MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

Vaniyambadi – 635 751

PG Department of Computer Applications

for

Postgraduate Programme

Master of Computer Applications

From the Academic Year 2024-25

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1. **Preamble**

The Department of Computer Applications was established in 2002, with the objective of imparting quality education in the domain of Computer Applications. With rapidly evolving technology and the continuous need for innovation, the department has always produced quality professionals, holding important positions in Information Technology industries in India and abroad. The Department updates its syllabi frequently to attract young talents from all over the country. The academic activities of the department, during the last four years, were centered on teaching programmes in computer Applications with a view to train postgraduates who can contribute significantly to the requirements of professional organizations in the field.

PROGRAMME OUTCOMES (PO)

Programme	MCA
Programme Code	**P08**
Duration	**2 Years**
Programme Outcomes	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that forma part of an undergraduate Programme of study.

PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself / himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO4: Problem solving: Capacity to extra polate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO5: Analytical reasoning: Ability to evaluate there liability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing view points.

PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.

PO7: Cooperation/ Teamwork : Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence, and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes:	**PSO1– Placement:** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions. **PSO2-Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skills that will facilitate startups and high potential organizations. **PSO3 –Research and Development:** Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards Growth and development.

Eligibility for Admission:

- Candidates must have a Bachelor's degree with Mathematics as a subject.
- A minimum of 50% of marks are required in a Bachelor degree.
- Candidates must have completed 10+2 i.e. senior secondary Education with science as a major.

Methods of Evaluation and Assessment

Methods of Evaluation		
Internal Evaluation		25 Marks
External Evaluation	End Semester Examination	75 Marks
	Total	**100 Marks**
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand / Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or overview	
Application (K3)	Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate Between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

Semester – III						
24PCAC31	CC – Machine Learning	2	1	2	0	5
24PCAC32	CC – Digital Forensics	2	1	2	0	5
24PCAC33	CC – Advanced Web Technology	2	1	1	0	3
24PCAC34P	CC – Practical V- Machine Learning Lab	0	0	4	0	3
24PCAC35P	CC –Practical VI- Internet of Things Lab	0	0	4	0	3
24PCAE31 / 24PCAE32	EC – 1. Algorithm of Design and Analysis 2. Object Oriented Analysis and Design	2	1	1	0	3
24PCAS31	SEC – Full Stack Development	1	0	1	0	2
24PCAIN31	Internship	0	0	2	0	2
					30	26

Semester – IV						
24PCAC41	CC – Digital Image Processing	3	1	2	0	5
24PCAC42P	CC - 14 Project Work	0	2	4	6	5
24PCAE41	EC – High Performances Computing/ BigData Analytics	4	1	1	0	3
24PCAP41	PEC – 1 Digital Marketing	1	1	0	0	2
24PCAL41	SLC – 1 Ecommerce & its Applications	0	0	1	3	2
					30	17
	Total Credit	90+2*				

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAC31	**Machine Learning**	Core	2	1	2	0	5	5	25	75	100

Learning Objectives	
LO1	To understand the concepts of Machine Learning.
LO2	To understand the theoretical and practical aspects of types of machine learning.
LO3	To teach and get familiarized with supervised learning and their applications.
LO4	To teach and get familiarized with the concepts and algorithms of unsupervised learning. .
LO5	To appreciate the concepts and algorithms of deep learning.

Unit	Content	Hours
1	**Introduction** Introducing Machine Learning: The Origins of Machine Learning, Uses and Abuses of Machine Learning _ Basics of Machine Learning Algorithm Model Works Steps to apply Machine Learning Choosing a Machine Learning Algorithm Using Machine Learning concepts. **Chapter 1: Page No: 1 - 24** **Chapter 2: Page No: 28-61**	14
2	**Lazy Learning** – Classification Using Nearest Neighbors: The kNN Algorithm Diagnosing Breast Cancer with the kNN Algorithm **Probabilistic Learning** – Classification Using Naive Bayes: Basic concepts of Bayesian Methods The Naïve Bayes Algorithm. **Chapter 3: Page 66 – 86** **Chapter 4: Page 90 -124** **Chapter 5: Page 126-158**	14
3	**Forecasting Numeric Data – Regression Methods**: Understanding Regression Example – Predicting Medical Expenses using Linear Regression Understanding Regression Trees and Model Trees. **Black Box Methods – Neural Networks:** Understanding Neural Networks, from Biological to Artificial Neurons. **Chapter 6:172-200** **Chapter 7:220-229**	14

4	**Finding Groups of Data**: Clustering with KMeans: Understanding Clustering -The kmeans Algorithm for clustering Finding teen market segments using kmeans Clustering.	14	
5	**Introduction to Deep Learning:** Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs)	14	

CO	Course Outcomes
CO1	To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data
CO2	To comprehend, apply and evaluate the classification techniques for real world applications
CO3	To understand, use and perform evaluation of Regression methods
CO4	To recognize, implement and analyse the unsupervised techniques for real world applications
CO5	To understand, identify, implement and review the deep learning techniques for real time applications

Text books:

1	Brett Lantz, "Machine Learning with R", Addison Wesley Packt Publishing, 2013**. (Unit 1 to 4)**
2	Taweh Beysolow, "Introduction to Deep Learning Using R: A Step by Step Guide to Learning and Implementing Deep Learning Models Using R", San Francisco, California, USA, 2017. **(Unit 5)**
3	Hands-On Machine Learning With Scikit-Learn Keras, and TensorFlow by Aurélien Géron's
4	Foundations of Machine Learning Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar
5	R in a Nutshell: A Desktop Quick Reference 2nd Edition by Joseph Adler

Reference Books:

1	Daniel T. Larose, Chantal D. Larose, "Data mining and Predictive analytics", Second Ed., Wiley Publication, 2015.
2	Bertt Lantz, "Machine Learning with R: Expert techniques for predictive modeling", 3rd Edition, April 15,2019.
3	Jason Bell, "Machine Learning: HandsOn for Developers and Technical Professionals", Wiley Publication,2015.
4	R for Data Analysis in easy steps 2nd Edition by Mike McGrath
5	Practice datascience with R- Nine Zumel,John Mount.

