K.K. Wagh Institute of Engineering Education and Research, Nashik

Curriculum S.Y. MCA

w.e.f.: AY 2024-2025

K.K.Wagh Institute of Engineering Education and Research, Nashik (Autonomous)
Master of Computer Application
Details of Course Structure (2024): Semester - III S.Y.M.C.A.

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Evaluation Scheme and Marks							Credits			
			TH	TU	PR	In Sem	End Sem	CCE	TW	TU	PR	Total	TH	TU	PR*	Total
2409601	MC	Software Project Management	3	-	-	20	60	20	-	-	-	100	3	-	-	3
2409602		Machine Learning	3	-	2	20	60	20	25	-	-	125	3	-	1	4
2409603		Full Stack Development	3	-	4	20	60	20	25	-	50	175	3	-	2	5
2409604		NoSQL	-	1	2	-	-	-	25	25	-	50	-	1	1	2
2409605A	ME	Quantum Computation	3	-	-	20	60	20	-	-	-	100	3	-	-	3
2409605B		Industry Elective	3	-	-	20	60	20	-	-	-	100	3	-	-	3
2409605C		Business Intelligence and Analytics	3	-	-	20	60	20	-	-	-	100	3	-	-	3
243001	HSSM	Introduction to Constitution	2	-	-	-	30	20	-	-	-	50	2	-	-	2
2409607	RP	Research Work	-	-	6	-	-	-	50	-	50	100	-	-	3	3
		Total	**14**	**1**	**14**	**80**	**270**	**100**	**125**	**25**	**100**	**700**	**14**	**1**	**7**	**22**

Note: Credits are as per the Teaching Scheme. * Credits for ‘PR’ head are linked with ‘TW’ marks.

K.K.Wagh Institute of Engineering Education and Research, Nashik (Autonomous)
Master of Computer Application
Details of Course Structure (2024): Semester - IV S.Y.M.C.A.

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Evaluation Scheme and Marks							Credits			
			TH	TU	PR	In Sem	End Sem	CCE	TW	TU	OR	Total	TH	TU	PR	Total
2409611	**MC**	Industrial Training	-	-	-	-	-	-	100	-	200	300	-	-	12	12
2409612	**ME**	Research Paper/ MOOCs	-	-	8	-	-	-	50	-	-	50	-	-	4	4
2409613	**RP**	Research Project	-	-	12	-	-	-	50	-	100	150	-	-	6	6
		Total	-	-	**20**	-	-	-	**200**	-	**300**	**500**	-	-	**22**	**22**

Suggested MOOCs List-NPTEL/SWAYAM
Natural Language Processing
Advanced Computer Networks
Data Mining
Introduction To Industry 4.0 And Industrial Internet Of Things
Introduction To Soft Computing
Deep Learning
Edge Computing
Any other MOOC course suggested by institute

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. M.C.A.
Pattern 2024 Semester: III
2409601: Software Project Management

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 03 hrs/week	**03**	**InSem Exam: 20Marks** **Continuous Assessment:20Marks** **EndSem Exam: 60Marks**

Prerequisite Courses, if any: Software Engineering

Course Objectives:

1. To aware about Foundations of Project Initiation and Planning
2. To learn the basis and importance of effort estimation in software project management
3. To familiarize with the principles of project monitoring and control
4. To get acquainted with the concept of Ssoftware Configuration and Risk Management
5. To know the key concept of Software Quality Assurance

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Describe the principles and techniques of project initiation, planning, and scope management	2-Understanding
CO2	Develop the skills to create detailed project plans that include all project activities, timelines, and required resources in software project managementt	3- Apply
CO3	use different techniques of project-monitoring, control and review.	3-Apply
CO4	Correlate project management tools with risk management activities to estimate potential risks in software projects	4-Anlayze
CO5	Differentiate product quality from process quality to relate quality attributes, metrics and **SQA Activities**	4-Anlayze

COURSE CONTENTS

Unit I	**Foundations of Project Initiation and Planning**	**07hrs**	**COs Mapped - CO1**

Introduction to Project Management, Project Manager's Role and Skills, Project Management Life Cycle, Gathering Project Information and Identifying Needs, Traditional vs. Modern Project Management Approaches, Stepwise Project Planning, Project Scope and Work Breakdown Structure (WBS)

Unit II	**Effort Estimation and Activity Scheduling in Project Management**	**07hrs**	**COs Mapped – CO2**

Project Effort Estimation: Basis for software estimating, software effort estimation techniques, bottom up estimating , top down approach, parametric models, COCOMO: Parametric productivity model

Activity Planning: Objectives of Activity Planning, Project Schedule, Project and Activities, Sequencing and scheduling activities, formulating a Network planning models, Time Dimension: Forward and Backward, identifying the critical activities, activity on arrow network

Unit III	Project Monitoring and Control	07hrs	COs Mapped – CO3
Project control cycle, 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 Reviews			
Unit IV	**Software Configuration and Risk Management**	**08hrs**	**COs Mapped – CO4**
Software Configuration Items and Tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control Risk Management: Risks and Risk Types, Risk Breakdown Structure (RBS), Risk Management Process: Risk Identification, Risk Analysis, Risk Planning, Risk Monitoring Cost Benefit Analysis, Software Project Management Tools: CASE Tools, MS-Project			
Unit V	**Software Quality Assurance in Project Management**	**07 Hrs**	**COs Mapped – CO5**
Software Quality: Definition and importance of software quality, factors influencing software quality, **Software Quality Attribute, Software Quality Metrics and Indicators, SEI Capability Maturity Model (CMM), SQA Activities,**Product vs. Process Quality Management			

Text Books

1. "Software Project Management" Bob Hughes, Mike Cotterell and Rajib Mall, Sixth Edition, Tata McGraw-Hill
2. Software Project Management in Practice, Pankaj Jalote, Pearson Education, 2002

Reference Books

1. Software Project Management: A Unified Framework – Walker Royce, Addison-Wesley
2. IT Project Management: On Track from Start to Finish, Third Edition, Joseph Phillips
3. Software Project Management – Kieron Conway, Dreamtech Press
4. Software Project Management – S. A. Kelkar, PHI Publication.
5. Kshirasagara Naik, Priyadarshi Tripathy: Software Testing and Quality Assurance, Wiley India 2012

	Strength of CO-PO Mapping							
COs	1	2	3	4	5	6	7	8
CO1	3	2	1	-	1	2	-	1
CO2	2	1	1	-	1	1	1	1
CO3	3	2	2	-	-	1	-	1
CO4	2	1	2	1	2	1	-	2
CO5	3	3	3	1	-	2	1	1

Guidelines for Continuous Assessment of Theory Course		
Sr. No.	**Components for Continuous Assessment**	**Marks Allotted**
1	Assignment on Unit 1 and Unit 2	5
2	Quiz on Unit 3 and Unit 4	5
3	Case Study	10

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. M.C.A.
Pattern 2024 Semester: III
2409602: Machine Learning

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 3 hrs/week **Practical: 2 hrs/week**	**03** **01**	**InSem Exam : 20 Marks** **Continuous Comprehensive Evaluation : 20 Marks** **EndSem Exam: 60 Marks** **Term Work : 25 Marks**

Prerequisite Courses, if any: Artificial Intelligence, Python Programming

Course Objectives:

6. To introduce the foundational concepts of Machine learning
7. To understand feature engineering process
8. To enable students to understand and implement various regression and classification techniques
9. To equip students with the knowledge to apply various clustering techniques to discover patterns in data.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Describe basic concepts of Machine Learning	02-Understand
CO2	Illustrate feature engineering process	02-Understand
CO3	Apply different regression and classification techniques	03-Apply
CO4	Implement clustering methods	03-Apply
CO5	Implement various ensemble techniques	03-Apply

COURSE CONTENTS

Unit I	**Introduction to Machine Learning**	**07hrs**	**COs Mapped - CO1**

Overview: Concept of Machine Learning, Real life applications, traditional programming vs Machine learning, Steps in ML Model Development (Data Collection → Preprocessing → Model Training → Evaluation), Training versus Testing, Types of Learning: Supervised, Unsupervised, Semi-Supervised Learning and Reinforcement learning, Validation techniques, confusion matrix.

