SEMESTER-III

COURSE TITLE: Data Science with Python

Course Code: MMCACDS325						**Examination Scheme**	**T**	**P**
Total number of Lecture Hours: 60						**External**	**72**	**-**
						Internal	**28**	**-**
Lecture (L):	**4**	**Practical(P):**	**0**	**Tutorial (T):**	**0**	**Total Credits**	**4**	

COURSE LEARNING OUTCOMES (CLO):

CLO1: Apply foundational concepts of data analytics and differentiate between descriptive, predictive, and prescriptive analytics with real-world applications.

CLO2: Demonstrate proficiency in Python programming by writing and executing code using built-in data structures, functions, and essential libraries such as Pandas, NumPy, and Matplotlib.

CLO3: Perform data preprocessing and wrangling tasks including handling missing values, encoding categorical variables, transforming and reshaping datasets for analysis.

CLO4: Conduct exploratory data analysis using statistical techniques and visualizations, and interpret evaluation metrics for assessing data quality and analytical outcomes.

Course Content	**TEACHING HOURS**
UNIT I: Foundation of Data Analytics:	**15 Hrs.**
Introduction to Data Analytics, Evolution, Concept and Scopes Big Data, Metrics and Data classification, Data Reliability & Validity, Problem Solving with Analytics Different phases of Analytics in the business and Data science domain Types of Data Analytics - Descriptive Analytics, Predictive Analytics, Prescriptive Analytics, Applications of Data Analytics. Text Analytics and Web Analytics, Skills for Business Analytics. Concepts of Data Science, Basic Skills for Data Science	
UNIT II: Fundamentals of python	**15 Hrs.**
Introduction to Python - Editors & Interactive Development Environments; Custom environment settings for Jupyter, Spyder, PyCharm. Basic data types -numeric, string, float, tuples, list, Python Dictionary, sets and their operations Control flow in python - (if-elif-else), loops (for, while). Inbuilt functions for data conversion, Writing user defined functions in Python. Important packages – NumPy, SciPy, Scikit-learn, Pandas, Matplotlib, Seaborn, etc; Installing and loading packages in Python Reading and writing data from/to different formats Python Multi-threaded Programming. Plotting in python, functions, list comprehensions, Database connectivity in python, Playing with Date Format.	
UNIT III: Data Preprocessing and Wrangling	**15 Hrs.**
Introduction to data preprocessing, Data transformation-normalization, standardization, scaling, discretization, and binning. Encoding techniques – label encoding, one-hot encoding, ordinal encoding. Using Pandas for data manipulation – indexing, filtering, sorting, grouping, merging, reshaping, and pivoting datasets. Feature engineering – deriving new features, handling categorical and textual data	

UNIT IV: Exploratory Data Analysis and Model Evaluation Metrics	**15 Hrs.**
Concept and importance of Exploratory Data Analysis (EDA).Descriptive statistics – mean, median, mode, variance, standard deviation, percentiles, skewness, and kurtosis. Correlation analysis – Pearson, Spearman, and heatmaps. Evaluation metrics for classification – Confusion matrix, Accuracy, Precision, Recall, F1 Score.Evaluation metrics for regression – Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R-squared.	

CLO-PLO Matrix for the Course

	PLO										
Unit-Wise CLOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Avg (CLO)**
MMCACDS325.1	3	1	2	1	2	1	2	1	2	2	**1.7**
MMCACDS325.2	2	3	3	1	2	0	2	1	1	3	**1.8**
MMCACDS325.3	2	3	3	1	3	0	2	2	2	3	**2.1**
MMCACDS325.4	2	3	3	2	3	0	1	2	2	3	**2.1**
Average (PLO)	**2.25**	**2.5**	**2.75**	**1.25**	**2.5**	**0.25**	**1.75**	**1.5**	**1.75**	**2.75**	**1.93**

Textbooks:

1. **Jake VanderPlas**, *"Python Data Science Handbook"*, O'Reilly Media, 2016
2. **Joel Grus**, *"Data Science from Scratch"*, O'Reilly Media
3. **Madhusree Ghosh**, *"Data Science and Machine Learning"*, Springer

COURSE TITLE: Web Programming									
Course Code: MMCACWP325							**Examination Scheme**	**T**	**P**
Total number of Lecture Hours: 60							**External**	**72**	**-**
							Internal	**28**	**-**
Lecture (L):	**4**	**Practical (P):**	**-**	**Tutorial (T):**	**-**		**Total Credits**		**4**

COURSE LEARNING OUTCOMES (CO):

CLO1: Students will be able to develop structured and interactive web pages using HTML and XHTML.
CLO2: Students will be able to apply CSS techniques to design responsive and visually appealing web layouts.
CLO3: Students will implement dynamic client-side functionality using JavaScript.

CLO4: Students will be able to build secure and dynamic server-side web applications using PHP and MySQL.

Course Content	TEACHING HOURS
UNIT I: HTML and XHTML	**15 Hrs**
Introduction to HTML and XHTML: History and evolution of HTML and XHTML, Differences between HTML, Basic structure of an HTML document. HTML Basics: Elements and Attributes, creating paragraphs, headings, and lists, Working with images, links, and tables, Forms and form controls. Advanced HTML: Semantic HTML5 elements, Multimedia elements: audio and video	
UNIT II: CSS and Web Design	**15 Hrs**
Introduction to CSS: CSS syntax and selectors, Inline, internal, and external CSS, The cascade and inheritance. Styling Text and Elements: Fonts, text properties, and color, Styling lists, links, and tables, the box model: padding, margin, border Layout Techniques: Positioning elements: static, relative, absolute, and fixed, Flexbox and Grid layout systems, Responsive web design principles, Media queries for different devices.	
UNIT III: JavaScript	**15 Hrs**
Introduction to JavaScript: History and evolution of JavaScript, JavaScript syntax and data types, Variables, operators, and expressions. JavaScript Basics: Functions and scope, Control structures: loops and conditionals, Objects and arrays, The Document Object Model (DOM). JavaScript and the Web: Event handling, Form validation, Working with JSON, AJAX.	
UNIT IV: PHP and Server-Side Programming	**15 Hrs**
Introduction to PHP: History and features of PHP, Installing and configuring PHP, PHP syntax and data types. PHP Basics: Variables, constants, and operators, Control structures: conditionals and loops, Functions and arrays, Working with forms and user input. PHP and Databases: Connecting to a MySQL database, Performing CRUD operations, Prepared statements and security. Advanced PHP: Sessions and cookies.	

