

**SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV  
COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI - 600044.**

**Re accredited with A+ Grade by NAAC**

**MASTER OF COMPUTER SCIENCE**

**(Shift – SFS)**

**Under the faculty of Arts/Science/Commerce**

**(M.Sc Computer Science)**



**CHOICE BASED CREDIT SYSTEM (CBCS)  
OUTCOME BASED EDUCATION (OBE)**

**(Effective from the Academic Year 2020-21)**

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## **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

PSO1: Identifying the real world problem and design new techniques to find the solution using recent technologies like Artificial Intelligence, Machine learning, Image Processing, Cloud computing and network security.

PSO2: Analysing the basic algorithms related to problem solving techniques, computational methodologies, mathematical and statistical models.

PSO3: Compare and evaluate the algorithms extensively leading to solutions for research and to get industry expertise.

PSO4: Apply the strategies in real-time software project development using open-source programming environment or commercial environment to deliver quality product and developing employability skills.

PSO5: Ability to impart the leadership qualities in a responsive, ethical and innovative manner in the societal, industrial and professional fields

PSO6: Realising the importance of lifelong learning to keep updating with emerging technologies and open source tools.

**COURSE FRAME WORK**  
**SEMESTER I**

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
<b>I</b>	20PCSCT1001	Core Paper-I	Theory of Computation	6	4	40	60	100
	20PCSCT1002	Core Paper-II	J2EE Programming	6	4	40	60	100
	20PCSCT1003	Core Paper - III	Advanced Web Designing	6	3	40	60	100
	20PCSCP1001	Core Practical - I	Practical – I: J2EE Programming Lab	4	2	40	60	100
	20PCSCP1002	Core Practical - II	Practical-II : Advanced Web Designing Lab	4	2	40	60	100
	20PCSET1001	Elective Theory - I	Any one from the list of Electives(Theory) – <b>Introduction to Machine Learning</b>	4	3	40	60	100
	18PSSTS1001	Skill Based Electives	Teaching Skills		3	50		100
			<b>TOTAL</b>	<b>30</b>	<b>21</b>			<b>700</b>

## SEMESTER II

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
<b>II</b>	20PCSCT2004	Core Paper-IV	Design and Analysis of Algorithms	5	4	40	60	100
	20PCSCT2005	Core Paper-V	Digital Image Processing	5	4	40	60	100
	20PCSCT2006	Core Paper-VI	Data Science using Python	4	3	40	60	100
	20PCSCP2003	Core Practical - III	Practical - III (Digital Image Processing Lab)	4	2	40	60	100
	20PCSCP2004	Core Practical- IV	Practical - IV ( Data Science Lab)	4	2	40	60	100
	20PCSEP2001	Elective Practical - I	Any one from the list of Electives (Practical) - <b>Android Using Java</b>	4	3	40	60	100
	20PCSET2002	Elective Theory- II	Any one from the list of Electives (Theory) – <b>Social Network Analysis</b>	4	3	40	60	100
	18MOOC2002	Soft Skill	Swayam (MOOC)		4	50		100
				<b>30</b>	<b>25</b>			<b>800</b>

### SEMESTER III

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
<b>III</b>		Core Paper-VII	Modern Operating System	5	4	40	60	100
		Core Paper-VIII	Advanced Database Management Systems	5	4	40	60	100
		Core Paper-IX	Software testing	4	3	40	60	100
		Core Practical - V	Practical–Advanced Database Management Systems Lab	4	2	40	60	100
		Core Practical- VI	Practical – Software testing Lab	4	2	40	60	100
		Elective Theory - III	Any one from the list of Electives(Theory) Cryptography & Network Security	4	3	40	60	100
		Elective Practical - II	Any one from the list of Electives(Practical) “R” Programming	4	3	40	60	100
		Skill Based Electives	<b>Research Skills</b>		3	50		100
		INTERNSHIP			2	50		100
				<b>30</b>	<b>26</b>			<b>900</b>

## SEMESTER IV

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
<b>IV</b>		Core Practical- VII	Case study- Practical 1*	5	3	40	60	100
		Core Practical- VIII	Case study- Practical 2*	5	3	40	60	100
		CORE Project	Project & Viva-Voce	20	9	50	150	200
		Extra Disciplinary	Swayam (MOOC)		4	40	60	100
				<b>30</b>	<b>19</b>			<b>500</b>

### List of Electives: Group – I (Theory)

1. Introduction to Machine Learning
2. Soft Computing
3. Cryptography and Network Security
4. Ethical Hacking
5. Mathematical Theory for Computer Science
6. Social Network Analysis
7. Cloud Computing

### List of Electives: Group – II (Practical)

1. “R” Programming
  2. Big Data
  3. Weka Tool
  4. Cloud Computing
  5. Fuzzy Tool Kit
  6. Deep Learning Tool Kit
  7. Machine Learning Tool Kit
  8. Web Applications Framework
  9. Natural Language Processing Tool Kit
  10. Android Using Java
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## SEMESTER I

### THEORY OF COMPUTATION

**TOTAL HOURS: 90 hrs**

**SUB CODE :20PCST1001**

**CREDIT: 4**

**L-T-H: 5-1-6**

#### COURSE OBJECTIVES

1. To make the students to understand the importance of logical skills
2. To understand the concepts of Automaton machines
3. To encourage the students to pursue research in the field of computer science.

**COURSE OUTCOMES:** on completion of the course the students will be able to...

CO No.	CO Statement
CO1	Understand the concepts of Automata Theory and its types.
CO2	Analyze the regular expression with properties and equivalence.
CO3	Understand and apply Context Free Grammars and Push down Automata.
CO4	Design Turing Machine for Undecidability.
CO5	Analyze P and NP problems and Post Correspondence Problem.

#### UNIT 1

**(Total number of hours: 18)**

Automata -Introduction To Formal Proof – Additional Forms Of Proof – Inductive Proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-Deterministic Finite Automata (NFA) – Finite Automata With Epsilon Transitions.

#### UNIT 2

**(Total number of hours: 18)**

Regular Expressions and Languages - Regular Expression – FA and Regular Expressions – Proving Languages Not to Be Regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

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**UNIT 3****(Total number of hours: 18)**

Context-Free Grammars And Languages - Context-Free Grammar (CFG) – Parse Trees – Ambiguity In Grammars And Languages – Definition Of The Pushdown Automata – Languages Of Pushdown Automata – Equivalence Of Pushdown Automata And CFG– Deterministic Pushdown Automata.

**UNIT 4****(Total number of hours: 18)**

Properties Of Context-Free Languages - Normal Forms For CFG – Pumping Lemma For CFL – Closure Properties Of CFL – Turing Machines – Programming Techniques For TM.

**UNIT 5****(Total number of hours: 18)**

Undecidability - A Language That Is Not Recursively Enumerable (RE) – An Undecidable Problem That Is Re – Undecidable Problems about Turing Machine – Post’s Correspondence Problem – The Classes P And NP.

**Text books:**

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, (2007), “Introduction to Automata Theory, Languages and Computations”, second Edition, Pearson Education.
2. K.Krishna kumari “Theory of computation” A.R.S publications Third Edition.
3. H.R. Lewis and C.H. Papadimitriou,(2003), “Elements of the theory of Computation”, Second Edition, Pearson Education.
4. Thomas A. Sudkamp,(2007), “An Introduction to the Theory of Computer Science, Languages and Machines”, Third Edition, Pearson Education.
5. Raymond GreenlawH.James Hoover, (1998), “Fundamentals of Theory of Computation, Principles and Practice”, Morgan Kaufmann Publishers.

**References:**

1. Micheal Sipser,(1997), “Introduction of the Theory and Computation”, Thomson Brokecole.
2. J. Martin, (2007), “Introduction to Languages and the Theory of computation” Third Edition, Tata McGraw Hill.
3. Mishra.K.L.P, (2006), “Theory of Computer Science: Automata, Languages and Computation”, Pearson Education.
4. Vivek Kulkarni,(2013), “Theory of computation”, Oxford Publications.
5. C.K.Nagpal,(2011), “Formal Languages and Automata Theory “, Oxford Publications.

**Web resources:**

1. <http://www.nesoacademy.org/computer-science/toc-and-automata-theory/theory-of-computation>
  2. <https://www.geeksforgeeks.org › theory-of-computation-automata-tutorials>
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3. [https://www.tutorialspoint.com › automata\\_theory](https://www.tutorialspoint.com › automata_theory)
4. [http://www.vssut.ac.in/lecture\\_notes/lecture1428551440.pdf](http://www.vssut.ac.in/lecture_notes/lecture1428551440.pdf)
5. [http://www.cs.virginia.edu/~robins/Sipser\\_2006\\_Second\\_Edition\\_Problems.pdf](http://www.cs.virginia.edu/~robins/Sipser_2006_Second_Edition_Problems.pdf)

**Pedagogy** : Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	2	3	3	1	1	2
<b>CO2</b>	2	3	3	1	1	2
<b>CO3</b>	2	3	3	1	1	2
<b>CO4</b>	3	3	3	1	1	2
<b>CO5</b>	3	3	3	1	1	2
<b>Average</b>	<b>2.4</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>

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## J2EE PROGRAMMING

**TOTAL HOURS:90**

**SUB CODE: 20PCSCT1002**

**CREDIT:4**

**L-T-P: 5-1-6**

### COURSE OBJECTIVES

1. Students will get hands-on experience on GUI technologies, event handling mechanisms & Network programming.
2. Develop client/server-based communication
3. Develop web and stand-alone applications using advanced concepts of Java

**COURSE OUTCOMES:** on completion of the course the students will be able to...

CO No.	CO Statement
CO1	Understand the concept of servlet and JDBC connectivity
CO2	Creating a swing application using controls and menus.
CO3	Examine the RMI technique by registering and accessing the remote objects like stubs & skeletons.
CO4	Understand the layers of networks, Streams and Threads
CO5	Apply the TCP and UDP to create the client/server communication.

### SYLLABUS

**UNIT– 1**  
**of hours: 18)**

**(Total number**

Servlets: Servlet overview – the Java web server – Simple servlet – servlet chaining – Session management –Security – HTML forms – using JDBC in servlets – applet to servlet communication.

