CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

NATIONALLY ACCREDITED WITH "A" GRADE BY NAAC

ISO 9001:2015 Certified

TIRUCHIRAPPALLI

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M. SC COMPUTER SCIENCE

SYLLABUS

2022-2023 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

VISION

To create an ambience for a quality academic erudition which drives technologically adept, innovative and globally competent graduates with ethical values

MISSION

- To have a breath of knowledge across the subject areas of Computer Science
- To professionally enrich the students for successful career in Academic, Industry and Research
- To promote and inculcate ethics and code of professional practice among students

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR M.Sc COMPUTER SCIENCE PROGRAMME

PO NO.	Programme Outcome On completion of M.Sc. Computer Science The students will be able to
PO 1	**DOMAIN KNOWLEDGE** Acquire the in-depth computing knowledge both conceptual and applied pertaining to the core discipline
PO 2	**PROBLEM SOLVING** Procure knowledge-based skills to satisfy the needs of society and the industry by providing hands on experience of various technologies in Computer Science
PO 3	**INNOVATION AND CRITICAL THINKING** Critically evaluate global issues, recognize the need and identify sustainable solutions through research capabilities towards Nation building initiatives
PO 4	**LIFE LONG LEARNING** Capable of upgrading and advancing knowledge through innovation and technology as evidenced by current developments
PO 5	**LEADERSHIP AND TEAMWORK** Work in collaborative environment through applications of scientific reasoning and communicate effectively to the stakeholders

PROGRAMME SPECIFIC OUTCOMES FOR M.Sc COMPUTER SCIENCE PROGRAMME

PSO NO.	Programme Specific Outcomes Students of M.Sc Computer Science will be able to	PO s Addressed
PSO 1	Identify, formulate and develop solutions for computational challenges	PO 1 PO 2
PSO 2	Inculcate broad knowledge in core areas of Computer Science and emerging technologies in related domains	PO 1 PO 2
PSO 3	Integrate computing knowledge on crafting innovative solutions and to provide a gateway for research.	PO 2 PO 3 PO 4
PSO 4	Develop analytical and technical skills to enhance employment potential and entrepreneurship	PO 3 PO 4 PO 5
PSO 5	Imbibe professional and ethical skills to become a competent citizen for the betterment of society	PO 3 PO 4 PO 5

Cauvery College for Women (Autonomous), Trichy-18

PG & Research Department of Computer Science

M.Sc Computer Science

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (CBCS- LOCF)

(For the Candidates admitted from the Academic year 2022-2023 onwards)

Semester	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total
						Hrs.	Marks		
							Int.	Ext.	
I	Core Course– I (CC)	Mathematical Foundation for Computer Science	22PCS1CC1	6	5	3	25	75	100
	Core Course – II (CC)	Web Technologies	22PCS1CC2	6	5	3	25	75	100
	Core Course –III (CC)	Machine Learning Techniques	22PCS1CC3	6	5	3	25	75	100
	Core Practical - I (CP)	Web Technologies (P)	22PCS1CC1P	6	5	3	40	60	100
	Discipline Specific Elective Course-I (DSE)	A. Advanced Computer Architecture	22PCS1DSE1A	6	3	3	25	75	100
		B. Advanced Database System	22PCS1DSE1B						
		C. Software Testing	22PCS1DSE1C						
	Total			**30**	**23**	-	-	-	**500**
15 Days INTERNSHIP during Semester Holidays									
II	Core Course– IV (CC)	Data Mining and Warehousing	22PCS2CC4	6	5	3	25	75	100
	Core Course – V (CC)	Design and Analysis of Algorithms	22PCS2CC5	6	5	3	25	75	100
	Core Choice Course– I (CCC)	A. Mobile Computing	22PCS2CCC1A	6	4	3	25	75	100
		B. Wireless Sensor Networks	22PCS2CCC1B						
		C.MANET	22PCS2CCC1C						
	Core Practical - II (CP)	Data Mining (P)	22PCS2CC2P	6	5	3	40	60	100
	Discipline Specific Elective Course-II (DSE)	A. Cryptography and Network Security	22PCS2DSE2A	6	3	3	25	75	100
		B. Blockchain and Cryptocurrencies	22PCS2DSE2B						
		C. Ethical Hacking	22PCS2DSE2C						
	Internship	Internship	22PCS2INT	-	2	-	25	75	100
	Extra Credit Course	SWAYAM	As per UGC Recommendation						
	Total			**30**	**24**	-	-	-	**600**

III	Core Course– VI (CC)	WAP & XML	22PCS3CC6	6	5	3	-	100	100
	Core Course – VII (CC)	Cloud Computing	22PCS3CC7	6	5	3	25	75	100
	Core Choice Course– II (CCC)	A. Cyber Security	22PGCS3CCC2A	5	4	3	25	75	100
		B. IoT	22PCS3CCC2B						
		C. Compiler Design	22PCS3CCC2C						
	Core Practical - III (CP)	Cloud Computing (P)	22PCS3CC3P	5	5	3	40	60	100
	Discipline Specific Elective Course-III (DSE)	A. Computer Science for Competitive Examinations	22PCS3DSE3A	5	3	2	-	100	100
		B. IoT (P)	22PCS3DSE3BP			3	40	60	
		C. Smart Devices Programming (P)	22PCS3DSE3CP						
	Generic Elective Course -I (GEC)	Data Analysis (P)	22PCS3GEC1P	3	2	3	40	60	100
	Extra Credit Course	SWAYAM	As per UGC Recommendation						
	Total			**30**	**24**	-	-	-	**600**
IV	Core Course–VIII (CC)	Big Data Analytics	22PCS4CC8	6	5	3	25	75	100
	Core Choice Course– III (CCC)	A. Robotic Process Automation	22PCS4CCC3A	6	4	3	25	75	100
		B. Virtual and Augmented Reality	22PCS4CCC3B						
		C. Digital Image Processing	22PCS4CCC3C						
	Core Practical - IV (CP)	FOSS (P)	22PCS4CC4P	6	5	3	40	60	100
	Generic Elective Course-II (GEC)	Animation (P)	22PCS4GEC2P	3	2	3	40	60	100
	Project	Project Work	22PCS4PW	9	5	-	-	100	100
	Total			**30**	**21**				**500**
	Grand Total			**120**	**92**				**2200**

Courses & Credits for M.Sc Computer Science Programme

S. No	Courses	No of Courses	No of Credits	Marks
1.	Core Course– (CC)	8	40	800
2.	Core Choice Course– (CCC)	3	12	300
3.	Core Practical - (CP)	4	20	400
4.	Discipline Specific Elective- (DSE)	3	9	300
5.	Generic Elective Course - (GEC)	2	4	200
6.	Project	1	5	100
7.	Internship	1	2	100
	Total	**22**	**92**	**2200**

The Internal and External marks for theory and practical courses are as follows:

Course	Internal Marks	External Marks
Theory	25	75
Practical	40	60
Project	-	100
Internship	25	75

For Theory courses:

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 75 marks (i.e. 30 marks)

c) The passing minimum not less than 50% in the aggregate.

For Practical courses:

a) The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16 marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 60 marks (i.e. 24 marks)

c) The passing minimum not less than 50% in the aggregate.

For Project Work:

a) The passing minimum not less than 50% out of 100 marks

For Internship:

a) The passing minimum not less than 50% in the aggregate.

SEMESTER I

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS1CC1	**MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE**	**CORE**	**6**	**5**

Course Objective

- **Explore** the basic concepts of Discrete Mathematics, Graph Theory,
- **Acquire** the knowledge of Fundamentals in Fuzzy set Theory and combinatorics.
- **Analyze** the method of logical reasoning to solve variety of problems.