Web resources:

1	https://www.coursera.org/learn/machine-learning
2	https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	1	2	3	2	2
CO2	3	3	3	2	3	2	2	2	3	3	2
CO3	3	2	2	2	3	1	1	2	3	3	2
CO4	3	3	3	3	3	2	1	3	3	3	3
CO5	3	2	3	2	3	2	1	2	3	3	2
Total	15	13	13	11	14	9	6	11	15	14	11
Average	3	3	3	2	3	2	1	2	3	3	2

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAC32	**Digital Forensics**	Core	2	1	2	0	5	5	25	75	100

	Learning Objectives										
LO1	To understand the fundamentals of digital forensics and its techniques.										
LO2	To comprehend digital crimes and the methodologies of investigation.										
LO3	To prepare for digital forensic readiness in various scenarios.										
LO4	To learn and utilize forensic tools specific to iOS devices.										
LO5	To learn and utilize forensic tools specific to Android devices.										

Unit	Content	Hours
1	Introduction to Digital Forensics: Forensic Science and its relevance to digital forensics-Digital Evidence: Types and characteristics-Digital Forensics Process: Identification, Collection, Examination, Analysis, and Presentation phases	14
2	Digital Crime and Investigation: Understanding Digital Crime and Substantive Criminal Law-General Conditions and Offenses in the digital realm-Investigation Methods for Collecting Digital Evidence-International Cooperation in Digital Evidence Collection	14
3	Digital Forensic Readiness-Concept of Digital Forensic Readiness -Law Enforcement vs. Enterprise Digital Forensic Readiness-Frameworks, Standards, and Methodologies-Challenges in Digital Forensics	14
4	iOS Forensics-Overview of Mobile Hardware and Operating Systems-iOS Fundamentals and Jail breaking-File System and Hardware Analysis-iPhone Security and Forensic Procedure	14
5	Android Forensics -Android Architecture and Rooting Techniques-File System and Hardware Analysis-Android Security and Forensic Procedures-Tools for Android Forensics: Oxygen Forensics, Mobil Edit, Android App Decompiling	14

CO	Course Outcomes
CO1	Understand the principles and practices of digital forensics.
CO2	Identify and investigate various forms of digital crimes.
CO3	Prepare and implement strategies for digital forensic readiness.
CO4	Apply forensic techniques to extract and analyze data from iOS devices.
CO5	Apply forensic techniques to extract and analyze data from Android devices.

Textbooks:	
1	André Årnes, "Digital Forensics", Wiley, 2017.
2	Nelson, B, Phillips, A, Enfinger, F, Stuart, C., ―Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
3	Chuck Easttom, "An In-Depth Guide to Mobile Device Forensics", 2nd Edition, CRC Press, 2019.
4	Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

Reference Books:	
1	John Sammons, The Basics of Digital Forensics The Primer for Getting Started in Digital Forensics, Second Edition, Syngress, 2015.
2	Bill Nelson,Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, 1st Edition, Cengage Learning, 2014
3	Cory Altheide and Harlan Carvey, ―Digital Forensics with Open Source Tools, 1st Edition, Elsevier publication, April 2011.
4	Nihad A. Hassan, Digital Forensics Basics: A Practical Guide Using Windows OS, 1st Edition,APress, 2019
5	Thomas J. Holt, Adam M.Bossler, K.C.Seigfried – Spellar, Cybercrime and Digital Forensics An Introduction, 1st Edition, Taylor and Francis,New York, 2015.

Web resources:	
1	https://www.simplilearn.com/what-is-digital-forensics-article
2	https://nyayags.org/digital-forensics-and-legal-aspects
3	https://www.mailxaminer.com/blog/digital-evidence-collection,https://infosavvy.com/evidence-collection/
4	https://www.ibm.com/think/topics/computer-forensics
5	https://www.eccouncil.org/cybersecurity-exchange/computer-forensics/mobile-device-forensics/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	1	3	3	2	3
CO2	3	3	3	3	2	3	2	3	3	2	3
CO3	3	3	2	2	3	2	2	3	3	3	3
CO4	3	3	3	3	3	2	1	2	3	3	3
CO5	3	3	3	3	3	2	1	2	3	3	3
Total	15	15	13	13	13	11	7	13	15	13	15
Average	3	3	3	3	3	2	1	2	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAC34P	**Machine Learning Lab**	**Practical- V**	**0**	**0**	**4**	**0**	**3**	**4**	**25**	**75**	**100**

	Learning Objectives
LO1	To formulate machine learning problems corresponding to different applications.
LO2	To understand a range of machine learning algorithms along with their strengths and weaknesses.
LO3	To apply machine learning algorithms to solve problems of moderate complexity.
LO4	To apply CNN to solve problems of moderate complexity.
LO5	To apply LSTM and RNN to solve problems.

