



K.K. Wagh Institute of Engineering Education and Research, Nashik
Curriculum
Final Year B.Tech.
Information Technology
w.e.f.: AY 2026-2027
(2023 Pattern)



K.K.Wagh Institute of Engineering Education and Research,Nashik (Autonomous w.e.f. A.Y.2022-23)
Details of Course Structure 2026-27 Year B.Tech. (2023Pattern) Semester: VII

Board of Studies in Information Technology Engineering

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Evaluation Scheme and Marks								Credits				
			TH	TU	PR	In Sem	End Sem	CCE	TU	TW	PR	OR	Total	TH	TU	PR	OR	Total
2308401	PCC	Distributed Computing and System	3	-	-	20	60	20	-	-	-	-	100	3	-	-	-	3
2308402	PCC	Information Storage and Retrieval	3	-	-	20	60	20	-	-	-	-	100	3	-	-	-	3
2308403	PCC	Laboratory Practice - I	-	-	2	-	-	-	-	25	25	-	50	-	-	1	-	1
2308404	PCC	Laboratory Practice – II	-	-	2	-	-	-	-	25	25	-	50	-	-	1	-	1
2308405	PEC	Introduction to DevOps / Software Testing and Quality Assurance/ Data Warehousing and Data Mining	3	-	-	20	60	20	-	-	-	-	100	3	-	-	-	3
2308406	PEC	Blockchain Technology / Human Computer Interaction/ Augmented Reality &Virtual Reality	2	-	-	20	30	-	-	-	-	-	50	2	-	-	-	2
2308407	RM	Research Methodology	3	-	-	20	60	20	-	-	-	-	100	3	-	-	-	3
2308408	HSSM-EEM	Startup and Entrepreneurship	2	-	-	-	-	50	-	-	-	-	50	2	-	-	-	2
2308409	PSI	Project Work	-	-	8	-	-	-	-	100	-	50	150	-	-	-	4	4
Total			16	00	12	100	270	130	-	150	50	50	750	16	-	2	4	22

Elective -		Elective –	
Course Code	Title of Course	Course Code	Title of Course
2308405A	Introduction to DevOps	2308406A	Blockchain Technology
2308405B	Software Testing and Quality Assurance	2308406B	Human Computer Interaction
2308405C	Data Ware Housing and Data Mining	2308406C	Augmented Reality &Virtual Reality



K.K.Wagh Institute of Engineering Education and Research, Nashik (Autonomous w.e.f. A.Y.2022-23)
Details of Course Structure 2026-27 Year B.Tech. (2023 Pattern) Semester :VIII

Board of Studies in Information Technology Engineering

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Evaluation Scheme and Marks								Credits			
			TH	TU	PR	In Sem	End Sem	CCE	TU	TW	PR	OR	Total	TH	TU	OR	Total
2308411	PCC*	Deep Learning	3	-	-	-	60	40**	-	-	-	-	100	3	-	-	3
2308412	PEC*	Natural Language Processing / Business Intelligence and Analytics / Computer Vision/ User Interface and User Experience	3	-	-	-	60	40**	-	-	-	-	100	3	-	-	3
2308413	HSSM-EEM*	Financial Management	2	-	-	-	-	50	-	-	-	-	50	2	-	-	2
2308414	Internship	On-Job Training	-	-	24	-	-	-	-	200	-	100	300	-	-	12	12
Total			8	00	24	-	120	130	-	200	-	100	550	8	-	12	20

* Considering Internship of 6 months, these courses to be offered in online mode.

** Four Written Assignments/LMS Tests of 10 marks each will be conducted at the end of each month and one at the end of semester, when students will report for review/presentation of Internship work.