CLO-PLO Matrix for the Course

	PLO										
Unit-Wise CLOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Avg (CLO)**
MMCACWP325.1	2	3	2	1	2	1	1	2	1	2	**1.7**
MMCACWP325.2	2	3	3	1	2	1	1	3	1	2	**1.9**
MMCACWP325.3	2	3	3	1	3	1	1	3	1	3	**2.1**
MMCACWP325.4	2	3	3	1	3	2	1	2	1	3	**2.1**
Average (PLO)	**2.00**	**3.00**	**2.8**	**1.0**	**2.5**	**1.3**	**1.0**	**2.5**	**1.0**	**2.5**	**1.96**

Textbooks

1. Learning PHP, MySQL & JavaScript by Robin Nixon, O'Reilly Media 4th Edition (2018).
2. JavaScript and JQuery: Interactive Front-End Web Development by Jon Duckett 1st Edition (2014)

Reference Books

1. Web Design The complete Reference, Thomas Powell, Tata McGrawHill 2nd Edition (2010)
2. HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill 5th Edition (2010)
3. JavaScript 2.0: The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider 2nd Edition (2004)
4. PHP: The Complete Reference by Steven Holzner, Tata McGrawHill 1st Edition (2008)

COURSE TITLE: Quantum Computing

Course Code: MMCADQC325						**Examination Scheme**	
Total number of Lecture Hours: 60						**External**	**72**
						Internal	**28**
Lecture (L):	**4**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits**	**4**

COURSE LEARNING OUTCOMES (CLO):

CLO1: Understand the fundamental principles of quantum mechanics such as superposition, entanglement, and measurement, and differentiate classical computing from quantum computing models and hardware architectures.

CLO2: Analyze and interpret core quantum algorithms such as Shor's, Grover's, and Deutsch-Jozsa, and evaluate their performance in terms of computational complexity, speedup, and applicability.

CLO3: Develop and simulate quantum circuits and programs using modern quantum programming frameworks like Qiskit, Cirq, and PennyLane, and apply basic quantum error correction techniques.

CLO4: Evaluate the practical applications of quantum computing in areas such as cryptography, optimization, and machine learning, and discuss the ethical, security, and societal implications of quantum technologies and their future trends.

Course Content	TEACHING HOURS
UNIT 1: Introduction to Quantum Computing	**15 Hrs**
Fundamentals of Quantum Computing: Quantum mechanics principles (superposition, entanglement, measurement). Qubits: Representation, properties, and differences from classical bits. Quantum Gates: Single-qubit gates (Hadamard, Pauli), multi-qubit gates (CNOT, Toffoli).Quantum Circuits: Design and representation.Quantum Computing Models: Gate-based, adiabatic, and measurement-based quantum computing.Overview of Quantum Hardware: Superconducting qubits, trapped ions, and topological qubits.	
UNIT 2: Quantum Algorithms	**15 Hrs**
Introduction to Quantum Algorithms: Classical vs. quantum computational paradigms.Key Quantum Algorithms: Shor's algorithm (factoring), Grover's algorithm (search), Deutsch-Jozsa algorithm.Quantum Fourier Transform (QFT) and its applications.Algorithm Complexity: Speedup analysis and limitations.Algorithm Design Principles: Quantum parallelism, interference, and amplitude amplification.Simulation of Quantum Algorithms: Tools and techniques for algorithm testing.	
UNIT 3: Quantum Programming and Tools	**14 Hrs**
Quantum Programming Frameworks: Qiskit (IBM), Cirq (Google), PennyLane. Building Quantum Circuits: Syntax, libraries, and simulation environments. Quantum Programming Concepts: Quantum registers, measurements, and classical-quantum hybrid programs. Error Correction: Basics of quantum error correction codes (surface codes, stabilizer codes). Quantum Simulators vs. Real Quantum Hardware: Capabilities and limitations. Debugging and Optimization: Techniques for improving quantum circuit performance.	

UNIT 4: Applications and Future Trends	14 Hrs
Quantum Computing Applications: Cryptography (post-quantum cryptography), optimization problems, machine learning, and chemistry simulations.Quantum Computing in Industry: Use cases in finance, logistics, and healthcare. Challenges in Quantum Computing: Decoherence, noise, and scalability.Ethical and Security Implications: Impact on classical cryptography, data privacy, and responsible innovation. Emerging Trends: Quantum cloud computing (IBM Quantum, Amazon Braket), quantum supremacy, and quantum internet.Future Directions: Hybrid quantum-classical systems, fault-tolerant quantum computing, and quantum machine learning.	

CLO-PLO Matrix for the Course

Unit wise CLOs	PLOs										
	1	2	3	4	5	6	7	8	9	10	Avg (CLO)
MMCADQC325.1	3	3	2	2	2	1	2	2	2	2	**2.1**
MMCADQC325.2	3	3	3	2	3	1	2	2	2	2	**2.3**
MMCADQC325.3	3	3	3	2	3	2	3	2	3	2	**2.6**
MMCADQC325.4	3	3	2	2	2	3	3	3	2	3	**2.6**
Average (PLO)	**3.0**	**3.0**	**2.5**	**2.0**	**2.5**	**1.75**	**2.5**	**2.25**	**2.25**	**2.25**	**2.4**

Textbooks:

1. Quantum Computing: An Applied Approach, Jack D. Hidary, Springer, 2019.
2. Quantum Computation and Quantum Information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press, 2010.