Unit	Content	Hours
1	Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation.	6
2	Implement a Linear Regression and Multiple Linear Regression with a Real Dataset.	6
3	Implementation of Logistic Regression using sklearn.	6
4	Implement a binary classification model.	6
5	Classification with Nearest Neighbours and NavieBaye Algorithm	6
6	Implementation Decision tree for classification using sklearn and its parameter tuning.	6
7	Implement the k-means algorithm.	6
8	Implement an Image Classifier using CNN in TensorFlow/Keras.	6
9	Implement an Autoencoder in TensorFlow/Keras.	6
10	Implement a Simple LSTM using Tensor Flow/Keras.	6
	Total	60

CO	Course Outcomes
CO1	To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming
CO2	To recognize and develop the machine learning models through python in built functions
CO3	To understand, impart and develop the machine learning models for real-time dataset
CO4	To comprehend, impart and implement the deep learning models for real-time applications
CO5	To identify and evaluate the performance machine learning models for real-time dataset

Text Books:

1	Brett Lantz, "Machine Learning with R", AddisonWesley Packt Publishing, 2013. **(Unit 1 to 4)**
2	TawehBeysolow, "Introduction to Deep Learning Using R: A Stepby Step Guide to Learning and Implementing Deep Learning Models Using R", San Francisco, California, USA, 2017. **(Unit 5)**
3	Hands-On Machine Learning With Scikit-Learn Keras, and TensorFlow by Aurélien Géron's
4	Foundations of Machine Learning Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar
5	R in a Nutshell: A Desktop Quick Reference 2nd Edition by Joseph Adler

Reference Books:

1	Daniel T. Larose, Chantal D. Larose, "Data mining and Predictive analytics", Second Ed., Wiley Publication, 2015.
2	Bertt Lantz, "Machine Learning with R: Expert techniques for predictive modeling", 3rd Edition, April 15,2019.
3	Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals", Wiley Publication,2015.
4	R for Data Analysis in easy steps 2nd Edition by Mike McGrath
5	Practice datascience with R- Nine Zumel,John Mount.

Web resources:

1	https://www.coursera.org/learn/machine-learning
2	https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	1	1	2	3	3	2
CO2	3	3	3	3	3	2	1	2	3	3	3
CO3	3	2	2	2	3	1	2	2	3	3	2
CO4	3	2	3	2	3	1	-	2	3	3	2
CO5	3	3	3	3	3	2	2	3	3	3	3
Total	15	13	13	12	15	7	6	11	15	15	12
Average	3	3	3	2	3	1	1	2	3	3	2

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAC35P	**Internet of Things Lab**	**Practical-VI**	0	0	4	0	3	4	25	75	100

	Learning Objectives
LO1	To implement the concepts of IoT.
LO2	To interface different platforms like Arduino and Raspberry pi
LO3	To design and implement the related applications.
LO4	To learn how to analysis the data in IoT.
LO5	To learn IoT system involving prototyping, programming and data analysis.

Unit	Content	Hours
1	Controlling the Light Emitting Diode (LED) with a push button.	4
2	Interfacing Arduino to Zigbee module	4
3	Interfacing the RGB LED with the Arduino	4
4	Controlling the LED blink rate with the potentiometer interfacing with Arduino	4
5	Detection of the light using photo resistor	4
6	Interfacing of temperature sensor LM35 with Arduino	4
7	Interfacing Servo Motor with the Arduino	4
8	Interfacing of the Active Buzzer with Arduino.	4
9	Interfacing of the Relay with Arduino.	4
10	Directional Control of the DC motor using Arduino	4
	Total	40

CO	Course Outcomes
CO1	On this completion of this course the students will be able to the basics of the Raspberry Pi platform and Python programming for embedded applications.
CO2	On this completion of this course the students will be able to Interface Arduino with Zigbee, GSM, and Bluetooth modules for wireless communication.
CO3	On this completion of this course the students will be able to Interface various sensors (temperature, humidity, motion, etc.) with Raspberry Pi.
CO4	On this completion of this course the students will be able to Establish wireless data exchange between Arduino and Raspberry Pi using Zigbee, Bluetooth, Wi-Fi, or RF communication.
CO5	On this completion of this course the students will be able to Apply acquired knowledge to create real-world IoT applications in domains like home automation, smart agriculture, or industrial monitoring.

Textbooks:

1	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
2	Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
3	Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
4	"Springer Handbook of Internet of Things" edited by Reza Malekian, Álvaro Rocha, and Nuno M. Garcia Publisher: Springer ,2023
5	"Internet of Things: Technology, Applications, and Standardization" edited by Jaydip Sen et al. ArXiv, 2018

Reference Books:

1	The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2	"From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence",Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
3	Architecting the Internet of Things,Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer,2011.
4	Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition,Michael Margolis, Arduino Cookbook and O"Reilly Media,2011.
5	"Learning Internet of Things" by Peter Waher , Packt Publishing , 2015

Web resources:

1	Learn Internet of Things (IoT)	.NET
2	IoT Hub - Connecting YOU to the Internet of Things

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	1	2	3	3	2
CO2	3	3	3	2	3	2	2	2	3	3	2
CO3	3	3	3	2	3	2	2	3	3	3	3
CO4	3	3	3	2	3	2	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	11	15	11	11	12	15	15	13
Average	3	3	3	2	3	2	2	2	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks CIA	Marks External	Marks Total
24PCAC33	**Advanced Web Technology**	**Core**	**2**	**1**	**1**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand the fundamentals of the web development and design.
LO2	Provide basic knowledge HTML, CSS and JavaScript.
LO3	Learn Client-side Scripting and Server-side Scripting programming languages.
LO4	Learn database management using SQL and NoSQL databases.
LO5	Understand Web development frameworks and Libraries.

Unit	Content	Hours
1	**Introduction to Web Development:** Overview of Web Development. Web Development Process. Web Development tools and technologies. Introduction to HTML, CSS, and JavaScript. Web Development frameworks and libraries.	12
2	**HTML and CSS and JavaScript:** HTML-Basic HTML Elements, Forms, Tables and Frames, HTML5 Features. CSS-Basics, Selectors, Properties, CSS box Model, Layouts. JavaScript- Basics, Variables, Control Structures, Functions. JavaScript Basics: Variables, Data types and Operators, Control Structures. JavaScript Libraries and Frameworks.	12
3	**Client-Side Scripting and Server-Side Scripting** Client-Side Scripting**:** DOM Manipulation, Events and Event Handling. Introduction to Server –Side Scripting. PHP-Basics, Variables, Control Structures, Functions and Function Expressions. Other Server-Side Technologies(Python, Ruby, Etc)	12
4	**Database Management:** Introduction to databases: Overview of database Management Systems, Types of databases. Relational Databases-Database Design, SQL Queries, Database Security. NoSQL databases:(MongoDB,Etc)-Introduction to NoSQL Databases, Data Modeling and Schema design, Querying NoSQL databases.	12

