

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 breadth 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	-	-	-
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)	Compiler Design	22PCS3CC6	6	5	3	25	75	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. Natural Language Processing	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. Natural Language Processing (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			
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
“3” – Substantial (High) Correlation

“2” – Moderate (Medium) 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*. 7th Edition, TMH.

Web References

1. www.w3schools.com
2. www.geeksforgeeks.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
“3” – Substantial (High) Correlation

“2” – Moderate (Medium) 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.iitk.ac.in/
2. <https://passlab.github.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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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. Ragu 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

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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

“3”-Substantial (High) Correlation

“2”-Moderate (Medium) 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. Prabhhu (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

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“3”–Substantial (High) Correlation

“2”–Moderate (Medium) 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, Hopcroft, 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

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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-Appling 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. Raj Kamal.(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
“3”–Substantial (High) Correlation

“2”–Moderate (Medium) 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, Taieb Znati (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
“3”–Substantial (High) Correlation

“2”–Moderate (Medium) 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

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“3”–Substantial (High) Correlation

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“-”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
“3”–Substantial (High) Correlation

“2”–Moderate (Medium) 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, 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, 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, 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, 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, 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, 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 Fleegeer, Shari Lawrence P Fleegeer.(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
“3”–Substantial (High) Correlation

“2”–Moderate (Medium) 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'sPress.
2. Imran Bashir (2018). *Mastering Blockchain*. 1st Edition, Packt, Birmingham.
- 3.David Hooper, Kevin Solorio (2019). *Hands-On Smart Contract Development with Solidity andEthereum: 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](https://mrcet.com/downloads/digital%20notes.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

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“3”–Substantial (High) Correlation

“2”–Moderate (Medium) 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-Yougetsinal.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 Aircrack-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

SEMESTER III

Semester : III	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3CC6	COMPILER DESIGN	CORE	6	5

Course Objective

- To enrich the knowledge in various development phases of compiler and its uses
- To learn Code optimization techniques, machine code generation and use of symbol table
- To identify the similarities and differences among various parsing techniques and grammar transformation techniques

Prerequisites

Basic Knowledge in Programming Languages, Data Structures and Discrete Mathematics

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand the structure of compiler, applications of finite automata, regular expressions, Grammar and identify the significance of different phases of the compiler.	K1,K2
CO2	Demonstrate the construction of finite automaton, various parsing, intermediate, target code generation and code optimization techniques.	K2
CO3	Construct the finite automaton, various parsing tables and develop intermediate and target code by using storage allocation strategies.	K3,K4
CO4	Analyze and explain the relationship among the phases of compiler, various parsing and code optimization techniques	K4,K5
CO5	Assess and Recommend tools, methods, and techniques to build compiler	K4,K5

Mapping of CO with PO and PSO

COs	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	2	3	3	3	3	2
CO4	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction to Compiler– The Structure of a Compiler – Lexical Analysis: The Role of the Lexical Analyzer – Specification of Tokens–Finite Automata- Nondeterministic Finite Automata-Deterministic Finite Automata- From Regular Expressions to Automata-Conversion of an NFA to a DFA-Construction of an NFA from Regular Expression.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Syntax Analysis: The Role of the Parser-Context Free Grammars-Verifying the language generated by a grammar-Context Free Grammars versus Regular Expressions-Writing a Grammar-Eliminating ambiguity -Elimination of Left Recursion-Left Factoring – Top-Down Parsing-Recursive Descent Parsing – Nonrecursive Predictive Parsing- Bottom-Up Parsing- Shift-Reduce Parsing.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	LR Parsers- The LR-Parsing algorithm-Constructing SLR Parsing tables-Canonical LR(1) Parsing tables-Constructing LALR Parsing tables. Syntax-Directed Translation: Inherited and Synthesized Attributes – Dependency Graphs – S-Attributed Definitions – L-Attributed Definitions – Construction of syntax trees- Syntax Directed Translations Schemes.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Intermediate-Code Generation: Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type Checking - Control Flow - Backpatching - Switch Statements – Intermediate Code for Procedures.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Code Generation: Issues in the design of a Code Generator - Basic Blocks and Flow graphs– Optimization of Basic Blocks- The DAG Representation of Basic Blocks - Peephole Optimization	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examinations) Compiler Construction tools -Input buffering- Recognition of tokens- Symbol Tables - Lexical analyzer Generator Lex-Parser Generator YACC. Error recovery in Parsing – Run time Environments- Storage organization- The target machine - A simple code generator.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman,(2013). “*Compilers- Principles, Techniques and Tools*”, Second Edition, Pearson Education.

Reference Books

1. Kennath C. Loudon,(2006). “*Compiler Construction: Principles and Practice*”, Vikas publishing House.
2. S.Godfrey Winster, S.Aruna Devi, R.Sujatha,(2020). “*Compiler Design*”, Second Edition, Yesdee Publishers.
3. Raghavan V, (2017). “*Principles of Compiler Design*” Tata McGraw Hill Education Pvt. Ltd.

Web References

1. <https://www.geeksforgeeks.org/introduction-of-finite-automata/>
2. https://www.slideshare.net/appasami/cs6660-compiler-design-notes?next_slideshow=1
3. <https://www.javatpoint.com/lr-parser>
4. https://www.tutorialspoint.com/compiler_design/compiler_design_phases_of_compiler.htm
5. <https://byjus.com/gate/intermediate-code-generation-in-compiler-design-notes/>
6. <https://www.youtube.com/watch?v=F9ZoFP7D474>
7. <https://www.codingninjas.com/codestudio/library/code-generation-4403>

Pedagogy

Chalk & Talk, PPT, Group Discussion, Seminar and Assignment

Course Designer

Ms.K.Sangeetha

Semester : III	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3CC7	CLOUD COMPUTING	CORE	6	5

Course Objective

- To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
- To motivate students to do programming and experiment with the various cloud computing environments
- To introduce about the Cloud Standards

Prerequisites

Distributed and Grid Computing

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand and discuss the fundamentals of various cloud models	K1, K2
CO2	Determine the applications and the architectures of cloud	K3, K5
CO3	Identify and Examine services and appropriate virtualization concepts	K3, K4
CO4	Explore and recommend cloud solutions for mobile cloud and mobile web services	K4, K5
CO5	Justify and Enhance real time cloud applications to its appropriate environment	K5, K6