**UNIT– 2**  
**of hours: 18)**

**(Total number**

Swing: JApplet - Icons and Labels –Text Fields- Buttons – Combo Boxes – Tabbed

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Panes- Scroll Panes – Trees – Tables-Working with Menus

**UNIT– 3**  
**of hours: 18)**

**(Total number**

RMI – Overview – Developing applications with RMI: Declaring& Implementing remote interfaces-stubs &skeletons, Registering remote objects, writing RMI clients –Pushing data from RMI Servlet – RMI over Inter-ORB Protocol.

**UNIT– 4**  
**of hours: 18)**

**(Total number**

Basic Network Concepts: Networks – The layers of a Network –IP, TCP, UDP – Internet –Client Server Model. Streams: Output Stream – Input Stream – Filter Stream – Threads

**UNIT– 5**  
**of hours: 18)**

**(Total number**

Introduction to Socket Programming- Sockets for clients – Sockets for Server – UDP Sockets

**Text books:**

1. H. Schildt, (2002), “Java 2 Complete Reference”, 5th Edition, Tata McGraw-Hill, New Delhi.
2. Elliotte Rusty Harold,(2013), “ Java Network Programming” (4<sup>th</sup> ed), O’Reilly.
3. James MCGovern, Rahim Adaitia et.al, J2EE 1.4 Bible, Wiley India Publications, NewDelhi.
4. James Holmes(2006), Struts – The Complete Reference, Tata McGraw Hill Publications.
5. Jason Hunter,William Crawford, (2001), “Java Servlet Programming” (2<sup>nd</sup> Edition), O’Reilly.

**References:**

1. KishoriSharan, (2004), “Beginning javaAPIs JavaScript, JDBC”, Apress.
  2. Herbert Schildt, “Swing A Beginner’s Guide”, Tata McGraw Hill, New Delhi.
  3. Marc Loy, Robert Eckstein, Dave Wood, (2003), “Java Swing”, O’Reilly.
  4. Joel Murach, Michael Urban,(2014), “Java Servlets and JSP”, Murach Publications.
  5. William Groso, (2002), “Java RMI”, O’Reilly.
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**Web resources:**

1. <http://www.javalearner.com/advanced.htm>
2. <http://www.webucator.com/java/course/advanced-java-programming.cfm>.
3. <http://www.tutorialspoint.com/servlets>
4. <http://nptel.ac.in/courses/106105084/30>
5. <http://javapoint.com>

**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	2	2	3	2	2	2
<b>CO2</b>	3	2	3	2	2	2
<b>CO3</b>	2	2	2	2	2	2
<b>CO4</b>	2	2	2	2	2	2
<b>CO5</b>	2	3	2	3	2	3
<b>Average</b>	<b>2.2</b>	<b>2.2</b>	<b>2.4</b>	<b>2.2</b>	<b>2</b>	<b>2.2</b>

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## ADVANCED WEB DESIGNING

TOTAL HOURS : 90

SUB CODE: 20PCSCT1003

CREDIT:3

L-T-P: 5-1-6

### COURSE OBJECTIVES

1. Explore the innovative tools in the key domain of computer science.
2. To enable the students to adapt, contribute and innovate new technologies and systems.
3. To design the real time scenarios.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO No.	CO Statement
CO1	Understand the Bootstrap Framework and Layout Components.
CO2	Examine Bootstrap with JavaScript.
CO3	Explore the knowledge of PHP with OOPS and Database using MySQL.
CO4	Analyze the Backup and Restore data with security features.
CO5	Understand PHP with AJAX and XML

### SYLLABUS

#### UNIT– 1

(Total number of hours: 18)

Introduction to Bootstrap Framework - Advantages of Bootstrap Framework-  
Bootstrap Layout Components

#### UNIT– 2

(Total number of hours: 18)

Bootstrap CSS – Bootstrap JavaScript

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### **UNIT– 3**

**(Total number of hours: 18)**

Basics of PHP - Functions - Object-Oriented Programming. Arrays: Array fundamentals. Database basics: Data base design - Structured Query Language.

### **UNIT– 4**

**(Total number of hours: 18)**

Using MySQL: MySQL Database - Managing the Database - Backing up and Restoring Data - Advanced SQL. Getting PHP to talk to MySQL: The process-querying the database with PHP functions - Working with Forms: Building a form.

### **UNIT– 4**

**(Total number of hours: 18)**

Cookies, Sessions and Access Control: Cookies - – sessions - Security: Validation and Error handling: Validating user input with JavaScript- PHP Filters – PHP XML – PHP AJAX

### **TEXT BOOKS:**

1. Jake Spurlock, (2013), “BOOTSTRAP – Responsive Web Development”, O’Reilly Media.
2. Michele Davis, Jon Phillips, (2006), “Learning PHP and MySQL”, O’Reilly Publication.
3. David Sklar, Nathan Torkington, (2004), “Learning PHP 5”, O’Reilly.
4. W. Jason Gilmore, (2006), “Beginning PHP and MySQL 5 “(2<sup>nd</sup>edition), Apress.
5. Aravind Shenoy, Ulrich Sossou, (2014), “Learning Bootstrap”, Packt Publishers.

### **REFERENCES:**

1. Kevin Yank,(2011), “Build Your Own Database Driven Web Site Using PHP & MySQL” ( 4<sup>th</sup> edition), Sitepoint.
  2. Ahsanul Bari, (2008), “Cake Php Application Development” (1st edition), Packet publishing ltd.
  3. Jorg Krause, (2016), “Introducing Bootstrap 4”, Apress.
  4. Jake Spurlock, Dave Winer, (2013), “Bootstrap – Responsive Web Development”, O’Reilly.
  5. Luke Welling, Laura Thompson, (2003), “Php and Mysql Web Development”, Developer’s Library.
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## WEB RESOURCES:

1. [www.w3schools.com/php](http://www.w3schools.com/php)
2. [php.net/downloads.php](http://php.net/downloads.php)
3. <https://www.tutorialspoint.com/bootstrap/index.htm>
4. <https://www.tutorialrepublic.com/twitter-bootstrap-tutorial/>
5. <https://www.javatpoint.com/php-tutorials>

**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

## Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	2	2	1	2
CO2	3	2	3	3	2	3
CO3	3	2	3	3	2	3
CO4	2	2	2	2	1	2
CO5	3	2	2	3	1	3
Average	2.6	2.4	2.4	2.6	1.4	2.6

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## J2EE PROGRAMMING LAB

**TOTAL HOURS:60**

**SUB CODE: 20PCSCP1001**

**CREDIT:2**

**L-T-P: 3-1-4**

### COURSE OBJECTIVES

1. This course provides exercises to design and develop web-based applications
2. To implement servlet, RMI and networking concepts.
3. Students will be able to create interactive application with the help of J2EE

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO No.	CO Statement
CO1	Understand the concept of compiling and create HTML and Applet communication with the help of servlets.
CO2	Implement database connectivity to web applications with the database
CO3	Create RMI application to access the remote object
CO4	Apply the different swing controls and create the menu applications
CO5	Examine the TCP, UDP techniques with client/server communication

**PEDAGOGY:** Demonstration

### Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	2	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	2	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	2	3
Average	3	3	3	3	2	3

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## ADVANCED WEB DESIGNING LAB

**TOTAL HOURS:60**

**SUB CODE: 20PCSCP1002**

**CREDIT:2**

**L-T-P: 3-1-4**

### COURSE OBJECTIVES

1. To develop web applications using Bootstrap framework
2. To design the real time website
3. To enable students to develop responsive web pages along with database connectivity.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO No.	CO Statement
CO1	Demonstrate the Bootstrap Framework and Layout Components.
CO2	Implementation of Bootstrap with JQuery and XML.
CO3	Implementation of PHP with OOPS and Database using MySQL.
CO4	Examining Backup and Restore data with security features.
CO5	Demonstrate PHP with AJAX and XML

**PEDAGOGY:** Demonstration

**Mapping of CO with PSO:**

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	1	1	3	3	3
CO2	3	1	1	3	3	3
CO3	3	1	1	3	3	3
CO4	3	1	1	3	3	3
CO5	3	1	1	3	3	3
Average	3	1	1	3	3	3

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## SEMESTER II

### DESIGN AND ANALYSIS OF ALGORITHM

**TOTAL HOURS: 75 hrs**

**SUB CODE :20PCSCT2004**

**CREDIT : 4**

**L-T-H: 4-1-5**

#### COURSE OBJECTIVES

1. To understand the various analysis measures of algorithm
2. To make the student familiarise with algorithm design techniques
3. To make the student design and apply good algorithm for problem solving

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand the design principles of algorithm and to be able to carry out the analysis of various algorithms based on time and complexity
CO2	Examine the different algorithm techniques and strategies.
CO3	Analyses how the choice of data structures and the algorithm design methods impact the performance of programs.
CO4	Compute the range of behaviors of algorithm and the notion of tractable and intractable problems.
CO5	Identifying the different NP complete problems and also discuss the various advance topics of algorithm

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**UNIT 1****(Total number of hours: 15)**

Introduction - Definition of Algorithm – pseudocode conventions – recursive algorithms – time and space complexity –big-“oh” notation – practical complexities randomized algorithms – repeated element – primarily testing - Divide and Conquer: General Method - Finding maximum and minimum – merge sort.

**UNIT 2****(Total number of hours: 15)**

Divide and conquer – Quicksort, Selection sort, Strassen's matrix multiplication Greedy Method: General Method –knapsack problem - Tree vertex splitting - Job sequencing with deadlines – optimal storage on tapes.

**UNIT 3****(Total number of hours: 15)**

Dynamic Programming: General Method - multistage graphs – all pairs shortest paths – single source shortest paths - String Editing – 0/1 knapsack. Search techniques for graphs DFS-BFS-connected components – biconnected components.

**UNIT 4****(Total number of hours: 15)**

Back Tracking: General Method – 8-queens - Sum of subsets - Graph Coloring Hamiltonian cycles. Branch and Bound: General Method - Traveling Salesperson problem.

**UNIT 5****(Total number of hours: 15)**

Lower Bound Theory: Comparison trees - Oracles and advisory arguments - Lower bounds through reduction - Basic Concepts of NP-Hard and NP-Complete problems.