5	**Web Frameworks and Libraries:** Introduction to Web Frameworks. Front-End Frameworks (React, Angular, Vue.js, etc).Overview of Popular front-end frameworks, Building Applications with Front-End Frameworks. Back-End Frameworks(Laravel, Django, Ruby on Rails, etc), Overview of Popular back-end frameworks. Building Applications with back-end Frameworks.	12

CO	Course Outcomes
CO1	Design and develop dynamic web applications
CO2	On the Completion of this course the student will be to learned about the basics of HTML, CSS and JavaScript.
CO3	Apply client-side and Side scripting techniques.
CO4	Implement database –driven web applications.
CO5	Apply web development frameworks and libraries

Textbooks:

1	Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015. UNITS: 1,2,3,4
2	Dayley Brad, Dayley Brendan ,"AngularJS, JavaScript, and jQuery All in One", Sams Teach Yourself 1st Edition, Kindle Edition, 2015.UNIT: 5.

Reference Books:

1	M. Srinivasan: Web Programming Building Internet Applications, 3 rdEdition, Wiley India, 2009.
2	Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7thImpression,2012.
3	Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
4	Raj Kamal: Internet and Web Technologies, McGraw Hill Education.

Web resources:

1	https://www.w3schools.com/html/
2	https://www.tpointtech.com/what-is-xhtml
3	https://javascript.info/first-steps
4	https://www.geeksforgeeks.org/how-to-create-xml-dynamically-using-javascript/
5	https://www.geeksforgeeks.org/introduction-to-angularjs/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1	2	2	2	2
CO2	3	3	3	2	3	2	1	2	3	3	2
CO3	3	2	3	2	3	2	1	2	3	2	3
CO4	3	3	2	3	3	2	1	2	3	3	3
CO5	3	2	3	2	3	1	1	2	3	3	3
Total	15	12	13	11	14	9	5	10	14	13	13
Average	3	2	3	2	3	2	1	2	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAE31	**Algorithm of Design and Analysis**	Elective	2	1	1	0	3	4	25	75	100

Learning Objectives	
LO1	Learn the fundamentals of algorithm efficiency, including time and space complexity.
LO2	Learn the fundamental principles of the Greedy Method and how it differs from other problem-solving techniques like Divide and Conquer and Dynamic Programming.
LO3	Learn how overlapping sub problems and optimal substructure help solve problems efficiently and Compare Dynamic Programming (DP) with Divide and Conquer and Greedy methods.
LO4	Learn how backtracking systematically explores all possible solutions to a problem.
LO5	Learn how Branch and Bound systematically explores the solution space for optimization problems.

Unit	Content	Hours
1	Introduction – Performance Analysis – Asymptotic Notation- Divide and conquer Method: Binary Search, Finding Maximum and Minimum, Merge Sort and Quick Sort.	12
2	Greedy Methods: Knapsack Problem, Minimum Cost Spanning Trees, Optimal Storage on Tapes and Single Source Shortest Path Problem.	12
3	Dynamic Programming: Multistage Graphs, 0/1 knapsack and Traveling Salesman Problem. Basic Traversal and Search Techniques: Techniques for Binary Tree, Techniques for Graphs: Depth First Search and Breadth First Search - Connected Components and Spanning Tree - Biconnected Components and DFS.	12
4	Backtracking: 8 Queens Problems, Sum of Subsets, Graph Colouring, Hamiltonian Cycle and Knapsack Problem.	12
5	Branch and Bound: Least Cost Search. Bounding: FIFO Branch and Bound and LC Branch and Bound. 0/1 Knapsack Problem, Travelling Salesman Problem.	12

CO	Course Outcomes
CO1	On the completion of this course the students will able to understand and apply asymptotic notations (Big-O, Ω, Θ) for time and space complexity analysis.
CO2	On the completion of this course the students will able to apply Divide and Conquer for efficient searching and sorting (Binary Search, Merge Sort, Quick Sort)
CO3	On the completion of this course the students will able to implement Depth-First Search (DFS) and Breadth-First Search (BFS) for graph-based problems.
CO4	On the completion of this course the students will able to implement Backtracking algorithms for 8 Queens, Graph Coloring, Hamiltonian Cycle, and Knapsack.
CO5	On the completion of this course the students will able to apply FIFO and Least Cost (LC) Branch and Bound techniques.

Textbooks:

1	E.Horowitz, S.Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms , Second edition, Universities Press.
2	S. K. Basu, Design Methods and Analysis of Algorithms , PHI, 2005.
3	Goodman and S. T. Hedetniem, Introduction to the Design and Analysis of Algorithms , MGH, 1977
4	A.V. Aho, J.D. Ullman and J.E.Hospcraft, The Design and Analysis of Computer Algorithms Pearson Education.