Prerequisites

Basic Knowledge in Essential Mathematics, Numerical and Statistics.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Define the various concepts in Discrete Mathematics and Fuzzy Set Theory.	K1
CO 2	Understand the different terminologies of Discrete Mathematics and Fuzzy set theory.	K2
CO 3	Analyze the problems in different aspects and give solutions in their respective streams.	K3
CO 4	Examine some methodologies for the related area in an effective manner.	K4
CO 5	Apply the notions to distinct problems and get solutions in a easy way.	K5

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	2	3	2	2	3	2	2	2	3
CO 2	2	2	3	2	2	2	2	2	2	3
CO 3	3	2	3	2	2	3	2	2	3	3
CO 4	3	2	2	2	2	2	2	2	2	2
CO 5	2	2	2	3	3	2	3	3	2	2

"1" – Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation
"-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Mathematical Logic:** Statements and notation– Connectives – Negation– Conjunction– Disjunction-Statement Formulas and Truth Tables – Conditional and Biconditional – Well-formed Formulas – Tautologies – Duality law – Tautological Implications – Theory of inference for the statement calculus–Validity using Truth Tables – Rules of inference – Consistency of Premises and indirect Method of Proof	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Ordering:** Partial ordering – Partially Ordered Set: Representation and Associated Terminology. **Lattices and Boolean Algebra:** Lattices as Partially ordered sets – Definition and Example – Some Properties of Lattices – Boolean Algebra – Definition and examples – Subalgebra, Direct Product and Homomorphism – Fundamental principles of counting: Permutations – Combinations: The Binomial theorem – Combinations with Repetition– The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Algebraic Structures:** Introduction – Algebraic Systems: Examples and General Properties: Definition and Examples – Some Simple Algebraic Systems and General Properties – Semigroups and Monoids : Definitions and Examples – Homomorphism of Semigroups and Monoids – Subsemigroups and Submonoids – Groups: Definitions and Examples – Subgroups and Homomorphisms – Cosets and Lagrange's Theorem. **Group Codes:** The Communication Model and Basic Notions of Error Correction – Generation of Codes by Using Parity Checks – Error Recovery in Group Codes**.**	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Graph Theory:** Definition of a Graph – Application of Graphs – Finite & Infinite graphs – Incidence and Degree – Isolated Vertex, Pendent Vertex and Null Graph. **Paths and Circuits:** Subgraphs–Walks, Paths and circuits–Connected Graphs, Disconnected Graphs and Components – Euler graphs – More on Euler graphs – Hamiltonian paths and Circuits. **Trees and Fundamental Circuits:** Trees – Some Properties of Trees – Pendant Vertices in a Tree	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

V	**From Classical (Crisp) Sets to Fuzzy Sets:** Fuzzy sets: Basic types – Fuzzy sets: Basic Concepts. **Fuzzy Sets Versus Crisp Sets:** Additional Properties of α - cuts **Operations on Fuzzy Sets:** Types of Operations– Fuzzy Intersections: t-Norms – Fuzzy Unions: t-Conorms (Proof not needed).	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment:** **(Not included for End Semester Examinations)** Equivalence of Formulas – Recurrence relations: First order linear Recurrence Relation – The Application of Residue Arithmetic to Computers: Introduction to Number Systems – Residue Arithmetic – Operations on Graphs, Spanning trees – Fuzzy Complements.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Tremblay, J.P. & Manohar, R. (1997). *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw- Hill Publishing Company Limited, New Delhi.

2. Ralph,P. Grimaldi.(2002). *Discrete and Combinatorial Mathematics*, Pearson Asia Education.

3. Narsingh Deo.(1997). *Graph Theory With Applications To Engineering & Computer Science.* Prentice Hall of India, New Delhi.

4. Klir, G. J. and Yuan . R , (2001)*Fuzzy Sets And Fuzzy Logic*, Prentice Hall of India, New Delhi.

UNIT-I	Chapter 1: Sections 1-1, 1-2(1-2.1 to 1-2.4,1-2.6 to 1-2.8, 1-2.10, 1-2.11)[1], 1-4(1-4.1 to 1-4.3) [1]
UNIT-II	Chapter 2: Sections 2-3(2-3.8, 2-3.9) [1] Chapter 4: Sections 4-1(4-1.1, 4-1.2), 4-2(4-2.1, 4-2.2) [1] Chapter 1: Sections 1.2 to 1.4 [2] Chapter 8: Sections 8.1 [2]
UNIT-III	Chapter 3: Sections 3-1, 3-2, 3-5 (3-5.1, 3-5.2 & 3-5.3 Only), 3-7 [1]
UNIT- IV	Chapter 1: Sections 1.1 to 1.5 [3] Chapter 2: Sections 2.2, 2.4 to 2.6, 2.8, 2.9 [3] Chapter 3: 3.1 to 3.3 [3]
UNIT- V	Chapter 1: Sections 1.3, 1.4 [4] Chapter 2: Sections 2.1 [4] Chapter 3: Sections 3.1, 3.3, 3.4 [4]

Reference Books

1. Ganesh, G.J.M. (2006). *Introduction To Fuzzy Sets And Logic*, Prentice-Hall of India, New Delhi.

2. Arumugam, S. & Ramachandran, S. (2001). *Invitation To Graph Theory*, Scitech Publications India Pvt Limited, Chennai.

3. Seymour Lipschutz, Marc Laris Lipson.(1999) *Schuam's Outlines Discrete Mathematics,* Tata McGraw- Hill Publishing Co., Ltd., New Delhi

Web References

1. https://www.youtube.com/results?search_query=negation+of+the+statement
2. https://www.youtube.com/results?search_query=permutation
3. https://www.youtube.com/results?search_query=graph+theory+definitions+and+examples
4. https://www.youtube.com/results?search_query=trees+in+graph+theory
5. https://www.youtube.com/results?search_query=fuzzi+sets+

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz, Seminar

Course Designer

Dr.S.Saritha

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS1CC2	**WEB TECHNOLOGIES**	**CORE**	**6**	**5**

Course Objective

- To create own web page and how to host own web site on internet
- To familiarize Server Side Programming with Java Servlets, JSP and to commence Client Side Scripting with Java Script
- To analyze the basics involved in publishing content on the World Wide Web

Prerequisites

Java, HTML and Scripting

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Recall, Understand and Analyze the fundamentals of web application and web services	K1, K2,K3
CO 2	Determine the essential elements and the attributes to design a web page	K3, K5,K6
CO 3	Identify and Apply appropriate Client Side and Server Side programming for creating interactive web design	K3,K5
CO 4	Examine and recommend a solution to complex problems using appropriate method, technologies and web services	K4, K5
CO 5	Create and deploy real time web applications in web servers	K6

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	2	3	3	2	3	2
CO 2	3	3	2	3	2	3	3	2	3	2
CO 3	3	3	2	3	3	3	3	2	3	3
CO 4	3	3	2	3	3	3	3	2	3	3
CO 5	3	3	3	3	3	3	3	3	3	3

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Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Web Essentials: Clients, Servers, and Communication:** The Internet-Basic Internet Protocols –TCP/IP- UDP-DNS-Domain Names–The World Wide Web-HTTP Request Message-Response Message-Web Clients-Web Servers-**Markup Languages: XHTML 1.0:** An Introduction to HTML- History and Versions-Basic XHTML Syntax and Semantics- Some fundamental HTML Elements-Relative URLs-Lists-Tables-Frames-Forms.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Style Sheets: CSS** -Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML-Style Rule Cascading and Inheritance-Text Properties-CSS Box Model- Normal Flow Box Layout- Beyond the Normal Flow: properties for positioning, relative, float, absolute positioning.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Client- Side Programming**: **The JavaScript Language**: History and Versions - Introduction - JavaScript in Perspective-Syntax -Variables and DataTypes-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Server-Side Programming: Java Servlets:** Architecture Overview-A Servlet-Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies-URL Rewriting - Servlets and Concurrency. RMI Architecture - Working With RMI- Application Development With RMI.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Separating Programming and Presentation: JSP Technology**- Introduction to JSP- Running JSP Applications: Web Applications and Parameters- Basic JSP – Support for the Model-View-Controller Paradigm – **Web Services:** Web Services Concepts- Writing a Java Web Service Client-Describing Web Services: WSDL-Representing Data Types: XML Schema.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Search Engine features:** Real time applications for client and server side programming (JavaScript, RMI) – Platform supporting for web services.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. Jeffrey C.Jackson.(2009). *Web Technologies-A Computer Science Perspective*. 1st Edition, Pearson Education.