**Text books:**

1. E. Horowitz, S. Sahni and S. Rajasekaran, (1997), “Computer Algorithms”,Galgotia Publishers.
2. S Sridhar , (2014), “Design and Analysis of Algorithms”, Oxford Higher Education.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, (2012), “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited.
4. Donald E. Knuth, (2009), “The Art of Computer Programming”, Volumes 1& 3 Pearson Education.
5. A.V.Aho, J.E. Hopcroft, J.D. Ullmann, (2002), “The Design and Analysis of Computer Algorithms” , Pearson Publications.

**References:**

1. G. Brassard and P. Bratley, (1997), “*Fundamentals of Algorithms*” (1<sup>st</sup> Edition), PHI.
  2. Ellis Horowitz, SartajSahni and Sanguthevar Rajasekaran (2008). *Fundamentals of Computer Algorithms*, 2/e, Universities Press Private Limited, India.
  3. Robert L Kruse, (2008), “*Data Structures & Program Design*”, Prentice Hall, New Delhi.
  4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, (2006), “*Data Structures and Algorithms*”, Pearson Education.
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5. Shewta Bajaj Mundra, (2013) , “Design and Analysis of Algorithms”,Laxmi Publications.

**Web resources:**

1. [www.nptel.iitm.ac.in/video.php?subjectId=106102064](http://www.nptel.iitm.ac.in/video.php?subjectId=106102064)
2. [www.cs.berkeley.edu/~vazirani/algorithms.html](http://www.cs.berkeley.edu/~vazirani/algorithms.html)
3. [tps://onlinecourses.nptel.ac.in/noc16\\_cs04/preview](https://onlinecourses.nptel.ac.in/noc16_cs04/preview)
4. [https://www.tutorialspoint.com/design and analysis of algorithms](https://www.tutorialspoint.com/design_and_analysis_of_algorithms)
5. [web.stanford.edu/class/archive/cs/cs161/cs161.1176/](http://web.stanford.edu/class/archive/cs/cs161/cs161.1176/)

**Pedagogy :** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	2	3	3	2	1	3
<b>CO2</b>	3	3	3	1	1	3
<b>CO3</b>	3	3	3	2	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>2.8</b>	<b>3</b>	<b>3</b>	<b>2.2</b>	<b>1.6</b>	<b>3</b>



# DIGITAL IMAGE PROCESSING

**TOTAL HOURS: 75hrs**

**SUB CODE: 20PCST2005**

**CREDIT : 4**

**L-T-H: 4-1-5**

## COURSE OBJECTIVES

1. To explore the innovative tools in the key domain of computer science.
2. To encourage the students to pursue research in the field of computer science
3. To explore the real time scenarios by performing case study.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand the fundamentals and basic relationships of Image Processing.
CO2	Analyze the types of image transformation and filtering techniques
CO3	Explore the knowledge of Image Restoration techniques.
CO4	Analyze the knowledge of image compression.
CO5	Understand the concepts of Image segmentation Techniques

## SYLLABUS

### UNIT 1

**(Total number of hours: 15)**

Introduction – steps in image processing, Image processing applications, digital imaging system. Digital image processing operations – Basic relationships and distance metrics, Classification of Image processing operations. Color image processing – Introduction, Color models.

### UNIT 2

**(Total number of hours: 15)**

Digital image transforms –Fourier transform, Discrete cosine transform, Haar transform. Image enhancement – Image enhancement point operations, spatial filtering concepts, Frequency domain filtering.

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**UNIT 3****(Total number of hours: 15)**

Image restoration: Model of degradation, Categories of Image degradations, Image restoration in the presence of noise, Image restoration techniques.

**UNIT 4****(Total number of hours: 15)**

Image compression– Image compression model, Compression algorithm and its types, Types of redundancy, Loss less compression – Huffman coding, Run length coding, Lossy predictive coding, Lossy compression algorithms.

**UNIT 5****(Total number of hours: 15)**

Image segmentation –Edge detection, Thresholding, Region growing.

**Text books:**

1. S.Sridhar, (2016), “Digital Image processing” (Second Edition), Oxford University Press.
2. R.C. Gonzalez, R.E.Woods, (2002), “Digital Image processing” (Second Edition), Pearson Education.
3. Kenneth R. Castleman, “Digital Image Processing” 1st Edition.
4. Wilhelm Burger, Mark J. Burge, (2013), “Principles of Digital Image Processing Advanced Methods”, Springer.
5. Chris Solomon, Toby Breckon, (2011), “Fundamentals of Digital Image Processing”, Wiley BlackWell.

**References:**

1. Anil K. Jain, (1994), “Fundamentals of Digital image Processing” (Second Edition), Prentice Hall of India, New Delhi.
2. Pratt. W.K., (1978), “Digital Image Processing” (Third Edition), John Wiley & Sons.
3. Rosenfeld A. &Kak, A.C, (1982), “Digital Picture Processing”, Vol .I & II, Academic.
4. Reinhard Klette, Piero Zamperoni, (1996), Handbook of Image Processing Operators.
5. John Jensen,(2016), “ Introductory Digital Image Processing: A Remote Sensing Perspective”(4th edition), Pearson.

**Web resources:**

1. <http://www.nptel.iitm.ac.in/video.php?subjectId=117105079>
2. [http://en.wikipedia.org/wiki/Digital\\_image\\_processing](http://en.wikipedia.org/wiki/Digital_image_processing)
3. <http://www.library.cornell.edu/preservation/tutorial/contents.html>
4. <https://www.tutorialspoint.com/dip/index.htm>
5. <https://www.javatpoint.com/digital-image-processing-tutorial>

**PEDAGOGY:** Lecture, Group discussion, Power point Presentation , Open Book

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**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	2	2	3	1	1
<b>CO2</b>	3	3	3	3	1	3
<b>CO3</b>	3	3	3	3	1	3
<b>CO4</b>	3	3	3	3	1	3
<b>CO5</b>	3	3	3	3	1	3
<b>Average</b>	<b>3</b>	<b>2.8</b>	<b>2.8</b>	<b>3</b>	<b>1</b>	<b>2.6</b>

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## DATA SCIENCE USING PYTHON

**TOTAL HOURS: 60hrs**

**SUB CODE: 20PCST2006**

**CREDIT : 3**

**L-T-H: 3-1-4**

### COURSE OBJECTIVES

1. To make students to manipulate real datasets from various disciplines
2. Equip students to become data scientist
3. Create visualization effects in real datasets.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand python basics, Lists, Tuple and mappings
CO2	Examine to handle missing data in real datasets using Numpy& pandas.
CO3	Create visualization of real data with Matplotlib.
CO4	Implementation of machine learning algorithm using python..
CO5	Analyze the algorithms with datasets

### UNIT 1

**(Total number of hours: 11)**

Python basics – Strings – Lists – Tuples- Mapping and set types.Conditionals and loops – Functions - Errors and Exceptions.

### UNIT 2

**(Total number of hours: 11)**

Introduction to Numpy- Understanding Data types in Python - Basics of Numpy, Arrays – Data Manipulation with pandas - Installing & Using Pandas - Introducing Pandas Objects - Data Indexing & Selection- Handling Missing data.

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**UNIT 3****(Total number of hours: 12)**

Visualization with Matplotlib- General Matplotlib- Simple line plots- simple & scatter plots- Visualizing errors – Histograms- Binning & density.

**UNIT 4****(Total number of hours: 13)**

Machine learning – Bayesian classification, Simple Linear regression, Support Vector machines

**UNIT 5****(Total number of hours: 13)**

Decision trees, Principal component analysis, k-means Clustering

**Text books:**

1. Chan J., Jan, (2018), “Core Python Programming” (2<sup>nd</sup> edition), Wesley.
2. Martin C. Brown, (2001), “The Complete Reference-Python”, Osborne.
3. Jake Vander Plas, “Python Data Science Handbook – Essential tools for working with data”, O’Reilly.
4. Allen B.Downey, (2002), “Think Python: An Introduction to Software Design”, O’Reilly.
5. Dr.Bharti Motwani, (2020), “Data Analytics using Python”, Wiley.

**References:**

1. Will Richert, Luls Pedro Coelho, “Building Machine Learning systems with python”, Packt Publishing.
2. Wes Mckinney , “Python for Data Analysis”, O’Reilly.
3. Mark Lutz, (2013), “Learning Python” (5th Edition), O’Reilly.
4. Reema Thareja, (2017), “Python Programming: Using Problem Solving Approach”, Oxford Higher Education.
5. U Dinesh Kumar Manaranjan Pradhan, (2019), “Machine Learning using Python”, Wiley.

**Web resources:**

1. <http://www.eecs.wsu.edu/~assefaw/CptS483-06/>
  2. <https://www.coursera.org/specializations/jhu-data-science>
  3. <https://www.udemy.com/course/datascience/>
  4. <https://www.python.org/about/gettingstarted/>
  5. [https://www.tutorialspoint.com/python\\_data\\_science/index.htm](https://www.tutorialspoint.com/python_data_science/index.htm)
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**PEDAGOGY** : Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	1	2	2	3	1	2
<b>CO2</b>	3	3	3	3	2	2
<b>CO3</b>	3	3	3	3	3	2
<b>CO4</b>	3	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3	3
<b>Average</b>	<b>2.6</b>	<b>2.8</b>	<b>2.8</b>	<b>3</b>	<b>2.4</b>	<b>2.4</b>

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## DIGITAL IMAGE PROCESSING LAB

**TOTAL HOURS: 60hrs**

**SUB CODE: 20PCSCP2003**

**CREDIT: 2**

**L-T-H: 3-1-4**

### COURSE OBJECTIVES

1. To explore the innovative tools in the key domain of computer science
2. To enable the students to adapt, contribute and innovate new technologies and systems
3. To encourage the students to pursue research in the field of computer science.
4. To explore the real time scenarios by performing case study.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Implement the color models in Image Processing.
CO2	Examine the preprocessing techniques for image enhancement.
CO3	Implement the Compression Techniques.
CO4	Compare and examining the techniques of image segmentation.
CO5	Analyze the techniques of feature extraction.

### SYLLABUS

This lab gives hands on training on the concepts of Digital Image Processing.