Elective -	
Course Code	Title of Course
2308412A	Natural Language Processing
2308412B	Business Intelligence and Analytics
2308412C	Computer Vision
2308412D	User Interface and User Experience



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

Final Year B. Tech. Pattern 2023 Semester: VII Information Technology 2308401: Distributed Computing and System			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03 hrs./week		03	Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks
Prerequisite Courses: Operating System, Communication Network, Data Structure and Algorithm			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom's Level
CO1	Demonstrate the core concepts of distributed systems.		2-Understand
CO2	Apply various Inter-process communication methods and analyze different coordination algorithms.		3-Apply
CO3	Demonstrate the application of replication methods to achieve fault tolerance in distributed system environments.		3-Apply
CO4	Analyze the design and functioning of existing distributed file systems, distributed multimedia and distributed web-based systems.		4-Analyze
CO5	Understand various Recent Trends in distributed systems.		2-Understand
COURSE CONTENTS			
Unit I	Introduction to Distributed Systems	(08hrs.)	COs Mapped – CO1
Introduction: Network operating System VS Distributed operating systems, Characteristics, Design goals, challenges of Distributed Systems, Trends in Distributed systems: Pervasive networking and the modern Internet, Mobile and ubiquitous computing, focus on resource sharing Distributed Computing Models: Physical, Architecture and Fundamental models Middleware: Framework, RMI, CORBA, Types of middleware, Distributed computing Environment(DCE) Case Study :XML Based middleware			
Unit II	Inter-Process Communication and Coordination	(08hrs.)	COs Mapped – CO2
IPC: Introduction, Layered protocols, API for internet protocols ,IPC through shared memory, external data representation and marshaling, Types of communication, inter process communication, multicast communication, message-oriented communication, MPI, network virtualization, overlay networks Coordination: Clock synchronization, logical clocks, mutual exclusion, election algorithms, Gossip based coordination Case Study :IBM Web Sphere Message Queuing, kafka, gRPC			
Unit III	Replication and Fault Tolerance	(08hrs.)	COs Mapped – CO3
Replication: Reasons for replication, Replica management—Finding the best server location, Content replication and placement, Content distribution, Managing replicated objects Consistency protocols: Primary based protocols, replicated write protocols, Fault Tolerance: Introduction to fault tolerance, Reliable client server communication, Reliable group communication, distributed commit,			

Recovery—Check pointing, Message logging Case Study: Caching and replication in web			
Unit IV	Distributed Files System, Multimedia and Web Based System	(08hrs.)	COs Mapped – CO4
Distributed Files: Introduction, File System Architecture, Sun Network File System and HDFS. Distributed Multimedia Systems: Characteristics of Multimedia Data, Quality of Service Management, Resource Management Distributed Web Based Systems: Architecture of Traditional Web-Based Systems, Apache Web Server, Web Server Clusters, Communication by Hypertext Transfer Protocol, Synchronization, Web Proxy Caching, Case Study: The Global Name Service, The X.500 Directory Service, Bit Torrent			
Unit V	Recent Trends in Distributed System	(08hrs.)	COs Mapped – CO5
Recent Trends: Introduction, Portable and handheld Devices, Wearable devices, Devices embedded in Appliances, Parallel Virtual Machine (PVM), Jini, Service Oriented Architecture, The Future of Recent Trends Case study: WWW 1.0, 2.0, 3.0, Mach, Chorus.			
Textbooks			
1. Distributed Systems: Concepts and Design by George Coulouris, J. Dolli More and Tim Kindberg, Pearson Education, ISBN: 9789332575226, Fifth edition, 2017 2. Distributed Systems, Maarten van Steen, Andrew S.T, Third edition 3. Andrew S. Tanenbaum, Maarten van Steen, PHI, Second edition, ISBN: 978-0130888938 4. Distributed Operating Systems: Concepts and Design P.K. Sinha, PHI, ISBN: 978-0780311190			
Reference Books			
1. Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University 2. Distributed Computing, Fundamentals, Simulations and Advanced topics, Second edition			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1 & 2 and Unit-5	6
2	One Test on Unit 3 & 4	4
3	LMS Test on each Unit	10
	Total	20