Reference Books

1. Robert W.Sebesta.(2007). *Programming the World Wide Web*. 4th Edition, Pearson Education.
2. Harvey M.Deitel, Paul J.Deitel, Andrew B.Goldberg.(2006). *Internet & World Wide Web How To Program* . 3rd Edition, Pearson Education.
3. Marty Hall, Larry, Brown.(2001) .*Core Web Programming*. 2nd Edition, Volume I& II, Pearson Education.
4. Moseley(2007). *Developing Web Applications*. 1st Edition, Wiley.
5. Herbert Schildt. (2012). *The Complete Reference–JAVA.* 7thEdition, TMH.

Web References

1. www.w3schools.com
2. www.geeksforgeets.org/web-technology/
3. www.guide.freecodecamp.org
4. www.alphadevx.com

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment.

Course Designer

Dr.K.Reka

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS1CC3	**MACHINE LEARNING TECHNIQUES**	**CORE**	**6**	**5**

Course Objective

- To understand the need of machine learning to solve problems in real time applications
- To study the various learning algorithms in machine learning
- To be able to formulate new approaches in machine learning

Prerequisites

Basic Knowledge in Programming Languages (Python, R), Statistics, Linear Algebra and Calculus

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Recognize and Understand the rudiments of Machine Learning	K1, K2
CO 2	Examine and Infer the hypothesis, limitations of Machine Learning methods	K2, K4
CO 3	Identify, Analyze and Interpret various Learning algorithms	K3, K4, K5
CO 4	Apply and Evaluate the solutions of various Machine Learning techniques	K4, K5
CO 5	Assess, Distinguish and Determine the Machine Learning techniques for Real-world applications	K3, K4, K5

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	2	3	3	3	3	2
CO 2	3	3	3	3	2	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3

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Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Let's Integrate with Machine Learning**: General Introduction to Machine Learning – The Details of Machine Learning - **The Practical Concepts of Machine Learning:** Machine Learning, AI, the Brain and the Business of Intelligence – General Architecture of Machine Learning – Types of Machine Learning	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Concept Learning and the General-to-Specific Ordering:** A Concept Learning Task– Concept Learning as Search – Version Spaces and Candidate-Elimination Algorithm - Inductive Bias – **Decision Tree learning:** Decision Tree Representation – The Basic Decision Tree Learning Algorithm – Issues in Decision Tree Learning	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Artificial Neural Networks:** Neural Network Representation – Appropriate Problems for Neural Network Learning – Perceptrons – Multilayer Networks and the Back Propagation Algorithm –**Genetic Algorithms:** Genetic Algorithms –Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Bayesian Learning:** Bayes Theorem – Bayes Theorem and Concept Learning –Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Networks – The EM Algorithm – **Computational Learning Theory:** Sample Complexity for Finite Hypothesis Spaces - Sample Complexity for Infinite Hypothesis Spaces	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Instance-Based Learning:** K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions–Case-Based Reasoning **-Combining Inductive and Analytical Learning:** The EBNN Algorithm – The FOCL Algorithm – **Reinforcement Learning:** Q Learning	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** Machine Learning Models- Find-S: Finding a Maximally Specific Hypothesis- Advanced Topics in Artificial Neural Networks- The Mistake Bound Model of Learning- Industrial Applications of Machine Learning: Manufacturing Analytics – Healthcare Analytics.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Patanjali Kashyap(2017). *Machine Learning for Decision Makers*. 1st Edition. Apress**. (Unit I)**
2. Tom M. Mitchell(2018). *Machine Learning*. 1st Edition, McGraw-Hill Education (India) Private Limited **(Units II-V)**

Reference Books

1. Ethem Alpaydin (2010). *Introduction to Machine Learning*. Second Edition.The MIT Press.
2. Stephen Marsland (2014). *Machine Learning: An Algorithmic Perspective*. Second Edition. CRC Press.

Web References

1. https://www.simplilearn.com/tutorials/machine-learning-tutorial
2. https://machinelearningmastery.com/start-here/
3. https://www.mygreatlearning.com/blog/machine-learning-tutorial/

Pedagogy

Chalk and talk, Discussion, Quiz, Assignment & PPT

Course Designer

Ms S.Udhaya Priya

Semester: I	Internal Marks: 40		External Marks: 60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS1CC1P	**WEB TECHNOLOGIES (P)**	**CORE**	**6**	**5**

Course Objective

- To provide fundamental concept of Internet, JavaScript, Servlet with a view to developing professional software development skills
- To implement JSP and Servlet concepts to create an interactive application
- To inculcate knowledge in developing application using RMI

Prerequisites

Java, HTML and Scripting

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	List and Illustrate the usage of HTML Tags	K1,K2
CO2	Demonstrate and make use of Java Script in web applications	K2, K3
CO3	Apply and compare JSP tags to create a web page	K3, K4
CO4	Examine and Evaluate the client/server application using RMI	K4, K5
CO5	Interpret and Develop web application using Servlet	K5,K6

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	2	3	3	3	3	2
CO 2	3	3	2	3	2	3	2	2	3	2
CO 3	3	3	2	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	2
CO 5	3	3	3	3	3	3	3	3	3	3

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Exercises

1. Develop your college web portal using HTML.
2. To develop a Style Sheet using Link, Table, Box, List and Positioning.
3. Write a Java Script code block, which checks the contents entered in a form's text element. If the text entered is in the lower case, convert to uppercase.

4. Write a Java Script code block, which validates a username and password.
   a) If either the name or password field is not entered, display an error message.
   b) If the fields are entered do not match with default values display an error message.
   c) If the fields entered match, display the welcome message.
5. Write a program in Java to implement a Client/Server application using RMI.
6. Write a program in Java to create a Cookie and set the expiry time of the same.
7. Write a program in Java to create Servlet to count the number of visitors to a web page.
8. Write a program in Java to create a form and validate a password using Servlet.
9. Create an application using basic JSP tag

Web References

1. https://www.w3.org/TR/html401/present/styles.html
2. www.studytonight.com/java/rmi-in-java.php
3. https://www.tutorialspoint.com/servlets/servlets-session-tracking.htm
4. https://www.edureka.co/blog/servlet-and-jsp-tutorial/

Pedagogy

Demonstration

Course Designer

Ms.S.Udhaya Priya

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS1DSE1A	**ADVANCED COMPUTER ARCHITECTURE**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To understand the micro-architectural design of processors
- To learn about the various techniques used to obtain performance improvement and power savings in current processors
- To gain knowledge in distributed and Parallel Computing Architecture

Prerequisites

Microprocessor

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Remember and Understand the computer architecture	**K1, K2**
CO 2	Interpret and Experiment with different pipelined processor	**K2, K3, K5**
CO 3	Organize and Analyze the architectural features of advanced processors	**K3, K4**
CO 4	Examine and Evaluate the cache and memory related issues in multiprocessors	**K4, K5**
CO 5	Assess the historical and current developments in computer architecture and adopt to the needs	**K5, K6**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	2	3	2	3	2	3	2	2	3
CO 3	2	3	2	3	2	3	3	3	3	3
CO 4	3	3	3	2	3	3	3	3	2	2
CO 5	2	3	3	3	2	2	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Fundamentals of Quantitative Design and Analysis:** Introduction-classes of computers- defining computer architecture-Trends in Technology, Power, Energy and Cost, Dependability	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**ILP Concepts and challenges:** Compiler Techniques for Exposing ILP – Dynamic Branch Prediction-Dynamic Scheduling-Multiple Instruction Issue-Hardware based Speculation-Static Scheduling-Multi threading	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Vector Architecture:** SIMD Extensions-Graphics Processing Units-Loop Level Parallelism	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**TLP:** Introduction-Centralized Shared Memory-Architectures-Performance of Symmetric shared memory multiprocessor-Synchronization-Models of Memory Consistency	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Programming Models and Workloads for Warehouse:** Scale Computers- Computer Architecture of Warehouse Scale Computers - Physical Infrastructure and Costs of Warehouse Scale Computers - Cloud Computing: The Return of Utility Computing	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Historical Perspectives Quantitative Design and Analysis:** Limitations of Instruction-Level Parallelism and Its Exploitation-Fallacies and pitfalls of Data-Level Parallelism in Vector-Cross Cutting Issues in Thread-Level Parallelism-Using Energy Efficiency inside the server.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book:

1. John L Hennessey, David A Patterson (2012). *Computer Architecture A Quantitative Approach.* Fifth Edition, Morgan Kaufmann Elsevier.