- Develop the realtime applications using Image processing
- Exercise the code using opensource tools to make preprocessing
- Implement the image processing techniques to compare and visualize the images

**PEDAGOGY :** Demonstration

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<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	2	3	2	3	2	2
<b>CO2</b>	3	3	3	2	2	3
<b>CO3</b>	3	3	3	2	2	3
<b>CO4</b>	3	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3	3
<b>Average</b>	<b>2.8</b>	<b>3</b>	<b>2.8</b>	<b>2.6</b>	<b>2.4</b>	<b>2.8</b>

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## DATA SCIENCE LAB

**TOTAL HOURS: 60hrs**

**SUB CODE: 20PCSCP2004**

**CREDIT : 2**

**L-T-H: 3-1-4**

### COURSE OBJECTIVES

1. To explore the innovative tools in the key domain of computer science
2. To enable the students to adapt, contribute and innovate new technologies and systems
3. To encourage the students to pursue research in the field of computer science.
4. To explore the real time scenarios by performing case study.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Implement code using python programming language
CO2	Handle missing data in real datasets using Numpy& pandas.
CO3	Create visualization of real data with Matplotlib.
CO4	Implement machine learning algorithm using python.

### SYLLABUS

This lab gives hands on training on the concepts of Data Science and Python.

- Exercise the code using the basic concepts of python
- Develop the application using the tools of python
- Develop the machine learning application using python
- Analysis the datasets using the machine learning concepts
- Create the machine learning model using python

**PEDAGOGY :** Demonstration

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<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	2	3	2	3	2	2
<b>CO2</b>	3	3	2	2	3	3
<b>CO3</b>	3	3	2	2	3	3
<b>CO4</b>	3	3	3	2	3	3
<b>Average</b>	<b>2.75</b>	<b>3</b>	<b>2.25</b>	<b>2.25</b>	<b>2.75</b>	<b>2.75</b>

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## SEMESTER III

### MODERN OPERATING SYSTEM

**TOTAL HOURS:75**

**CREDIT:4**

**SUB CODE:**

**L-T-P: 4-1-5**

#### COURSE OBJECTIVES

1. To learn and understand the concepts of modern operating system
2. To impart the knowledge of core structure, functions and design principles of OS.
3. Interposes communications and basic concepts of virtualization.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO No.	CO Statement
CO1	Discuss about the multiprocessor operating system and multicomputer system processes and their communication
CO2	Understand the various components of distributed systems synchronization and deadlock algorithms.
CO3	Analyse the resource management, process management and load balancing concepts in distributed systems.
CO4	Explain the security environment, access controls and formal models of secure systems.
CO5	Understand the study of virtualization, cloud and their case studies.

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## **SYLLABUS**

### **UNIT– 1**

**(Total number of hours: 15)**

Multiprocessors – Multiprocessor Hardware – Multiprocessor Operating System – Multiprocessor Synchronization – Multiprocessor Scheduling - Multicomputers – MultiComputer Hardware – Low-Level Communication Software – User-Level Communication Software – Remote Procedure call – Distributed Share Memory – MultiComputer Scheduling – Load Balancing.

### **UNIT– 2**

**(Total number of hours: 15)**

Distributed Systems – Network Hardware – Network Services & Protocols – Document Based Middleware – File-System Based Middleware – Objectx Based Middleware – Coordination Based Middleware - Synchronization: mutual exclusion- Deadlock-Election algorithm.

### **UNIT– 3**

**(Total number of hours: 15)**

Resource management: Global scheduling algorithm-Task assignment-Load balancing and sharing approach. Process management: Process migration- Threads.

### **UNIT– 4**

**(Total number of hours: 15)**

Security - The security environment - Operating systems security - Controlling access to resources - Formal models of secure systems – Authentication – Defenses.

### **UNIT– 5**

**(Total number of hours: 15)**

Virtualization and the Cloud – History – Requirement for Virtualization – Type1 and Type2 Hypervisors – Techniques for Efficient Virtualization – Are Hypervisors Microkernels Done Right? – Memory Utilization – I/O Virtualization – Virtual Appliances – Virtual Machines on Multicore CPUs – Licensing Issues – Clouds – Case Study VMWARE.

### **TEXT BOOKS:**

1. Andrew S. Tanenbaum Herbert Bos, (2015), “Modern Operating System 4/e, Pearson Education.
  2. Pradeep K Sinha, (1998), “Distributed Operating System- Concepts and Design” PHI.
  3. Shubhra Garg, (2013), “Fundamentals of Distributed Operating Systems”, S.K. Kataria & Sons.
  4. Andrew S.Tanenbaum, MaartenVan Steen, (2011), “Distributed System – Principles and Paradigms 2/e”, Prentice Hall of India Pvt. Ltd.
-



- George Coulouris, Jean Dollimore et al, (2017), "Distributed Systems Concepts and Design" (Fifth Edition), Pearson Publications.

## REFERENCES:

- Yakup Paker et al, (2012), "Distributed Operating Systems:Theory and Practice", Springer.
- S SKudate A P Kale et al, (2012), "Distributed Operating Systems", NiraliPrakash.
- Andrew S.Tanenbaum, (2011), "Distributed Operating Systems" (10/e), Pearson Education.
- Dac-Nhuong Le, Raghvendra Kumar et al., (2018), "Cloud Computing and Virtualization" 2018, Scrivener Publishing LLC.
- Silberschatz, Galvin, GregGagne, (2018), "Operating System Concepts" (Tenth Edition), John Wiley & Sons, Inc.

## WEB RESOURCES

- <http://www.cs.mcgill.ca>.
- <http://www.cs.kent.edu>.
- <http://www.cise.ufl.edu>.
- <Http://users.soe.ucsc.edu>
- [www.unf.edu](http://www.unf.edu)

**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

## Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
<b>CO1</b>	2	2	2	3	1	3
<b>CO2</b>	2	3	3	3	1	3
<b>CO3</b>	2	3	3	2	1	2
<b>CO4</b>	2	2	2	2	1	2
<b>CO5</b>	3	3	2	2	1	3
<b>Average</b>	<b>2.2</b>	<b>2.6</b>	<b>2.4</b>	<b>2.4</b>	<b>1</b>	<b>2.6</b>

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## ADVANCED DATABASE MANAGEMENT SYSTEMS

**TOTAL HOURS:75**

**SUB CODE:**

**CREDIT:4**

**L-T-P: 4-1-5**

### COURSE OBJECTIVES

1. Design a Fundamental tool for Managing Information.
2. Ability to apply the concepts to real world problems.
3. To develop interfaces and central modules in the project software.

**COURSE OUTCOMES:** On completion of the course the students will be able to...

CO No.	CO Statement
CO1	Understand the Parallel and Distributed Architecture of relational database applications
CO2	Design the object relational database applications
CO3	Analyze the Multidimensional Data storage
CO4	Apply the different techniques of data mining in multidimensional data storage
CO5	Explore the knowledge of information retrieval and spatial data.

### SYLLABUS

#### UNIT- 1

**(Total number of hours: 15)**

Parallel and Distributed Databases : Introduction - Architectures for Parallel Databases - Parallel Query Evaluation - Parallelizing Individual Operations- Parallel Query Optimization - Introduction to Distributed Databases - Distributed DBMS Architectures - Storing Data in a Distributed DBMS - Distributed Catalog Management - Distributed Query Processing - Updating Distributed Data - Distributed Transactions - Distributed Concurrency Control - Distributed Recovery

#### UNIT – 2

**(Total number of hours: 15)**

Object-Database Systems : Motivating Example - Structured Data Types - Operations on Structured Data- Encapsulation and ADTs – Inheritance - Objects, aIDs, and Reference Types - Database Design for an ORDBJ\IS- ORDBMS Implementation Challenges – OODBMS - Comparing RDBMS, OODBI\VIS, and ORDBMS

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### **UNIT – 3**

**(Total number of hours: 15)**

Introduction to Recursive Queries - Theoretical Foundations - Recursive Queries with Negation - From Datalog to SQL - Evaluating Recursive Queries - Data Warehousing And Decision Support : Introduction to Decision Support - OLAP: Multidimensional Data Model- OLAP: Multidimensional Data Model - Multidimensional Aggregation Queries- Implementation Techniques for OLAP - Data Warehousing - Views and Decision Support

### **UNIT – 4**

**(Total number of hours: 15)**

Data Mining : Introduction to Data Mining - Counting Co-occurrences - Mining for Rules - Tree-Structured Rules – Clustering - Similarity Search over Sequences

### **UNIT – 5** **15)**

**(Total number of hours:**

Information Retrieval And XML Data : Introduction to Information Retrieval - Indexing for Text Search - Web Search Engines - A Data Model for XML - XQuery: Querying XML Data - Efficient Evaluation of XML Queries – Spatial Data Management : Types of Spatial Data and Queries - Applications Involving Spatial Data - Introduction to Spatial Indexes - Indexing Based on Space-Filling Curves - Grid Files - R Trees: Point and Region Data

#### **Text books:**

1. Raghu Ramakrishnan, Johannes Gehrke, (2014), “Database Management Systems” (3<sup>rd</sup> Edition), McGraw Hill.
2. Rajiv Chopra, (2016), “Database Management Systems (DBMS)”.
3. Abraham Silberschatz, (2013), “Database System Concepts” (6th edition), McGraw Hill.
4. P.S. Gill, (2019), “Database Management Systems” (2nd edition) , L.K.International.
5. Rini Chakrabarti, (2011), “Advanced Database Management System”, DreamTech Press.