K. K. Wagh Institute of Engineering Education and Research, Nashik
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Final Year. B. Tech. Pattern 2023 Semester: VII Information Technology 2308402: Information Storage and Retrieval			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03 hrs./week		03	Continuous Comprehensive Evaluation: 20 Marks InSem Exam: 20 Marks EndSem Exam: 60 Marks
Prerequisite Courses: Data Structure and Algorithm, Database Management Systems			
Course Outcomes: On completion of the course, students will be able to–			
	Course Outcomes		Bloom’s Level
CO1	Understand the concept of Information retrieval and study various clustering techniques in Information retrieval.		2-Understand
CO2	Apply an indexing approach for retrieval of text and multimedia data.		3-Apply
CO3	Evaluate performance of information retrieval systems.		3-Apply
CO4	Apply the concepts of multimedia and distributed information retrieval.		3-Apply
CO5	Use appropriate tools in analyzing the web information		3-Apply
COURSE CONTENTS			
Unit I	Introduction to Information Retrieval	(08 hrs.)	COs Mapped – CO1
Basic Concepts of IR, Data Retrieval & Information Retrieval, Text mining and IR relation, IR system block diagram, Automatic Text Analysis: Luhn's ideas, Conflation Algorithm, Indexing and Index Weighting, Probabilistic Indexing, Automatic Classification. Measures of Association, Different Matching Coefficients, Cluster Hypothesis, Clustering Techniques: Rocchio’s Algorithm, Single pass algorithm Single Link algorithm. Case study on Google Search or PubMed IR systems for practical understanding.			
Unit II	Indexing and Searching Techniques	(08 hrs.)	COs Mapped – CO2
Indexing: Inverted file, Suffix trees & suffix arrays, Signature Files, Scatter storage or hash Addressing Searching Techniques: Boolean search, sequential search, Serial search, cluster-based retrieval, Query languages, Types of queries, Patterns matching, structural queries. IR Models: Basic concepts, Boolean Model, Vector Model, Probabilistic Model.			
Unit III	Evaluation and Visualization of Information Retrieval System	(08 hrs.)	COs Mapped – CO3
Performance evaluation: Precision and recall, MRR, F-Score, NDCG, user-oriented measures. Visualization in Information System: Starting points, Query Specification, document context, User relevance judgment, Interface support for search process			
Unit IV	Distributed and Multimedia IR	(07 hrs.)	COs Mapped – CO4
Distributed IR: Introduction, Collection Partitioning, Source Selection, Query Processing,			

Multimedia IR: Introduction, Data Modelling Query Language, Background-Spatial Access Method, A Generic Multimedia Indexing Approach, One Dimensional Time Series, Two-Dimensional color Images, Automatic Feature Extraction, Trends and Research Issue.			
Unit V	Web Searching and Advanced Information Retrieval	(07 hrs.)	COs Mapped – CO5
Introduction, Challenges, Web Characteristics, Search Engines: Centralized Architecture, Distributed Architecture, User Interfaces, Ranking, Crawling the web, Indices, Browsing, Meta-searchers, Searching using Hyperlinks, Trends and Research Issues, Introduction to Web Scraping: Python for web scraping, Request, HTML parsing, BeautifulSoup.XML Retrieval Basic XML concepts, Challenges in XML retrieval, Vector space model for XML retrieval, Recommendation system: Collaborative Filtering and Content Based Recommendation of Documents and Products. Introduction to Semantic Web. The web scraping for Selenium and Scrapy to handle dynamic websites.			
Textbooks			
1. Ricardo Baeza-Yates, Berthier Riberio-Neto, Modern Information Retrieval, Pearson Education, ISBN: 81 297-0274-6. 2. C.J. Rijsbergen, Information Retrieval, (www.dcs.gla.ac.uk), Second edition ISBN: 978-408709293. 3. Ryan Mitchell, Web Scraping with Python, O'Reilly, second Edition, ISBN: 9781491985571. 4. Ricci F, Rokach L, Shapira B, Kantor P, Recommender Systems Handbook, Springer, ISBN: 978-0-387-858197. 5. Norbert Fuhr, Mounia almas, Saadia Malik, Gabriella Kazai, Advances in XML Information Retrieval and Evaluation, Springer New York Publisher.			
Reference Books			
1. Chabane Djeraba, Multimedia mining: A highway to intelligent multimedia documents, Kulwer Academic Publisher, ISBN: 1-4020-7247-3. 2. V. S. Subrahmanian, Satish K. Tripathi, Multimedia information System, Kulwer Academic Publisher. 3. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze, An Introduction to Information Retrieval, Cambridge University Press, 2008. 4. David Grossman, Ophir Frieder, Information Retrieval - Algorithms and Heuristics, Springer International Edition, ISBN: 978-1-4020-3004-8. 5. Robert Korfhage, Information Storage and Retrieval, John Wiley & Sons, First Edition, ISBN: 9788126507702.			
Guidelines for Continuous Comprehensive Evaluation of Theory Course			
Sr.No.	Components for Continuous Comprehensive Evaluation	Marks Allotted	
1	Two Assignments on Unit-1&2, Unit5	06	
2	One Test on Unit-3&4	04	
3	LMS Test on each Unit	10	
	Total	20	