Reference Books:

1	Introduction to Algorithms – Cormen, Leiserson, Rivest, and Stein (MIT Press)
2	Algorithm Design – Jon Kleinberg, Eva Tardos (Pearson)
3	The Design and Analysis of Computer Algorithms – Aho, Hopcroft, Ullman (Pearson)
4	Algorithms – Robert Sedgewick and Kevin Wayne (Addison-Wesley)
5	Data Structures and Algorithm Analysis in C++ – Mark Allen Weiss (Pears

Web resources:

1	https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	2	1	3	3	2
CO2	3	3	3	3	2	2	1	1	3	3	2
CO3	3	3	3	2	2	1	2	1	3	3	3
CO4	3	3	3	3	2	1	2	1	3	3	3
CO5	3	3	2	2	2	1	2	2	3	3	3
Total	15	15	13	12	10	6	9	6	15	15	13
Average	3	3	3	2	2	1	2	1	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAE32	**Object Oriented Analysis and Design**	Elective	2	1	1	0	3	4	25	75	100

	Learning Objectives
LO1	To provide a brief, hands-on overview of object-oriented concepts and its life cycle for software development.
LO2	To learn for modelling the software and to design them using UML diagrams
LO3	To understand the problem domain and to identify the objects from the problem specification.
LO4	To understand, how to apply design axioms and corollaries for the classes and object relational systems.
LO5	To gain knowledge about open source tools for Computer Aided Software Engineering

Unit	Content	Hours
1	**INTRODUCTION** : An overview – Object basics – Object state and properties – Behaviour – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle.	12
2	**METHODOLOGY AND UML** Introduction – Survey – Rumbaugh, Booch, Jacobson methods – Unified modelling language – Static and Dynamic models – Rational Rose Suite - UML diagrams – Static diagram : Class diagram – Use case diagrams – Behaviour Diagram : Interaction diagram – State chart diagram – Activity diagram - Implementation diagram: Component diagram – Deployment diagram – example - Design of online railway reservation system using UML diagrams - Dynamic modelling – Model organization – Extensibility.	12
3	**OBJECT ORIENTED ANALYSIS** Identifying Use case – Business object analysis – Use case driven object oriented analysis – Use case model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility – construction of class diagram for generalization, aggregation – example – vehicle class.	12
4	**OBJECT ORIENTED DESIGN** Design process and benchmarking – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface-OOUI - MVC Architectural Pattern and Design – Designing the system.	12
5	**CASE TOOLS** Railway domain : Platform assignment system for the trains in a railway station - Academic domain : Student Marks Analysing System - ATM system - Stock maintenance - Quiz System - E-mail Client system - Cryptanalysis – Health Care Systems. Use Open source CASE Tools: StarUML/ UML Graph for the above case studies.	12

CO	Course Outcomes
CO1	Able to understand the object oriented concepts and to apply object oriented life cycle model for a project.
CO2	Able to design static and dynamic models using UML diagrams.
CO3	Able to perform object oriented analysis to identify the objects from the problem specification.
CO4	Able to identify and refine the attributes and methods for designing the object oriented system.
CO5	Able learn the open source CASE tools and to apply them in various domains.

Textbooks:

1	Ali Bahrami, "Object Oriented System Development", McGraw Hill International Edition, 2008
2	Brahma Dathan, Sarnath Ramnath, "Object-Oriented Analysis, Design and Implementation", Universities Press, 2010
3	Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Patterns and Java, Pearson 2004

Reference Books:

1	Craig Larman, Applying UML and Patterns – An Introduction to Object-Oriented Analysis and Design and Iterative Development" , 3rd Edition, Pearson Education, 2005
2	Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley Long man, 1999
3	Martin Fowler, "UML Distilled A Brief Guide to Standard Object Modeling Language", 3rd Edition, Addison Wesley, 2003
4	Russ Miles, Kim Hamilton, "Learning UML 2.0", O'Reilly, 2008

Web resources:

. http://www.spinellis.gr/umlgraph/doc/index.html

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	2	1	2	3	3	2
CO2	3	3	3	2	2	2	1	2	3	3	2
CO3	3	3	3	2	3	2	1	2	3	3	3
CO4	3	3	3	3	3	2	1	2	3	3	3
CO5	3	2	3	2	3	3	1	3	3	3	3
Total	15	13	14	10	13	11	5	11	15	15	13
Average	3	3	3	2	3	2	1	2	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAS31	**Full Stack Development**	**SEC**	**1**	**0**	**1**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To become knowledgeable about the most recent web development technologies.
LO2	Idea for creating two tier and three tier architectural web applications.
LO3	Design and Analyze real time web applications.
LO4	Constructing suitable client and server side applications
LO5	To learn core concept of both front end and back end programming.

Unit	Content	Hours
1	Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI Version control - Git &Github HTML, CSS	6
2	Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format.	6
3	REACT JS: Introduction to React React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication	6
4	Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application using Maven	6
5	Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud	6

CO	Course Outcomes
CO1	Develop a fully functioning website and deploy on a web server.
CO2	Gain Knowledge about the front end and back end Tools
CO3	Find and use code packages based on their documentation to produce working results in a project.
CO4	Create web pages that function using external data.
CO5	Implementation of web application employing efficient database access.
Textbooks:	
1	Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2	Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-byStep Guide to Creating Dynamic Websites by Robin Nixon
3	Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BYAZAT MARDAN
Reference Books:	
1	Full-Stack JavaScript Development by Eric Bush.
2	Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil Przeorski , Maciej Czarnecki

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	1	1	2	2	3	2
CO2	3	3	3	2	3	1	1	2	3	3	3
CO3	3	3	3	2	3	2	1	3	3	3	3
CO4	3	3	3	2	3	2	2	3	3	3	3
CO5	3	2	3	2	3	2	1	3	3	3	3
Total	15	13	14	9	15	8	6	13	14	15	14
Average	3	3	3	2	3	1	1	3	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAC41	**Digital Image Processing**	Core	3	1	2	0	5	6	25	75	100

Learning Objectives	
LO1	Understand the **basic concepts of digital images**, including image formation, sampling, and quantization.
LO2	Apply **point operations**, including gray-level transformations and histogram manipulation, to enhance images.
LO3	Implement **inverse filtering** and **least mean square (LMS) filtering**.
LO4	Identify and analyze **image discontinuities** using edge detection techniques.
LO5	Use **transform-based compression techniques**, including those based on DCT and wavelets.