Mapping of CO with PO and PSO

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

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Defining Cloud Computing- Cloud Types: The NIST model - The Cloud Cube Model -Deployment models - Service models - Examining the Characteristics of Cloud Computing: Paradigm shift- Benefits of cloud computing - Disadvantages of cloud computing – Assessing the Value Proposition: Measuring the Cloud's value: The laws of clouconomics - Cloud computing obstacles - Behavioral factors relating to cloud adoption – Measuring cloud computing costs – Avoiding Capital Expenditures – Computing the Total Cost of Ownership – Specifying Service Level Agreements.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	Understanding Cloud Architecture: Exploring the Cloud Computing Stack–Composability- Infrastructure – Platforms - Virtual Appliances - Communication Protocols –Applications – Connecting to the Cloud. Understanding Services and Applications by Type: Defining Infrastructure as aService (IaaS) - Defining Platform as a Service (PaaS) - Defining Software as a Service (SaaS) –SaaS characteristics- Salesforce.com and CRM SaaS – Defining Identity as a Service (IDaaS).	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	Understanding Abstraction and Virtualization: Using Virtualization Technologies – Load Balancing and Virtualization: Advanced load balancing - The Google cloud – Understanding Hypervisors: Virtual machine types-VMware vSphere-Understanding Machine Imaging –Porting Applications: The Simple Cloud API-AppZero Virtual Application Appliance. Capacity Planning -Load testing-Resource ceilings - Network Capacity - Scaling.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	Understanding Service Oriented Architecture: Introducing Service Oriented Architecture – Defining SOA Communications – Managing and Monitoring SOA. Using the Mobile Cloud: Working with Mobile Devices – Defining the Mobile Market–Using Smartphones with the Cloud. Working with Mobile Web Services: Understanding Service Types– Performing Service Discovery – Using SMS – Defining WAP and other Protocols –Performing Synchronization	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	Cloud Programming and Software Environments: Parallel and Distributed Programming Paradigms – Programming support of Google App Engine – Programming on Amazon AWS and Microsoft Azure – Ubiquitous Clouds and the Internet of Things: Cloud Trends in Supporting Ubiquitous Computing.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

VI	Self Study for Enrichment (Not included for End Semester Examinations) Using Media and Streaming: Understanding the Streaming process- Protocols in use – The cloud computing advantages -Audio Streaming – Working with VoIP applications-Skype – Google Voice and Google Talk-Video Streaming – Television in the cloud- Streaming video formats – YouTube	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
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Text Books

1. Barrie Sosinsky.(2011).*Cloud Computing Bible*. Wiley Publishing Inc.(Unit I – IV)
2. Kai Hwang, Geoffrey C.Foxand Jack J.Dongarra (2013). *Distributed and Cloud computing: From parallel processing to the Internet of Things*. Morgan Kaufmann (Unit V)

Reference Books:

1. Michael Miller(2012).*Cloud Computing*. 7th Edition, Pearson Education Inc.
2. Rajkumar Buyya & Co,(2011). *Cloud Computing Principles and Paradigms*, John Wiley & Sons Publications

Web References

1. https://www.tutorialspoint.com/cloud_computing/index.htm
2. <https://data-flair.training/blogs/cloud-computing-tutorial/>

Pedagogy

Chalk & Talk, Discussion, Quiz, Assignment & PPT

Course Designer

Ms. S. Udhaya Priya

Semester : III	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PGCS3CCC2A	CYBER SECURITY	CORE CHOICE	3(T) + 2(P)	4

Course Objective

- To develop skills in students that can help them plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets.
- To expose students to governance, regulatory, legal, economic, environmental, social, and ethical contexts of cyber security.
- To expose students to the responsible use of online social media networks.
- To systematically educate the necessity to understand the impact of cyber-crimes and threats with solutions in a global and societal context.
- To select suitable ethical principles, commit to professional responsibilities and human values, and contribute value and wealth for the benefit of society

Prerequisites

Basic Knowledge of Cyber Security

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand the cyber security threat landscape	K1,K2
CO2	Develop a deeper understanding and familiarity with various types, cyber crimes, vulnerabilities, and remedies thereto.	K2, K3
CO3	Analyse and evaluate existing legal frameworks and laws on cyber security.	K4, k5
CO4	Analyse and evaluate the digital payment system security and remedial measures.	K4, K5
CO5	Analyse and evaluate the cyber security risks, plan suitable security controls	K4, k5

Mapping of CO with PO and PSO

COs	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	2	3	3	3	3	2
CO4	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

**Syllabus
Theory:**

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Overview of Cyber Security: Cyber security increasing threat landscape, -Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyber warfare, Case Studies.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Cyber Crimes: Cyber Crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber-squatting, Pharming, Cyber espionage, Cryptojacking, Darknet-illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake news cyber crime against persons –cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Cyber Law: Cyber Crime and legal landscape around the world, IT Act, 2000 and its amendments. Limitations of IT Act, 2000. Cyber Crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies-AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Data Privacy and Data Security: Defining data, meta-data, big data, non-personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA). Social media-data privacy and security issues.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Cyber security Management, Compliance and Governance: Cyber security Plan-cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	Self Study for Enrichment (Not included for End Semester Examinations) Case Studies: Largest Cyber Attacks : Yahoo Data Breach, Equifax Data Breach, WannaCry Malware Attack, Simple Locker.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
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Reference Books

1. Vivek Sood, (2017). *Cyber Law Simplified*. McGraw Hill Education
2. Sumit Belapure and Nina Godbole, (2011). *Computer Forensics and Legal Perspectives*. Wiley India Pvt. Ltd.
3. Dorothy F. Denning, (1998). *Information Warfare and Security*. Addison Wesley.
4. Henry A. Oliver, (2015). *Security in the Digital Age: Social Media Security Threats and Vulnerabilities*. Create Space Independent Publishing Platform.
5. Natraj Venkataramanan and Ashwin Shriram, (2016). *Data Privacy Principles and Practice*. 1st Edition, CRC Press.
6. W.Krag Brothy, (2008). *Information Security Governance, Guidance for Information Security Managers*. 1st Edition, Wiley Publication.
7. Martin Weiss, Michael G.Solomon, (2015). *Auditing IT Infrastructures for Compliance*. 2nd Edition, Jones & Bartlett Learning.

Web References

1. <https://www.tutorialspoint.com/principles-of-information-system-security>
2. <https://www.geeksforgeeks.org/principle-or-information-system-security/>
3. <https://www.techtarget.com/searchsecurity/definition/cybersecurity>
4. <https://www.ukessays.com/essays/computer-science/analysis-of-the-yahoo-data-breaches.php>
5. <https://www.csoononline.com/article/3444488/equifax-data-breach-faq-what-happened-who-was-affected-what-was-the-impact.html>
6. <https://www.techtarget.com/searchsecurity/definition/WannaCry-ransomware>
7. <https://www.cloudflare.com/learning/ddos/syn-flood-ddos-attack/>

Practicals:

List of Exercises: (Not included for End Semester Examinations)

1. Platforms for reporting cyber crimes.
2. Checklist for reporting cyber crimes online
3. Setting privacy settings on social media platforms.
4. Do's and Don'ts for posting content on Social media platforms.
5. Registering complaints on a Social media platform.
6. Prepare password policy for computer and mobile device.
7. List out security controls for computer and implement technical security controls in the personal computer.
8. List out security controls for mobile phone and implement technical security controls in the personal mobile phone.
9. Log into computer system as an administrator and check the security policies in the system.