Reference Books

1. Kai Hwang, Faye Brigg(2000). *Computer Architecture And Parallel Processing*. International Edition, McGraw-Hill.
2. Sima D, Fountain T,KacsukP(2000). *Advanced Computer Architectures: A Design Space Approach*. Addison Wesley.

Web References

1. www.cs.iiie.edu.in/
2. https://passlab.githlub.io/CSE565/note

Pedagogy

Chalk and talk & Seminar

Course Designer

Ms.R.Rita Jenifer

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS./WEEK**	**CREDITS**
22PCS1DSE1B	**ADVANCED DATABASE SYSTEM**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To inculcate knowledge in Transaction Management with ACID properties
- To learn about advanced concepts of Database Management System
- To gain Knowledge in Information retrieval using XML and Internet Databases

Prerequisites

RDBMS

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Remember and Understand the concepts of databases	**K1, K2**
CO 2	Demonstrate and make use of different kinds of databases	**K2, K3**
CO 3	Identify and analyze databases for real life applications	**K3, K4**
CO 4	Compare and evaluate the performance of databases based on its transaction and concurrency control feature	**K4, K5**
CO 5	Interpret and develop parallel, distributed, object oriented and advanced databases for handling real time data	**K5, K6**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	2	3	2	3	3	3	2	2	3
CO 3	2	3	2	3	2	3	3	3	3	3
CO 4	3	3	3	2	3	2	3	3	2	2
CO 5	2	3	3	3	2	3	3	3	3	3

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"3" – Substantial (High) Correlation
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Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Parallel Databases:** I/O Parallelism-Inter Query Parallelism –Intra Query Parallelism - Interoperation Parallelism -Query Optimization-Design of Parallel Systems-Parallelism on Multicore Processors	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Distributed Databases:** Homogeneous and Heterogeneous Databases-Distributed Data Storage-Distributed Transactions-Commit Protocol-Concurrency Control in Distributed Databases-Distributes Query Processing- Heterogeneous Distributed Databases-Cloud Based Databases-Directory Systems	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Object Based Databases:** Complex Data Types-Structured types and Inheritance in SQL– Table Inheritance-Object Identity and Reference Types in SQL –Implementing O-R features – Object Relational Mapping-Object- Oriented versus Object-Relational.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Transactions Management:** Transaction Concepts—A Simple Transaction Model-Transaction Atomicity and Durability–Transaction Isolation- Transaction Isolation and Atomicity– **Concurrency Control:**Lock based Protocols-Deadlock Handling-Multiple Granularity-Timestamp-Based Protocols-Validation- Based Protocols.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**XML:** Extensible Markup Language-Structured Semi Structured and Unstructured Data-XML Hierarchical (Tree) Data Model-XML Documents, DTD, XML Schema-Storing and Extracting XML documents from Databases-XML Languages.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Query Optimization techniques supporting platforms** (SQL, MYSQL, Oracle)-Most popular Cloud Databases and their Features (DynamoDB, NO SQL)- Popular Object Databases and their Features(Mongo DB)- Transaction and Concurrency control used in Real time Systems- **Advanced Technologies in Database Systems**: Data mining, Information Retrieval(Text Data Base).	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Abraham Silberschatz., Henry F. Korth. S. Sudharshan (2013). *Database System Concepts*. 6th Edition, Tata McGraw Hill. **(Unit I-IV)**
2. Ramez Elmasri, Shamkant. B.Navathe (2015). *Fundamentals of Database Systems*. 6th Edition, Pearson Education. **(Unit V)**

Reference Books

1.Thomas Connolly, Carolyn Begg (2015). *Database Systems, A Practical Approach to Design, Implementation and Management*. 6th Edition, Pearson Education.

2.Raghu Ramakrishnan, Johannes Gehrke (2007).*Database Management System*.3rd Edition, McGraw Hill Higher Education.

Web References

1. https://www.db-book.com/db6/
2. https://www.worldcat.org

Pedagogy

Chalk and talk, Lecture, Discussion, Quiz, Demonstration and PPT

Course Designer

Ms.G.Sujatha

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS1DSE1C	**SOFTWARE TESTING**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To understand the quality aspects of a software
- Able to identify and prevent the defects of the software
- Provides exposure on principles in testing

Prerequisites

Software Engineering

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Remember and Understand testing approaches for the software	**K1, K2**
CO 2	Compare and Identify the testing strategies to be used for efficient software construction	**K2, K3, K4**
CO 3	Identify and Inspect the quality factors and best practices in various testing	**K3, K4**
CO 4	Examine and explain the different phases of testing for the software development	**K4, K5**
CO 5	Analyze and Interpret the tools for software testing	**K4, K5**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	2	3	3	3	2	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3

"1" – Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
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Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Software Development Life Cycle Models:** Phases of Software Project- Quality, Quality Assurance and Quality control – Testing, Verification & Validation – Process Model – Life Cycle Models - **White Box Testing**– Static Testing – Structural Testing – Black Box Testing	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Integration Testing:** Integration Testing as a Type of Testing – Integration Testing as a Phase of Testing – Scenario testing – Defect Bash - **System and Acceptance Testing:** Overview –System Testing – Functional Vs Non Functional Testing — Acceptance Testing –Summary of Testing Phases	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Factors governing Performance Testing:** Methodology for Performance Testing –Performance Testing – Process for Performance Testing - Regression Testing - Best Practices in Regression Testing	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Test Phases:** Enabling Testing – Locale Testing – Validation – Language Testing – Localization Testing – Tools– **Ad hoc Testing:** Overview – Buddy Testing – Pair Testing – Exploratory Testing – Iterative Testing – Usability and Accessibility Testing: - Usability Testing – Quality Factors **–** Aesthetics Testing	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Test Planning, Management, Execution and Reporting:** Test Planning -Test Management – Test Process – Test Reporting – Best Practices - **Software Test Automation:** Terms used in Automation – Skills Needed for Automation – Automate, Scope of Automation– Process model for Automation – Selecting a Test tool – Automation for Extreme Programming Model **–** Challenges in Automation	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Tools for White Box and Black Box Testing**- Specialized Testing types in Functional and Non-Functional Testing-Tools for Regression and performance Testing- Agile and Extreme testing in Real time with example-Different types of Automated tools for Software testing	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1.Srinivasan Desikan, Gopalaswamy Ramesh (2011). *Software Testing – Principles & Practices*. 1st Edition,Pearson Education.

Reference Books

1.Ron Patton (2006). *Software Testing*. 2nd Edition, Pearson Education.
2.William E. Perry (2006). *Effective Methods for Software Testing*.3rd Edition,Wiley India.
3.Renu Rajani, Pradeep Oak (2004). *Software Testing – Effective Methods, Tools and Techniques*. 2nd Edition.TMH Publishing Company Limited.