Reference Books

1. Learn Quantum Computing with Python and IBM Quantum Experience, Jack D. Hidary and Noson S. Yanofsky, Packt Publishing, 2020.
2. Quantum Computing for Computer Scientists, Eleanor G. Rieffel and Wolfgang H. Polak, Cambridge University Press, 2011.
3. Programming Quantum Computers, Eric R. Johnston, Nic Harrigan, and Mercedes Gimeno-Segovia, O'Reilly Media, 2019.

DCE-V

COURSE TITLE: Ethical Hacking								
Course Code: MMCADEH325						**Examination Scheme**	**T**	**P**
Total number of Lecture Hours: 60						**External**	**72**	**-**
						Internal	**28**	**-**
Lecture (L):	**4**	**Practical (P):**	**-**	**Tutorial (T):**	**-**	**Total Credits**		**4**

COURSE LEARNING OUTCOMES (CLO):

After completing the course, the student will be able to:

CLO1: Understand the purpose, legal context, and foundational phases of ethical hacking, and demonstrate basic proficiency with Kali Linux in a virtual environment.

CLO2: Apply passive and active reconnaissance, scanning, and enumeration techniques using industry-standard tools.

CLO3: Perform vulnerability assessments and exploit known vulnerabilities using tools like Metasploit, and understand wireless network attacks and defenses.

CLO4: Identify and exploit web application vulnerabilities, use tools like sqlmap and Hydra, and document findings through structured penetration testing reports.

Course Content	TEACHING HOURS
UNIT 1: Introduction to Ethical Hacking	**15 Hrs.**
Definition and purpose, Differences between ethical hacking and malicious hacking, Importance of ethical hacking in cybersecurity, Types of Hackers (White Hat Hackers, Black Hat Hackers, Grey Hat Hackers), Legal and Ethical Considerations: Laws and regulations, Codes of conduct, Importance of permission and documentation, Ethical Hacking Process: Reconnaissance, Scanning, Gaining Access, Maintaining Access, Covering Tracks. Setting up your Kali Linux Environment Using a virtual environment, Navigating the Linux command line, Essential Linux Commands.	
UNIT 2: Reconnaissance and Scanning	**15 Hrs.**
Information Gathering: Passive vs. Active Reconnaissance, Tools for information gathering (e.g., Google Dorks, Whois), Network metadata analysis, tools for network metadata analysis, Active information gathering techniques: Nmap, Zenmap, Vulnerability Scanning: Understanding vulnerabilities (SQL Injection, XSS Attack), Tools: Nessus, OpenVAS, Enumeration: Identifying network resources and shares, Tools: Netcat, Nbtstat, Case Studies and Practical Examples: Performing a basic scan using Nmap and analyzing scan results.	
UNIT 3: Executing Vulnerability Assessment and Exploitation Techniques	**15Hrs.**
Exploiting Vulnerabilities: Exploitation frameworks in Kali Linux, Tools: Metasploit Framework, Password Attacks and Brute force: types of password attacks, Password cracking tools, Best practices and mitigations, Essential resources for understanding password attacks, Wireless networking fundamenta Types of wireless networks, Wireless network components, Basic Kali Linux commands for wireless Networking, Wireless network vulnerabilities and attack Tools for wireless Network exploitation, Defending against wireless attacks.	

UNIT 4: Web Application Attacks, Covering Tracks and Reporting	**15 Hrs.**
Web application security fundamentals, Common web application components, Common web application threats, Understanding HTTP and HTTPS, Web Application Firewalls, scanning for vulnerabilities using Nitko, Brute forcing lo forms with Hydra, Exploiting SQL injection with sqlmap, Web application att and vulnerabilities, Web application exploitation tools and techniques, Covering Tracks: Importance of covering tracks, Techniques: Log manipulatio clearing logs, spoofing, Anonymity Tools: Proxy servers, VPNs, and Tor, Tools Proxy-Chains, Tor Browser, Reporting and Documentation: Importance of repo in ethical hacking, Structure of a penetration testing report, writing an executive summary, and Creating a sample penetration testing report.	

CLO-PLO Matrix for the Course

Unit-Wise CLOs	PLOs										
	1	2	3	4	5	6	7	8	9	10	Avg (CLO)
MMCADEH325.1	3	2	2	2	2	3	2	1	1	2	**2.0**
MMCADEH325.2	3	3	3	2	3	2	2	2	2	3	**2.5**
MMCADEH325.3	3	3	3	2	3	2	2	2	2	3	**2.5**
MMCADEH325.4	3	3	3	3	3	2	2	2	2	3	**2.6**
Average (PLO)	**3.0**	**2.75**	**2.75**	**2.25**	**2.75**	**2.25**	**2.0**	**1.75**	**1.75**	**2.75**	**2.4**

Textbooks

1. "Kali Linux for Ethical Hacking: Penetration testing and vulnerability assessment for network security Mohamed Atef, First Edition, BPB, 2024.
2. Network Security Assessment: Know Your Network by Chris McNab, 3rd Edition, Oreily, 2017.

Reference Books

1. Ethical Hacking and Penetration Testing Guide, by Rafay Baloch, CRC Press, 1e, 2015.

COURSE TITLE: Computer Vision									
Course Code: MMCADCV325							**Examination Scheme**	**T**	**P**
Total number of Lecture Hours: 60							**External**	**72**	**-**
							Internal	**28**	**-**
Lecture (L):	**4**	**Practical (P):**	**-**	**Tutorial (T):**	**-**		**Total Credits**		**4**

COURSE LEARNING OUTCOMES (CLO):

CLO1: Students will describe the history, applications, and challenges in computer vision.

CLO2: Students will extract features using methods like SIFT, SURF, HOG, and Hough Transform.

CLO3: Students will model object motion and track features over time across video frames.

CLO4: Students will apply optical flow and feature-matching algorithms to image sequences.