Unit	Content	Hours
1	Digital image fundamentals & Image Transforms:- Digital Image fundamentals, Sampling and quantization, Relationship between pixels. Image Transforms: 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Discrete Wavelet Transform.	14
2	Image enhancement (spatial domain) : Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, gray level Transformation, local or neighborhood operation, median filter, spatial domain high- pass filtering.	12
3	Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration.	13
4	Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation Morphological Image Processing :Dilation and Erosion, Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit or Miss Transformation.	12
5	Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.	11

CO	Course Outcomes -The Students will be able to
CO1	Understand appreciation of the fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression
CO2	Implement basic image processing algorithms in MATLAB.
CO3	The skill base necessary to further explore advanced topics of Digital Image Processing.
CO4	A position to make a positive professional contribution in the field of Digital Image Processing.
CO5	A clear impression of the breadth and practical scope of Digital Image Processing.
Textbooks:	
1	Digital Image Processing- S Jayaraman, S. Essakkirajan, T. Veerakumar-TMH,2010
2	Digital Image Processing- Rafeal C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
3	Digital Image Processing and analysis-human and computer vision application with using CVIP Tools – Scotte Umbaugh,2nd Ed, CRC Press,2011
4	Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
5	Digital Image Processing with MATLAB & Labview - Vipula Singh Elsevier
Reference Books:	
1	Digital Image Processing using Matlab, Rafeal C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson Education.
2	Digital Image Processing and computer Vision-Somka, Halavac, Boyle - Cengage learning (Indian edition)2008.
3	Introduction to Image Processing & Analysis-John C. Russ, J. Christian Russ, CRC Press, 2010
4	Fundamentals of Digital Image Processing-A.K. Jain, PHI,1989
Web resources:	
1	https://nptel.ac.in/courses/117105079
2	https://www.coursera.org/learn/digital
3	https://www.udemy.com/course/digital-image-processing-operations-and-applications/
4	https://www.edx.org/course/fundamentals-of-digital-image-and-video-processing
5	https://www.classcentral.com/subject/digital-image-processing

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	1	2	3	2	2
CO2	3	3	3	2	3	2	2	2	3	3	2
CO3	3	2	2	2	3	1	1	2	3	3	2
CO4	3	3	3	3	3	2	1	3	3	3	3
CO5	3	2	3	2	3	2	1	2	3	3	2
Total	15	13	13	11	14	9	6	11	15	14	11
Average	3	3	3	2	3	2	1	2	3	3	2

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Review	External	Total
									Marks		
24PCAC42P	**Project Work**	**Core**	0	2	4	6	5	12	80	120	200

	Learning Objectives
LO1	Expose to the various phases of Software Development Life Cycle.
LO2	Learn to apply the Skills and Knowledge in Design, Coding and Testing with appropriate Technological Tools and Procedures.
LO3	Learn to Develop Applications with Personal, Societal and Professional Ethical Standards.

Unit	Content	Hours
	1. The Candidates have to undergo a Minimum of 150 Hours of Project Work during the Course of Study either in an IT Industry / Public or Private Sector Organization / Research Institutes / Institution itself.	
	2. The Candidates need to identify and analyze real world problems on the selected project domain.	
	3. During the course of study, the Candidates need to Develop, Design, Test, etc., the Applications as per the directions by the Guide.	
	4. Then the Candidates have to prepare and submit the manuscript of the Project Work as a Report as per the requirements of the Institution / Department for Evaluation.	
	5. The submission of the Project Report will be done at the end of the Semester for Presentation and VivaVoce during the Practical Examinations of the Semester.	
	6. The Passing Minimum for Project Work is 50%.	
	7. If the Candidate fails to score 50% in the Project Work, the Candidate has to improve it during the next attempt.	
	8. A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Project Work.	
	9. The Faculty Member will act as the Internal Examiner during the course of Project Work as well as at the time of conducting the VivaVoce Examination.	
	10. The Internal Marks for the Project Work will be awarded by the concerned Guide / Internal Examiner.	
	11. The Internal and External Examiners shall both evaluate the Project Report, Presentation and conduct the VivaVoce Examination.	

| | INTERNAL MARKS AWARDED FOR THE PROJECT WORK – 80 Marks
1. Plan of the Project – 15 Marks
2. Execution of the Plan – 15 Marks
3. Individual Initiative – 10 Marks
4. Review 1 – 20 Marks
5. Review 2 – 20 Marks | |
| | EXTERNAL MARKS AWARDED FOR THE PROJECT WORK – 120 Marks
1. Evaluation of the Project Report 50 Marks
2. Presentation – 30 Marks
3. VivaVoce Examination – 40 Marks | |

CO	Course Outcomes -The Students will be able to
CO1	Show leadership skills and learn time management
CO2	Identify various tools to be applied to a specific problem
CO3	Evaluate the reports
CO4	Involve in the Team and Manage it to deliver the excellent outcomes
CO5	Assess and Develop the individual skills to present and organize the projects

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	CIA	External	Total
									marks		
24PCAE41	**High Performances Computing**	Core	4	1	1	0	3	6	25	75	100

Learning Objectives

LO1	To get a clear idea of High Performance Computing concept.
LO2	To get brief knowledge about how to function the HPC systems.
LO3	To get idea of what techniques used in HPC models.
LO4	To understand a Parallel computing concepts.
LO5	To get familiar with OpenMP technology that is widely used in HPC technology.