Machine learning models: Geometric model, Probabilistic Models, Logical Models, Grouping and Grading models, Parametric and non-parametric models.

Unit II	**Feature Engineering**	**07hrs**	**COs Mapped – CO2**

Feature Engineering: Concept of feature, types of features (Nominal, Ordinal, Interval, Ratio), Managing missing values, Feature Selection and Transformation, Normalization and Standardization, Dimensionality Reduction, Feature Extraction: Principal Component Analysis (PCA), Local Binary Pattern

Unit III	**Supervised Learning**	**07hrs**	**COs Mapped – CO3**

Regression: Overview of Regression, Linear Regression Models, Least-Square Method, Cost Functions:

MSE, MAE, R-Square, Overfitting and Underfitting, Bias and Variance Dilemma,
Binary and Multiclass Classification: Assessing Classification Performance, Multiclass Classification- One vs One, One vs Rest,
Tree Based Models: Decision Trees, Impurity Measures – Gini Index and Entropy,
K-nearest neighbor, Support vector machine, Naïve Bayes Classifier

Unit IV	**Unsupervised Learning**	**08hrs**	**COs Mapped – CO4**

Distance Based Models: Euclidean, Hamming, Manhattan and Minkowski Distance Metric, K-means clustering Algorithm, k-medoid algorithm, Hierarchical Clustering: divisive and agglomerative, Evaluation metrics : elbow method , Association Rule Mining: Frequent Itemsets, Closed Itemsets, Apriori Algorithm, Generating Association Rules from Frequent Itemsets, Performance Measures – Support, Confidence, Lift.

Unit V	**Ensemble Learning**	**07hrs**	**COs Mapped - CO5**

Introduction to Ensemble Learning, Need of Ensemble Learning, Homogeneous and Heterogeneous ensemble methods, Applications of Ensemble Learning, Voting Ensemble, Bagging, Randomization, Boosting, Stacking, Random forest

Text Books

1. Ethem Alpaydin," Introduction to Machine Learning", PHI 2nd Edition-2013.

2. C. M. Bishop," Pattern Recognition and Machine Learning", Springer 1st Edition-2013

Reference Books

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012.
2. Jiawei Han, Micheline Kamber, and Jian Pie, "Data Mining: Concepts and Techniques", Elsevier Publishers Third Edition, ISBN: 9780123814791, 9780123814807
3. Kevin P Murphy, "Machine Learning – A Probabilistic Perspective", MIT Press, August 2012.

Strength of CO-PO Mapping								
	PO							
	1	2	3	4	5	6	7	8
CO1	3	2	1	1	1	1	1	1
CO2	3	2	2	3	1	1	1	1
CO3	3	3	3	3	2	1	1	2
CO4	3	3	2	3	2	1	1	2
CO5	3	3	3	3	2	1	1	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Evaluation**	**Marks Allotted**
1	Assignments on unit 1 and Unit 2	5
2	Quiz on unit 3 and Unit 4	5
3	Micro Project	10

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Study the Machine Learning Libraries and tools (Python library, tensorflow, keras,...) and perform the following operations on the given data set a) Importing the libraries b) Importing the Dataset c) Handling of Missing Data d) Handling of Categorical Data e) Splitting the dataset into training and testing datasets f) Feature Scaling	**CO1,CO2**
2	Implement linear regression on Data set	**CO3**
3	Design and implement SVM for classification with the proper data set.	**CO3**
4	Implement Naïve Bayes Classifier and K-Nearest Neighbor Classifier on Data set of your choice. Test and Compare for Accuracy and Precision.	**CO3**
5	Implement K-Means Clustering and Hierarchical clustering on the proper data set. Compare their Convergence	**CO4**
6	Implement a-priori algorithm to find frequently occurring items from given data and generate strong association rules using support and confidence thresholds for the given dataset.	**CO4**

Guidelines for Laboratory Conduction

1. Use of open source software is encouraged.
2. Instructor should identify and set one assignment beyond the scope of syllabus.
3.Operating System recommended :- Windows / Open source Linux or its derivative

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by student in the form of journal.
2. Journal consists of certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Date of Completion, assessor's sign, Theory- Concept in brief, algorithm, flowchart, conclusion.).
3. Program codes with sample output of all performed assignments are to be submitted as softcopy.
4. Course in-charge is highly encouraged to maintain softcopy of all the students assignments

Guidelines for Term work Assessment

Continuous assessment of laboratory work is done based on overall performance of student. Each lab assignment assessment will assign marks based on rubrics. Suggested rubrics for overall assessment include-

Sr. No.	Components for Continuous Assessment	Marks Allotted
1	R1: Timely Submission	10
2	R2: Understanding	10
3	R3: Clarity of Journal Writing	10
	Total Marks:	**30**
Each assignment will get 30 marks. Average of all assignments is converted in to total TW marks		

K. K. Wagh Institute of Engineering Education and Research, Nashik
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S. Y. M.C.A.
Pattern 2024 Semester: III
2409603: Full Stack Development

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 3 hrs/week **Practical : 4 hrs/week**	**3** **2**	**InSem Exam : 20 Marks** **Continuous Comprehensive Evaluation : 20 Marks** **EndSem Exam:60 Marks** **Term Work: 25 Marks** **Practical :50 Marks**

Prerequisite Courses, if any: Web Technologies

Course Objectives:

1. Understand modern JavaScript (ES6+) features for writing efficient and modular code.
2. Build server-side applications using Node.js and its core modules.
3. Create RESTful APIs using Express.js with routing and form validation.
4. Develop front-end apps using React.js and connect them to MongoDB using Mongoose.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Describes modern ES6+ features to write efficient JavaScript code.	02-Understand
CO2	Develop basic server-side applications using Node.js.	03- Apply
CO3	Build RESTful APIs using Express.js with routing and validation.	03-Apply
CO4	Use React concepts to develop single-page applications with components, state, hooks, and routing.	03-Apply
CO5	Perform CRUD operations in MongoDB using Mongoose with Node.js	03- Apply