Course Content	**TEACHING HOURS**
UNIT I: Introduction.	**15 Hrs**
Introduction to Computer Vision: Overview, History, and Applications of Computer Vision, Key Challenges, Image Formation and Representation, Basic Image Processing Techniques, Overview of Computer Vision Algorithms.	
UNIT II: Feature Extraction and Image Segmentation	**15 Hrs**
Feature Extraction: Edges (Canny, LOG, DOG), Line Detectors (Hough Transform), Corners (Harris and Hessian Affine), Orientation Histogram (SIFT, SURF, HOG, GLOH), Scale-Space Analysis (Image Pyramids and Gaussian Derivative Filters), Other Filters (Gabor Filters and DWT). Image Segmentation: Region Growing, Edge-Based Approaches to Segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.	
UNIT III: Object Motion & Tracking	**15 Hrs**
Object Motion & Tracking: Understand Motion Models (Define Object Movement Over Time), Analyze Videos as Sequences of Individual Image Frames, Programmatically Track a Single Point Over Time, implement a Method for Tracking a Set of Unique Features Over Time.	
UNIT IV: Optical Flow & Feature Matching	**15 Hrs**
Optical Flow & Feature Matching: Optical Flow (Track a Moving Car Using Optical Flow), Feature Matching (Match Features from One Image Frame to Another), Depth Estimation and Multi-camera Views (Perspective, Binocular Stereopsis, Camera and Epipolar Geometry, Homography, Rectification, DLT, RANSAC, 3-D Reconstruction Framework, Auto-calibration).	

CLO-PLO Matrix for the Course

Unit-Wise CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	Average (CLO)
MMCADCV325.1	3	1	1	1	2	0	1	1	1	2	1.3
MMCADCV325.2	2	3	2	1	3	0	1	2	2	3	1.9
MMCADCV325.3	2	3	3	1	3	0	1	2	2	3	2.0
MMCADCV325.4	2	3	2	1	3	0	1	2	2	3	1.9
Average (PLO)	**2.3**	**2.5**	**2.0**	**1.0**	**2.8**	**0.0**	**1.0**	**1.8**	**1.8**	**2.8**	**1.78**

Textbooks:

1. Computer Vision: Algorithms and Applications" by Richard Zaleski, Springer Nature, 2nd Edition, 2022
2. Multiple View Geometry in Computer Vision" by Richard Hartley and Andrew Zisserman, Cambridge University Press, 2nd Edition, 2004
3. Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods, Pearson Publishing, 4th Edition 2018.

Reference Books:

1. Computer Vision: A Modern Approach" by David A. Forsyth and Jean Ponce, Pearson Publishing, 2nd Edition, 2012.

COURSE TITLE: Enterprise Resource Planning

Course Code: MMCADER325						Examination Scheme	T	P
Total number of Lecture Hours: 60						External	72	-
						Internal	28	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits		4

COURSE LEARNING OUTCOMES (CLO):

By the end of this course, students will be able to:

CLO1: Explain the evolution, significance, and advantages of ERP systems, and evaluate ERP modules and their applicability to different business environments, including small and make-to-order enterprises.
CLO2: Analyze the relationship between ERP systems and associated technologies such as BPR, MIS, EIS, DSS, and SCM, and assess their role in enhancing organizational efficiency.
CLO3: Demonstrate understanding of ERP implementation life cycles, methodologies, and frameworks, including vendor and consultant roles, training, and data migration processes.
CLO4: Evaluate the post-implementation impact of ERP systems on organizations, identify critical success and failure factors, and explore emerging trends like CRM, SCM integration, and web-enabled ERP systems.

Course Content	TEACHING HOURS
UNIT I: Introduction to ERP	**15 Hrs**
Evolution of ERP; what is ERP? Reasons for the Growth of ERP; Scenario and Justification of ERP in India; Evaluation of ERP; Various Modules of ERP; Advantage of ERP. An Overview of Enterprise. Integrated Management Information; Business Modeling; ERP for Small Business; ERP for Make to Order Companies; Business Process Mapping for ERP Module Design; Hardware Environment and its Selection for ERP Implementation	
UNIT II: ERP and related Technologies	**15 Hrs**
ERP and Related Technologies; Business Process Reengineering (BPR); Management Information System (MIS); Executive Information System (EIS); Decision support System (DSS); Supply Chain Management (SCM	
UNIT III: ERP Implementation	**15 Hrs**
ERP Implementation: Planning Evaluation and selection of ERP systems - Implementation life cycle - ERP implementation, Methodology and Frame work-Training – Data Migration - People Organization in implementation-Consultants, Vendors and Employees	
UNIT IV: Post Implementation and Emerging Trends	**15 Hrs**
Post Implementation: Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation Emerging Trends on ERP: Extended ERP systems and ERP add-ons -CRM, SCM, Business analytics - Future trends in ERP systems-web enabled.	

CLO-PLO Matrix for the Course

Unit-Wise CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	Avg (CLO)
MMCADER325.1	3	2	3	2	2	1	1	2	1	2	1.90
MMCADER325.2	2	3	3	2	3	1	2	2	2	3	2.30

MMCADER325.3	3	3	3	2	3	2	2	2	2	3	**2.50**
MMCADER325.4	3	2	3	3	3	2	2	3	2	3	**2.60**
Average (PLO)	**2.75**	**2.50**	**3.00**	**2.25**	**2.75**	**1.50**	**1.75**	**2.25**	**1.75**	**2.75**	**2.32**

Textbooks

1. Manufacturing Resource Planning (MRP II) with Introduction to ERP; SCM; an CRM by Khalid Sheikh, Publisher: McGraw-Hill
2. ERP and Supply Chain Management by Christian N. Madu, Publisher: CHI.

Reference Books

1. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008
2. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
3. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009
4. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, PHI.