Unit	Content	Hours
1	**Modern processors:** Stored-program computer architecture-General purpose cache-based microprocessor architecture-Memory Hierarchies- Multicore processors-Multithreaded processors-Vector processors. **Basic optimization techniques for serial code:** Scalar Profiling-Common sense optimizations-Simple measures, large impact-The role of compilers-C++ optimizations.	14
2	**Data access optimization:** Balance analysis and light speed estimates- Storage order-Algorithm classification and access optimizations-The Jacobi algorithm-Algorithm classification and access optimizations-Sparse matrix- vector multiply. **Parallel computers:** Taxonomy of parallel computing paradigms-Shared-memory computers-Distributed memory computers- Hierarchical systems-Networks.	14
3	**Basics of parallelization:** Introduction to Parallelism -Parallel scalability. **Shared memory parallel programming with OpenMP:** Short introduction to OpenMP-OpenMP-parallel Jacobi algorithm.	14
4	**Efficient OpenMP programming:** Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply. **Locality optimizations on ccNUMA architectures:** Locality of access on ccNUMA-ccNUMA optimization of sparse MVM-Placement pitfalls-ccNUMA issues with C++.	14
5	**Distributed-memory parallel programming with MPI:** Message passing- A short introduction to MPI-MPI parallelization of a Jacobi solver. **Efficient MPI programming:** MPI performance tools-Communication parameters-Synchronization, serialization, contention-Reducing communication overhead-Understanding intranode point-to-point communication.	14

CO	Course Outcomes
CO1	Understand of the HPC and ccNUMA concepts
CO2	Design and develop a parallel programming with modern C, C++ and new version of FORTRAN
CO3	Apply with parallel computing
CO4	Develop an efficient OpenMP programming
CO5	Evaluate an efficient MPI programming

Textbooks:

1	Georg Hager, Gerhard Wellein "Introduction to High Performance Computing for Scientists and Engineers", CRC Press, 2011.Chapters: 1 to 10.
2	Introduction to High Performance Computing for Scientists and Engineers ,Georg Hager and Gerhard Wellein, Publisher: CRC Press.
3	High Performance Computing: Modern Systems and Practices, Thomas Sterling, Matthew Anderson, Maciej Brodowicz, Morgan Kaufmann Edition/Year: 1st Edition, 2017
4	High Performance Computing, Charles Severance Kevin Dowd
5	High Performance Computing: Modern Systems and Practices, Maciej Brodowicz, Matthew Anderson

Reference Books:

1	Michael W. Berry, Kyle A. Gallivan, Efstratios Gallopoulos, Ananth Grama, Bernard Philippe, Yousef Saad, Faisal Saied, "Highperformance scientific computing: algorithms and applications", Springer, 2012.
2	Victor Eijkhout, "Introduction to High Performance Scientific Computing", MIT Press, 2011.
3	Using OpenMP: Portable Shared Memory Parallel Programming, Barbara Chapman, Gabriele Jost, Ruud van der Pas, MIT Press, Edition/Year: 2007
4	Parallel Programming. Techniques and Applications Using Networked Workstations and Parallel Computers by Barry Wilkinson and Michael Allen, Pearson Prentice Hall, second edition, 2005.
5	Vipin Kumar, Ananth Grama , Anshul Gupta , George Karypis. Introduction to Parallel Computing (2nd ed.) Pearson India, 2003.

Web resources:

1	https://researchcomputing.princeton.edu/education/external-online-resources/hpc-overview
2	https://www.redhat.com/en/blog/high-performance-computing-101
3	https://ubuntu.com/engage/a-guide-to-high-performance-computing
4	https://www.nvidia.com/en-us/training/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	1	3	3	2	3
CO2	3	3	3	3	2	3	2	3	3	2	3
CO3	3	3	2	2	3	2	2	3	3	3	3
CO4	3	3	3	3	3	2	1	2	3	3	3
CO5	3	3	3	3	3	2	1	2	3	3	3
Total	15	15	13	13	13	11	7	13	15	13	15
Average	3	3	3	3	3	2	1	2	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAP41	**Digital Marketing**	PEC	1	1	0	0	2	2	25	75	100

	Learning Objectives
LO1	To provide basic knowledge about digital marketing.
LO2	To understand and develop various digital marketing.
LO3	To know the digital analytics and measurement tools used for business.
LO4	To familiarize online and Social Media Marketing.
LO5	To understand various data a analytics and measurement tools in digital marketing.

Unit	Content	Hours
1	Introduction to Digital Marketing-Origin and Development of Digital Marketing-Traditional vs Digital Marketing-Opportunities, Fundamentals of Digital Marketing: Changing Media Consumption and Buyer's Behaviour, Brand and Ad exposure, Internet Marketing .	6
2	Content Marketing -Content creation process -Content pillar -Types-Display Advertising -Search Engine Marketing-Search Engine Optimization (On page and Off page optimization)-Email Marketing -Mobile Marketing, Affiliate Marketing.	6
3	Social Media Marketing: Building successful social media digital strategy-Piggy bank theory -Personal branding in social media -Lead generation and sales in social media, Introduction to Blogging, Content Planning and writing Introduction to Face book, Twitter, Google +, LinkedIn, YouTube, Instagram and Pinterest, their channel advertising and campaigns.	6
4	Online Reputation Management: Social commerce: Ratings and Reviews-Word of Mouth- Co-Marketing -Influencer Marketing, Digital Innovation and Trends: The contemporary digital revolution, Frame work of digital transformation. Issues in Security and privatization towards digital marketing.	6
5	Digital Analytics & Measurement -Importance of Analytics in digital space-Data capturing in online space-Types-Tracking Mechanism-Ad words and Display Networks.	6

CO	Course Outcomes
CO1	Discuss Digital Marketing and its Frame work.
CO2	Identify, use appropriately and explain digital marketing tools.
CO3	Explain social media marketing and crowd sourcing.
CO4	Discuss online reputation management and its influence.
CO5	Identify the various data analytics and measurement tools in digital marketing.