Web References

1. <https://cybercrime.gov.in/>
2. https://cybercrime.gov.in/webform/crime_onlinesafetytips.aspx
3. <https://www.digitalvidya.com/blog/social-media-dos-and-donts/>
4. <https://www.medianama.com/2023/02/223-platform-grievance-appellate-committees-social-media/>
5. <https://www.ibm.com/topics/security-controls>
6. <https://docs.oracle.com/cd/E19683-01/817-0365/concept-2/index.html>

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment.

Course Designer

From UGC SYLLABUS

Semester: III	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
22PCS3CCC2B	IoT	CORE CHOICE	5	4

Course Objective

- To understand the technology behind Internet of Things
- To get familiar with the design principles of connected devices
- To know about IoT platforms and design methodologies

Prerequisites

Basic Knowledge in Communication Technologies

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand and Describe the basic concepts of IoT	K1,K2
CO2	Apply and Analyze the IoT based sensor systems	K3,K4
CO3	Illustrate and Analyze the various IoT enabling Technologies	K3,K4
CO4	Design and Evaluate portable IoT using Raspberry /equivalent boards	K4,K5
CO5	Create and Design real time applications	K5,K6

Mapping of CO with PO and PSO

COs	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

“3”–Substantial(High) Correlation

“2”–Moderate(Medium) Correlation

“-” Indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	Introduction to IoT: Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies –IoT Levels & Deployment Templates– Domain Specific IoTs: Home Automation–Cities–Environment–Energy–Logistics – Retail – Agriculture.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	IoT and M2M: Introduction–M2M–Difference between IoT and M2M – SDN and NFV for IoT– IoT System Management with NETCONF- YANG: Need for IoT systems management -Simple Network Management Protocol (SNMP)-Network operator Requirement–NETCONF–YANG-NETOPEER– Developing IoT: IoT platforms design methodology–IoT Design Methodology.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	IoT Systems – Logical Design using Python: Introduction - Python Packages of interest for IoT – IoT physical Devices and Endpoints : What is an IoT Device – Exemplary Devices - Raspberry pi Interfaces – Programming Raspberry pi with Python –other IoT Devices.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Data Analytics for IOT: Apache Hadoop –Using Hadoop MapReduce for Batch Data Analysis–Apache oozie-Apache Spark– Apache Storm-Using Apache Storm for Real–time Data Analysis.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs–WAMP–AutoBahn for IoT- Xively c l o u d f o r I o T– Designing a RESTful web API- Amazon Web Services for IoT-Tools for IoT: Chef – Chef Case studies-Puppet–Puppet Casestudy Multi Tier deployment - NETCONF-YANG Case Studies	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment (Not included for End Semester Examinations) APPLICATIONS: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Arshdeep Bahga, Vijay Madisetti, (2014), "*Internet of Things – A hands on approach*", Universities Press

Reference Books

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), (2011) "*Architecting the Internet of Things*", Springer
2. Jan Holler, Vlasios Tsiatis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Aves and David Boyle, (2014), "*From Machine-to Machine to the Internet of Things – Introduction to a New Age of Intelligence*", Elsevier
3. David Easley and Jon Kleinberg, (2010) "*Networks, Crowds, and Markets: Reasoning About a Highly Connected World*" - Cambridge University Press
4. Olivier Hersent, David Boswarthick, Omar Elloumi, (2012), "*The Internet of Things – Key applications and Protocols*", Wiley

Web References

1. <https://github.com/connectiot/iottoolkit>
2. <https://www.arduino.cc/>
3. <https://www.tutorialspoint.com/>
4. <https://www.guru99.com/>
5. <https://www.pythonforbeginners.com/>

Pedagogy

Chalk and Talk, Seminar, e-Contents

Course Designer

Ms.K.Pradeepa

Semester : III	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3CCC2C	NATURAL LANGUAGE PROCESSING	CORE CHOICE	5	4

Course Objective

- To understand the Natural Language Processing (NLP) techniques
- To be familiarized with the data structures and algorithms used in NLP
- To understand the process of raw text and apply categorizing tagging words for classification
- To apply text analytics grammar approaches for real-time applications
- To know the basics of first order logic and propositional logic

Prerequisites

Basic understanding of mathematics concepts, statistics, machine learning, python programming and data structures

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand how key concepts from NLP and linguistics are used to describe and analyze language	K1, K2,K4
CO2	Identify the suitable data structures and algorithms used in NLP	K3
CO3	Analyze data stored in standard formats	K4
CO4	Analyze and compare the methods and algorithms used to process different types of textual data	K4, K5
CO5	Formulate how to extract grammatical features and to know the basics of first order logic and propositional logic	K6

Mapping of CO with PO and PSO

COs	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	3	3	3	2	3	2
CO2	3	3	3	2	2	3	3	3	3	2
CO3	2	3	3	2	2	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	2	3

“1” – Slight (Low) Correlation
 “3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation
 “-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction: Natural Language Processing and its Neighbors-Three themes in Natural Language Processing- Language Processing and Python: Computing with Language: Texts and Words - A Closer Look at Python: Texts as Lists of Words - Computing with Language: Simple Statistics - Back to Python: Making Decisions and Taking Control -Automatic Natural Language Understanding. Accessing Text Corpora and Lexical Resources: Accessing Text Corpora-Conditional Frequency Distributions -More Python: Reusing Code - Lexical Resources – WordNet.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	Processing Raw Text: Accessing Text from the Web and from Disk - Strings: Text Processing at the Lowest Level- Text Processing with Unicode- Regular Expressions for Detecting Word Patterns- Useful Applications of Regular Expressions - Normalizing Text - Regular Expressions for Tokenizing Text - Segmentation –Formatting: From Lists to Strings . Writing Structured Programs : Back to the Basics-Sequences- Questions of Style - Functions: The Foundation of Structured Programming - Doing More with Functions- Program Development-Algorithm Design-A Sample of Python Libraries.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	Categorizing and Tagging Words: Using a Tagger-Tagged Corpora- Mapping Words to Properties Using Python Dictionaries-Automatic Tagging- N-Gram Tagging-Transformation Based Tagging- Determine the Category of a Word. Learning to Classify Text: Supervised Classification- Examples of Supervised Classification-Evaluation-Decision Trees-Naive Bayes Classifiers- Maximum Entropy Classifiers-Modeling Linguistic Patterns.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	Extracting Information from Text: Information Extraction- Chunking-Developing and Evaluating Chunkers- Recursion in Linguistic Structure- Named Entity Recognition-Relation Extraction. Analyzing Sentence Structure: Some Grammatical Dilemmas-Use of Syntax - Context-Free Grammar-Parsing with Context-Free Grammar-Dependencies and Dependency Grammar- Grammar Development.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