COURSE CONTENTS

Unit I	ECMAScript	07hrs	COs Mapped - CO1

Introduction to ECMAScript, Brief history and version of ECMAScript, Relationship with javascript, How Browser intercept ECMAScript, Introduction to ES6, Block Scope with let and const, Iterators , Map object , Set object, Arrow Function, Template literals, Default Parameters, Rest Parameters, Promises and async/await, Classes, Modules, Arrays, Math, Number, and Global Methods

Unit II	Node.js	07hrs	COs Mapped – CO2

Introduction to Node.js: Node.js architecture (event loop, non-blocking I/O), Installing Node.js and npm, Node.js REPL, Writing first Node.js program, Node.js Modules, Core modules (fs, http, path, os, url, etc.),Importing modules using require(), Creating and exporting custom modules, Using third-party modules (with npm install), Understanding package.json, File System and Events, HTTP and Web Server, Creating a basic web server with http module

Unit III	Express.js	07hrs	COs Mapped – CO3
Introduction to Express.js and its features, Setting up an Express server, Routing and route parameters, Handling HTTP GET Request, Handling HTTP POST, Handling HTTP PUT Request, Handling HTTP DELETE Request, Calling Endpoints Using Postman, Handling form data and validation (body-parser, express-validator), Building RESTful APIs with Express.			
Unit IV	**ReactJs**	**08hrs**	**COs Mapped – CO4**
Introduction to React : What is React.js ,Features of React, Single Page Applications (SPAs), React vs Traditional JavaScript frameworks, Setting up React environment using Create React App (CRA), Project structure overview, Components (Class-based and Functional) and JSX, React Hooks and Functional Components, , Routing and Navigation , Forms and User Input , State Management, API Integration.			
Unit V	**Database connectivity with MongoDB**	**07hrs**	**COs Mapped - CO5**
Introduction to NoSQL and MongoDB, Features and advantages of MongoDB, MongoDB architecture and data model (Documents and Collections), Installing and Setting up MongoDB, MongoDB Compass GUI overview, CRUD Operations with MongoDB. **Integrating MongoDB with Node.js using Mongoose:** Introduction to Mongoose ODM, Connecting Node.js app to MongoDB**,** Defining schemas and models**,** Performing CRUD operations using Mongoose			

Text Books

1. Mehul Mohan, “Advanced Web Development With React”
2. Mario Casciaro, “Node.js Design Patterns: Design and implement production-grade Node.js applications using proven patterns and techniques”, 3rd Edition, July 2020
3. AzatMardanov, “Express.js Guide: The Comprehensive Book on Express.js”, November 2013

Reference Books

1. Narayan Prusty, “Learning ECMAScript 6” eBook
2. Robin Wieruch, “The Road to Learn React”, January 2018
3. Valentin Bojinov, “RESTful Web API Design with Node.js -: A step-by-step guide in the RESTful world of Node.js”, January 2016
4. Rick L.. “Express.js: Guide Book on Web framework for Node.js”, March 2016
5. Adam Bretz & Colin J Ihrig, “Full Stack Javascript Development with MEAN”, SPD, ISBN-13:978-0992461256

Strength of CO-PO Mapping								
	PO							
	1	2	3	4	5	6	7	8
CO1	3	0	0	3	0	0	0	2
CO2	3	2	2	3	0	0	0	2
CO3	0	3	3	3	2	0	2	2
CO4	0	3	3	3	3	2	0	2
CO5	3	3	3	3	0	2	2	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Evaluation**	**Marks Allotted**
1	Assignments on Unit 1 and Unit 2	5
2	Quiz on Unit 3 and Unit 4	5
3	Micro Project	10

List of Laboratory Experiments / Assignments		
S.NO.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Create a function greetUser(name, city = "your city") that prints: your name and city by Using let, const, arrow function, and template literals.	CO1
2	Write a function in ECMAScript that: • Accepts any number of product prices • Bonus: Apply 18% GST using arrow functions. • Returns the total bill amount. • Using Concepts: arrays, rest parameters, forEach, arrow functions	CO1
3	Create a Student class with: • name, rollNo, and marks properties. • Method isPassed() to return true if marks > 40. • Store multiple students in an array and filter those who passed. • Using Concepts: class, constructor, array, map, filter	CO1
4	Read and Write a file in Node.js	CO2
5	Create a custom module that exports functions like: • add(a, b) • multiply(a, b) Import this module in another file and display results.	CO2
6	Create a basic Node.js web server that: • Displays "Welcome to My College" on localhost:3000 • Show different messages on different routes like /about, /contact	CO2
7	Create a JSON file students.json with a list of student records. Write a Node.js program that: • Reads the file • Parses the JSON • Displays the list of student names	CO2
8	Create a basic Express server with the following routes: • / → returns "Welcome to Student Portal" • /about → returns "This is an Express app" • /contact → returns your name and email	CO3
9.	Develop a Single Page Application as “College website” using ReactJs	CO4
10.	Build a ToDo Application with React and MongoDB	CO4, CO5

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Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by student in the form of journal.
2. Journal consists of certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Date of Completion, assessor's sign, Theory- Concept in brief, algorithm, flowchart, conclusion.).
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Sr. No.	Components for Continuous Assessment	Marks Allotted
1	R1: Timely Submission	10
2	R2: Understanding	10
3	R3: Clarity of Journal Writing	10
	Total Marks:	**30**
Each assignment will get 30 marks. Average of all assignments is converted in to total TW marks		

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. M.C.A.
Pattern 2024 Semester: III
2409604: NoSQL

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial : 01hr/week **Practical : 02 hrs/week**	**01** **01**	**Term Work: 25 Marks** **Tutorial :25 Marks**

Prerequisite Courses, if any:Nil

Course Objectives:

1. To understand types and features of NoSQL databases.
2. To learn data modeling using document and key-value stores.
3. To understand development of NoSQL-based solutions using CRUD and aggregation operations.

Course Outcomes: On completion of the course students will be able to

	Course Outcomes	**Bloom's Level**
CO1	Understand the principles and architecture of NoSQL databases.	L-2 Understanding
CO2	Explore different types of NoSQL databases (Document, Key-Value, Columnar, and Graph)	L-2 Understanding
CO3	Perform basic and advanced operations in NoSQL databases	L- 3 Applying
CO4	Design scalable and high-performance NoSQL schemas.	L- 3 Applying

Text Books

1. Pramod J. Sadalage, Martin Fowler, "**NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence ",** Addison-Wesley

2. Kristina Chodorow **,"MongoDB: The Definitive Guide (3rd Edition**)", O'Reilly Media

Reference Books

1. Martin Kleppmann, **"Designing Data-Intensive Applications",** O'Reilly Media

Strength of CO-PO Mapping								
	PO							
	1	2	3	4	5	6	7	8
CO1	3	2	-	-	-	-	-	2
CO2	3	2	-	2	-	-	-	2
CO3	3	2	2	3	-	-	-	2
CO4	3	3	3	3	2	-	-	2