Web References

1. https://www.gcreddy.com/2021/05/software-testing-syllabus.html
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. https://www.softwaretestinghelp.com/online-software-testing-course-syllabus/

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz and Seminar

Course Designer

Dr.D.Radhika

SEMESTER II

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2CC4	**DATA MINING AND WAREHOUSING**	**CORE**	**6**	**5**

Course Objective

- Able to understand the data sets and data preprocessing
- Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification, clustering and regression
- Exercise the data mining techniques with varied input values for different parameters
- Ability to apply mining techniques for realistic data
- To prepare the students for building career in data warehousing and data mining areas

Prerequisites

Basic knowledge in Probability, Programming Languages and Database concepts

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Recognize the basic concepts and functionality of data mining and warehousing.	K1, K2
CO 2	Identify and Choose appropriate data mining techniques	K2, K3
CO 3	Apply and Analyse the suitable solution to the problem	K3, K4
CO 4	Build and Justify the results produced by data mining	K3, K5
CO 5	Categorize and evaluate skills in selecting the appropriate data mining algorithm for solving practical problems	K4, K5

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	2	2	3	3	3	2	2
CO2	3	3	3	2	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1"-Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"-Substantial (High) Correlation "-"-indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction**: Data mining – Kinds of data to be mined– Kinds of patterns to be mined– Kinds of Applications to be targeted-Major Issues in Data mining –**Data mining Trends and Research Frontiers:** Other Methodologies – Data mining Applications –Data mining Trends.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Data Pre-Processing**: Data Cleaning–Data Integration-Data Reduction: Overview of Data Reduction Strategies – Wavelet Transforms – Principle Component Analysis – Attribute Subset Selection –Data Transformation and Data Discretization: Data Transformation Strategies Overview – Data Transformation by Normalization. **Mining Frequent Patterns, Associations and Correlations**: Basic concepts – Frequent Itemset Mining Methods- Pattern Evaluation Methods.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Advanced Pattern Mining**: Pattern Mining: A Road Map – Pattern Mining in Multilevel, Multidimensional Space-Constraint-Based Frequent Pattern Mining. **Data Warehousing**: Basic Concepts – Data Warehouse Modeling: Data cube and OLAP – Data Warehouse Design and usage.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Classification:** Basic concepts- Decision Tree Induction - Bayes Classification Methods – Rule Based Classification – Model Evaluation and Selection-Techniques to improve Classification Accuracy - Classification using Frequent Patterns.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Cluster analysis**: **Basic concepts and methods –** Cluster analysis – Partitioning methods - Hierarchical Methods – Density Based Methods-Grid Based Methods-Evaluation of Clustering.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Classification**: **Advanced Methods**: Classification by Back Propagation – Support Vector Machines –K - Nearest-Neighbor Classifiers – Genetic algorithms. **Advanced Cluster Analysis**: Clustering High Dimensional data. **Outlier Detection**: Outlier and Outlier Analysis.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. Jiawei Han, Micheline Kamber, JianPei. (2019).*Data Mining: Concepts and Techniques*. Third Edition, Morgan Kaufman Publishers.

Reference Books

1. Margaret H. Dunham. (2006).*Data Mining Introductory and Advanced Topics*. Pearson Education.
2. C. S. R. Prabhu (2010). *Data Warehousing: Concepts, Techniques, Products and Applications*. Second Edition, PHI Learning Private Ltd.
3. K.P.Soman, Shyam Diwakar, V.Ajay. (2010).*Insight into Data Mining Theory and Practice*. First Edition, PHI Learning Private Ltd.

Web References

1. www.tutorialride.com/data-mining/data-mining-tutorial.htm
2. https://hanj.cs.illinois.edu/bk3/bk3_slidesindex.htm
3. www.guru99.com/datawarehouse-architecture.htm
4. www.tutorialpoint.com/dwh/dwh_data_warehousing.htm

Pedagogy

Chalk and Talk, Group discussion, Seminar& Assignment.

Course Designer

Ms**.** S.Udhaya Priya

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2CC5	**DESIGN AND ANALYSIS OF ALGORITHMS**	**CORE**	**6**	**5**

Course Objective

- To learn the techniques for effective problem solving in computing
- Apply important algorithmic design paradigms and methods of analysis
- Analyze the asymptotic performance of algorithms to show the efficiency of the algorithm
- Write rigorous correctness proofs for algorithms
- Demonstrate a familiarity with major algorithms and data structures

Prerequisites

Basic Knowledge in Programming and Data Structures

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand & Identify the suitable data structures and Design algorithms for various computing problems.	K1, K2, K3
CO2	Explain the algorithm design technique & demonstrate the complexity of algorithms.	K2, K3, K4
CO3	Analyze the different algorithm design techniques for a given problem and time & space complexity of the algorithm	K3, K4, K5
CO4	Assess and Compare the efficiency of the algorithm	K4, K5
CO5	Determine and Recommend the suitable algorithmic design techniques for a given problem	K3, K4, K5

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	3	2	3	3	3	3	2
CO2	3	3	3	3	2	3	3	3	3	2
CO3	3	3	3	2	2	3	3	3	3	2
CO4	3	3	2	2	2	2	2	2	2	2
CO5	3	3	2	2	2	2	2	2	2	2

"1"–Slight (Low) Correlation
"2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation
"-" Indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Notion of an Algorithm –Properties of an algorithm-Techniques to write an algorithm-Fundamentals of the analysis of algorithmic efficiency-Problem types-Analysis framework-Space & time complexity- measuring input size and running time-Asymptotic notation and its properties-Big Oh notation, Omega notation and Theta notation –Recurrence equation-solving best case-worst case and average case - Empirical Analysis-Mathematical Analysis for Recursive and non Recursive algorithms.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Elementary Data Structures**: Stacks and Queues – Trees – Priority Queues – Heap sort- Graphs-Analysis. **Divide and Conquer:** The General Method –Linear search- Binary search-Merge Sort – Quick Sort-performance measurement–Analysis.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**The Greedy Method:** General Method - Knapsack Problem – Job Sequencing With Deadlines - Minimum Cost Spanning Trees - Optimal Storage On Tapes – Single Source Shortest Paths-Analysis. **Dynamic Programming**: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - Reliability Design-The Traveling Sales Person Problem- Analysis.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Basic Traversal and Search Techniques:** Techniques for Binary Trees – Techniques for Graphs –Connected Components and Spanning Trees– DFS-Analysis. **Backtracking:** The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Knapsack Problem.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Branch and Bound:** The Method –Least cost search-Control abstraction for least cost search-Bounding-Least cost branch and bound- **NP-HARD and NP-COMPLETE PROBLEMS:** Basic concepts-NP-HARD Graph Problems	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** Dictionaries – Sets and Disjoint Set, Union– Graphs-Container Loading -Tree Vertex Splitting –Optimal merge pattern-Optimal Binary Search Trees -String Editing - 0/1 Knapsack- Flow Shop Scheduling- Bi-Connected Components- Hamiltonian Cycles – 0/1 Knapsack Problem-TSP	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Mrs.Anuradha, A.Putnam Baker.(2019). *Design & Analysis of algorithms*. First Edition,Technical publications.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar, Rajasekaran. (2015). *Fundamentals of Computer Algorithms.* Second Edition, Universities Press.

Reference Books

1. V.Aho, Hopcropft, Ullman,(2009). *Data Structures and Algorithms.* 4th Edition, Pearson Education.
2. Anany Levitin(2012). *Introduction to the Design and Analysis of Algorithms*. Third Edition, Pearson Education
3. Gajendra Sharmah (2015).*Design & Analysis of Algorithms*. 4thedition,Khanna Publishers.

Web References

1. http://nptel.ac.in/courses/106101059/
2. http://nptel.ac.in/courses/106101060/
3. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
4. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-toalgorithms-fall-2011/lecture-videos/
5. http://cs.uef.fi/pages/franti/asa/notes.html

Pedagogy

Chalk and Talk, Seminar, e-Content

Course Designer

Ms.K.Sangeetha

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2CCC1A	**MOBILE COMPUTING**	**CORE CHOICE**	**6**	**4**

Course Objective

- To understand Wireless networks GSM, UMTS and WAP Architecture
- To gain basic knowledge about Android Application Development
- To create real time application using Content Providers

Prerequisites

Java, Computer Fundamentals and Networking

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Define and Outline the Mobile Computing frameworks	**K1, K2**
CO 2	Demonstrate the network concepts and Identify Routing protocols	**K2, K3**
CO 3	Identify and Analyze the basics of Android Programming	**K3, K4**
CO 4	Examine and Assess the Interfaces for the Android platform	**K4, K5**
CO 5	Explain and Build the key Android programming concepts	**K5, K6**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	2	3	3	3	2	3
CO 2	3	3	3	3	3	3	3	2	3	3
CO 3	3	3	3	3	3	3	3	3	2	3
CO 4	3	3	3	2	3	3	2	3	3	3
CO 5	3	3	2	2	3	3	3	2	3	3