V	Building Feature-Based Grammars: Grammatical Features-Processing Feature Structures-Extending a Feature-Based Grammar. Analyzing the Meaning of Sentences: Natural Language Understanding- Propositional Logic- First-Order Logic- The Semantics of English Sentences- Discourse Semantics. Applications and Case Studies: Question Answering and Machine Reading- Machine Translation- Text Generation	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	Self Study for Enrichment: (Not included for End Semester Examinations) Life Cycle of a Corpus-Language Processing versus Symbol Processing- Contemporary Philosophical Divides-NLTK Roadmap-Envoi.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Steven Bird, Ewan Klein and Edward Loper (2009). *Natural Language Processing with Python*. 1st Edition, O'Reilly Media. (Unit 1: Chapter 1, 2; Unit 2: Chapter 3,4; Unit 3: Chapter 5, 6 ; Unit 4: Chapter 7, 8; Unit 5: Chapter 9,10)
2. Jacob Eisenstein (2019). *Introduction to Natural Language Processing*. Kindle Edition, MIT Press.(Unit 1: Chapter 1; Unit 5: Chapter17: (17.5), Chapter 18,19)

Reference Books

1. Daniel Jurafsky and James H.Martin(2013). *Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition*. 2nd Edition, Pearson Education.
2. Nitin Hardeniya, Jacob Perkins, Deepti Chopra, Nisheeth Joshi, Iti Mathur (2016). *Natural Language Processing: Python and NLTK*. 1st Edition, Packt Publishing.
3. Akshar Bharati, Vineet Chaitanya, Rajeev Sangal (1996). *Natural Language Processing – A Paninian Perspective*. Prentice Hall of India.
4. Clark, A., Fox, C., & Lappin, S. (2013). *The handbook of computational linguistics and Natural Language Processing*. John Wiley & Sons.
5. Bender, E. M., & Lascarides, A. (2019). *Linguistic fundamentals for Natural Language Processing II: 100 essentials from semantics and pragmatics*. *Synthesis Lectures on Human Language Technologies*, 12(3), 1-268.
6. Hapke, H. M., Lane, H., & Howard, C. (2019). *Natural Language Processing in Action: Understanding, analyzing and generating text with Python*. Kindle Edition, Manning Publications Co.
7. Indurkha, N., & Damerau, F. J. (2010). *Handbook of Natural Language Processing*. 2nd Edition, Chapman and Hall/CRC Press.
8. James Allen (2002). *Natural Language Understanding*, 2nd Edition, Pearson Education.

Web References

1. <https://tjzhifei.github.io/resources/NLTK.pdf>
2. https://www.google.co.in/books/edition/Introduction_to_Natural_Language_Process/72yuDwAAQBAJ?
3. <https://towardsdatascience.com/data-to-text-generation-with-t5-building-a-simple-yet-advanced-nlg-model-b5cce5a6df45>
4. <https://archive.nptel.ac.in/courses/106/101/106101007/>
5. https://books.google.co.in/books/about/Introduction_to_Natural_Language_Process.html?id=72yuDwAAQBAJ&redir_esc=y

Pedagogy

Chalk & Talk, PPT, Group Discussion, Seminar and Assignment

Course Designer

Dr.K.Reka

Semester : III	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3CC3P	CLOUD COMPUTING (P)	CORE	5	5

Course Objective

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud-based application
- To learn to implement and use parallel programming using Hadoop

Prerequisites

Java, Python, HTML and Linux

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	List and illustrate the usage of Python and HTML Tags in web applications	K1,K2
CO2	Demonstrate and make use of Google App Engine (GAE) in web applications	K2,K3
CO3	Apply and Compare python for cloud-based applications	K3,K4
CO4	Examine and Evaluate the web applications with CloudSim	K4,K5
CO5	Interpret and Develop web application using Hadoop	K5,K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2	3	3	3	3	2
CO2	3	3	2	3	2	3	2	2	3	2
CO3	3	3	2	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

Exercises

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install GAE. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using TryStack.
8. Install Hadoop single node cluster and run simple applications like wordcount.
9. i) Explore JustCloud, Amazon Drive file storage and sharing solutions.
ii) Work with YouTube, a cloud service to upload your own educational video(s) and use appropriate settings to make it public.

Web References

1. <https://www.iitk.ac.in/nt/faq/vbox.htm>
2. <https://www.javatpoint.com/virtualbox-installation>
3. <https://cloud.google.com/appengine/docs/flexible/python/create-app>
4. <https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-in-trystack/>
5. <https://www.geeksforgeeks.org/how-to-install-single-node-cluster-hadoop-on-windows/>
6. <https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster>

Pedagogy

Demonstration

Course Designer

Ms. S. Udhaya Priya

Semester: III	Internal Marks: -		External Marks: 100	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3DSE3A	COMPUTER SCIENCE FOR COMPETITIVE EXAMINATIONS	DISCIPLINE SPECIFIC ELECTIVE	5	3

Course Objective

- To understand the need for preparing competitive exams
- To study the basic concepts of core subjects in computer science
- To inculcate the knowledge of implementation of various concepts

Prerequisites

Basic concept of core computer science

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Explain concepts of computer science core subjects	K2
CO2	Apply the knowledge to solve various types of problems	K3
CO3	Examine various computer science concepts on real time applications	K4
CO4	Develop a scientific aptitude and sense of reasoning	K6
CO5	Develop students with professional and ethical attitude	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	2	3	3	3	3	3
CO3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	3	2	2	3	3	3	3	3
CO5	3	3	3	3	2	3	3	3	3	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” –indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Number Systems- Series Completion -Coding & Decoding- Problems on Ages - Blood Relation - Probability – Permutation & Combination - Data Interpretation - ICT (Information and Communications Technology-Logical Reasoning & Non – Verbal Reasoning. Programming Languages - Programming in C- Object Oriented Programming – Programming in C++/JAVA - Web Programming	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Mathematical Logic: Propositional and Predicate Logic - Predicates and Quantifiers-Rules of Inference-Sets and Relations: Set Operations, Representation and Properties of Relations, Equivalence Relations, Partially Ordering. Counting, Mathematical Induction and Discrete-Probability - Group Theory –Graph Theory – Minimum Spanning Tree – Graph Algorithms-Optimization- Digital Logic: Number systems-Boolean Algebra – Map Simplification - Combinational Circuits – Sequential Circuits. Memory Hierarchy: Main Memory - Auxilliary Memory - Associative Memory - Cache Memory - Virtual Memory	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Operating System: Threads – CPU Scheduling - Disk Scheduling– Deadlocks - Paging– Process Management-Memory Management – Storage Management – File and Input/output Systems – Security – Kernel modules - Linux – Data Structures and Algorithms: Time and Space Complexity,Linked Lists, Stacks and Queues – Trees-Search and Sorting Algorithms – Hashing – Algorithm design techniques: Greedy Approach, Dynamic Programming - Divide and Conquer – Graph Search, Minimum Spanning trees, Shortest paths – Complexity Theory(P and NP Class problem)	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Data Communication and Computer Networks: Concept of Layering – Network Types & Models – Functions of OSI & TCP/IP Layers - Flow and Error Control techniques, switching – IPV4/IPV6, routers and routing algorithms – TCP/UDP and sockets, congestion controls. Application Layer Protocols (WWW, DNS, SMTP, POP, FTP, and HTTP) -Network Security: authentication- basics of public key- cryptography-digital signatures and certificates- firewalls. Database Management Systems: Basic concepts – Data Modeling – SQL – Normalization- Data models.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Theory of Computation: Finite Automata and Regular Languages–Context Free Languages and Push down Automata–Recursive Enumerable sets and Turing Machines – Syntax & Semantic Analysis- Compiler Design: Lexical Analysis and Parsing – Syntax Directed Translation- Intermediate code generation – Code optimization Approaches to AI: Turing Test and	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	Rational Agent Approaches- State Space Representation of Problems - Heuristic Search Techniques - Min-Max Search - Alpha Beta Cutoff Procedures.			
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) Estimation and Scheduling of Software Projects: Software Sizing - LOC and FP based Estimations. Estimating Cost and Effort- Estimation Models- Constructive Cost Model (COCOMO). Computer Organization and Architecture: Machine Instruction and Addressing Modes – ALU & Data Path, CPU Control Design – Memory & I/O Interface – Instruction Pipeline – Secondary Storage – Microprocessor- Computer Graphics: 2-D Geometrical Transforms and Viewing- 3-D Object Representation, Geometric Transformations and Viewing	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Reference Books:

1. Dr.R.S.Aggarwal, (2017), *Quantitative Aptitude for Competitive Examinations* ,S.Chand Publishing
2. Dr.R.S.Aggarwal,(2020), *A modern Approach to verbal & Non-verbal Reasoning*, S.Chand Publishing
3. R.Gupta,(2015), *UGC – NET/SET Computer Science & Applications*, R.Gupta
4. Surbhi Sharma, Kailasah Chandra Gurunani,(2018), *UGC NET Computer Science and Applications*, Arihant Publication
5. Trishna Knowledge Systems, (2019), *GATE Computer Science and Information Technology- GATE 2020*, Pearson

Web References

1. <https://www.careerbless.com/apptitude/qa/home.php>
2. <https://www.sawaal.com/apptitude-reasoning/quantitative-apptitude-arithmetic-ability-questions-and-answers.html>
3. <https://www.indiabix.com/non-verbal-reasoning/questions-and-answers/>
4. <https://www.geeksforgeeks.org/ugc-net-cs-preparation/>
5. <http://www.netugc.com/ugc-net-solved-question-papers-in-computer-science-and-applications>
6. <https://gatecse.in/>
7. <https://gateoverflow.in/>

Pedagogy

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

Course Designer

Ms.Rita Jenifer, Ms.S.Saranya and Ms.R.Ramya

Semester III	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
22PCS3DSE3BP	IoT (P)	DISCIPLINE SPECIFIC ELECTIVE	5	3

Course Objective

- To create IoT program to turn ON/OFF LED
- To implement IoT program for object detection
- To develop IoT programs for agricultural purpose
- To create web server program for local hosting
- To design IoT application for health monitoring

Prerequisites

Java , C,C++

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand the basic concepts of IoT	K2
CO2	Design Embedded platforms in IoT using Microprocessor	K3
CO3	Apply wireless peripherals for exchange of data.	K4
CO4	Apply Cloud Platform to Upload and Analyze the Sensor Data	K5
CO5	Deploy simple application of IoT for Realtime	K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	3	3	3	3	3	3	2	3
CO2	3	3	3	3	3	3	3	3	2	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

“3”–Substantial(High) Correlation

“2”–Moderate (Medium) Correlation

“-”indicates there is no Correlation.

Exercises

1. To develop an IoT program to turn ON/OFF LED light (3.3V)
2. To develop an IoT program using IR sensor (Smart Garbage Monitoring, Detecting Parking Availability, etc.)
3. To develop an IoT program using Humidity and Temperature Monitoring (Forest fire Detection, Weather Monitoring)
4. To develop an IoT web server program for local hosting

5. To develop an IoT program using Soil Moisture Sensor
6. To develop an IoT program using Ultrasonic Sensor (Distance Measurement, etc.)
7. To develop a real-time IoT program using Relay Module (Smart Home Automation with 230V)
8. To develop an IoT program for Fire Detection (Home, Industry, etc.)
9. To develop an IoT program for Gas Leakage detection (Home, Industry, etc.)
10. To develop an IoT program using Heartbeat Sensor

Web References

- 1.<https://www.comsoc.org/publications/best-readings/internet-things>
- 2.<https://mitpress.mit.edu/books/internet-things>
- 3.<https://circuitdigest.com/internet-of-things-iot-projects>

Pedagogy

Live Demonstration, You Tube Videos, Tutorials

Course Designer

Ms.K.Pradeepa

Semester : III	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3DSE3CP	NATURAL LANGUAGE PROCESSING (P)	DISCIPLINE SPECIFIC ELECTIVE	5	3

Course Objective

- To learn the fundamentals of Natural Language Processing (NLP)
- To understand the use of Context Free Grammar (CFG)
- To gain practical experience in the Natural Language Toolkit (NLTK)
- To design and implement applications based on NLP

Prerequisites

Basic knowledge on python and different types of parsing techniques

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand NLP pipeline	K2
CO2	Apply different Machine translation techniques for translating a source to target language(s)	K3
CO3	Analyze and compare the methods and algorithms used to process different types of textual data	K4, K5
CO4	Determine the concepts of morphology, syntactic analysis, semantic interpretation and pragmatics of the language, and understanding them to apply in different research areas	K5
CO5	Design an innovative application using NLP components	K6

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2	3	3	2	3	2
CO2	3	3	3	3	3	3	3	3	3	2
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

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

Exercises

Using Python

1. Installation
2. Frequency Distribution Histogram Plotting using WordNet
3. NLP preprocessing such as tokenization, stemming, lemmatization
4. Perform Morphological Analysis
5. POS Tagging
6. Bigrams and N-Gram Tagging
7. Text Classification using Naive Bayes Classifier
8. Named Entity Recognition
9. Context Free Grammars
10. Large Context Free Grammars and Parsing

Web References

1. <https://www.coursehero.com/file/87991863/18CS3167-NLP-LAB-MANUAL-pdf/>
2. <http://www.nltk.org/install.html>
3. <https://www.scribd.com/document/570254598/NLP-Lab-Manual#>

Pedagogy

Demonstration

Course Designer

Dr.K.Reka

Semester : III	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3GEC1P	DATA ANALYSIS (P)	GENERIC ELECTIVE	3	2