DCE-VI

COURSE TITLE: Natural Language Processing

Course Code: MMCADNL325						**Examination Scheme**	
Total number of Lecture Hours: 60						**External**	**72**
						Internal	**28**
Lecture (L):	**4**	**Practicals(P):**	**0**	**Tutorial (T):**	**0**	**Total Credits**	**4**

COURSE LEARNING OUTCOMES (CLO):

CLO1: Explain the foundational concepts of natural language processing, including text representation, preprocessing, and word embeddings.
CLO2: Analyze and apply key NLP algorithms such as HMMs, CRFs, RNNs, LSTMs, and transformer-based models.
CLO3: Develop NLP pipelines using standard programming libraries and frameworks (e.g., NLTK, spaCy, Hugging Face).
CLO4: Evaluate real-world NLP applications, assess challenges like bias and multilinguality, and explore emerging trends like LLMs and conversational AI.

Course Content	TEACHING HOURS
UNIT 1: Introduction to Natural Language Processing	**15 Hrs**
Introduction to NLP: definitions, goals, applications, Components of NLP: tokens, lexicon, grammar, semantics. Text preprocessing techniques: tokenization, normalization, stop-word removal, stemming vs. lemmatization, Basic feature extraction: bag-of-words, TF–IDF.	
UNIT 2: Linguistic Analysis	**15 Hrs**
Part-of-Speech tagging and morphological analysis, Syntactic parsing: constituents vs. dependency trees, Chunking and shallow parsing, Syntax-based feature generation, Evaluating tagging and parsing performance	
UNIT 3: Semantics & Language Modeling Word semantics: embeddings (Word2Vec, GloVe), Contextual representations (e.g., BERT overview), Language modeling: n-grams and neural models, Word sense disambiguation applications, Semantic similarity and clustering	**15Hrs**
UNIT 4: Applications and Future Trends	**15 Hrs**
Sentiment analysis and opinion mining , Text classification and document clustering, Information extraction: NER, relation extraction, Introduction to question answering and summarization, Advanced interpretability (e.g. feature importance, opening the door to your SHAP work)	

LEVEL OF CO-PO MAPPING TABLE

Unit wise CLOs	PLOs										
	1	2	3	4	5	6	7	8	9	10	Avg (CLO)
MMCADNL325.1	3	2	2	2	2	1	1	2	1	2	**1.8**
MMCADNL325.2	3	3	3	2	3	1	2	2	2	2	**2.3**
MMCADNL325.3	3	3	3	2	3	2	2	2	2	2	**2.4**
MMCADNL325.4	3	3	2	2	2	3	3	3	2	3	**2.6**
Average (PLO)	**3.0**	**2.75**	**2.5**	**2.0**	**2.5**	**1.75**	**2.0**	**2.25**	**1.75**	**2.25**	**2.28**

Textbooks:

1. Speech and Language Processing, Daniel Jurafsky and James H. Martin, Prentice Hall, 2020.
2. Deep Learning for Natural Language Processing, Palash Goyal, Sumit Pandey, and Karan Jain, Apress, *2018.*

Reference Books

1. Natural Language Processing with Python, Steven Bird, Ewan Klein, and Edward Loper, O'Reilly Media, 2009.
2. Foundations of Statistical Natural Language Processing, Christopher D. Manning and Hinrich Schütze, MIT Press, 1999.
3. Transformers for Natural Language Processing, Denis Rothman, Packt Publishing, 2021.

COURSE TITLE: Software Quality Assurance								
Course Code: MMCADSQ325						**Examination Scheme**	**T**	**P**
Total number of Lecture Hours: 60						**External**	**72**	**-**
						Internal	**28**	**-**
Lecture (L):	**4**	**Practical (P):**	**-**	**Tutorial (T):**	**-**	**Total Credits**		**4**

COURSE LEARNING OUTCOMES (CO):

CLO1: Understand software quality principles, quality planning, assurance components, and their relevance across software and project life cycles.

CLO2: Apply quality engineering tools and risk management strategies to ensure continuous software quality improvement.

CLO3: Analyze software quality standards and evaluate AI-assisted quality assurance methods and model validation techniques.

CLO4: Demonstrate the ability to implement Agile principles and Scrum framework using modern project management tools.

Course Content	TEACHING HOURS
UNIT I: Software Quality	**15 Hrs**
Definition of Software Quality, Quality Planning, Quality system. Quality Control vs Quality Assurance , Product life cycle , Project life cycle models. The Software Quality Challenge, Software Quality Factors, Components of the Software Quality Assurance System. Pre-Project Software Quality Components, Contract Review, Development and Quality Plans	
UNIT II: Software Quality Engineering Tools And Techniques	**15 Hrs**
Supporting quality activities- Metrics, Reviews, SCM , Software quality assurance and risk management, Seven basic Quality tools, Checklist, Pareto diagram, Cause and effect diagram, Run chart, Histogram, Control chart, Scatter diagram, Poka Yoke, Statistical process control ,Failure Mode and Effect Analysis, Quality Function deployment, Continuous improvement	
UNIT III: Quality Assurance Models and AI Assurance	**15 Hrs**
Software Quality Standards, ISO 9000 series, CMM, CMMI, P-CMM , Six Sigma, Malcolm Baldrige Quality, Introduction to AI in Software Quality Assurance-Definition and Importance of AI Assurance, Overview of AI in Software Development and Testing, Benefits and Challenges of Integrating AI in QA, Overview of AI Techniques in Software Testing, Automated Test Case Generation-Techniques for Automated Test Case Generation, Ensuring AI Model Quality-Verification and Validation of AI Models, Testing AI Models for Accuracy, Robustness, and Fairness	
Unit IV: Scrum and Agile Model	**15 Hrs**
Introduction to Agile-Definition and History of Agile, Principles of Agile Manifesto, Benefits of Agile Methodology, Overview of Scrum Framework-Definition of Scrum, Scrum Values and Principles, Scrum Artifacts-Product Backlog, Sprint Backlog, Increment, Agile Project Management Tools-Introduction to Tools (e.g., JIRA, Trello, Asana), Implementing Scrum in an Organization-Steps to Transition to Scrum	

CLO-PLO Matrix for the Course

Unit-Wise CLOs	PLOs										
	1	2	3	4	5	6	7	8	9	10	Average (CLO)
MMCADSQ325.1	3	2	3	1	3	3	2	2	2	3	**2.4**
MMCADSQ325.2	3	3	3	1	3	3	2	2	2	3	**2.5**
MMCADSQ325.3	3	2	3	1	3	2	2	2	3	3	**2.4**
MMCADSQ325.4	2	3	3	2	3	2	2	2	2	3	**2.4**
Average (PLO)	**2.75**	**2.5**	**3.0**	**1.25**	**3.0**	**2.5**	**2.0**	**2.0**	**2.25**	**3.0**	**2.43**

Textbooks:

1. Galin, D. (2018). Software Quality Assurance: From Theory to Implementation (2nd ed.). Pearson.
2. Godbole, N. S. (2017). Software Quality Assurance: Principles and Practice (1st ed.). Alpha Science International Ltd.

