R. S. Aggarwal	Sultan Chand and Sons, New Delhi	2018
2	Quantitative Aptitude	R. S. Aggarwal	Sultan Chand and Sons, New Delhi	2018
3	Verbal and Non – Verbal Reasoning	Chopra	MacMillan India	
	Magical Book on Quicker Maths	M Tyra	BSC Publications	

2018

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
		1	2	3	4	5	6	7	8	9	10	11	12	O1	O2	O3
Sl.No	Programme Outcomes															
	Course Outcomes															
<b>The students will be able to:</b>																
1	learnt to handle personal interviews successfully										3		2			
2	enhanced the usage and understanding of the various structures in the English Language										3		3			
3	augmented his/her leadership and team workmanship skills		3													
4	understood analysis of the given problem and learnt to develop a method for solving it		3													
5	enhanced and augmented his/her ability to work with quantitative problems										3		2			

<b>B.E (Computer Science and Engineering)</b> <b>Outcome Based Education (OBE) and Choice Based Credit System (CBCS)</b> <b>SEMESTER -VII</b>			
<b>Computer Networks Laboratory</b>			
<b>Course Code</b>	UCS658L	<b>CIE Marks</b>	50
<b>Teaching Hours/Week (L:T:P)</b>	(0:0:2)	<b>SEE Marks</b>	50
<b>Credits</b>	01	<b>Exam Hours</b>	03
<p><b>Course Objectives:</b>            At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>• Simulate the network with different configurations to measure the performance parameters.</li> <li>• Implement the data link, network layer and application layer protocols.</li> <li>• Analyze routing algorithm to find the suitable path for transmission and control of flow rate.</li> <li>• Enable communication between the peers using TCP/IP and UDP sockets.</li> </ul>			
<b>Assignment List</b>			
<b>Part –A</b>			
<p><b>Simulation Exercises</b>  <b>Introduction Part</b>            Introduce students to network simulation through the Network simulation Package, Create a simple network model with multiple scenarios, Collect statistics on network performance through the use of simulator tools, Analyze and draw conclusion on network performance</p> <ol style="list-style-type: none"> <li>1. Simulate four nodes point-to-point network and study how the loss, utilization and transmission of wireless LAN (IEEE 802.11b) network varies as the distance between access point and wireless nodes.</li> <li>2. Simulate point-to-point network which consists of 4 to 6 nodes and study network performance analysis of different scheduling technique like First In Out (FIFO), Priority, Round Robin, Weight Fair Queue (WFQ) using NetSim.</li> <li>3. Simulate and study the throughputs of slow start, Congestion avoidance (also known as Old Tahoe) and First Retransmit (also known as Tahoe), Congestion Control Algorithms during client-server TCP downloads.</li> <li>4. Create a network topology which consists of six nodes, simulate and study the working and routing table formation of Interior Routing Protocol i.e. Routing Information Protocol (RIP) and Open Shortest Path First (OSPF).</li> </ol>			
<p><b>PART – B</b></p> <p><b>Implement the following in C/C++:</b></p> <ol style="list-style-type: none"> <li>1. Write a program for error detecting code using CRC-CCITT (16 bit)</li> <li>2. Write a program for hamming code generation for error detection and correction.</li> <li>3. Write a program for distance vector algorithm to find suitable path for transmission.</li> <li>4. Write a program for congestion control using leaky bucket algorithm.</li> </ol>			

5. Write a C program to develop a DNS client server to resolve the given hostname.
6. Write a client-server application for chat using UDP.
7. Using TCP / IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents to the requested file if present.
8. Write a program for simple RSA algorithm to encrypt and decrypt the data.

**Course outcomes:**

At the end of the course the student will be able to:

- Simulate the network with different configurations to measure the performance parameters.
- Implement the data link, network layer and application layer protocols
- Analyze routing algorithm to find the suitable path for transmission and control of flow rate
- Enable communication between the peers using TCP/IP and UDP sockets.