Course Objective

- To provide fundamental concepts of data analysis
- To interpret, summarize and present numerical data using Excel
- To explore, analyse, and visualise data in Python

Prerequisites

Basic Computer Knowledge

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Recall and understand the different types of data analysis and their use cases	K1, K2
CO2	Apply Exploratory Data Analysis on a real-world dataset	K3
CO3	Analyze the various methods and functions in Excel	K4
CO4	Compare and recommend external libraries in Python for analysing the data	K4, K5
CO5	Create powerful and dynamic Excel dashboard	K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	2	3	3	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	2	3	3	2	2	3	2	3	2
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

Exercises

Using MS-Excel

1. Importing data
2. Demonstrate the usage of essential Functions and methods
3. Publish worksheet as web page with interactivity
4. Using PivotTables and Charts to create dashboards
5. Connect multiple slicers to the pivot tables

Using Python

1. Working with libraries
2. Importing and exporting data
3. Cleaning and preparing data
4. Replacing strings with numbers
5. Exploratory Data Analysis

Web References

1. <https://www.analyticsvidhya.com/blog/2021/11/a-comprehensive-guide-on-microsoft-excel-for-data-analysis/>
2. https://www.academia.edu/34282340/Excel_data_analysis_tutorial
3. <https://www.datacamp.com/courses/data-analysis-in-excel?>
4. <https://www.myexcelonline.com/blog/connect-slicers-to-multiple-excel-pivot-tables/>
5. <https://www.geeksforgeeks.org/data-analysis-with-python/>
6. <https://www.geeksforgeeks.org/data-analysis-with-scipy/?ref=rp>

Pedagogy

Demonstration

Course Designer

Dr.K.Reka

SEMESTER IV

Semester: IV	Internal Marks: 25		External Marks:75	
COURSECODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4CC8	BIG DATA ANALYTICS	CORE	6	5

Course Objective

- To provide knowledge about Big data Analytics
- To study the basic concepts on Data Science & Analytical Technologies
- To understand about Hadoop & MAPREDUCE fundamentals
- To inculcate knowledge about MongoDB & Analytics with R Machine

Prerequisites

Basic knowledge in Analytics, Data Mining, Database and Machine learning concepts

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, the students will be able to

CONumber	CO Statement	Cognitive Level
CO1	Understand the fundamentals of Big data analytics	K2
CO2	Describe the Hadoop architecture and Filesystem	K2
CO3	Apply the MapReduce Programming model for real-world problems	K3
CO4	Explore the concepts of NoSQL databases	K4
CO5	Design and assess a complete business data analytics solution	K5,K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	3	2	2	3	1	3	2	2
CO2	3	3	3	2	3	3	3	3	3	3
CO3	3	3	2	3	3	3	3	3	3	3
CO4	2	3	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	3	2	3	3	3

“1”-Slight (Low) Correlation
“3”-Substantial (High) Correlation

“2”– Moderate (Medium) Correlation
“-”- indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Types of Digital Data: Classification of Digital Data – Introduction to Big Data: Characteristics of Data- Evolution of Big Data – Definition of Big Data - Challenges with Big Data – Other characteristics of data - Need for Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop Environment.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	Understanding Analytics and Big Data: Comparing reporting and analysis - Types of Analytics – Points to consider during analysis – Developing an analytic team – Understanding text analytics.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	Big data Technology: Hadoop. Introduction to Hadoop: Introducing Hadoop – Need for Hadoop- Limitations of RDBMS – RDBMS versus HADOOP- History of Hadoop – Hadoop overview - Interacting with Hadoop ecosystem – HDFS - Processing Data with Hadoop MapReduce – Managing resources and applications with Hadoop YARN - Introduction to MAPREDUCE programming.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	Introduction to MongoDB: Need for MongoDB - Terms used in RDBMS and MongoDB - Data types in MongoDB - MongoDB Query Language.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	Reading Datasets and Exporting Data from R: Using the c() Command - Using scan() Command – Reading multiple data values from large files - Reading data from R Studio – Exporting data from R. Working with Functions and Packages in R: Using functions instead of scripts – Using arguments in Functions – Built-in Functions in R – Introducing Packages – Working with Packages.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	Self Study for Enrichment (Not included for End Semester Examinations) Exploring R .Manipulating and Processing Data in R - Introduction to Cassandra.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Seema Acharya, Subhashini Chellappan, (2015). *Bigdata and Analytics*, Wiley India Pvt. Ltd (Unit I, III-IV)
2. DT Editorial Services, (2017), *Big Data Black Book*, Dream Tech Press. (Unit- II, V)

Reference Books

1. V. Bhuvaneswari, T. Devi (2016). *Bigdata Analytics – A Practioner's Approach*, Bharathiyar University, Coimbatore
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj (2013). *Big data Big Analytics*, Wiley
3. Bart Baesens (2014). *Analytics in a BigdataWorld*, Wiley

Web References

1. https://webopedia.com/TERM/B/big_data_analytics.html
2. <https://www.coursera.org/learn/big-data-introduction>
3. <https://hadoop.apache.org/>
4. <https://www.tutorialspoint.com/cassandra/index.htm>
5. <https://www.edureka.co/blog/mapreduce-tutorial/>

Pedagogy

Chalk and Talk, Group discussion, Seminar, Quiz & Assignment.

Course Designer

Ms. A. Sahaya Jenitha

Semester: IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4CCC3A	ROBOTIC PROCESS AUTOMATION	CORE CHOICE	6	4

Course Objective

- Understand the RPA and differentiate from other types of automation
- Outline the benefits of RPA and its various platforms
- Summarize the Risks and Challenges of RPA

Prerequisites

Knowledge in Programming languages and algorithmic way of understanding and thinking capability

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Cognitive Level
CO1	List and Interpret RPA, where it can be applied	K1, K2
CO2	Explain and Identify the usage of AI	K2, K3
CO3	Make use of and distinguish the process and its automation	K3, K4
CO4	Compare and Evaluate the bots	K4, K5
CO5	Assess the RPA and its use cases in various domains	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	2	3	2	3	3	2	2	3
CO2	2	2	3	3	3	3	3	2	3	3
CO3	3	3	2	3	1	3	3	3	2	1
CO4	2	2	3	2	3	3	2	1	3	3
CO5	3	3	2	2	1	3	3	2	1	1