#### **References:**

1. Sanjeev Sharma, (2017), “Advanced Database Management System”, DreamTech Press.
  2. Prashant B. Jawalkar, (2019), “ADVANCED DATABASE MANAGEMENT SYSTEMS”, Nirali Prakashan.
  3. Dr. Jae K. Shim, (2002), “Database Management Systems: A Handbook for Managers and Their Advisors”,
  4. R. Panneerselvam, (2017), “Database Management Systems” (3<sup>rd</sup> edition), PHI.
  5. Carlos M Coronel, (2006), “Database Systems: Design, Implementation, and Management”.
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**Web resources:**

1. [https://www.tutorialspoint.com > dbms](https://www.tutorialspoint.com/dbms)
2. <https://www.studyjaar.com/index.php/learning-program/7-advanced-database-management-system>
3. <https://www.exploredatabase.com/2014/03/advanced-dbms-topics.html>
4. <http://aries.ektf.hu/~hz/pdf-tamop/pdf-xx/Radvanyi-hdbms-eng2.pdf>
5. [https://www.javatpoint.com > dbms-tutorial](https://www.javatpoint.com/dbms-tutorial)

**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	2	1	3	1	3
<b>CO2</b>	3	3	3	3	1	3
<b>CO3</b>	3	2	1	3	1	3
<b>CO4</b>	3	3	3	3	1	3
<b>CO5</b>	3	2	2	3	1	3
<b>Average</b>	<b>3</b>	<b>2.5</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>3</b>



# SOFTWARE TESTING

**TOTAL HOURS: 60 hrs**

**SUB CODE**

**CREDIT: 3**

**L-T-P: 3-1-4**

## COURSE OBJECTIVES

1. To understand the Software testing techniques
2. To make the student to design Test plan, implement and report the test output.
3. To make the student understand the difference between the manual and automation testing.
4. To train the student to make use of open source software automation tools by practising hands on exercises.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO No	CO Statement
CO1	Understanding the basic software life cycle model. Analysing different software models
CO2	Understanding different types of testing and their measures of performance
CO3	Learning special types of testing to be applied for real time projects
CO4	Learning to plan and documenting Testing process, implementation and reports
CO5	Understanding the concept of Software test automation and learning to apply software measures and metrics

## UNIT 1

**(Total number of hours: 12)**

Principles of Testing, Software development life cycle models-Phases of Software Project-Quality, Quality Assurance and Quality Control-Testing, Verification and Validation-Process Model to Represent Different Phases- Life Cycle Models.

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**UNIT 2****(Total number of hours: 12)**

Types of Testing-White Box Testing, Black Box Testing, Integration Testing, System and Acceptance Testing.

**UNIT 3****(Total number of hours: 12)**

Performance Testing, Regression Testing, Ad hoc Testing, Usability and Accessibility Testing

**UNIT 4****(Total number of hours: 12)**

Test Planning, Test Management, Test Process, Test Reporting, Best Practices

**UNIT 5****(Total number of hours: 12)**

Software Test Automation, Test Metrics and Measurements

**Recommended Texts:**

1. Srinivasan Desikan, Gopalaswamy Ramesh, (2013) , “Software Testing Principles and Practices”, Pearson.
2. B. Beizer ,(2003), “*Software Testing Techniques*” (Second Edition) , DreamTech India, New Delhi.
3. Burnstein, (2003), “*Practical Software Testing*”(1<sup>st</sup> Edition), Springer International Edition.
4. M G Limaye, (2009), “*Software Testing- Principles, techniques and tools*”, TMH, New Delhi.
5. Cem Karner,(2002) , “Lessons Learned in Software Testing: A Context-Driven Approach” Paperback.

**Reference Books:**

1. Vijay Shinde and Debassis Pradhan, “Software Testing Career Package – A Software Tester’s Journey from Getting a Job to Becoming a Test Leader!”,
2. Mark Fewster, Dorothy Graham, (2000), “Software Test Automation – Effective Use of Test Execution Tools”..
3. Lee Copeland, (2003), “A Practitioner’s Guide to Software Test Design”.
4. Rex Black, (2009), “Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing”.
5. Chinda, Damodar, “Practical Software Testing – Manual Testing Help”, eBook Version 2.0, STH Association.

**Web-Resources:**

1. <https://www.guru99.com/software-testing.html>
  2. <https://www.geeksforgeeks.org/software-testing-basics/>
  3. <https://www.softwaretestinghelp.com/automation-testing-tutorial-1/>
  4. <https://theqalead.com/tools/qa-automation-tools/>
  5. <https://www.javatpoint.com/selenium-tutorial>
-

**Pedagogy** : Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	2	2	3
<b>CO2</b>	2	3	3	3	2	3
<b>CO3</b>	3	3	3	3	3	2
<b>CO4</b>	2	2	2	3	3	2
<b>CO5</b>	3	3	3	3	3	2
<b>Average</b>	<b>2.6</b>	<b>2.8</b>	<b>2.8</b>	<b>2.8</b>	<b>2.6</b>	<b>2.4</b>

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## ADVANCED DATABASE MANAGEMENT SYSTEMS LAB

**TOTAL HOURS:60**

**SUB CODE:**

**CREDIT:2**

**L-T-P: 3-1-4**

### COURSE OBJECTIVES

1. To explore the innovative tools in the key domain of computer science.
2. To explore the real time scenarios by performing case study.
3. To understand, analyze and develop data science concepts

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO No	CO Statement
CO1	Create the Parallel and Distributed Architecture of relational database applications
CO2	Design the object relational database applications
CO3	Create and Analyze the Multidimensional Data storage
CO4	Apply the different techniques of data mining in multidimensional data storage
CO5	Create the spatial data and explore the knowledge of information retrieval

**PEDAGOGY:** Demonstration

### Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	3	1	3
CO2	3	3	3	3	1	3
CO3	3	2	1	3	1	3
CO4	3	3	3	3	1	3
CO5	3	2	2	3	1	3
Average	3	2.5	2	3	1	3

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# SOFTWARE TESTING LAB

**TOTAL HOURS: 60 hrs**

**SUB CODE**

**CREDIT: 2**

**L-T-P : 3-1-4**

## COURSE OBJECTIVES

1. To design the manual test cases for testing the program code and test the web application program using Selenium IDE
2. To design and apply automated testing for web application programs using Selenium Driver commands
3. To get knowledge of Open source tools for Regression and performance testing.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand creating the test suite and manual test cases
CO2	Recording and testing the user interaction with any website using selenium IDE
CO3	Writing and applying Selenium IDE commands to test simple programs
CO4	Writing and applying Selenium web driver commands to test simple programs
CO5	Creating a website and automated test suite with test cases of different types of testing

**PEDAGOGY:** Demonstration

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**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	1	1	3	3	3
<b>CO2</b>	3	1	1	3	3	3
<b>CO3</b>	3	1	1	3	3	3
<b>CO4</b>	3	1	1	3	3	3
<b>CO5</b>	3	1	1	3	3	3
<b>Average</b>	3	1	1	3	3	3

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## ELECTIVES – THEORY

### INTRODUCTION TO MACHINE LEARNING

**TOTAL HOURS: 60 hrs**

**SUB CODE: 20PCSET1001**

**CREDIT: 2**

**L-T-P: 3-1-4**

#### COURSE OBJECTIVES

1. To enable the students to adapt, contribute and innovate new technologies and systems.
2. To encourage the students to pursue research in the field of computer science
3. To explore the real time scenarios by performing case study.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand the applications of machine learning and its types.
CO2	Comparison of Parametric and Non-Parametric Models.
CO3	Applying Multivariate data for classification and clustering.
CO4	Comparison of different dimensionality reduction methods
CO5	Demonstration of non-parametric models – Decision Tree, Neural Network, SVM Kernel.

#### SYLLABUS

##### UNIT 1

**(Total number of hours: 12)**

Introduction: Machine Learning, Applications, Supervised Learning: Learning a Class from Examples, Noise, Learning Multiple Classes, Bayesian Decision Theory: Introduction, Classification, Losses and Risks, Association Rules.

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**UNIT 2****(Total number of hours: 12)**

Parametric Methods: Introduction, Maximum Likelihood Estimation, Evaluating an Estimator- Bias and Variance, Model Selection Procedures, Multivariate Methods: Multivariate Data, Parameter Estimation, Estimation of Missing Values, Multivariate Normal Distribution, Multivariate Classification.

**UNIT 3****(Total number of hours: 12)**

Dimensionality Reduction: Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Linear Discriminant Analysis. Clustering: Introduction, kMeans Clustering, Hierarchical Clustering, Choosing the Number of Clusters

**UNIT 4****(Total number of hours: 12)**

Nonparametric Methods: Introduction, Nonparametric Classification, Condensed Nearest Neighbor, Nonparametric Regression-Smoothing Models, Decision Trees: Introduction, Univariate Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees.

**UNIT 5****(Total number of hours: 12)**

Multilayer Perceptrons: Introduction, The Perceptron, Training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, Backpropagation Algorithm, Radial Basis Function-Deep Learning Computation : - Layers and Blocks – Parameter Management – Deferred Initialization – Custom Layers – Convolutional Neural Networks : From Fully connected layers to Convolutions – Convolution for Images – Padding and Stride – Multiple Input and Multiple Output Channels – Pooling – Convolution Neural Networks

**Text books:**

1. Ethem Alpaydin, (2010), "Introduction to Machine Learning" (Second Edition), MIT Press.
2. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, (2021), "Dive into Deep Learning"
3. Shai Shalev Shwartz, Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms".
4. Christopher M. Bishop, (2006), "Pattern Recognition and Machine Learning", Springer.
5. Yuxi (Hayden) Liu, "Python Machine Learning by Example", Packt publishers.
6. Chandra, "Artificial Intelligence and Machine Learning", PHI.

**References:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning – Data Mining, Inference, and Prediction" (Second Edition), Springer,
  2. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python".
  3. Saikat Dutt, "Machine Learning".
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4. Andriy Burkov, “The Hundred-Page Machine Learning Book”.
5. Tom M. Mitchell, “Machine Learning”,

**Web resources:**

1. [https://www.tutorialspoint.com/machine\\_learning\\_with\\_python/index.htm](https://www.tutorialspoint.com/machine_learning_with_python/index.htm)
2. <https://www.guru99.com/machine-learning-tutorial.html>
3. <https://data-flair.training/blogs/machine-learning-tutorial/>
4. [https://www.python-course.eu/machine\\_learning.php](https://www.python-course.eu/machine_learning.php)
5. <https://machinelearningmastery.com/start-here/>

**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	1	3
<b>CO2</b>	3	3	3	3	1	3
<b>CO3</b>	3	3	3	3	1	3
<b>CO4</b>	3	3	3	3	1	3
<b>CO5</b>	3	3	3	3	1	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>

## SOFT COMPUTING

**TOTAL HOURS: 60 hrs**

**SUB CODE: 20PCSET2002**

**CREDIT 2**

**L-T-P : 3-1-4**

### COURSE OBJECTIVES

1. To enable the students to adapt, contribute and innovate new technologies and systems.
2. To encourage the students to pursue research in the field of computer science.
3. To explore the real time scenarios by performing case study

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand soft computing technologies.
CO2	Analyze Neural Network Model and its types.
CO3	Compare Fuzzy Sets and Classical Relations
CO4	Analyze the Defuzzification process.
CO5	Demonstration of non-parametric models – Decision Tree, Neural Network, SVM Kernel.