List of Tutorial Assignments		
Sr. No.	**Tutorial Assignments**	**CO Mapped**
1	**Setting up and Configuring NoSQL Databases:** • MongoDB: Learning to install and configure MongoDB, understanding the basics of collections and documents, and practicing CRUD (Create, Read, Update, Delete) operations. • Cassandra: Working with keyspaces, tables, and defining data models within Cassandra. • Other NoSQL systems: Depending on the tutorial, it might involve setting up and configuring other systems like Redis, Couchbase, or Neo4j.	**CO1**
2	**Designing NoSQL Schemas:** • Document Databases (e.g., MongoDB): Designing schemas for collections to efficiently store and retrieve data in JSON-like documents. • Key-Value Stores (e.g., Redis): Understanding how to store and retrieve data using key-value pairs. • Column-Family Stores (e.g., Cassandra): Defining tables and columns with appropriate data types. • Graph Databases (e.g., Neo4j): Designing nodes and relationships to represent data connections.	**CO2**
3	**Implementing CRUD Operations:** • Inserting Data: Learning how to insert new documents, key-value pairs, or nodes into the NoSQL database. • Reading Data: Practicing querying and retrieving data based on different criteria, such as by document ID, key, or node properties. • Updating Data: Understanding how to modify existing documents or key-value pairs. • Deleting Data: Learning how to remove data from the database**.**	**CO3**
4	**Querying Data:** **Simple Queries:** • Practicing basic queries to retrieve specific documents or key-value pairs.	**CO3**
5	**Querying Data:** **Advanced Queries:** • Learning how to use more complex query expressions, aggregations, and indexing to efficiently retrieve data. • Querying in Different NoSQL systems: Understanding the specific query languages or mechanisms used by different NoSQL databases**.**	**CO4**

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1.	Design a NoSQL MongoDB database for a bookstore management system. The system should contain the following entities: Books: bookId, title, author, price, category, stock • Customers: customerId, name, email, phone, address • Orders: orderId, customerId, books[], orderDate, status Create MongoDB collections for each entity and provide example documents for each collection	CO1,CO3
2.	Write MongoDB queries for the following CRUD operations using the products and customers collections: 1. Insert: Add a new product to the products collection. 2. Find: Retrieve all customers whose name starts with "R". 3. Update: Update the price of a product with a specific productId. 4. Delete: Delete a product from the products collection by productId.	CO1,CO2, CO3,CO4
3.	Use the aggregation pipeline in MongoDB to achieve the following: • Find all books that belong to the "Fiction" category. • Calculate the total value of stock for each book category. • Sort customers by their name in ascending order. • Display only the bookId, title, and price from the books collection.	CO1,CO2, CO3,CO4
4.	Implement MongoDB Schema Validation for the customers collection to ensure: • email is a string and follows a valid email format. • phone is a string and must contain exactly 10 digits. • address is a required field. Provide the code for schema validation and demonstrate inserting valid and invalid data to show how the validation works.	CO1,CO2, CO3,CO4
5.	Design the following MongoDB collections for a University database: • Students: o Fields: studentId, name, age, major, gpa, enrolledCourses[] • Courses: o Fields: courseId, courseName, instructor, credits • Enrollments: o Fields: enrollmentId, studentId, courseId, enrollmentDate Insert sample documents into these collections, ensuring that they reflect the relationships between the data (such as students enrolled in courses and	CO1,CO2, CO3,CO4

course assignments to instructors).

For each of the following, write a MongoDB query that uses the specified operators. Provide the query and explain the output.

1. Write a query to retrieve all students whose **major** is "Computer Science".
2. Write a query to find all students whose **GPA** is greater than 3.5.
3. Write a query to find all students whose **age** is less than 23.
4. Write a query to find students who are **older than 21** and have a **GPA greater than 3.5**.
5. Write a query to find students who are either enrolled in the course "CS101" or have a **GPA greater than** 3.7.
6. Write a query to find all students who are enrolled in either "CS101" or "CS102".
7. Write a query to find all students whose **GPA** is **not equal** to 3.4.
8. Write a query to find all students who have an **age** field present in their document.

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Sr. No.	Components for Continuous Assessment	Marks Allotted
1	R1: Timely Submission	10
2	R2: Understanding	10
3	R3: Clarity of Journal Writing	10
	Total Marks:	30
Each assignment will get 30 marks. Average of all assignments is converted in to total TW marks		

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. M.C.A.
Pattern 2024 Semester: III
2409605A: Quantum Computation

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 03 hrs/week	**03**	**InSem Exam : 20 Marks** **Continuous Comprehensive Evaluation : 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses, if any: Nil

Course Objectives:

1. Introduce mathematical tools such as matrices, tensors, and Dirac notation essential for understanding quantum systems.
2. Provide foundational knowledge of quantum mechanics and its physical implications in computation.
3. Explain the principles of quantum communication and entanglement.
4. Illustrate the working of quantum logic gates and circuits.
5. Introduce quantum algorithms, quantum key distribution, and error correction techniques.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Apply matrix, tensor, and Dirac notation to represent quantum states and operations.	03-Apply
CO2	Understand key quantum mechanical phenomena relevant to computation, including wave-particle duality and qubits.	02-Understand
CO3	Analyze concepts of quantum communication such as entanglement, no-cloning theorem, and quantum teleportation.	04-Analyze
CO4	Simulate quantum circuits using basic quantum gates.	06 - Create
CO5	Describe quantum key distribution and error correction	02-Understand

COURSE CONTENTS

Unit I	**Matrix, Tensor and Dirac Notation**	**07hrs**	**COs Mapped - CO1**

Basis vectors and orthogonality,Matrices Hilbert spaces,Inner and outer products,Tensors in index notation,Metric tensors, covariant and contravariant tensors ,Unitary operators and projectors,Hermetian operator, Adjoint of operator,Wave function as vector and operator as metrics ,Dirac notation

Unit II	**Overview of Quantum Mechanics**	**07hrs**	**COs Mapped – CO2**

Photon, Concept of Planck Constant , Photoelectric effect ,Wave particle duality, Wave packet , Davisson and Germer Experiment , Superposition Principle ,Young Double slit experiment , Qubits and pieces ,Concept of Bloch sphere

Unit III	**Fundamentals of Quantum Communication**	**07hrs**	**COs Mapped – CO3**

No-cloning theorem , Hidden Information of state , Einstein-Podolsky-Rosen Paradox ,Bell states , Bell inequalities,Bell inequalities – Examples,Quantum entanglement,Quantum entanglement considering Heisenberg principal ,Quantum teleportation

Unit IV	**Quantum Gate**	**08hrs**	**COs Mapped – CO4**

Pauli Gates ,Phase Gate ,Controlled phase shift,Hadamard gates ,SWAP Gates ,CNOT Gates ,Toffoli gates , Combination of Gates,Circuit of Gates

Unit V	Quantum Algorithm, Key Distribution and Error	07hrs	COs Mapped - CO5

Deutsch algorithm ,Deutsch-Josza algorithm , Shor's Algorithm - Periodicity ,Shor's period-finding algorithm ,Introduction to Quantum key distribution ,BB84 protocol ,Quantum Error Correction

Text Books

1. Phillip Kaye, Raymond Laflamme, and Michele Mosca (2007). An Introduction to Quantum Computing. Oxford University Press.
2. Chris Bernhardt, Quantum Computing for Everyone, The MIT Press,Cambridge, 2020
3. David McMahon-Quantum Computing Explained-Wiley-Interscience , IEEE Computer Society(2008)