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
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Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Applications- Simplified Reference Model – **Wireless Transmission:** Signal Propagation- Path Loss of Radio Signals-Multipath Propagation- Multiplexing – Modulation- Cellular Systems- **Telecommunication Systems:** GSM – System Architecture- Handover – Security. **Satellite Systems:** Applications– Basics.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Wireless LAN:** Advantages- Disadvantages- Design Goals- IEEE 802.11 – System Architecture-MAC Frames – MAC Management –Synchronization - Power Management – Roaming -Bluetooth - Architecture. **Mobile Network Layer:** Mobile IP- Goals –Entities and Terminology–IP Packet Delivery –Agent Advertisement and Discovery-Registration – Adhoc Networks – Routing - Routing Strategies- Destination Sequence Distance Vector – Dynamic Source Routing- Hierarchical Algorithms - Alternative Metrics.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Getting started with Android Programming:** Introduction to Android – Obtaining the Required Tools-Creating an Android Application-Anatomy of an Android Application. **Activities, Fragments, and Intents:** Understanding Activities-Applying styles and Themes to an activity-Hiding the activity title-Displaying a dialog window-Displaying a progress dialog-Linking Activities Using Intents –Resolving Intent Filter collision-Returning Intents from an Intent-Fragments.	21	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Getting to know the Android User Interface**: Understanding the Components of a Screen-Adapting to Display Orientation - Managing Changes to Screen Orientation -**Designing user interface with views** : Using Basic Views - Using Picker Views-Using List Views to Display Long Lists.	21	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Displaying Pictures and Menus with Views**: Using Image views to display Pictures-Some additional views. Content Providers: Sharing Data in Android- **Messaging**: SMS Messaging-Sending SMS messages programmatically- Getting feedback after sending a message-Receiving SMS message- Sending E-mail– **Location Based Services**: Displaying Maps	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Data Persistence:** Creating and using databases**. Content Providers:** Sharing data in Android-Using Content Provider. **Developing Android services:** Creating own services-Establishing communication between a service and an activity-Binding activity to services.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Jochen H.Schiller.(2014). *Mobile Communications.*2nd Edition, Addison Wesley Pearson Education.
2. Wei Meng Lee.(2012). *Beginning Android 4 Application Development.*1st Edition, Wiley India Pvt Ltd.

Reference Books

1. RajKamal.(2012),*Mobile Computing*,2nd Edition, Oxford University Press.
2. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal(2010).*Mobile Computing*. 2nd Edition, Tata McgrawHill Publishing Company Limited.

Web References

1. https://www.tutorialspoint.com/gsm/gsm_architecture.html
2. https://www.geeksforgeeks.org/advantages-and-disadvantages-of-wlan
3. http://developer.android.com/guide/
4. http://developer.android.com/reference/packages.html

Pedagogy

Chalk and Talk, Lecture, Group Discussion, e-Contents-Power point, Demonstration

Course Designer

Ms.K.Pradeepa

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2CCC1B	**WIRELESS SENSOR NETWORKS**	**CORE CHOICE**	**6**	**4**

Course Objective

- To get a thorough knowledge about sensors and its architecture
- To learn the characteristics of wireless transmission
- To understand the working of MAC and Routing Protocols for sensor networks
- To gain knowledge in Transport layer, QoS and Security for sensor networks

Prerequisites

Basic knowledge in Data Communication Networks

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	List and Summarize the applications, challenges of wireless sensor networks	**K1, K2**
CO 2	Interpret and Make use of the architecture for the wireless networks	**K2, K3**
CO 3	Apply and Correlate the concepts in sensor networking	**K3, K4**
CO 4	Categorize and compare the different routing protocols	**K4, K5**
CO 5	Evaluate and Conclude the QoS in wireless networks	**K5**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	3	2	3	3	3	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	3	2	3
CO4	3	3	3	2	3	3	2	3	3	3
CO5	3	3	2	2	3	3	3	2	3	3

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Application Examples-Types of Applications -Challenges for Wireless Sensor Networks-Why are sensor networks different-**Single-node architecture**: Hardware components	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Single-Node Architecture:** Energy Consumption of Sensor Nodes - Operating Systems and Execution Environments- **Network Architecture**: Sensor Network Scenarios-Design principles of WSNs.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**MAC Protocols:** Fundamentals of MAC Protocol - Low Duty Cycle Protocols and Wakeup Concepts-Contention-based protocols -The IEEE 802.15.4 MAC protocol	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Routing protocols:** Energy efficient unicast-Broadcast and multicast-Geographic routing. **Data-centric and content based Networking:** Data centric routing	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Transport Layer and Quality of Service:** QoS-Transport protocols-Sensing models-Coverage measures-Reliable data transport-Single packet delivery-Congestion situations in sensor networks. **Advanced application support**: Security Fundamentals-Security considerations in wireless sensor networks -DoS Attacks	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Link Layer Protocols:** Fundamentals-Tasks and requirements-Error control-Framing-Link Management	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Holger Karl, Andreas Willig (2015). *Protocols and Architectures for Wireless Sensor Networks.* Student Edition, John Wiley & Sons.

Reference Books

1. Waltenegus Dargie, Christian Poellabauer (2010). *Fundamentals of Wireless Sensor Networks Theory and Practice.* 1st Edition, John Wiley and Sons.
2. Xiang-Yang Li (2008). *Wireless Ad Hoc and Sensor Networks: Theory and Applications*. Illustrated Edition, Cambridge University Press.
3. Feng Zhao, Leonidas J.Guibas (2007).*Wireless Sensor Networks-An Information Processing*. 1st Edition, Elsevier.
4. Kazem Sohraby, Daniel Minoli,TaiebZnati (2007). *Wireless Sensor Networks Technology, Protocols, and Applications*. Student Edition, John Wiley and sons.
5. Anna Hac (2003). *Wireless Sensor Network Designs.* 1st Edition, John Wiley and sons.

Web References

1. https://www.intechopen.com/chapters/38793
2. https://www.geeksforgeeks.org/wireless-sensor-network-wsn/
3. https://nptel.ac.in/courses/106105160
4. http://www.tfb.edu.mk/amarkoski/WSN/Kniga-w02

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz and Seminar

Course Designer

Dr.D.Radhika

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2CCC1C	**MANET**	**CORE CHOICE**	**6**	**4**

Course Objective:

- To understand the principles of adhoc networks
- To get a knowledge of routing protocols and their performance
- To gain knowledge about battery management schemes
- To identify the issues and solutions of transport layer

Prerequisites

Computer Networks

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Recall and Understand the fundamentals of Mobile ad-hoc Networks.	**K1, K2**
CO 2	Identify and analyze the current features of MANET and WSN	**K3, K4**
CO 3	Determine and Classify the functions of various routing protocols and their implications	**K3, K4**
CO 4	Identify the issues of architecture and its protocol, and Design solutions to overcome the issues	**K3, K5**
CO 5	Discriminate the current trends in MANETs and WSNs from industry and research point of views.	**K5**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	2	3	3	3	1	3	3	2	3	1
CO2	2	3	3	2	2	3	3	2	3	2
CO3	2	3	3	2	2	3	2	2	2	2
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms – Characteristics of the Wireless Channel – IEEE 802 Networking Standard – **Ad Hoc Networks:** Introduction – Issues in Ad Hoc Wireless Networks – Ad Hoc Wireless Internet	14	CO1, CO2, CO4, CO5	K1, K2, K3, K4 K5
II	**Routing Protocols for Ad Hoc Wireless Networks:** Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – On-Demand Routing Protocols - Hybrid Routing Protocols.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Multicast Routing in Ad Hoc Wireless Networks:** Issues in Designing a Multicast Routing Protocol – Classifications of Multicast Routing Protocols – Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols– Energy–Efficient Multicasting.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Transport layer and Security Protocols for Ad Hoc Wireless Networks:** Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks - Classification of Transport Layer Solutions – Network Security Requirements - Security in Ad Hoc Wireless Networks - Network Security Attacks - Secure Routing in Ad Hoc Wireless Networks – **Quality of Service in Ad Hoc Wireless Networks:** Network Layer Solutions	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Energy Management in Ad Hoc Wireless Networks:** Battery Management Schemes-Transmission Power Management Schemes-**Recent advances in Wireless Networks:** Ultra-Wide-Band Radio Communication-Wireless Fidelity Systems.	20	CO1, CO2, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Wireless Sensor Networks:** Sensor Network Architecture – Data Dissemination – Data Gathering – MAC Protocols for Sensor Networks – Location Discovery – Quality of Sensor Networks – Evolving Standards – Other Issues.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. C.Siva Ram Murthy, B.S.Manoj (2014).*Ad hoc Wireless Networks Architectures and protocols.* Pearson Education.