<b>B.E (COMPUTER SCIENCE AND ENGINEERING)</b>			
<b>Outcome Based Education (OBE) and Choice Based Credit System (CBCS)</b>			
<b>SEMESTER – VI</b>			
<b>MINI PROJECT</b>			
Course Code	<b>UCS657P</b>	CIE Marks	50
Hours/Week (L:T:P)	(0:0:3)	SEE Marks	50
Credits	3	Hours/week	6
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• Have insight into current state of art and trends in their area of interest and problem defined.</li> <li>• To have proficiency in design, implementation of different components using appropriate tools</li> </ul>			
<p>Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students. The mentor shall monitor progress of the student/s continuously. The student/s is/are required to present the progress of the Mini Project work during the semester as per the schedule provided by the Department Project Coordinator.</p>			
<b>Course Outcomes:</b>			
After completion of the Mini Project the student is able to			
CO1: Develop the ability to solve real life problems related to software development.			
CO2: Identify the issues and challenges in the domain.			
CO3: Apply the knowledge and techniques learnt in theoretical classes.			
CO4: Explain the deeper understanding in specific functional areas of the real problems.			
CO5: Explore career opportunities in their areas of interest.			
<b>CIE for Mini-Project:</b>			
(i) <b>Single discipline:</b> The CIE marks shall be awarded by a committee consisting of the Head of the Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.			
(ii) <b>Interdisciplinary:</b> Continuous Internal Evaluation shall be group wise at the college level with the participation of all the guides of the college. The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.			
<b>SEE for Mini-Project:</b>			
(i) <b>Single discipline:</b> Contribution to the Mini-project and the performance of each group member shall be assessed individually in the semester end examination (SEE) conducted at the department. (ii) <b>Interdisciplinary:</b> Contribution to the Mini-project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belongs to.			

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>Programme Outcomes</b>															
<b>Course Outcomes</b>															
<b>The students will be able to:</b>															
Simulate the network with different configurations to measure the performance parameters.	3	3	3	3	2		2					2	1	2	1
Implement the data link, network layer and application layer protocols.	0	3	3	3	3	1	3					2	1	2	3
Analyze routing algorithm to find the suitable path for transmission and control of flow rate.	1	3	3	3	1	1	2					2	1	2	3
Enable communication between the peers using TCP/IP and UDP sockets.	0	3	3	2	3	1	2		2			2	1	3	2

**Scheme of Evaluation for Mini Project**

Sl.No.	Course Component	CIE Evaluation (Max. 50 Marks)	SEE Evaluation (Max. 50 Marks)
1	Mini Project	Respective Guide (Project Report, Project Presentation Skill, Interaction in the ratio of 50:25:25)	(Project Evaluation: 30 Marks and Presentation : 20 Marks)  Conducted by Departmental Committee consisting of 1. HOD/Nominee 2. Project Coordinator/Guide 3. Examiner
<b>Total Marks</b>			<b>100</b>

### Rubrics for CIE Evaluation

The following percentage of weightage is assigned to the student based on the performance in the CIE Evaluation

Sl.No.	Performance	Percentage of Weightage
1	Excellent	91 to 100
2	Very Good	81 to 90
3	Good	71 to 80
4	Moderate	61 to 70
5	Poor	40 to 60

### Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>No</b>	<b>Programme Outcomes</b>															
	<b>Course Outcomes</b>															
<b>The students will be able to:</b>																
1	Develop the ability to solve real life problems related to software development.	3	2	2	2	1	2	-	-	3	3	2	3	2	2	3
2	Identify the issues and challenges in the domain.	-	3	2	2	-	-	-	-	3	3	1	3	-	2	3
3	Apply the knowledge and techniques learnt in theoretical classes.	-	3	3	2	-	2	-	-	2	2	2	2	3	1	2
4	Explain the deeper understanding in specific functional areas of the real problems.	3	3	3	2	3	-	-	-	2	2	3	2	3	3	3
5	Explore career opportunities in their areas of interest.	-	3	3	2	2	-	-	-	1	2	2	3	2	1	1

**B.E (COMPUTER SCIENCE AND ENGINEERING)**  
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**

**Internet Of Things and Applications**  
**Open Elective**

Course Code:	<b>UCS0634N</b>	CIE Marks	50
Teaching Hours/Week (L:T:P)	<b>(3:0:0)</b>	SEE Marks	50
Credits	03	Hours	40

**Course objectives:**

This course will enable students to

- To understand the fundamentals of IOT
- To learn about the basics of IOT Protocol
- Illustrate Mechanism and Key Technologies in IOT
- Explain the Standard of the IOT
- To develop IOT applications using Raspberry Pi and apply Cloud services for IOT systems

**Unit -1 (10 Hours)**

**Introduction to Internet of Things**, Definition and Characteristics of IoT, Physical Design of IoT, IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies, Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Internet of things application examples: Overview, Smart metering /Advanced metering infrastructure, ehealth/ Body area networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking.