Reference Books:

1. Cohn, M. (2006). Agile Estimating and Planning. Prentice Hall.
2. Partridge, D. (1992). Artificial Intelligence in Software Engineering. Routledge.
3. Black, R. (2002). Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing (2nd ed.). Wiley.
4. Jones, C. (2017). Applied Software Measurement: Global Analysis of Productivity and Quality (3rd ed.). Addison-Wesley Professional.

COURSE TITLE: Deep Learning

Course Code: MMCADDL325						Examination Scheme	T	P
Total number of Lecture Hours: 60						External	72	-
						Internal	28	-
Lecture (L):	4	Practical (P):	0	Tutorial (T):	0	Total Credits		4

COURSE LEARNING OUTCOMES (CO):

CLO1: Understand core concepts of deep learning and artificial neural networks.
CLO2: Apply convolutional neural network techniques and analyze their architectures.
CLO3: Evaluate neural architecture search methods and their challenges
CLO4: Implement and assess advanced deep learning models in real-world applications

Course Content	TEACHING HOURS
UNIT I: Fundamentals of Neural Networks and Deep Learning	**15 Hrs**
Introduction to Machine Learning vs Deep Learning, Biological Neuron vs Artificial Neuron, Basics of Neural Networks: Perceptron, Multilayer Perceptron (MLP), Activation Functions: Sigmoid, Tanh, ReLU, Leaky ReLU, Softmax, Loss Functions: MSE, Cross-Entropy, Gradient Descent and Backpropagation, Overfitting and Underfitting, Bias-Variance Tradeoff	
UNIT II: Deep Neural Networks and Training Techniques	**15 Hrs**
Deep Neural Network Architectures, Batch Normalization and Dropout, Weight Initialization Methods, Optimization Algorithms: SGD, Adam, RMSProp, Hyperparameter Tuning: Epochs, Batch Size, and Learning Rate, Model Evaluation: Confusion Matrix, Precision, Recall, F1 Score, ROC-AUC	
UNIT III : Convolution Neural Networks	**15 Hrs**
Introduction to CNNs: Need and Applications, CNN Architecture: Convolutional Layers, Pooling Layers, Fully Connected Layers, Filters, Stride, Padding, Transfer Learning and Pre-trained Models (VGG, ResNet, etc.), Data Augmentation, Case Studies: Image Classification, Object Detection (basic intro)	
UNIT IV: Advanced Topics and Applications	**15 Hrs**
Recurrent Neural Networks (RNNs): Basics and Applications, Long Short-Term Memory (LSTM) and GRU, Introduction to Generative Adversarial Networks (GANs), Autoencoders and Variational Autoencoders, Applications of Deep Learning in NLP, Computer Vision, and Healthcare	

CLO-PLO Matrix for the Course

UNIT-WISE CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	Avg (CLO)
MMCADDL325.1	3	2	2	0	0	0	0	0	0	0	**2.33**
MMCADDL325.2	0	0	3	3	2	0	0	0	0	0	**2.67**
MMCADDL325.3	0	0	0	0	3	2	0	0	0	0	**2.5**
MMCADDL325.4	0	0	0	0	0	0	3	3	0	0	**3.0**
Avg (PLO)	**1.5**	**1.0**	**1.67**	**1.5**	**1.5**	**1.0**	**1.5**	**1.5**	**0**	**0**	**2.63**

Textbooks

1. Deep Learning by Ian GoodFellow, MIT Press.2016
2. Advanced Deep Learning with Python, Ivan Vasilev, 2019
3. Advances in Deep Learning, M. Arif Wani, 2019

Reference Books

1. Deep Learning with Python, Francois Chollet, 2nd edition, 2021
2. Deep Reinforcement Learning Hands-On, Maxim Lapan, 2nd edition, 2020
3. Automated Machine Learning Methods, Systems, Challenges, 2019
4. Deep Learning: A Visual Approach, Andrew Glassner, 2021
5. Selected Journal and Conference Papers.

COURSE TITLE: Internet of Things

Course Code: MMCADIT325						Examination Scheme	T	P
Total number of Lecture Hours: 60						External	72	-
						Internal	28	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits		4

COURSE LEARNING OUTCOMES (CLO):

CLO1: Students will be able to describe and differentiate between key IoT enabling technologies, such as Wireless Sensor Networks, Cloud Computing, and M2M communication, while understanding the role of software-defined networks and embedded systems.

CLO2: Students will gain knowledge of the challenges in IoT design and development, including security and technical constraints, and propose solutions to overcome these issues.

CLO3: Students will acquire skills in designing and analyzing IoT architecture, considering various views like functional, information, and deployment, and apply these concepts to industrial automation and real-world applications.

CLO4: Students will develop practical skills in using Arduino for IoT projects, including setting up the environment, connecting to sensors and actuators, and implementing cloud-based data monitoring and M2M interactions.