Reference Books

1. Michael A. Nielsen and Isaac L. Chuang (2000). Quantum Computation and Quantum Information. Cambridge University Press.
2. Quantum Computing, A Gentle Introduction , Eleanor G. Rieffel and Wolfgang H. Polak MIT press (2014)

Strength of CO-PO Mapping								
	PO							
	1	2	3	4	5	6	7	8
CO1	2	1	1	1	-	-	-	1
CO2	1	1	-	-	-	-	-	1
CO3	2	2	1	-	-	-	1	1
CO4	2	2	2	2	1	-	-	1
CO5	1	2	2	1	1	-	1	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Evaluation**	**Marks Allotted**
1	Assignments on unit 1 and unit 2	5
2	Quiz on unit 3 and unit 4	5
3	Group Presentation	10

(Autonomous from Academic Year 2022-23)

F. Y. M.C.A.
Pattern 2024 Semester: III
2409605B: Industry Elective: Product and system Design Thinking

Teaching Scheme:	**Teaching Scheme:**	**Teaching Scheme:**
Theory : 03 hrs/week	**03**	**InSem Exam : 20 Marks** **Continuous Comprehensive Evaluation : 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses, if any: -

Course Objectives:

- To understand the fundamental concepts of design thinking for systems and products.
- To understand empathy and problem-solving ability through user-centered design.
- To explore ideation techniques for creative and innovative solutions.
- To know prototyping and testing strategies to develop real-world product/system models.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Understand the principles and process of design thinking.	**CO1**
CO2	Identify user needs and define actionable problem statements.	**CO2**
CO3	Generate innovative ideas through ideation techniques.	**CO3**
CO4	Create low- and high-fidelity prototypes and evaluate solutions.	**CO4**
CO5	Apply design thinking approach to a system/product development case study.	**CO5**

COURSE CONTENTS

Unit I	**Introduction to Design Thinking**	**(07hrs)**	**COs Mapped – CO1**

Evolution and importance; five stages: Empathize, Define, Ideate, Prototype, Test; application in system and product design

Unit II	**Empathy and Problem Definition**	**(08hrs)**	**COs Mapped – CO2**

Search field determination, Problem clarification, Understanding of the problem, Problem analysis, Reformulation of the problem, Observation Phase, Empathetic design, Tips for observing, Methods for Empathetic Design, Artifact Analysis, Behavioral Mapping and Tracking, Empathy Map, Cognitive Walkthrough, Heuristic Evaluation, Point-of-View Phase, Characterization of the target group, Description of customer needs, Persona, Define- Analysis and Drawing Inferences from Research

Unit III	**Ideation Techniques**	**(07hrs)**	**COs Mapped – CO3**

Idea generation Basic design directions, Themes of thinking, Inspiration and references, Brainstorming, Value, Inclusion, Sketching, presenting ideas Refinement Thinking in images, thinking in signs, Appropriation, Humour, Personification, Visual metaphors, Modification, thinking in words, Words and language, Type 'faces', thinking in shapes, thinking in proportions, Thinking in colours, Ideation tools & exercises. Storytelling and Tools for Innovation Evaluation of ideas

Unit IV	**Prototyping**	**(07hrs)**	**COs Mapped – CO4**

Prototype Phase - Lean Startup Method for Prototype Development, Visualization and presentation 67/94 techniques, Ideas to presentable concepts, Storyboards, Developing mock-ups, models and prototypes, Quick and Dirty Prototyping

Unit V	**Testing and Implementation**	**(07hrs)**	**COs Mapped – CO5**

Test Phase – Technique for interviews and surveys, Kano Model, Desirability Testing, Presenting Prototypes ,testing prototypes, Obtaining feedback to refine product Usability and Ergonomic testing

Reference Books:

1. Design Thinking: Understanding How Designers Think and Work by Nigel Cross
2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation" by Tim Brown
3. Design Thinking for Visual Communication" by Ranjan Nayar and Jaidip Subedi
4. The Design of Everyday Things" by Don Norman
5. "Design Thinking: Creativity and Innovation"by S. Balaram

Strength of CO-PO Mapping								
	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	1	1	-	-	2
CO2	1	3	2	1	2	-	-	2
CO3	1	2	3	2	2	-	-	3
CO4	2	2	3	3	2	-	-	2
CO5	2	3	3	2	3	2	-	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Evaluation**	**Marks Allotted**
1	Assignments on unit 1 and unit 2	5
2	Quiz on unit 3 and unit 4	5
3	Group Presentation	10

K.K.Wagh Institute of Engineering Education and Research, Nashik
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F. Y. M.C.A.
Pattern 2024 Semester: III
2409605C: Business Intelligence and Analytics

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 03 Hrs/week	**03**	**InSem Exam: 20 marks** **Continuous Assessment: 20 marks** **EndSem Exam: 60 marks**

Prerequisite Courses, if any: Data Science and Machine Learning

Course Objectives: The course aims to provide a comprehensive understanding of Business Intelligence (BI) concepts, including data warehousing, data integration, modeling, mining, and visualization. It equips students with the skills to analyze diverse data sources, apply predictive analytics, and utilize BI tools and technologies to support informed decision-making in business environments.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	To understand the fundamental concepts of Business Intelligence, including BI architectures, tools, and the KDD process.	Understand
CO2	To Categorize various data sources and apply data integration and data governance strategies in business environments.	Apply
CO3	To Design and model a data warehouse using appropriate data modeling techniques including star and snowflake schemas.	Apply
CO4	To Implement basic data mining and predictive analytics techniques such as association rule mining, regression, and classification.	Apply
CO5	To Analyze and visualize business data using appropriate EDA techniques, data visualization tools, and interpret emerging trends in BI.	Analyze

COURSE CONTENTS

Unit I	**Introduction to Business Intelligence**	**(07hrs)**	**COs Mapped – CO1**

Basic definitions- Business Intelligence; Data warehousing, Business Intelligence architecture, Use and benefits of Business Intelligence. **Knowledge Discovery in Databases**: KDD process model, Data Pre-processing: Cleaning: Missing Values; Noisy Values; Inconsistent values; redundant values. Outliers, Integration, transformation, reduction. **BI Architectures and Tools**: Overview of different BI architectures (e.g., centralized, decentralized). Introduction to various BI tools and platforms (reporting, dashboards, OLAP, data mining). Cloud-based BI solutions.

Unit II	**Data Sources and Data Management**	**(07hrs)**	**COs Mapped – CO2**

Types of Data Sources- Structured Data Sources, Semi-Structured Data Sources, Unstructured Data Sources, Internal Data Sources, External Data Sources, Real-Time (Streaming) Data Sources. Effective Data Integration Strategies- ETL (Extract, Transform, Load), ELT (Extract, Load, Transform), Data Governance Frameworks - Data Stewardship. Data Policies and Standards, Data Quality Management, Metadata Management, Data Security and Compliance, Master Data Management (MDM)

Unit III	**Data Warehousing and Data Modeling**	**(07hrs)**	**COs Mapped – CO3**

Key Features of a Data Warehouse, Benefits of Centralized Data Warehousing, Examples of Data Warehousing Technologies, **Key types of data models**- Conceptual Data Model, Logical Data Model, Physical Data Model, Key Components of Data Modeling, Benefits of Data Modeling. Dimensional modeling: Star schema, snowflake schema, fact tables, and dimension tables. OLAP (Online Analytical Processing) vs. OLTP (Online Transaction Processing).