**Revised Bloom's Taxonomy Level**

L<sub>1</sub> –Remembering, L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying , L<sub>4</sub>-Analysing

**Unit II (10 Hours)**

**Fundamental IOT Mechanism and Key Technologies:** Identification of IOT objects and services, structural aspects of the IOT, Key IOT Technologies, Evolving IOT standards overview and approaches, IETF IPv6 routing protocol for RPL Roll, Constrained application protocol, Representational state transfer, ETSI M2M, Third generation partnership Project service requirement for machine type communication, CENE\EC, IETF IPv6 over lower power WPAN, Zigbee IP(ZIP), IPSO(IP in smart object).

**Revised Bloom's Taxonomy Level**

L<sub>1</sub> –Remembering, L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying , L<sub>4</sub>-Analysing

**Unit III (10 Hours)**

**Layer ½ Connectivity:** Wireless technologies for the IOT, WPAN technologies for IOT/M2M, Cellular and mobile network technologies for IOT/M2M. Layer3 Connectivity, IPv6 technologies for the IOT: Overview and Motivations, Address Capabilities, IPv6 protocol Overview, IPv6 Tunelling, Ipvsec in IPV6 Header Compression Schemes, Quality of service in IPv6, Migration Strategies to IPv6

**Revised Bloom's Taxonomy Level**

L<sub>1</sub> –Remembering, L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying , L<sub>4</sub>-Analysing

**Unit IV (10 Hours)**

**IOT Platforms Design Methodology:** Introduction, IOT design methodology, Case Study on IOT System for Weather Monitoring, , IOT Systems- Logical design. **IOT physical devices and Endpoints:** What is an IOT device, Raspberry Pi, About the board, Linux on Raspberry Pi, Raspberry Pi interfaces. **IOT Physical Servers and Cloud Offerings:** Introduction to Cloud storage models and communication APIS,WAMP-AutoBahn for IOT, Cloud for IOT, Application Framework . Case Studies illustrating IOT design: Home Automation etc.

**Revised Bloom’s Taxonomy Level**

L<sub>1</sub> –Remembering, L<sub>2</sub> – Understanding. L<sub>3</sub> –Applying , L<sub>4</sub>-Analysing

**Course outcomes:**

At the end of the course the student will be able to:

- **Describe** the essentials of IOT
- **Analyze** the various models of IoT design
- **Examine** the design methodology of IOT and logical design using tools
- **Develop** a Portable IOT using Raspberry
- **Identify** Physical devices required to deploy on IOT application and connect to the cloud for real time scenarios

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Text Book</b>				
1	<b>A Hands-on Approach,</b> Internet of Things	Arshdeep Bahga and Vijay Madiseti	Universities Press , ISBN:978-81-7371- 954-7	2015.
2	<b>Building the Internet of Things with IPv6 and MIPv6:</b> The Evolving World of M2M Communications	<b>Daniel Minoli</b>	Wiley ISBN:9781118473474	2013.
<b>References</b>				
1	<b>The Internet of Things</b>	Michael Miller,	Pearson	First Edition,2015
3	Designing Connected Products, First Edition, O’Reilly	Claire Rowland, Elizabeth Goodman et.al	O’Reilly	First Edition,2015
4	<b>Getting Started with Raspberry Pi</b>	Matt Richardson & Shawn Wallace	O'Reill	(SPD), 2014
5	<b>Beginning Arduino</b>	Michael McRoberts	Technology in action	2nd edition.

**Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	<b>Programme Outcomes</b>															
<b>Sl.No</b>	<b>Course Outcomes</b>															
<b>The students will be able to:</b>																
1	<b>Describe</b> the essentials of IOT	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
2	<b>Analyze</b> the various models of IoT design	-	2	3	2	-	-	-	-	-	-	-	-	1	-	-
3	<b>Examine</b> the design methodology of IOT and logical design using tools	-	2	2	-	-	-	-	-	-	-	-	-	1	-	-
4	<b>Develop</b> a Portable IOT using Raspberry	1	2	3	-	-	-	-	-	-	-	-	-	1	-	-
5	<b>Identify</b> Physical devices required to deploy on IOT application and connect to the cloud for real time scenarios	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-