Reference Books

1. Stefano Basagni, Marco Conti, Silvia Giordano (2015). *Mobile Ad Hoc Networking: The Cutting Edge Directions*. 2nd Edition, Wiley India.
2. Mohamad Taha Sultan (2018). *Wireless Technologies in Mobile Ad-Hoc Networks.* Globe Edit.

Web References

1. https://www.tutorialspoint.com/what-is-ad-hoc-network
2. https://www.javatpoint.com/mobile-adhoc-network
3. https://www.geeksforgeeks.org/introduction-of-mobile-ad-hoc-network-manet/
4. http://et.engr.iupui.edu/~dskim/manet/

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment

Course Designer

Ms.R.Sangeetha

Semester II	Internal Marks: 40		External Marks: 60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2CC2P	**DATA MINING (P)**	**CORE**	**6**	**5**

Course Objective

- Exposure on Solving of data science problems
- Analyze real life data sets for analysis and prediction.
- Able to explore data using Python and R

Prerequisites

Data Mining, Python and R languages

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Interpret on data insights to evaluate preprocessing techniques	**K2**
CO 2	Identify various algorithms used in information analysis of data mining Techniques	**K3**
CO 3	Evaluate the performance of various data mining algorithms	**K5**
CO 4	Visualize the results produced by data mining techniques	**K6**
CO 5	Formulate library functions of Python and R	**K6**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	2	3
CO4	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	2	2

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Exercises

R

1. Built in functions
2. Operators
3. Looping statements
4. Reading and Writing Different Types of Datasets
5. Correlation and Covariance
6. Classification
7. Clustering
8. Visualizations

PYTHON

1. To compute central tendency and dispersion measures.
2. Implement python libraries.
3. Data Preprocessing
4. Implement Simple Linear and Multiple Linear Regressions.
5. Implement decision tree
6. Implement KNN
7. Implement K-means clustering
8. Implement Association Rule Mining

Web References

1. https://www.springboard.com/blog/data-science/data-mining-python-tutorial/
2. https://dzone.com/refcardz/data-mining-discovering-and
3. https://www.rdatamining.com/
4. https://edisciplinas.usp.br/pluginfile.php/

Pedagogy

Demonstration

Course Designer

Ms.S.Udhaya Priya

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2DSE2A	**CRYPTOGRAPHY AND NETWORK SECURITY**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To overview the principles of Network Security
- To inculcate the encryption standards and techniques
- To gain knowledge in establishing IP security

Prerequisites

Computer Networks

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Understand and state the Network security concepts	**K1, K2**
CO 2	Classify and apply network security principles	**K2, K3**
CO 3	Interpret and analyze network security protocols	**K3, K4**
CO 4	Examine and Defend network security threat	**K4, K5**
CO 5	Interpret with various network security applications	**K5**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	2	2	3	3	3	3	3
CO2	3	3	3	2	3	3	3	3	3	3
CO3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	3	2	2	3	3	2	3	2
CO5	3	3	3	2	3	3	3	3	3	3

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Computer and Network Security concepts:** Computer security concepts-The OSI Security architecture-Security Attacks – Security Services – Security Mechanisms-A model for Network Security**. Classical Encryption Techniques**: Symmetric Cipher Model-Substitution Techniques -Transposition Techniques –Steganography.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K3, K4, K5
II	**Block Ciphers and the Data Encryption Standard:** Traditional Block Cipher Structure-The Data Encryption Standard-A DES Example -The Strength of DES-Block cipher design Principles- **Public key cryptography and RSA:** Principles of Public Key Cryptosystems – The RSA Algorithm.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K3, K4, K5
III	**Digital Signatures:** Digital signatures-**Mutual Trust**: X.509 Certificates-Public Key Infrastructure. **User Authentication:** Remote User-Authentication Principles-Remote User-Authentication Using Symmetric Encryption-Kerberos-Remote User-Authentication Using Asymmetric Encryption.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K3, K4, K5
IV	**Network Access Control and Cloud Security:** Cloud Computing-Cloud Security Risks and Countermeasures. **Transport–Level Security:** Web Security Considerations-Transport layer Security**-Wireless Network Security:** Wireless Security – Mobile Device Security.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K3, K4, K5
V	**Electronic Mail Security**: Internet Mail Architecture-Email Formats- S/MIME-Pretty Good Privacy - **IP Security**: IP Security Overview –IP Security Policy-Encapsulating Security Payload- Combining Security Associations.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **System Security:** Malicious Software: Viruses and Related Threats-Distributed Denial of Service Attacks. **Intruders:** Intrusion Detection – Password Management-**Firewalls**: Need for Firewalls-Types of Firewalls.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K3, K4, K5

Text Book

1. William Stallings.(2017).*Cryptography and Network Security-Principles and Practices*. 7th edition, Pearson Education, New Delhi.

Reference Books

1.Behrouz.A.Forouzan(2020).Cryptography and Network Security.5th Edition.Tata McGraw Hill, New Delhi.

2.Atul Kahate (2017).*Cryptography and NetworkSecurity*.3rd Edition, Tata McGraw Hill, New Delhi.

3.Charles P Fleeger, Shari Lawrence P Fleeger.(2011). *Security in Computing*. 4th Edition, Pearson Education, New Delhi.

Web References

1. https://www.open.edu/openlearn/science-maths-technology/computing-and ict/systems-computer/network-security/scs.carleton.ca/~paulv/5900wBooks.html
2. scs.carleton.ca/paulv/5900wBooks.html
3. https://en.wikipedia.org/wiki/Network_security
4. https://www.slideshare.net/HatemMahmoud/network-security-applications-4562405
5. https://www.intechopen.com/books/security-enhanced-applications-for-information-systems/cybersecurity-in-the-real-world

Pedagogy

Chalk and Talk ,PPT, Discussion, Assignment

Course Designer

Ms.G.Sujatha

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/ WEEK**	**CREDITS**
22PCS2DSE2B	**BLOCKCHAIN AND CRYPTOCURRENCIES**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

- To assess blockchain applications in a structured manner
- To impart knowledge in block chain techniques and able to present the concepts clearly and structured
- To get familiarity with future currencies and to create own crypto token

Prerequisites

Basic knowledge in Cryptography, Data Structures, Distributed Systems and networking

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Understand the various technologies and its business use	**K1**
CO 2	Summarize the blockchain applications in a structured manner	**K2**
CO 3	Make use of the modern concepts of blockchain technology	**K3**
CO 4	Compare the modern currencies	**K4**
CO 5	Interpret the applications in real world scenario	**K5**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	2	2	3	2	2	2	2	2	2	2
CO2	2	2	3	2	2	2	2	2	2	2
CO3	3	2	3	2	2	2	2	2	3	2
CO4	3	2	2	2	2	3	2	2	2	2
CO5	2	2	2	3	3	3	2	2	2	2

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Basic Concepts:** Decentralized society - Distributed Database, Byzantine General problem - Fault tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete - P2P network - Private key - Public key - Cryptography - Hash Function - Digital Signature - ECDSA - Memory Hard Algorithm - Zero Knowledge Proof	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
II	**Blockchain:** Introduction-Advantage over conventional distributed database - Network and protocols - Block chain network - Mining - Mechanism - Life Cycle of Block chain - Distributed consensus - Merkle Patricia Tree - Gas Limit - Transactions and Fee - Anonymity - Reward - Chain policy- Life of Block chain applications -Soft and Hard Fork - Private and Public blockchain.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
III	**Distributed Consensus:** Nakamoto consensus - Proof of work - Proof of Stake - Proof of Burn - Difficulty level - Sybil Attack - Energy Utilization and alternate - Fabric model - SDKs - Components of Fabric Model - Architecture of Hyperledger fabric.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
IV	**Cryptocurrency:** History - Distributed ledger - Bitcoin protocols - Mining strategy and rewards - Ethereum - construction - Truffle - DAO - dApps - Smart Contract - Boot strapping - GHOST Vulnerability - Attacks - Sidechain - Namecoin	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
V	**Applications:** Payment Channels and State Channels - State Channels—Basic Concepts and Terminology - Simple Payment Channel Example-Routed Payment Channels- Bitcoin Transactions- Transaction Outputs and Inputs-Wallet Technology details	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Cryptocurrency Regulations**: Stakeholders - Roots and Bitcoin - Legal Aspects - Crypto currency exchange - Black market and Global economy	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5

Text Books

1. Daniel Drescher(2017). *Blockchain Basics A Non-Technical Introduction in 25 steps*, 1st Edition, Apress.
2. Andreas M.Antonopoulos.(2019). *Mastering Bitcoin:Unlocking Digital Cryptocurrencies*. 2nd Edition, O'REILLY.