Course Content	TEACHING HOURS
UNIT 1:	**15 Hrs**
Definition & Characteristics of Iot, Physical Design of Iot, Things in Iot, Iot Protocols; Logical Design Of Iot: Iot Functional Blocks, Iot Communication. Models, Iot Communication APIs; IoT Levels and Templates. Domain. Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.	
UNIT 2:	**15 Hrs**
Wireless Sensor Networks, Cloud Computing, Big Data Analytic, Communication Protocols, Machine to Machine, Difference between IoT and M2M, Software define Network, Embedded Systems. Design challenges, Development challenges, Security challenges, Other challenges.	
UNIT 3:	**15 hrs**
Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again. Data representation and visualization, Interaction and remote control. Industrial Automation- Service oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things.	
UNIT 4 :	**15 hrs**
Setting up the Arduino development environment: Options for Internet connectivity, Interacting with basic sensors, Interacting with basic actuators, Configuring Arduino for the IoT. Grabbing the content from a web page, Sending data to the cloud, Monitoring sensor data from a cloud dashboard, Monitoring several Arduino boards at, Storing data on Google Drive. Basic local M2M interactions, Cloud M2M with IFTTT; Case Study: IoT based Flood Monitoring and Alert System.	

CLO-PLO Matrix for the Course

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	Average (CLO)
MMCADIT325.1	3	1	2	0	2	1	1	1	1	2	1.4
MMCADIT325.2	2	1	2	1	3	3	2	2	2	3	2.1
MMCADIT325.3	2	2	3	1	3	1	2	2	2	3	2.1
MMCADIT325.4	2	3	3	1	3	1	2	3	2	3	2.3
Average(PLO)	2.25	1.75	2.5	0.75	2.75	1.5	1.75	2	1.75	2.75	1.97

Textbooks

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN-13: 978-8173719547)
2. Schwartz, Marco. "Internet of Things with Arduino Cookbook". Packt Publishing Ltd, 2016.

Reference Books

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of
2. Intelligence", 1st Edition, Academic Press, 2014. (ISBN-13: 978-0124076846)
3. The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World, Michael Miller

COURSE TITLE: Software Project Management

Course Code: MMCACSP325						**Examination Scheme**	
Total number of Lecture Hours: 60						**External**	**72**
						Internal	**28**
Lecture (L):	**4**	**Practicals(P):**	**0**	**Tutorial (T):**	**0**	**Total Credits**	**4**

COURSE LEARNING OUTCOMES (CLO):

CLO1: Understand the foundational concepts of Software Project Management, including project lifecycle, planning, and estimation techniques.
CLO2: Apply scheduling techniques (WBS, PERT, CPM, Gantt Charts) and organize personnel effectively in a software project environment.
CLO3: Analyze and apply project monitoring methods like Earned Value Analysis (EVA) and software reviews to ensure project control.
CLO4: Evaluate software quality using CMM, quality attributes, and formal SQA approaches; understand contracts and quality metrics in software projects.

Course Content	TEACHING HOURS
UNIT 1: Introduction to SPM	**15 Hrs**
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope Document, Project Management Cycle, SPM Objectives, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of Project Plan, Structure of a Software Project Management Plan. Software Project Estimation, Estimation Methods, Estimation Models, Decision Process	
UNIT 2: Project Organization and Scheduling Project Elements	**15 Hrs**
Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle. Ways to Organize Personnel, Project Schedule, Scheduling Objectives, Building the Project Schedule, Scheduling Terminology and Techniques. Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts	
UNIT 3: Project Monitoring and Control	**15 Hrs**
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI) Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Re views	
UNIT 4: Software Quality Assurance	**15 Hrs**
Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM). SQA Activities, Formal SQA Approaches: Proof of Correctness, Statistical Quality Assurance, Product versus process quality management, Introduction, types of contracts, stages in contract, placement, typical terms of a contract, contract management, acceptance.	

LEVEL OF CLO-PLO MAPPING TABLE

Unit wise CLOs	PLOs										
	1	2	3	4	5	6	7	8	9	10	Average (CLO)
MMCACSP325.1	3	3	3	2	3	1	2	2	2	3	**2.4**
MMCACSP325.2	3	3	3	2	3	1	2	3	2	3	**2.5**
MMCACSP325.3	3	3	3	2	3	1	2	2	2	3	**2.4**
MMCACSP325.4	3	3	3	2	3	2	2	2	2	3	**2.5**
Average (PLO)	**3.0**	**3.0**	**3.0**	**2.0**	**3.0**	**1.25**	**2.0**	**2.25**	**2.0**	**3.0**	**2.5**

Textbooks:

1. Software Project Management, Bob Hughes and Mike Cotterell, McGraw Hill

Reference Books

1. Software Project Management A Unified Framework, Walker Royce, Addison-Wesley
2. A practitioner's Guide to Software Engineering, Roger Pressman, Tata McGraw Hill 2014 8th edition.
3. Basics of Software Project Management, NIIT, Prentice-Hall India, Latest Edition

COURSE TITLE: Data Science with Python Lab

Course Code: MMCALDS325						Examination Scheme	T	P
Total number of Practical Hours: 60						External	0	36
						Internal	0	14
Lecture (L):	0	Practical (P):	2	Tutorial (T):	0	Total Credits		2

. COURSE LEARNING OUTCOMES (CO):

CLO1: Students will be able to write and execute basic Python programs using fundamental concepts such as variables, data types, operators, conditional statements, and loops.

CLO2: Students will apply functions, modules, packages, and object-oriented programming principles (classes, inheritance, and polymorphism) to develop modular and reusable Python programs.

CLO3: Students will use Python libraries such as NumPy, Pandas, Matplotlib, and SciPy to perform data manipulation, visualization, and statistical analysis.

CLO4: Students will implement basic machine learning and decision-making techniques such as regression analysis and decision tree classification using Python.

Practical's

Week 1

- Install Python and set up IDEs like Jupyter Notebook or VS Code
- Write a "Hello, World!" program.
- Write a program to perform basic arithmetic operations: addition, subtraction, multiplication, and division.
- Write a program to print your name and age.

Week 2

- Write a program to create variables of different data types (int, float, complex, string) and print their values.
- Write a program to perform string operations: concatenation, slicing, and repetition.
- Write a program to demonstrate arithmetic, logical, and relational operations.