“1”–Slight (Low) Correlation
“3”–Substantial (High) Correlation

“2”–Moderate (Medium) Correlation
“-” indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	INTRODUCTION TO ROBOTIC PROCESS AUTOMATION: Definition-Benefits of RPA, Types of RPA, RPA tools-Automation Anywhere-CRM Automation-Extracting the customer list from CRM-Looking up customer information	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	MODERATING SOCIAL MEDIA USING AI: Reading parameters from the configuration file-passing the configuration parameters to the main workflow-reading image files from input and create a list-setting up the google cloud vision API services-looping through images and invoking google cloud vision API-updating the image sheet with API results-passing the parameters and invoking safesearch -Testing the automation- PURCHASE ORDER PROCESSING WITH UIPATH REFRAMEWORK: Purchase order performer-init state changes-process state changes-	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	SALES ORDER PROCESSING: Creating the parent bot-creating the child bot for SO processing-invoking the child bot and updating excel sheet- ERP USER ADMINISTRATION: creating the child bot for new user creation- EMPLOYEE EMERGENCY NOTIFICATIONS:- create a child bot to send messages-create the parent bot-testing the automation	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	INTELLIGENT DOCUMENT PROCESSING- Uipath Document understanding-creating the IQ Bot learning instance-uploading invoices to IQ Bot-Downloading Structured data from IQ bot	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	RPA IN ENTERPRISE: Security and Error Handling-robot platform security-cognitive automation technology and smart process automation- BRINGING YOUR ROBOTS TO LIFE-THE DEVELOPMENT PROCESS: Scoping an RPA project-robotic validations-becoming an automation consultant	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment (Not included for End Semester Examinations) RPA Use cases: Retail -Healthcare-Finance and Accounting-BPO-Web application Automation	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Nandan Mullakara and Arun Kumar Asokan(2020). *Robotic Process Automation Projects*. Packt Publishing.(UNITS I-IV)
2. Richard Murdoch (2018). *Robotic Process Automation*. RPA Ultra.(UNIT V)

Reference Books

1. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston (2015). *Introduction to Robotic Process Automation: a Primer*.1stEdition, Institute of Robotic Process Automation.
2. Richard Murdoch (2018). *Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks and become an RPA Consultant*.1st Edition, Independently Published.
3. Srikanth Merianda (2018). *Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation*.1st Edition, Consulting Opportunity Holdings LLC.
4. Lim Mei Ying (2018). *Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes*.1st Edition, Packt Publishing.

Web References

1. <https://www.uipath.com/rpa/robotic-process-automation>
2. <https://www.academy.uipath.com>
3. <https://www.edureka.co/blog/rpa-tutorial/>
4. <https://www.udemy.com/course/robotic-process-automation/>
5. <https://www.guru99.com/robotic-process-automation-tutorial.html>
6. <https://www.automationanywhere.com/in/robotic-process-automation>
7. <https://www.uipath.com/blog/learning-robotic-process-automation-through-video-tutorials>
8. https://onlinecourses.nptel.ac.in/noc21_me32/preview

Pedagogy

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

Course Designer

Dr. D. Radhika

Semester: IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4CCC3B	VIRTUAL AND AUGMENTED REALITY	CORE CHOICE	6	4

Course Objective

- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to Virtual Reality (VR)/Augmented Reality (AR)
- To review the Virtual Environment and the various types of Hardware and Software in Virtual Reality systems
- To Simulate and Apply Virtual/Augmented Reality to varieties of Applications

Prerequisites

Numerical & Statistical Methods, Artificial Intelligence & Machine Learning and Computer Aided Engineering

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Understand and Identify the fundamental Computer Vision, Computer Graphics and Human - Computer Interaction Techniques related to VR/AR	K1,K2
CO2	Interpret and Analyze various Geometric Modeling Techniques	K2,K3
CO3	Apply and Analyze the Virtual Environment	K3,K4
CO4	Analyze the VR/AR Technologies	K4
CO5	Examine the VR/AR Technologies on real time applications	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
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

“3”- Substantial (High) Correlation

“2”– Moderate (Medium) Correlation

“-”- indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction: Defining Virtual and Augmented Reality: Introducing Virtual Reality and Augmented Reality – Other types of Virtual and Augmented Reality –History – Father of Virtual Reality – Early Virtual Reality failures-Virtual Reality breaks through – Augmented reality hits the mainstream – Evaluating the Technology Hype Cycle.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	Exploring the Current State of Virtual Reality & Augmented Reality: Looking at Available forms factors – Focusing on features – Considering controllers – Recognizing the current issues with VR – Assessing adoption rates	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Consuming Content in Virtual Reality : Exploring Consumers-Grade Virtual Reality – Identifying Near-Future Hardware – Comparing Current and Future options. Consuming Content in Augmented Reality : Exploring Consumers-Grade Augmented Reality – Identifying Near-Future Hardware – Comparing Current and Future options.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Evaluating Your Project: Choosing Virtual Reality – Choosing Augmented Reality. Planning Virtual Reality Project – Defining your Virtual Reality Project-Exploring Design Principles in Virtual Reality. Planning Augmented Reality Project – Defining your Augmented Reality Project – Exploring Design Principles in Augmented Reality – Defining your Social Experience.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Industries Transformed by Virtual and Augmented Reality: Travel – Museums – Aerospace – Retail – Military – Education – Entertainment - Real estate – Advertising and Marketing. – Mobile Apps for Experiencing Augmented Reality: Google translate – Amazon AR view –AR city – Ingress and Pokemon Go – Sketch AR – Find your car & Car finder AR	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment (Not included for End Semester Examinations) Exploring Virtual Reality use cases – Exploring Augmented Reality use cases -Future of Virtual and Augmented reality	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Paul Mealy (2018), *Virtual & Augmented Reality For Dummies*, John Wiley & Sons,

Reference Books

1. Bruno Arnaldi, Guillaume Moreau, Pascal Guitton, (2018), *Virtual Reality and Augmented Reality: Myths and Realities*, Wiley

Web References

1. <https://nptel.ac.in/courses/121106013>
2. <https://www.youtube.com/watch?v=zLMgdYI82IE>
3. <https://www.youtube.com/watch?v=MGuSTAqlZ9Q>

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment

Course Designer

Ms. K. Pradeepa

Semester: IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4CCC3C	DIGITAL IMAGE PROCESSING	CORE CHOICE	6	4

Course Objective

- To impart the knowledge of image fundamentals and mathematical transforms necessary for image processing
- To understand the image enhancement techniques
- To study image compression procedures
- To study the image segmentation and representation techniques

Prerequisites

Basic Programming Skills, Linear Algebra, Differential Equations & Basics of Digital Electronics