Unit IV	**Introduction to Data Mining and Predictive Analytics**	**(07hrs)**	**COs Mapped – CO4**

Data mining definitions and process: business and data understanding. Association Analysis: Definition of association rule, General issues: Support; Confidence; Lift; Conviction, Frequent Item sets: APriori Algorithm; Issues with APriori Algorithm, Data structures: Hash tree and FP tree.
Predictive Analytics Fundamentals: Introduction to predictive modeling. Difference between predictive and descriptive analytics. Basic concepts of regression analysis (linear and logistic). Introduction to classification techniques (decision trees, Naive Bayes). Model evaluation metrics.

Unit V	**Data Analysis, Visualization and Emerging trends in BI**	**(08hrs)**	**COs Mapped – CO5**

Fundamentals of Data Analysis: Descriptive statistics: Measures of central tendency, dispersion, and shape. Exploratory Data Analysis (EDA) techniques. Data aggregation and filtering. Cross-tabulation and pivot tables.
Data Visualization Principles and Techniques: Importance of effective data visualization. Types of charts and graphs. Principles of visual perception and design for BI dashboards. Creating interactive dashboards and reports. Introduction to data visualization tools.
Overview of Advanced Analytical Techniques, Overview of Big Data technologies (Hadoop, Spark - basic concepts), Emerging Trends in BI and Analytics: Artificial Intelligence (AI) and Machine Learning (ML) in BI. Real-time BI and streaming analytics.

Text Books

1. Business Intelligence (2nd Edition), Efraim Turban, Ramesh Sharda, Dursun Delen, David King, Pearson (2013)
2. Business Intelligence for Dummies, Swain Scheps, Wiley Publications (2008).
3. "Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals" by Paulraj Ponniah.
4. "Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole Nussbaumer Knaflic.
5. "Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei.

Reference Books

1 Data Warehousing in the Age of Big Data- by Krish Krishnan ,ISBN-13: 978-0124160010
2 The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling- by Ralph Kimball and Margy Ross ,ISBN-13: 978-1118530801
3 "Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst" by Dean Abbott.
4 "Business Intelligence and Data Mining" by Dr. Minakshi Malhotra.
5 "Big Data Analytics" by Seema Acharya and Subhashini Chellappan

Strength of CO-PO Mapping								
	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	-	-	-	-	-	-	2
CO2	3	2	2	3	-	-	-	-
CO3	-	3	-	3	2	-	2	-
CO4	-	-	3	2	3	2	-	-
CO5	3	3	3	2	-	2	2	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Evaluation**	**Marks Allotted**
1	Assignments on unit 1 and unit 2	5
2	Quiz on unit 3 and unit 4	5
3	Group Presentation	10

S. Y. M.C.A.
Pattern 2024 Semester: III
243001: Introduction to Constitution

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 02 hrs/week	**02**	**Continuous Comprehensive Evaluation:20Marks** **EndSem Exam: 30Marks**

Prerequisite Courses, if any: Nil

Course Objectives:

- To facilitate the student to understand the importance of constitution
- To recognize the structure of executive, legislature and judiciary machinery.
- To discuss the structure of Indian government, the structure of state government, the local Administration.
- To explain the structure of constitutional bodies like Supreme Court, high court, controller and auditor general of India and election commission of India and their directive principles.
- To acquaint the students about their freedom, duties and responsibilities.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it	1-Knowledge
CO2	To understand historical background of the e constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration	2-Understand
CO3	To apply the knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions for sustaining democracy.	3-Apply
CO4	To evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions of viz SC/ST/OBC and women	3-Apply

COURSE CONTENTS

Unit I	**PHILOSOPHY OF THE INDIAN CONSTITUTION**	**5 Hrs**	**CO1**

Constitutional History of India, Role of Dr. B.R. Ambedkar in Constituent Assembly, Preamble –, Source and Objects, Sovereign and Republic , Socialist and Secular, Democratic – Social and EconomicDemocracy, Justice – Social, Economic and Political, Liberty – Thought, Expression, Belief, Faith and Worship , Equality – Status and Opportunity, Fraternity, Human Dignity, Unity an Integrity of the Nation

Unit II	**FUNDAMENTAL RIGHTS**	**10 Hrs**	**CO2**

Right to equality, Right to freedoms, Right against exploitation, Right to freedom of religion, Cultural and educational rights, Right to property, Right to constitutional remedies

Unit III	**DIRECTIVE PRINCIPLES OF STATE POLICY**	**10 Hrs**	**CO3**

Equal Justice and free legal aid, Right to work and provisions for just and humane conditions of work, Provision for early childhood, Right to education and SC,ST, weaker section, Uniform Civil Code, Standard of Living, nutrition and public health, Protection and improvement of environment,

Separation of Judiciary from executive, Promotion of International peace and security			
Unit IV	**FUNDAMENTAL DUTIES**	**5 Hrs**	**CO4**
Duty to abide by the Constitution, Duty to cherish and follow the noble ideals, Duty to defend the country and render national service, Duty to value and pres erve the rich heritage of our composite culture, Duty to develop scientific temper, humanism ,the spirit of inquiry & reform, Duty to safeguard public property and abjure violence, Duty to strive towards excellence			

Text Books

1. D. D. Basu, Introduction to the Constitution of India, LexisNexis
2. Granville Austin, The Constitution of India: Cornerstone of a Nation, Oxford University Press
3. Subhash Kashyap, Our Constitution, National Book Trust M.P. Jain, Indian Constitutional Law, LexisNexis

Reference Books

1. V. N. Shukla, Constitution of India, Eastern Book Company
2. P. M. Bakshi, The Constitution of India, Universal Law Publishing
3. M. V. Pylee, Constitutional Government in India, S. Chand
4. V. S. Khare, Dr. B. R. Ambedkar and India's National Security
5. Brij Kishore Sharma: Introduction to the Indian Constitution, 8th Edition, PHI Learning Pvt. Ltd.
6. Granville Austin: The Indian Constitution: Cornerstone of a Nation (Classic Reissue), Oxford University Press.
7. Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.