Week 3

- Write a program to create a list, perform slicing, and append elements to it.
- Write a program to demonstrate the use of tuple data type and its operations.
- Write a program to find the length, maximum and minimum value of a list.

Week 4

- Write a program to demonstrate the use of if, else, and elif statements.
- Write a program to print the first 10 natural numbers using a for loop.
- Write a program to print a pattern using nested loops (e.g., a pyramid).

Week 5

- Write a program to iterate over a string, list, and dictionary using loops.
- Write a program to demonstrate the use of while loops.
- Write a program to manipulate loops using pass, continue, break, and else.

Week 6

- Write a program to to define and call a function that adds two numbers.
- Write a program to demonstrate the use of lambda functions.
- Write a program with a function that takes a list as an argument and returns the sum of all its elements.

Week 7

- Write a program to create and import a custom module.
- Write a program to to use an external library (e.g., math or random).
- Write a program to organize code into a package.

Week 8

- Write a program to define a class and create objects.
- Write a program to demonstrate inheritance.
- Write a program to show polymorphism using method overriding.

Week 9

- Write a program to perform basic array operations with numpy arrays.
- Write a program to create and manipulate DataFrame objects using Pandas.
- Write a program to draw basic plots in Python program using Matplotlib.
- Write a program to perform a basic statistical analysis using SciPy.

Week 10

- Write a program to Count the frequency of occurrence of a word in a body of text is often needed during text processing..
- Write a program to compute weighted averages in Python either defining your own functions or using Numpy.
  Write a python program to calculate the mean, median, mode, variance

Week 11

- Write a program to create a normal curve using python program.
- Write a python program for correlation with scatter plot
- Write a python program to compute correlation coefficient.

Week 12

- Write a program to demonstrate Regression analysis with residual plots on a given data set.
- Write a program to demonstrate the working of the decision tree-based ID3 algorithm.

Week 13

- Write a program to implement the Naïve Bayesian classifier for a sample training data set.
- Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set.

CLO-PLO Matrix for the Course

Unit-Wise CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	Avg (CLO)
MMCALDS325.1	2	3	2	1	2	0	1	1	0	2	1.4
MMCALDS325.2	2	3	2	1	2	0	1	2	1	2	1.6
MMCALDS325.3	2	3	3	1	3	0	2	2	2	3	2.1
MMCALDS325.4	2	2	3	1	3	0	1	2	2	3	1.9
Average (PLO)	**2.0**	**2.75**	**2.5**	**1.0**	**2.5**	**0.0**	**1.25**	**1.75**	**1.25**	**2.5**	**1.75**

COURSE TITLE: Web Programming Lab								
Course Code: MMCALWP325						**Examination Scheme**	**T**	**P**
Total number of Practical Hours: 60						**External**	-	**36**
						Internal	-	**14**
Lecture (L):	-	**Practical (P):**	**2**	**Tutorial (T):**	-	**Total Credits**		**2**

COURSE LEARNING OUTCOMES (CO):

By the end of this practical course, students will be able to:

CLO1: Students will be able to create well-structured documents using paragraphs, headings, lists, tables, and forms.
CLO2: Students will demonstrate the ability to use CSS for styling text, links, tables, and layouts using box model and positioning.
CLO3: Students will write JavaScript programs using variables, functions, control structures, and arrays.

CLO4: Students will write PHP scripts with form handling, session management, and database connectivity.

Practical's

Week 1

- Create a basic HTML document with paragraphs, headings, and lists.
- Add images, links, and tables to an HTML document.
- Create a simple form with various form controls (text inputs, radio buttons, checkboxes, etc.).

Week 2

- Create an HTML document using semantic HTML5 elements.
- Validate an XHTML document and correct any errors.
- Convert an HTML document to XHTML and ensure it follows proper syntax rules.

Week 3

- Create a basic CSS file and link it to an HTML document.
- Apply inline, internal, and external CSS styles to a webpage.
- Use CSS selectors to style different HTML elements.

Week 4

- Style lists, links, and tables using CSS.
- Implement the box model: padding, margin, and border.

Week 5

- Create a simple webpage layout using static, relative, absolute, and fixed positioning.
- Create a responsive webpage using media queries.

Week 6

- Implement CSS animations and transactions on a webpage.
- Write a simple JavaScript program that uses variables, operators, and expressions.

Week 7

- Create JavaScript functions and demonstrate scope.
- Implement control structures (loops and conditionals) in JavaScript.

Week 8

- Create and manipulate JavaScript objects and arrays.
- Use the Document Object Model (DOM) to interact with an HTML document.

Week 9

- Write a JavaScript program to handle events on a webpage.
- Write a JavaScript program that handles errors and debugging.

Week 10

- Write a basic PHP script to output "Hello, World!".
- Create a PHP script that uses variables, constants, and operators.
- Write PHP programs using control structures (conditionals and loops).

Week 11

- Create PHP functions and work with arrays.
- Develop a simple form in PHP and handle user input.
- Connect a PHP script to a MySQL database.

Week 12

- Perform CRUD (Create, read, Update, delete) operations in PHP.
- Implement session management in PHP.

Week 13

- Use cookies in PHP to store user preferences.
- Handle errors and debug a PHP application.

Week 14

- Develop the frontend using HTML, CSS and JavaScript.
- Create the backend using PHP and integrate it with MySQL database.

CLO-PLO Matrix for the Course

Unit-Wise CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	Average (CLO)
MMCALWP325.1	2	3	2	1	2	1	1	2	1	2	1.7
MMCALWP325.2	2	3	3	1	2	1	1	3	1	2	1.9
MMCALWP325.3	2	3	3	1	3	1	1	3	1	3	2.1
MMCALWP325.4	2	3	3	1	3	2	1	2	1	3	2.1
Average (PLO)	**2.00**	**3.00**	**2.8**	**1.0**	**2.5**	**1.3**	**1.0**	**2.5**	**1.0**	**2.5**	**1.96**