Reference Books

1.Paul Vigna and Michael J.Casey (2016). *The Age of Cryptocurrency*, 1st Edition, Picador St.Martin's Press.

2.Imran Bashir (2018). *Mastering Blockchain*. 1st Edition, Packt, Birmingham.

3.David Hooper, Kevin Solorio (2019). *Hands–On Smart Contract Development with Solidity and Ethereum: From Fundamentals to Deployment,* 1st Edition, O'REILLY.

4.Chris Dannen (2017).*Introducing Ethereum and Solidity*, 1st Edition, Apress.

Web References

1. https://www.simplilearn.com/tutorials/blockchain-tutorial/blockchain-technology
2. https://sjce.ac.in/wp-content/uploads/2021/12/Block-Chain-notes.pdf
3. https://mrcet.com/downloads/digital notes.pdf
4. https://www.ibm.com/in-en/topics/what-is-blockchain

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment.

Course Designer

Dr.D. Radhika

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS2DSE2C	**ETHICAL HACKING**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To understand and analyze information security threats and countermeasures
- To gain knowledge about security audit and testing
- To study the issues related to hacking and types of attacks

Prerequisites

Basic knowledge in Operating Systems, Networking and Programming Language

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Recall and Understand the vulnerabilities in hacking	**K1, K2**
CO 2	Analyze and apply testing for security	**K3, K4**
CO 3	Plan and Execute vulnerability assessment test for a network	**K4, K5**
CO 4	Assess the various kinds of standard attacks	**K5**
CO 5	Determine the target system vulnerability and make use of penetration test using standard hacking methods in an ethical manner	**K5**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	2	3	3	3	2	3	3	3	3	2
CO2	3	3	2	3	2	3	3	2	3	2
CO3	3	3	2	3	2	3	3	2	3	3
CO4	2	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	2

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction to Hacking:** Important terminologies-Categories of Penetration Test-Writing Reports-Structure of a Penetration Testing Report-Vulnerability Assessment Summary-Risk Assessment-Methodology-**Linux Basics:** Major Linux Operating systems-File structure inside of Linux-Linux Scheduler(Cron Jobs)-Users inside of Linux-Common Applications of Linux-What is BackTrack-Changing the Default Screen Resolution-Some Unforgettable basics-**Information Gathering Techniques**-Active Information Gathering-Passive Information Gathering-Sources of Information Gathering-Copying Websites Locally-Yougetsignal.com-Intercepting a Response-WhatWeb-Netcraft-Some basic Parameters-TIP regarding Filetype-Xcode Exploit Scanner-Interacting with DNS Servers-Nslookup-DIG-Forward DNS Lookup with Fierce-Reverse DNS Lookup with fierce-What is DNS Cache Snooping-Automating DNS Cache Snooping Attacks-Problem with SNMP-Sniffing SNMP Passwords-SMTP Enumeration	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Vulnerability Assessment:** What are Vulnerability Scanners and how do they work?-Pros and Cons of a Vulnerability Scanner-Vulnerability Assessment with Nmap-Updating the database-Testing SCADA environments with Nmap-Nessus Vulnerability Scanner-Installing Nessus on BackTrack-Adding a User-creating a new policy-Safe Checks-Silent Dependencies-Port Range **Network Sniffing:** Introduction-Types of sniffing-Hubs versus Switches-Promiscuous versus Nonpromiscuous Mode-MITM Attacks-ARP Protocol Basics-How ARP works-ARP Attacks-Denial of Service attacks-Tools of the trade-Using ARP Spoof to perform MITM Attacks-Hijacking Session with MITM Attack-Hijacking the session-DNS Spoofing-DHCP Spoofing	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Capturing Traffic:** Using Wireshark-ARP Cache Poisoning-DNS Cache Poisoning-SSL Attacks-SSL Stripping-**Password Attacks:** Password management-Online password attacks-offline password attacks-**Client Side Exploitation**-Bypassing filters with Metasploit payloads-Client side attacks-**Social Engineering:** Social Engineering toolkit-Spear Phishing attacks-Web Attacks-Mass E-mail attacks-Multipronged Attacks.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

IV	**Bypassing Antivirus Applications:** Trojans-How Antivirus application works-Microsoft Security essentials-Virustotal-Getting past an antivirus program-**Post Exploitation**: Meterpreter-Meterpreter scripts-Local privilege escalation-Lateral Movement-Pivoting Persistence-**Web Application Testing:** Using Burp proxy-SQL Injection-XPath Injection-Local file inclusion-Remote file inclusion-Command Execution-Cross Site Scripting-Cross site Request forgery-Web application Scanning with w3af.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Wireless Hacking:** Introduction-Requirements-Introducing Aircracks-ng-Uncovering Hidden SSIDs-Turning on the Monitor mode-Monitoring Beacon frames on Wireshark-Monitoring with Airodump-ng-Speeding up the process-Placing your wireless adapter in Monitor mode-Determining the target with Airodump-ng-Cracking a WPA/WPA2 Wireless Network using Aircrack-ng-Capturing packets-Capturing the Four way handshake-Cracking WPA/WPA2-Reducing the delay-**Web Hacking:** Attacking the authentication-Brute Force and Dictionary Attacks-Types of Authentication-Brute Force attack-SSRF Attack-impact-Server hacking-Finding the local root exploit-basic syntax-Updating the password-Finding a WHMCS Server-Symlinking the Configuration file.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Using Kali Linux:** Linux Command Line-The Linux filesystem-User privileges-File permissions-Editing files-Data manipulation-Managing Installed Packages-Processes and Services-Managing Networking-Netcat: The Swiss Army knife of TCP/IP Connections	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Rafay Baloch(2014).*Ethical Hacking and Penetration Testing Guide*.1st Edition, CRC Press(for Unit I, II & V)
2. Georgia Weidman(2014).*Penetration testing: A hands-on introduction to hacking*.1st Edition, No Starch Press(for Unit III,IV & VI)

Reference Books

1. Stuttard,Dafydd and Marcus Pinto(2011). *The web application hacker's handbook:Finding and exploiting security flaws* . 2ndEdition, John Wiley & Sons.
2. Himanshu Sharma(2017).*Kali-linux Ethical Hacker's cook book: End-to-End penetration testing solution.*1st Edition, Packt Publishing.
3. Kimberly Graves(2010).*Certified Ethical Hacker Study Guide*.1st Edition, Wiley India Pvt Ltd.
4. Kevin Beaver.(2018). *Ethical Hacking for Dummies*. 6thEdition, Wiley

Web References

1. https://www.elsevier.com/books/
2. https://www.elsevier.com/books/cyber-security-awareness-forlawyers
3. https://books.google.co.in/books
4. https://www.coursera.org/specializations/ethical-hacking
5. https://nptel.ac.in/courses

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment

Course Designer

Ms. S.Saranya

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS./WEEK**	**CREDITS**
22PCS2INT	**INTERNSHIP**	**INTERNSHIP**	**-**	**2**

- At the end of Semester I, the students should undergo an internship in a reputed IT company or IT division of reputed company
- Minimum number of days for the internship is 15 days
- A project report and a certificate of attendance are to be submitted after completing the internship

EVALUATION PATTERN FOR INTERNSHIP

Internal Components	Marks	External Components	Marks
Institution Profile	5	Regularity	10
Presentation skill	10	Problem solving	10
Report Evaluation	10	Participation and Hands – on training	20
		Professional Attitude	15
		Report Writing	20
Total	25	Total	75