Text Books:

1	Seema Gupta (2020) Digital Marketing Second Edition, Mc Graw Hill
2	Philip Kotler (2019) , Marketing 4.0: Moving from Traditional to Digital, Wiley
3	Jeremy Kagan , Siddharth Shekhar Singh ,(2020) Digital Marketing: Strategy & Tactics, Wiley
4	Punnet Sighn Bhatia (2019) Fundamentals of Digital Marketing ,Pearson Education; second edition.
5	Vandana, Ahuja (2015) Digital Marketing, Oxford University Press India

Reference Books:

1	Ryan Deiss and Russ Henneberry (2020) Digital Marketing for Dummies, Wiley
2	Joe Pulizzi,(2020) Epic Content Marketing: How to Tell a Different Story, Break through the Clutter, and WinMore Customers by Marketing Less, McGraw Hill.
3	Barker, Barker, Bormann and Neher(2017) Social Media Marketing: A Strategic Approach, 2E South-Western, Cengage Learning.
4	Ryan, Damian (2014) Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page 3rd Edition .
5	Eric Greenberg, and Kates, Alexander(2013) Strategic Digital Marketing: Top Digital Experts Share the Formula for Tangible Returns on Your Marketing Investment; McGraw Hill Professional

Web resources:

1	https://collegedunia.com/courses/seo/seo-courses-on-udemy
2	https://collegedunia.com/courses/social-media-marketing/udemy-social-media-marketing
3	https://collegedunia.com/courses/google-ads
4	https://collegedunia.com/courses/google-analytics
5	https://collegedunia.com/courses/web-designing

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	1	1	2	3	3	3
CO2	3	3	3	3	3	2	1	2	3	3	3
CO3	3	2	2	2	3	1	2	2	3	3	3
CO4	3	2	3	2	3	1	-	2	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3
Total	15	13	13	12	15	7	6	11	15	15	15
Average	3	3	3	2	3	1	1	2	3	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks CIA	Marks External	Total
24PCAL41	**Ecommerce & its Applications**	SLC	**0**	**0**	1	3	2	4	25	75	100

Learning Objectives	
LO1	Understand the fundamental concepts of E-Commerce and its difference from traditional business practices.
LO2	Explain the various types and models of E-Commerce such as B2B, B2C, C2C, and P2P along with their real-world applications.
LO3	Learn the process of developing an E-Commerce website, including planning, system analysis, design, implementation, and maintenance.
LO4	Gain knowledge about E-Commerce security and encryption techniques to ensure safe and reliable online transactions.
LO5	Understand various electronic payment systems and study the growth, trends, and challenges of E-Commerce in India.

Unit	Content	Hours
1	**UNIT I** E-Commerce: E-Commerce Practice vs Traditional Practices, Benefits of E-Commerce to Organization, Consumers and Society, Limitations of E-Commerce.	14
2	**UNIT – II** Types of E-Commerce: B2C, B2B, C2C, P2P. Major Business to Consumer (B2C) Business Models: Portal, E-Tailer, Content Provider, Transaction Broker, Market Creator, Service Provider, Applications in B2C: E-Banking, E-Trading, E-Auction, Introduction and Overview of these Concepts. Application in B2B: Major Business to Business (B2B), Business Models, E-Distributor, B2B Service Provider, Match Maker, Benefits of B2B on Procurement, Just in Time Delivery, Consumer to Consumer (C2C) Business Models, Peer to Peer (P2P) Business Models.	14
3	**UNIT – III** Building on E-Commerce Website: Planning – The Systems Development Life Cycle, System Analysis, Identify Business Objectives, System Functionality and Information Requirements, System Design – Hardware and Software Platforms, Building the System – In-house vs Outsourcing, Hosting, Testing the System, Implementations and Maintenance.	14
4	**UNIT – IV** Security and Encryption: The E-Commerce Security Environment - Dimensions of E-Commerce Security, Security Threats in the E-Commerce Environment, Malicious Code, Hacking, Credit Card Fraud, Spoofing, Denial of Service (DoS) Attacks, Sniffing. Technology Solutions: Protecting Internet Communication,	14

	Encryption, Securing Channels of Communication, Secure Sockets Layer (SSL), Protecting Networks, Firewalls and Proxy Server, Protecting Servers and Clients.	
5	**UNIT – V** E-Commerce Payment Systems: Digital Wallets, Digital Cash, Online Stored Value System, Digital Accumulating, Balance Payment Systems, Digital Credit Card Payment Systems, Digital Cheque Payment Systems. E-Commerce and India: Overview of E-Commerce in India	14

CO	Course Outcomes
CO1	Explain the basic concepts, benefits, and limitations of E-Commerce in comparison with traditional business practices.
CO2	Identify and differentiate between various types of E-Commerce models (B2B, B2C, C2C, P2P) and their business applications.
CO3	Design and outline the steps involved in developing an E-Commerce website using system development life cycle principles.
CO4	Demonstrate awareness of E-Commerce security threats and apply suitable technological measures such as encryption, SSL, and firewalls.
CO5	Evaluate different digital payment systems and discuss the current scenario and scope of E-Commerce in India.
Textbooks:	
1	David Kosiur, understanding Electronic Commerce, Addison Wesley.
2	Soka, From EDI to Electronic Commerce, Tata McGraw- hill.
Reference Books:	
1	Saily Chan, Electronic Commerce Management, John Wiley,1998.
2	Neil Randall, The Internet in a Wee, 2ndEdn. Prentice Hall of India, New Delhi.
3	Kamalesh, K. Balaji and Debjani Nag, "E-Commerce", the cutting eduge of business, Tata McGraw-Hill, 2000
4	Marilyn Greenstein and Todd M. Fein Mann, Electronic Commerce, security, Risk Management, Irwin McGraw Hill, 2000. Course Material: website links, e-Books and e-journals
Web resources:	
1	https://nptel.ac.in/courses/110105083
2	https://www.coursera.org/learn/introduction-e-commerce
3	https://www.edx.org/course/digital-transformation-in-business
4	https://alison.com/course/diploma-in-e-business

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	3	2	3	3	3
CO2	3	3	2	3	2	3	3	2	3	3	3
CO3	2	3	3	2	3	3	3	3	2	3	3
CO4	3	3	2	3	2	3	3	3	3	3	2
CO5	3	2	3	3	3	2	2	3	3	2	3
Total	14	14	13	13	13	13	14	13	14	14	14
Average	3	3	2	2	2	2	3	2	3	3	3

3 – Strong, 2- Medium, 1- Low