### SYLLABUS

#### UNIT 1

**(Total number of hours: 12)**

Introduction : Neural Networks-Fuzzy Logic – Genetic Algorithms – Hybrid Systems. Artificial Neural Network – Fundamental Concept – Basic Models of Neural Network-Important Terminologies of ANN-McCulloch-Pitts Neuron – Linear Separability – Hebb Network.

#### UNIT 2

**(Total number of hours: 12)**

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Supervised Learning Network – Perceptron Networks - Adaptive Linear Neuron – Back-Propagation Network-Radial Basis Function Network. Associative Memory Networks :BiDirectional Associative Memory – Hopfield Networks.

### **UNIT 3**

**(Total number of hours: 12)**

Introduction to Classical Sets and Fuzzy Sets : Classical Sets-Fuzzy Sets. Classical Relations and fuzzy Relations: Cartesian Product of Relation – Classical Relation-Fuzzy Relations. Membership Functions : Features of the Membership functions – Fuzzification – Methods of Membership Value Assignments.

### **UNIT 4**

**(Total number of hours: 12)**

Defuzzification – Lamda-Cuts for Fuzzy sets and Fuzzy Relation-Fuzzy Arithmetic and Fuzzy Measures: Fuzzy Rule Base and Arithmetic Reasoning: Truth values and Tables in Fuzzy logic- Fuzzy Propositions – Formation of Rules – Decomposition and Aggregation of rules- Fuzzy reasoning-Fuzzy Inference Systems

### **UNIT 5**

**(Total number of hours: 12)**

Genetic Algorithm -Introduction – Basic Operators and Terminologies in GAs – Traditional Algorithm vs. Genetic Algorithm – Simple GA – General Genetic Algorithm – The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems – Genetic Programming.

### **Text books:**

1. S.N. Sivanandan and S.N. Deepa, (2007), “Principles of Soft Computing”, Wiley India.
2. N.P. Padhy, (2015), “Soft Computing techniques”, Oxford Higher Education.
3. Dhotre, (2015), “Soft Computing”, Technical Education.
4. Charu C. Aggarwal, (2018), “Neural Networks and Deep Learning: A Textbook”, Springer.
5. Timothy J.Ross , (2007), “Fuzzy Logic: With Engineering Applications”,Wiley.

### **References:**

1. S. Rajasekaran and G.A.V.Pai, (2003), “Neural Networks, Fuzzy Logic and Genetic Algorithms”,PHI.
  2. Timothy J.Ross, (1997), “Fuzzy Logic with Engineering Applications”, McGraw-Hill.
  3. J.S.R.Jang, C.T.Sun and E.Mizutani, (2004), “Neuro-Fuzzy and Soft Computing”, PHI.
  4. Chuen-Tsai Sun, Eiji Mizutani, and Jyh-Shing Roger Jang, (1997), “Neuro-fuzzy and Soft Computing”, Pearson Education.
  5. 5. D. K. Pratihar, (2008), “Soft Computing”, Alpha Science International.
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**Web resources:**

1. <http://www.nptel.iitm.ac.in/video.php?subjectId=117105084>
2. [www.nptel.iitm.ac.in/syllabus/111106049](http://www.nptel.iitm.ac.in/syllabus/111106049)
3. [www.iitg.ac.in/rkbc/CE602/GA.pdf](http://www.iitg.ac.in/rkbc/CE602/GA.pdf)
4. [https://www.tutorialspoint.com/artificial\\_neural\\_network/index.htm](https://www.tutorialspoint.com/artificial_neural_network/index.htm)
5. [https://www.tutorialspoint.com/fuzzy\\_logic/index.htm](https://www.tutorialspoint.com/fuzzy_logic/index.htm)
6. [https://www.tutorialspoint.com/genetic\\_algorithms/index.htm](https://www.tutorialspoint.com/genetic_algorithms/index.htm)

**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

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# CRYPTOGRAPHY AND NETWORK SECURITY

**TOTAL HOURS: 60 hrs**

**SUB CODE**

**CREDIT 2**

**L-T-P : 3-1-4**

## COURSE OBJECTIVES

1. To understand the cryptographic and network security concepts
2. To understand the importance of network security
3. To understand the different secured algorithms

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand the importance of security, confidentiality and integrity of the information in the network.
CO2	Apply the techniques for the security system
CO3	Analyze the method for the network security
CO4	Analyze the different secured algorithms
CO5	Examine the various network security protocols

## SYLLABUS

### UNIT 1

**(Total number of hours:15 )**

Conventional encryption model –Security Concepts-Substitution and Transposition  
Ciphers

### UNIT 2

**(Total number of hours:15 )**

DES algorithm –AES algorithm - Random number generation.

### UNIT 3

**(Total number of hours:15)**

Principles of Public key Cryptography– RSA algorithm – Diffie – Hellman key exchange.

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## UNIT 4

(Total number of hours:15)

Message Authentication and Hash functions: Authentication requirements – Authentication function- Message Authentication codes- Hash functions – Secure Hash Algorithm- Digital Signatures – Public key infrastructure

## UNIT 5

(Total number of hours:15)

Network Security : Wireless Application Protocol – Email Security : DKIM – IP Security Overview

### Text books:

1. Stallings, W.,( 2005), “Cryptography and Network Security Principles and Practice”, Pearson Education, Delhi.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay, (2011), “Cryptography and Network Security” (SIE), McGraw Hill.
3. Atul Kahate, (2013), “Cryptography and Network Security”, McGraw Hill.
4. Prakash C. Gupta, (2014), “Cryptography And Network Security”, PHI.
5. Dr.S.Bose, Dr.P.Vijaykumar, (2016), “Cryptography and Network Security”, Pearson.

### References:

1. Charlie Kaufman, Radia Perlman, Mike specimen, “Network Security- Private Communication in a public world” (Second Edition), Pearson/PHI.
2. Michael Welsehenbach, (2005), “Cryptography in C & C++”, John Wiley.
3. Jean-Philippe Aumasson, (2017), “Serious Cryptography -A Practical Introduction to Modern Encryption”.
4. Christof Paar, Bart Preneel, Jan Pelzl, (2009), “Understanding Cryptography ,A Textbook For Students And Practitioners”.
5. William Stallings, (2007), “Network security essentials applications and standards”.

### Web resources:

1. <http://www.cs.auckland.ac.nz/~pgut001/tutorial>
  2. [https://onlinecourses.nptel.ac.in > noc21\\_cs16](https://onlinecourses.nptel.ac.in > noc21_cs16)
  3. <https://www.classcentral.com/course/swayam-cryptography-and-network-security-9896>
  4. <https://www.tutorialspoint.com/cryptography/index.htm>
  5. <https://www.udemy.com/topic/cryptography/>
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**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	2	1	1	1
<b>CO2</b>	3	3	3	3	2	2
<b>CO3</b>	3	3	3	3	2	2
<b>CO4</b>	3	2	3	3	3	3
<b>CO5</b>	3	2	3	3	3	3
<b>Average</b>	<b>3</b>	<b>2.6</b>	<b>2.8</b>	<b>2.6</b>	<b>2.2</b>	<b>2.2</b>

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## ETHICAL HACKING

**TOTAL HOURS: 60 hrs**

**SUB CODE**

**CREDIT 3**

**L-T-P : 3-1-4**

### COURSE OBJECTIVES

1. Assurance of changing point of view towards a computer and its security
2. Student get trained about hacking methodology.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO No.	CO Statement
CO1	Describe and understand the basics of ethical hacking
CO2	Explain social engineering and host reconnaissance.
CO3	Analyses the network infrastructure system and avoid the hacking network hosts.
CO4	Examine the hacking of windows and Linux operating system.
CO5	Learn the hacking applications in mobile apps, database storage systems.

### SYLLABUS

#### UNIT 1

**(Total number of hours: 12)**

Introduction to Ethical Hacking - Cracking the Hacker mindset- Developing Ethical Hacking plan- Hacking Methodology.

#### UNIT 2

**(Total number of hours: 12)**

Putting security testing in motion- Information Gathering- Gathering public Information- Mapping Network- Social Engineering- Physical security- Passwords.

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**UNIT 3****(Total number of hours: 12)**

Hacking Network hosts- Network Infrastructure Systems- Wireless Networks- Mobile devices.

**UNIT 4****(Total number of hours: 12)**

Hacking Operating systems- Windows- Linux

**UNIT 5****(Total number of hours: 12)**

Hacking Applications - Communication and Messaging System - Web Application and Mobile Apps- Databases and storage systems.

**Text books:**

1. Kevin Beaver, (2012), "Hacking For Dummies", John Wiley & Sons.
2. Rajat Khare, (2006), "Network Security and Ethical Hacking", Luniver Press.
3. Kimberly Graves, (2010), "Certified Ethical Hacker", Wiley India Pvt Ltd.
4. Thomas Mathew, (2003), "Ethical Hacking", OSB publishers.
5. Ramachandran V, (2011), "BackTrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.). Packt Publishing.

**References:**

1. Michael T. Simpson, (2010), "Hands-on Ethical Hacking & Network Defence", Course Technology.
2. Rajat Khare, (2006), "Network Security and Ethical Hacking", Luniver Press.
3. Certified Ethical Hacker, Version 9, Second Edition, Michael Gregg, Pearson IT Certification
4. Hein Smith and Hilary Morrison, (2018), "Ethical Hacking: A Comprehensive Beginner's Guide to Learn and Master Ethical hacking".
5. Zaid Sabih (2018), "Learn Ethical Hacking from Scratch: Your Stepping Stone to Penetration Testing".