Strength of CO-PO Mapping								
	PO							
	1	2	3	4	5	6	7	8
CO1	-	-	-	-	1	-	1	1
CO2	-	-	-	-	1	-	1	1
CO3	-	-	-	-	1	-	1	1
CO4	-	-	-	-	1	-	1	1

Guidelines for Continuous Comprehensive Evaluation for Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignment	10
2	Group Presentation	10

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S. Y. M.C.A.
Pattern 2024 Semester: III
2409607: Research Work

Teaching Scheme:	**Teaching Scheme:**	**Teaching Scheme:**
Practical : 06hrs/week	**Practical : 046hrs/week**	**Practical : 046hrs/week**

Course Objectives:

1. To conceptualize research methodology fundamentals, teamwork, and effective communication skills.
2. To foster critical thinking, problem analysis, and independent learning through research activities.
3. To adapt to emerging technologies, tools, and practices while solving real-world problems.
4. To acquaint students with the process of literature review, research planning, implementation, and documentation.
5. To enhance skills in technical writing, report preparation, and professional presentations.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Identify real-life or domain-specific research problems from a societal, academic, or industrial perspective.	1-Remember
CO2	Apply research methodology principles, project planning, and management skills during research work.	3-Apply
CO3	Analyze and synthesize information from literature to define clear research objectives and methodologies.	4-Analyze
CO4	Work effectively in small research groups, managing tasks collaboratively to achieve defined research goals.	6-Create
CO5	Design, develop, and evaluate research-based solutions for complex problems using appropriate tools and techniques.	6-Create
CO6	Develop communication skills for effective presentation, research reporting, and technical documentation.	6-Create

Course Execution details

Preamble:
Research Work through project-based and inquiry-driven learning is an instructional methodology designed to empower students with the opportunity to acquire in-depth knowledge, analytical skills, and hands-on experience through investigation-based projects centered around real-world challenges, current trends, or domain-specific problems. In Research Work, students are encouraged to investigate, analyze, and address authentic, engaging, and complex research problems with sustained effort, guided inquiry, and reflective thinking.

The core philosophy of Research Work lies in "learning through exploration and discovery." In today's rapidly evolving professional and academic landscape, success is driven by the ability to identify problems, evaluate existing literature, derive insights from data and findings, and propose evidence-based solutions or innovations. Preparing students for this future involves fostering research-oriented thinking and problem-solving abilities that go beyond theoretical knowledge.

Research Work also redefines the traditional role of faculty from mere content deliverers to mentors, research guides, and facilitators in the knowledge creation process. Faculty mentors actively engage with students to help them identify meaningful research areas, plan and execute experimental or analytical work, critically assess findings, and effectively document and present outcomes. This collaborative academic environment promotes curiosity, creativity, critical thinking, and scholarly discipline.

The Research Work course focuses students' efforts on a major research question, problem, or hypothesis to explore, investigate, and respond to through structured methodology and experimental work. It integrates what students academically know with what they should be capable of doing — including problem definition, literature review, methodology design, result analysis, and technical reporting.

Research Work is carried out either individually or in small groups (3 to 4 members per group) under continuous mentoring throughout the semester. Regular review meetings, progress tracking, and milestone-based assessments ensure focused, quality research outcomes. The research activity culminates in a final research report, presentation, and viva voce examination.

Credits for Research Work are awarded based on continuous internal assessment, quality of research output, documentation, and final evaluation at the end of the semester.

Guidelines for Research Work

Sr. No.	Guidelines for Research Work
1	Every student or group is required to submit a comprehensive proposal highlighting the research topic, objectives, proposed methodology, and anticipated results.
2	The institute will appoint a faculty mentor to each group to offer consistent guidance, monitor progress, and carry out internal evaluations.
3	Students must perform an extensive review of existing literature to gain insights into ongoing research and identify unexplored areas in their selected domain.
4	The approved research plan should be implemented systematically, ensuring compliance with ethical practices and academic norms.
5	Detailed documentation of the research activities — including procedures, data acquisition methods, and analysis processes — must be maintained throughout the project.
6	Upon completion of the research work, students must prepare a project report and encouraged to publish their research work in reputed journals, present at conferences or in recognized project competitions to disseminate their findings
7	Evaluation will be as per the Institute guidelines, based on the quality of the research work, adherence to the research plan, presentation skills, and contribution

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S. Y. M.C.A.
Pattern 2024 Semester: IV
2409611: Industrial Training

Teaching Scheme:	Credit	Examination Scheme:
-	12	Oral Exam:200Marks Term Work: 100Marks

Course Objectives:

1. To provide students with an opportunity to apply theoretical knowledge gained throughout the program in a real-world industrial setting
2. To foster professional skills such as teamwork, communication, time management, and problem-solving in an industrial environment.
3. To expose students to the practices, technologies, and challenges prevalent in the IT industry or related sectors.
4. To enable students to gain hands-on experience by working on projects or tasks relevant to their field of study.
5. To facilitate networking opportunities with professionals in the industry, potentially leading to future career prospects.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Apply theoretical concepts learned in the classroom to solve practical problems encountered in an industrial setting.	3-Apply
CO2	Demonstrate proficiency in using industry-standard tools, technologies, and methodologies relevant to their area of specialization.	3-Apply
CO3	Apply analytical and problem-solving skills to address challenges encountered during the industrial training	3-Apply
CO4	Collaborate effectively with team members to achieve project goals and objectives.	3-Apply
CO5	Manage time and resources efficiently to complete assigned tasks and projects within the stipulated timeframe	3-Apply
CO5	Prepare a comprehensive report documenting their experience, including project details, learnings, and reflections.	5-Evaluate

Guidelines for Industry Training

Industry training is a valuable educational and career development opportunity, providing students with practical experience in their field. It helps students develop the necessary skills and awareness of industry practices, environment, and culture. This structured and supervised training enables students to apply the theoretical knowledge they have gained in the classroom to real-world situations, thus bridging the gap between academia and industry.

Duration:

- The student is required to undergo industry training for a minimum of 360 hours, which should span the with at least 30 hours per week.
- The training is to be carried out during Semester IV, and students should complete their training by the end of the vacation period after their Semester III exams.

Industry Training Options:

Students have the option to carry out their industry training in the following environments:

- Industry or Government Organizations
- Consultancy or Research Projects
- Incubation, Innovation, or Entrepreneurship Cells/Start-ups at the institute
- In-house Product Development or Inter-department Research Internships
- Research Internships under faculty members of reputed institutes or research organizations
- Micro/Small/Medium Enterprises
- NGOs

Identifying the Training Opportunity:

- The industry training should be chosen based on the student's field of study and interests, after consulting with the faculty and industry mentor.
- Students must seek approval for their training proposal from the college authority well in advance. The identification of the training opportunity should begin in Semester III in collaboration with the Training and Placement Cell.
- This early planning ensures that students can initiate their internship during the winter vacation following Semester III exams.

Logbook:

- Students are required to maintain a logbook throughout the course of their industry training. The logbook serves as a daily record of the student's activities, observations, and reflections during the internship period.
- The logbook will help students develop the habit of systematic documentation, which is essential for their future professional work. It will also be useful for tracking the progress and tasks completed during the training.
- The logbook must be duly signed and stamped by the industry or organization supervisor at the end of the training.

Both the logbook and the Internship Report should be submitted to the institute at the conclusion of the training.

Report Preparation:

Upon completion of the internship, the student should submit a detailed **report** comprising the following sections:

- Title/Cover Page
- Training Completion Certificate from the industry
- Company Background: Information about the organization, its scope, and objectives
- Supervisor Details
- Index/Table of Contents
- Introduction: General overview of the internship
- Title/Problem Statement/Objectives: Description of the specific tasks and goals
- Motivation/Scope and Rationale: Why the work was undertaken and its importance
- Methodological Details: Approach or methods used in the work
- Results/Analysis/Inferences: Key findings or analysis based on the work carried out
- Suggestions/Recommendations: Proposals for improvement or observations that could benefit the industry
- Attendance Record
- Acknowledgment
- List of References: Books, magazines, and other sources referenced during the work

Guidelines for Assessment

The work carried out shall be evaluated on a continuous basis by the assigned faculty advisor / mentor for 100 marks and panel of examiners appointed shall evaluate the work based on the report and Oral for 200 marks.