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Recall and understand the algorithmic approach to illustrate the concepts of image processing	K1, K2
CO2	Understand the fundamental to the processing of digital images for specific tasks	K2
CO3	Solve real world problems by using digital image processing	K3
CO4	Analyze the images by using fundamental and advanced aspects of image processing	K4
CO5	Develop and evaluate the simplified tools for image processing	K5, K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	2	3	3	2	3
CO2	3	2	2	2	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” – indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction to Image Processing: Overview of Image Processing - Nature of Image Processing -Image Processing and Related Fields - Digital Image Representation - Types of Images – Digital Image Processing Operations – Fundamental Steps in Image Processing – Image Processing Applications- Colour Image Processing: Colour Models – Colour Quantization.	14	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	Digital Imaging System: Overview of Digital Imaging System - Physical Aspects of Image Acquisition - Digital Image Transforms: Need for Image Transforms – Properties of Fourier Transform – Discrete Cosine Transform – Discrete Sine Transform –Walsh Transform – Hadamard Transform – Haar Transform – Slant Transform –SVD and KL Transforms.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	Image Enhancement: Image Quality and Need for Image Enhancement – Image Enhancement Operations - Spatial Filtering Concepts – Image Smoothing in Frequency Domain Filtering. Image Restoration Image Degradation Model –Image Restoration in Presence of Noise only – Image Restoration Techniques	19	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	Image Segmentation: Introduction –Classification of Image Segmentation Algorithms - Detection of Discontinuities - Edge Detection: Stages in Edge Detection, Types of Edge Detectors, First-order Edge Detection Operators, Second – order Derivative Filters, Edge Operator Performance-Hough Transforms and Shape Detection - CornerDetection - Principlesof Thresholding – Principles of Region-growing – Active Contour Models	19	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	Image Compression: Image Compression Model–Compression Algorithms and its types– Types of Redundancy – Lossless Compression Algorithms – Lossy Compression Algorithms – Image and Video Compression Standards	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	Self-Study for Enrichment: (Not included for End Semester Examinations) Case study: Face Recognition - Iris Recognition- Finger print Recognition - Signature Verification	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. Dr. S. Sridhar.(2016). *Digital Image Processing*. 2nd Edition, Oxford University Press

Reference Books

1. Anil Jain K. (2011). *Fundamentals of Digital Image Processing*. PHI Learning Pvt.Ltd
2. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins.(2011). *Digital Image Processing Using MATLAB*. 3rd Edition, TataMcGrawHillPvt. Ltd.
3. MalayK. Pakhira (2011). *Digital Image Processing And Pattern Recognition*, 1st Edition PHI Learning Pvt. Ltd.

Web References

1. <https://www.cs.nmt.edu/~ip/lectures.html>
2. <https://archive.nptel.ac.in/courses/117/105/117105135/>
3. <https://www.geeksforgeeks.org/digital-image-processing-basics/>
4. <https://www.javatpoint.com/digital-image-processing-tutorial>
5. <https://github.com/FlagArihant2000/dip-notes>

Pedagogy

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

Course Designer

Ms. R. Sangeetha

Semester: IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4CC4P	FOSS (P)	CORE	6	5

Course Objective

- To expose students to FOSS environment
- To use and modify existing programs using open source packages/Technologies
- To inculcate knowledge in developing new software

Prerequisites

Knowledge in Programming Languages

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Cognitive Level
CO 1	Ability to install and run open-source operating systems	K1
CO 2	Explain open source project structure and how to successfully setup a project	K2
CO 3	Use Github for Software development projects	K3
CO 4	Analyze various FOSS options for any software requirement	K4
CO 5	Develop and testing an applications using open source code	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	2	3	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	2	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

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” - indicates there is no Correlation

Syllabus

1. Linux
2. GIMP: GNU Image Manipulation Program
3. Shotcut
4. Apache Struts
5. Perl
6. Ruby
7. Mongo DB
8. PHP
9. Selenium

Web References

1. <https://www.vmware.com/>
2. <https://www.cyberciti.biz/tips/linux-unix-bsd-documentations.html>
3. <https://developer.gimp.org/api/2.0/>
4. <https://struts.apache.org/>
5. https://www.tutorialspoint.com/perl/perl_references.html
6. <https://www.ruby-lang.org/en/documentation/>
7. <https://docs.mongodb.com/manual/reference/database-references/>
8. <https://shotcut.org/tutorials/>
9. https://www.nptelvideos.com/php/php_video_tutorials.php
10. <https://www.coursera.org/learn/selenium-webdriver-python>

Pedagogy

Demonstration

Course Designer

Dr.K.Reka

Semester: IV	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4GEC2P	ANIMATION (P)	GENERIC ELECTIVE COURSE	3	2

Course Objective

- To give an overall view of animation tools
- To learn the basic concepts of animation as an art.
- Explore the various photo editing features and animation techniques
- To create different types of animation using Flash

Prerequisites

Basic Computer Skills

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Understand the basic concepts behind animation	K2
CO2	Develop an animated movie	K3
CO3	Analyze the tools and techniques to create 2D and 3D animation	K4
CO4	Recommend the suitable methods available to create, render, and present images with professional quality	K5
CO5	Create simple shapes and videos using animation editing software	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2	3	3	3	3	2
CO2	3	3	3	3	2	3	3	2	3	2
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	2	3	2	3	3	3	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” –indicates there is no Correlation.

List of Exercises

USING PHOTOSHOP

1. Create a logo using shapes, texture and filling colors.
2. Develop a banner of recent activity in your college or any festival.
3. Perform an animation on still photo.
4. Develop a collage and apply Morphing, Merging and Overlapping on the images.
5. Design a visiting card containing at least one graphic and text information.
6. Create a dancing doll using Frame by Frame Animation.
7. Develop a Webpage.

USING FLASH

1. Create an application using shapes, colors, text and images.
2. Design a Virtual Drumbeat using audio and video.
(Draw a circle to represent a drum and edit as required on one layer. Insert another layer, draw suitable drum sticks and position them appropriately. Give visual effects. Also provide audio effect by selecting the sound item from Flash library Sounds.fl, so as to integrate audio and video clips)
3. Design a Sunset
(Create a suitable background with clouds and mountains on one layer. Draw the Sun on another layer. On the third layer draw birds. Provide animation to show the birds flying across the Sun that keeps fading)
4. Create a Stickman Walk using Motion Tweening
5. Design an animation using Shape Tweening.
6. Create Morphing and Masking effects in images
7. Create a Bouncing Ball using Frame by Frame animation

Web References

1. <https://www.adorama.com/alc/how-to-edit-your-photos-5-photoshop-editing-steps-for-beginners/>
2. <https://www.youtube.com/watch?v=ceAGVMn-syQ>
3. <https://www.geeksforgeeks.org/types-of-animations-in-flash/>
4. <https://www.photoshopessentials.com/basics/>
5. <https://www.guru99.com/photoshop-tutorials.html>
6. <https://www.instructables.com/Basics-of-Photoshop/>

Pedagogy

Power Point Presentation, Live Demonstration

Course Designer

Ms. R. Sangeetha

Semester: IV	Internal Marks: -		External Marks:100	
COURSECODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4PW	PROJECT WORK	PROJECT	9	5

- To understand the problem identification from the real world requirements
- To inculcate technical skills through the suitable application development environment for modeling real-world problems
- To expose the students to analyze various software testing tools and techniques before deploying the product

EVALUATION PATTERN FOR PROJECT

Components	Marks
Dissertation	80
Problem Identification – 20	
Domain Knowledge - 20	
Presentation - 20	
Communication Skills - 20	
Viva Voce	20
Total	100