**Web resources:**

1. <https://hackaday.com/>
2. <https://breakthesecurity.cysecurity.org/>
3. <https://www.eccouncil.org/programs/certified-ethical-hacker-ceh/>
4. <https://www.hackthissite.org/>
5. <http://www.udemy.com/>

**PEDAGOGY:** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

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**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	2	1	2	2
<b>CO2</b>	3	2	3	3	2	2
<b>CO3</b>	3	2	2	3	3	3
<b>CO4</b>	3	3	3	3	3	3
<b>CO5</b>	3	3	2	3	3	3
<b>Average</b>	<b>3</b>	<b>2.6</b>	<b>2.4</b>	<b>2.6</b>	<b>2.6</b>	<b>2.6</b>

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## MATHEMATICAL THEORY FOR COMPUTER SCIENCE

**TOTAL HOURS: 60 hrs**

**SUB CODE**

**REDIT 3**

**L-T-P : 3-1-4**

### COURSE OBJECTIVES

1. To make the student learn and apply the mathematical logic and inferences
2. To understand the mathematical concepts related to design of algorithms
3. To make the student familiarise with Graph theory concepts to apply the theory for problem solving.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understanding the logic to enhance the analytical skills
CO2	Learning the basic set operations and partial ordering
CO3	Understanding combinatorics for problem solving
CO4	Learning and applying Graph theory concepts for problem solving
CO5	Understanding the concept of Trees and its applications.

### SYLLABUS

#### UNIT 1

**(Total number of hours: 12)**

**MATHEMATICAL LOGIC-** Propositions, Connectives, Equivalence of Propositions, Duality Theorem, Tautological implication, Predicate calculus, Inference theory

#### UNIT 2

**(Total number of hours: 12)**

**SET THEORY** - Set operations, Types of Relations, Partitioning of a set, Hasse diagram for partial ordering.

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### UNIT 3

(Total number of hours: 12)

**COMBINATORICS-** Counting, Sum and product rule, Principle of Inclusion Exclusion. Pigeon Hole Principle, Counting by Bijections. Double Counting. Linear Recurrence relations - methods of solutions. Generating Functions. Permutations and counting. Mathematical Induction

### UNIT 4

(Total number of hours: 12)

**GRAPH THEORY** – Introduction, Terminology, Matrix representation of Graphs, Graph Isomorphism , Connectivity, Shortest Path algorithms

### UNIT 5

(Total number

of hours: 12)

**GRAPH THEORY** – Trees, Spanning trees, Rooted and Binary trees, Binary tree, Tree Traversals.

### Textbooks

1. Kenneth H. Rosen, (2007), “Discrete Mathematics and its Applications” (7th Edition), Tata McGraw Hill Publishers.
2. Veerarajan, T, (2006), “ Discrete Mathematics” , Tata McGraw Hill Publishing Co.
3. Tremblay, J. P. Manohar, R, (2004), “Discrete Mathematical structures with applications to Computer science”, Tata McGraw Hill Publishing Co.
4. Liu and Mohapatra, “Elements of Discrete Mathematics”, McGraw Hill Publications
5. B. Kolman, R.C. Busby, and S.C. Ross, “Discrete Mathematical Structures”, PHI Publications
6. R.P. Grimaldi, “Discrete and Combinatorial Mathematics”, Addison Wesley

### References

1. Kenneth H. Rosen, “Discrete Mathematics and Its Applications”, McGraw-Hill.
  2. Kolman. Busby. Ross (2008) Discrete Mathematical Structures, (6th ed.), Pearson
  2. Kenneth, Rosen (2007) Discrete Mathematics and its applications (SIE), Tata McGraw Hill
  3. Ronald Graham, Donald Knuth, and Oren Patashnik, (1996), “Concrete Mathematics” (2nd Edition), Pearson Education Publishers.
  4. Peter J. Cameron, (1994), “Combinatorics: Topics, Techniques, Algorithms”, Cambridge University Press.
  5. Narasingh Deo, (1979), “ Graph Theory with Applications to Engineering and Computer Science”.
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**Web-Resources:**

1. [Basics of Combinatorics Tutorials & Notes | Math | HackerEarth](#)
2. [Set Theory > Basic Set Theory \(Stanford Encyclopedia of Philosophy\)](#)
3. [Mathematics | Introduction to Propositional Logic | Set 1 - GeeksforGeeks](#)
4. [Graph Theory Tutorial - javatpoint](#)
5. [Graph Theory - Trees - Tutorialspoint](#)

**Pedagogy :** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
<b>CO1</b>	3	3	3	3	2	2
<b>CO2</b>	2	2	2	2	2	2
<b>CO3</b>	3	3	3	2	2	2
<b>CO4</b>	3	3	3	2	2	2
<b>CO5</b>	3	3	3	2	2	2
<b>Average</b>	<b>2.8</b>	<b>2.8</b>	<b>2.8</b>	<b>2.2</b>	<b>2</b>	<b>2</b>

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## SOCIAL NETWORK ANALYSIS

**TOTAL HOURS: 60 hrs**

**SUB CODE**

**CREDIT :4**

**L-T-H : 3-1-4**

### COURSE OBJECTIVES

1. To understand the social network concepts
2. To understand the types of social networks
3. To explore different methods of Data collection in Social media

### COURSE OUTCOME

CO Number	CO Statement
CO1	Understand the concepts of Social networks and analyzing the relationship to networks.
CO2	Understand the Graphs, sub graphs related to networks
CO3	Understand and apply 2- mode networks and information shape networks
CO4	Understanding different types of network data connected with the real world.
CO5	Design and applying the different methods of data collection in social media.

### SYLLABUS

#### UNIT I

**(Total No.of hours- 12)**

Introduction to social network analysis (SNA)- Analyzing relationships to understand people and groups, From Relationships to networks, Social Networks Vs Link analysis. Graph theory –Introduction, Graph traversals and distances, Graph distance.

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## **UNIT 2**

**(Total No.of hours- 12)**

Centrality, Power and Bottlenecks – Sample data, Centrality. Cliques, Clusters and Components – Components and sub graphs, Sub graph, Triads, Cliques, Hierarchical clustering.

## **UNIT 3**

**(Total No.of hours- 12)**

2-mode networks – Theory of 2-mode networks, Expanding Multimode networks. Information diffusion – Critical Mass, Information shape networks, Simple Dynamic model in Python

## **UNIT 4**

**(Total No.of hours- 12)**

Graph data in the real world – Medium data, Big data, Working with 2-mode data, Social Networks and Big data, Big data at work.

## **UNIT 5**

**(Total No.of hours- 12)**

Case Study - Data collection – Server Logs, Social Media sites, Twitter data collection, Facebook, Facebook social graph API

## **TEXT BOOKS**

1. MaksimTsvetovat, Alexander Kouznetsov, (2011), “Social Network Analysis for Startups-Finding connections on the social web”, O'Reilly Media.
2. Robert A. Hanneman, Mark Riddle, (2005), “Introduction to Social Network Methods”, University of California.
3. John Scott, (2012), “Social Network Analysis” (3rd edition),SAGE publications.
4. Stephen P Borgatti, Martin G. Everett, JeffreyC.Johnson , (2013), “Analyzing Social Networks”, SAGE Publications.
5. Peter J. Carrington, John Scott, Stanley Wasserman, (2005), “Models and Methods in Social Network Analysis”, Cambridge University Press.

## **REFERENCES**

1. WouterdeNooy, Andrej Mrvar, Vladimir Batagelj , (2011), “Exploratory Social Network Analysis with Pajek” (Second edition), Cambridge University Press.
  2. Eric D. Kolaczyk, Gábor Csárdi, (2014), “Statistical Analysis of Network Data with R”, Springer.
  3. Ulrik Brandes, Thomas Erlebach , (2005), “Network Analysis: Methodological Foundations”,Springer.
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4. Şule Gündüz-Öğüdücü , A. Şima Etaner-Uyar, Social Networks: Analysis and Case Studies, Springer, 2016
5. Brian V. Carolan, (2013), “Social Network Analysis and Education: Theory, Methods & Applications”, SAGE Publications.

## WEB RESOURCES

1. [http://www.mjdenny.com/workshops/SN\\_Theory\\_I.pdf](http://www.mjdenny.com/workshops/SN_Theory_I.pdf)
2. <https://www.datacamp.com/community/tutorials/social-network-analysis-python>
3. <https://freevideolectures.com/course/4597/nptel-social-networks/18>
4. <https://towardsdatascience.com/how-to-get-started-with-social-network-analysis-6d527685d374>
5. [https://faculty.ucr.edu/~hanneman/nettext/C17\\_Two\\_mode.html](https://faculty.ucr.edu/~hanneman/nettext/C17_Two_mode.html)

**PEDAGOGY** - Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	3
CO2	3	2	2	3	2	3
CO3	3	2	2	3	2	3
CO4	3	2	2	3	2	3
CO5	3	3	3	3	3	3
<b>Average</b>	<b>3</b>	<b>2.2</b>	<b>2.2</b>	<b>3</b>	<b>2.2</b>	<b>3</b>

# CLOUD COMPUTING

**TOTAL HOURS: 60 hrs**

**SUB CODE**

**CREDIT 3**

**L-T-P : 3-1-4**

## COURSE OBJECTIVES

1. To understand the infrastructure of cloud computing
2. To understand the migration from datacenters to cloud
3. To Manage and secure cloud services.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Describe and understand the basics of cloud computing
CO2	Explain the cloud infrastructure
CO3	Analyses the cloud infrastructure system and workload strategies.
CO4	Examine the different models of cloud services
CO5	Learn how to manage and secure the cloud services

## SYLLABUS

### Unit 1:

**(Total number of hours: 12)**

Introduction: Computing and defining the cloud. Getting inside the cloud: deciding on a strategy-administrating cloud services-Managing Cloud Resources.

### Unit 2:

**(Total number of hours: 12)**

Nature of cloud:Advantages of highly scaled data center: Scaling the cloud- Comparing Traditional and Cloud Data Center Costs. Exploring the Technical Foundation for Scaling Computer Systems: Server-ing Up Some Hardware- Economies of Scale- Keeping the Bottom Line in Mind.

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### **Unit 3:**

**(Total number of hours: 12)**

Checking the Cloud's Workload Strategy: Managing Workloads in the Cloud.- Balancing Risk and Practical ModelsId. Managing Data: Declaring Data Types- Securing Data in the Cloud.- Looking at Data, Scalability, and Cloud Services- Sorting Out Metadata Matters.Discovering and hybrid clouds: Pining for Privacy- Examining the Economics of the Private Cloud.