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S. Y. M.C.A.
Pattern 2024 Semester: IV
2409612: Research Paper / MOOC

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical:08hrs/week	4	Term Work : 50 Marks

Course Objectives:

1. To promote learning additional skills anytime and anywhere
2. To enhance teaching and learning on campus and online
3. To inculcate the quality of lifelong learning
4. To publish the research/ study undertaken for a specific identified problem.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Acquire additional knowledge and skills	3- Apply
CO2	write a complete research paper	6-Create

Guidelines

Research Paper

The course is designed to cover techniques that can be applied to academic writing of research papers. The student will practice techniques by drafting a research paper with support from other class members and the instructor.

The research paper is intended to provide students with the opportunity to more fully explore class discussion topic, as well as examine it from a more empirical perspective.

Students will undertake review of literature of research papers and submit a research paper as final submission.

Note : Each faculty ought to guide the students to provide a research paper and literature review

MOOCs (Massive Open Online Courses)

This course aims to create an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world famous experts from academics and industry are available. MOOCs (Massive Open Online Courses) provide affordable and flexible way to learn new skills. MOOCs are courses delivered online and accessible to all for free.

- Massive because enrollments are unlimited and can run into hundreds of thousands.
- Open because anyone can enroll — that is, there is no admission process. λ Online because

they are delivered via the internet.

- Course because their goal is to teach a specific subject.

MOOCs typically comprise video lessons, readings, assessments, and discussion forums.

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

NPTEL- National Programme on Technology Enhanced Learning is a project of MHRD initiated by seven Indian Institutes of Technology (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati and Roorkee) along with the Indian Institute of Science, Bangalore in 2003, to provide quality education to anyone interested in learning from the IITs. The main goal was to create web and video courses in all major branches of engineering and physical sciences at the undergraduate and postgraduate levels and management courses at the postgraduate level.

Spoken Tutorial is an initiative of national mission on education through ICT, MHRD, Govt. of India to promote IT literacy through Open Source Software. It is a multi-award winning educational content portal. Here one can learn various Free and Open Source Software all by oneself. Anybody with a computer and a desire for learning can learn from any place, at any time and in any language of their choice.

MOOCs course provider like, SWYAM, NPTEL, EDX, Coursera, Udemy, Udacity or similar ones can help the students in acquiring knowledge and also advancement in career.

Suggested List :

- R Programming
- LaTex
- Data Mining
- Any other course suggested by Institute

About Course and Grade

Non Credit course is compulsory. No grade points are associated with non-credit courses and are not accounted in the calculation of the performance indices SGPA & CGPA. Result of assessment will be PP or NP. Set of non-credit courses offered is provided. Conduction and assessment of performance in said course is to be done at institute level. PP and NP Grade - The student registered and completed non credit Research Paper/MOOC course shall be awarded the grade PP after satisfactory completion of credit course and shall be included in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the institute and satisfactory internal assessment performance and secured a passing grade in that course. Student who is unable to complete Research

Paper/MOOC course will be awarded as NP grade.

Guidelines for conduction

Research Paper:

1. Students will have to submit the copy of published paper before the end of the semester.
2. Students should publish the research paper in reputed National/ International Journal/Conference

MOOC:

Students have to enroll themselves for any one course which will be on going and complete the assignments. Grades will be given on the basis of submitted assignments and marks obtained. If student wants to earn a verified certificate, he/she will have to fill the online exam registration form and take the proctored exam conducted by NPTEL/Spoken Tutorial in person at any of the designated exam centers.

Academic Honesty And Integrity:

Academic honesty and integrity are important values in the educational process at KKWIEER.

Examples of academic dishonesty include but are not limited to:

• Plagiarism

• Cheating on exams and other assignments

• Academic fraud such as submitting work for multiple purposes or submitting false data Academic dishonesty in any form is a serious offense against the academic community.

Acts of academic dishonesty or fraud will be addressed according to the KKWIEER Academic Integrity Policy.

Reference Books

1.Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

2.Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

3.Jari Saramäki, How to Write a Scientific Paper: An Academic Self-Help Guide for PhD Students, Amazon Digital Services LLC - KDP Print US, 2018.

Learning Resources:

1. Swayam- https://swayam.gov.in/
2. NPTEL- https://onlinecourses.nptel.ac.in/
3. Spoken Tutorial - https://spoken-tutorial.org/tutorial-search
4. MOOC- http://mooc.org/
5. Edx - https://www.edx.org/

6. Coursera- https://www.coursera.org/

7. IEEE- https://ieeexplore.ieee.org/

8. Elsevier (Science Direct)- http://www.sciencedirect.com/

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. M.C.A.
Pattern 2024 Semester: IV
2409613: Research Project

Teaching Scheme:	**Credit**	**Examination Scheme:**
Practical : 12hrs	**06**	**Oral Exam:100Marks** **Term Work: 50Marks**

Course Objectives:

6. To understand and apply research methodology principles, including problem identification, data collection, and analysis.
7. To foster critical thinking and problem-solving skills for addressing real-world challenges through research.
8. To enhance teamwork and collaboration, improving communication within research groups.
9. To gain practical experience in the process of research planning, execution, and documentation.
10. To develop technical writing, reporting, and presentation skills for professional research communication.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Identify research problems from academic, industrial, or societal perspectives.	1-Remember
CO2	Apply research methodology and project management principles in conducting research.	3-Apply
CO3	Analyze literature to define clear research objectives and methodologies.	4-Analyze
CO4	Collaborate effectively within research teams to achieve research goals.	5-Evaluate
CO5	Design and implement research-based solutions using appropriate tools and techniques.	6-Create
CO6	Develop communication skills for effective presentation, research reporting, and technical documentation.	6-Create

Guidelines for Carrying Out Research Project

- Each student is required to undertake their research project during Semester IV while being engaged in Course 2409611 – Industrial Training at a company, organization, or research institute.
- The research work will be carried out under the supervision of a faculty advisor/mentor appointed by the institute.
- Ideally, this research should be a continuation or further development of the project undertaken during Semester III as part of the Research Work course. Alternatively, students may also select a new research project idea in consultation with their assigned faculty guide or industry mentor, based on current industrial trends, institutional research initiatives, or domain-specific interests.
- The project can be carried out in a group of a maximum of 2 students.
- Students must work on a well-defined research problem and are encouraged to produce outcomes such as:

- Publishing a research paper
- Filing a copyright or patent
- Or presenting their work at academic or industry platforms

- A comprehensive project report must be prepared and submitted, which should include:

- Title Page
- Certificate duly signed by the guide and authorities
- Acknowledgment
- Abstract
- Table of Contents
- List of Tables
- List of Figures
- List of Abbreviations
- Detailed chapters covering:

    - Introduction
    - Literature Review
    - Design and Methodology of the Proposed System
    - Experimental Results and Analysis
    - Conclusion and Future Scope

- List of Publications / Copyright / Patent
- References
- Appendices (if applicable)