### **Unit 4:**

**(Total number of hours: 12)**

Infrastructure as a Service: Tracing IaaS to ISP - Examining IaaS-Enabling Technology - Platform as a Service: Putting Platform as a Service on a Pedestal - Enabling Technologies as a Platform - Software as a Service:SalesForce.com's Approach to Evolving Software as a Service- Characterizing Software as a Service.- Examining Types of SaaS Platforms.

### **Unit 5:**

**(Total number of hours: 12)**

Managing and Securing Cloud Services: Understanding Security Risks- Reducing Cloud Security Breaches- Implementing Identity Management- Playing Detective: Detection and Forensics- Encrypting Data-Creating a Cloud Security Strategy. Virtualization and the Cloud-Managing the Cloud Environment.Planning for the cloud.

### **Text Book:**

1. Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Dr. Fern Halper ,Cloud Computing for Dummies, Wiley Publishing.
2. James Broberg, Andrzej M. Goscinski, (2010), "Cloud Computing- Principles and Paradigms", Wiley.
3. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi , (2013), Mastering Cloud Computing Foundations and Applications Programming, MK Publications.
4. Arshdeep Bahga, Vijay Madiseti, (2013), "Cloud Computing -A Hands-on Approach", The Orient Blackswan.
5. Barrie Sosinsky, (2010), Cloud Computing Bible, Wiley.

### **Reference:**

1. Dr.Kumar Saurabh, (2011), "Cloud Computing" (1st Edition), Wiley Publishing.
2. K. Chandrasekaran, (2014), "Essentials of Cloud Computing".
3. TimMather, Subra Kumaraswamy, Shahed Latif, (2009), "Cloud Security and Privacy,An Enterprise Perspective on Risks and Compliance", O,Reilly.
4. Ray Rafaels, (2015), "Cloud Computing: From Beginning to End".
5. Stephen Orban, (2018), "Ahead in the Cloud: Best Practices for Navigating the future of enterprise IT",AWS.

### **Web Resources**

1. <https://azure.microsoft.com/en-in/overview/what-is-cloud-computing/>
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2. [https://www.tutorialspoint.com/cloud\\_computing/index.htm](https://www.tutorialspoint.com/cloud_computing/index.htm)
3. <https://www.simplilearn.com/cloud-computing-tutorial-video>
4. <https://www.w3schools.in/cloud-computing/cloud-computing/>
5. <https://www.udemy.com/topic/cloud-computing/>

**Pedagogy :** Direct Instruction, Inquiry based learning, Flipped classrooms, Demonstration learning

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	1	2	3	3	3
<b>CO2</b>	3	1	2	3	3	3
<b>CO3</b>	3	1	2	3	3	3
<b>CO4</b>	3	1	2	3	3	3
<b>CO5</b>	3	1	2	3	3	3
<b>Average</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>



**ELECTIVE – PRACTICAL**  
**R PROGRAMMING**

**TOTAL HOURS: 60 HRS**

**SUB CODE:**

**CREDIT: 3**

**L-T-P: 3-1-4**

**COURSE OBJECTIVES**

1. To understand, analyze and perform data analytics
2. To explore the real time scenarios by performing case study

**COURSE OUTCOMES:** on completion of the course the students will be able to

<b>CO Number</b>	<b>CO Statement</b>
CO1	Understand the basic elements of R.
CO2	Explore the dataset from various sources.
CO3	Preprocess the dataset for Data Analytics.
CO4	Implement the data analytics using various techniques in R.
CO5	Visualize the dataset in various models.

**PEDAGOGY:** Demonstration, Hands on practice

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**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

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## BIG DATA

TOTALHOURS: 60 HRS

SUB CODE:

CREDIT: 3

L-T-P: 3-1-4

### COURSE OBJECTIVES

1. To understand the concepts of Big data
2. To learn handling and analyzing Big data

CO Number	CO Statement
CO1	Understand the basic elements of Big Data.
CO2	Explore the data acquisition and filtering from various sources.
CO3	Understanding RDD and Data framework
CO4	Analyze the data set in Big Data
CO5	Processing dataset using the concept of Map reduce

**COURSE OUTCOMES:** on completion of the course the students will be able to

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**PEDAGOGY:** Demonstration, Hands on practice

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

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## WEKA TOOL

TOTALHOURS: 60 HRS

SUB CODE:

CREDIT:3

L-T-P: 3-1-4

### COURSE OBJECTIVES

1. To enable the students to adapt, contribute and innovate new technologies and systems.
2. To explore the innovative open source tools for analyzing dataset

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Explore the dataset from various sources.
CO2	Preprocess the dataset for Data Analytics.
CO3	Implement the types of classification, clustering and association models.
CO4	Analyze the accuracy of the model using various techniques.
CO5	Visualize the model using different techniques

**PEDAGOGY:** Demonstration, Hands on practice

### Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	2	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	2	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	2	3
Average	3	3	3	3	2	3

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## CLOUD COMPUTING LAB

TOTALHOURS: 60 HRS

SUB CODE:

CREDIT:3

L-T-P: 3-1-4

### COURSE OBJECTIVES

1. To explore the innovative tools in the key domain of computer science.
2. To enable the students to adapt, contribute and innovate new technologies and systems.
3. To explore the real time scenarios by performing case study.

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand AWS Web services include compute, Storage, databases.
CO2	Design and manage the multiple hierarchies of directory data
CO3	Create the infrastructure with auto scaling and managing the servers
CO4	Create the application-specific policies to objects along different hierarchies using IAM
CO5	Implement the security in data centers.

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**PEDAGOGY:** Demonstration, Hands on practice

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	2	2	3	3	3
<b>CO2</b>	3	2	2	3	3	3
<b>CO3</b>	3	2	2	3	3	3
<b>CO4</b>	3	2	2	3	3	3
<b>CO5</b>	3	2	2	3	3	3
<b>Average</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>

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## FUZZY TOOL KIT

TOTALHOURS: 60 HRS

SUB CODE:

CREDIT:3

L-T-P: 3-1-4

### COURSE OBJECTIVES

1. To encourage the students to pursue research in the field of computer science
2. To explore the innovative and open source tools
3. To explore the real time scenario by performing case study

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand the open source tools, techniques and the environment
CO2	Implement the basic concepts with existing tools
CO3	Analyze the real world problems to apply the methods
CO4	Compare the existing methods for processing
CO5	Design the program to implement the real world problems

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**PEDAGOGY:** Demonstration, Hands on practice

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

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## DEEP LEARNING TOOL KIT

TOTALHOURS: 60 HRS

SUB CODE:

CREDIT:3

L-T-P: 3-1-4

### COURSE OBJECTIVES

1. To encourage the students to pursue research in the field of computer science
2. To explore the innovative and open source tools
3. To explore the real time scenario by performing case study

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand the open source tools, techniques and the environment
CO2	Implement the basic concepts with existing tools
CO3	Analyze the real world problems to apply the methods
CO4	Compare the existing methods for processing
CO5	Design the program to implement the real world problems

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**PEDAGOGY:** Demonstration, Hands on practice

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

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## MACHINE LEARNING TOOL KIT

TOTALHOURS: 60 HRS

SUB CODE:

CREDIT:3

L-T-P: 3-1-4

### COURSE OBJECTIVES

1. To encourage the students to pursue research in the field of computer science
2. To explore the innovative and open source tools
3. To explore the real time scenario by performing case study

**COURSE OUTCOMES:** on completion of the course the students will be able to

CO Number	CO Statement
CO1	Understand the open source tools, techniques and the environment
CO2	Implement the basic concepts with existing tools
CO3	Analyze the real world problems to apply the methods
CO4	Compare the existing methods for processing
CO5	Design the program to implement the real world problems

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**PEDAGOGY:** Demonstration, Hands on practice

**Mapping of CO with PSO:**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	3	3	3	3	2	3

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# WEB APPLICATION FRAMEWORK

**TOTALHOURS: 60 HRS**

**SUB CODE:**

**CREDIT:3**

**L-T-P: 3-1-4**

## COURSE OBJECTIVES

1. To develop web applications using open source web application software
2. To design the real time website
3. To enable students to develop responsive web pages along with database connectivity

**COURSE OUTCOMES:** on completion of the course the students will be able to

<b>CO Number</b>	<b>CO Statement</b>
CO1	To Learn different open source technologies to develop web application
CO2	Learn the basic syntax and practicing different tags
CO3	Designing simple static web pages
CO4	Designing interactive and responsive web pages.
CO5	Designing a website with database connectivity

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**PEDAGOGY: Demonstration**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	1	1	3	3	3
<b>CO2</b>	3	1	1	3	3	3
<b>CO3</b>	3	1	1	3	3	3
<b>CO4</b>	3	1	1	3	3	3
<b>CO5</b>	3	1	1	3	3	3
<b>Average</b>	3	1	1	3	3	3

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## NATURAL LANGUAGE PROCESSING TOOL KIT

**TOTALHOURS: 60 HRS**

**SUB CODE:**

**CREDIT:3**

**L-T-P: 3-1-4**

### **COURSE OBJECTIVES**

1. To encourage the students to pursue research in the field of computer science
2. To explore the innovative and open source tools
3. To explore the real time scenario by performing case study

**COURSE OUTCOMES:** on completion of the course the students will be able to

<b>CO Number</b>	<b>CO Statement</b>
CO1	Understand the open source tools, techniques and the environment
CO2	Implement the basic concepts with existing tools
CO3	Analyze the real world problems to apply the methods
CO4	Compare the existing methods for processing
CO5	Design the program to implement the real world problems

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**PEDAGOGY:** Demonstration, Hands on practice

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

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## ANDROID USING JAVA

**TOTALHOURS: 60 HRS**

**SUB CODE:**

**CREDIT:3**

**L-T-P: 3-1-4**

### COURSE OBJECTIVES

1. To design mobile application for any real time scenarios
2. To establish database connectivity for mobile apps.

**COURSE OUTCOMES:** on completion of the course the students will be able to

<b>CO Number</b>	<b>CO Statement</b>
CO1	Implement different layouts in Android Application.
CO2	Examine the validation using Java.
CO3	Implement database connectivity with SQLite.
CO4	Implement the GPS Tracking System.
CO5	Explore the Graphical Packages in Android Application.

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**PEDAGOGY:** Demonstration, Hands on practice

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

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