K. K. Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VII - Information Technology 2308403: Laboratory Practice-I		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical: 02 hrs./week	01	Term work: 25 Marks Practical: 25 Marks
Prerequisite Courses: Basics of Computer Networks and Programming languages C++, Java		
Course Outcomes: On completion of the course, students will be able to		
CO	Course Outcome	Bloom's Level
CO1	Demonstrate Knowledge of the core concept in Distributed System	3- Apply
CO2	Learn how to apply principles of state-of-art Distributed system in practical	3- Apply
CO3	Design, build and test application program on Distributed system.	3- Apply
CO4	Understand information retrieval concepts and study various clustering techniques and apply tools to analyze web data and extract image features and static website.	4- Analyze
CO5	Apply indexing to retrieval text and multimedia data. Analyze and evaluate the performance of information retrieval system .	3- Apply
List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Implement multi-threaded client/server Process communication using RMI.	CO1
2	Develop any distributed application using CORBA to demonstrate object brokering. (Calculator or String operations).	CO2
3	Develop a distributed system, to find sum of N elements in an array by distributing N/n elements to n number of processors using MPI or OpenMP. Demonstrate by displaying the intermediate sums calculated at different processors.	CO2
4	Implement Berkeley algorithm for clock synchronization and Bully and ring algorithms for leader election	CO2
5	Create a simple web service and write any distributed application to consume the web service.	CO3

Information Storage and Retrieval: List of Laboratory Experiments/Assignments		
6	Implement a conflation algorithm to generate document representations and implement the single-pass clustering algorithm on 4–5 text files using Python libraries such as scikit-learn or NLTK and Integrate a small hands-on lab component using real-world datasets (e.g., news articles, product descriptions).	CO4
7	Implement document retrieval using inverted files, demonstrate hands on indexing and search with Elastic search or Apache Lucene, and showcase Boolean and vector-based search using simple Python scripts with Whoosh.	CO5
8	Implement a program using real datasets to calculate Precision, Recall, F-measure, E-measure, and NDCG for query q1 with relevant documents Rq1 in Python or Excel. Also, provide a brief overview of A/B testing for evaluating IR interfaces and include user feedback examples from platforms like Amazon or Netflix.	CO5
9	Implement a program for feature extraction (e.g., color, texture) from 2D images, extract features from an input image, plot Feature histograms and use modern visualization tool like Helical Insight, Plotly, Tableau, or Matplotlib. Develop a CBIR(Content-Based Image Retrieval) system using sample images with OpenCV or Jupyter Notebook, and highlight use cases such as Spotify's music search and YouTube video retrieval and Use OpenCV and Image Hash for basic content-based image retrieval demonstrations.	CO5
10	Write a Python program to fetch live weather reports (temperature, wind speed, description) for a given city, and build a web crawler to extract product details and links from an e-commerce site	CO4
11	Design a hands-on assignment to develop a simple search engine for a static website using Python	CO4
Guidelines for Student's Lab Journal		
- Students should submit term work in the form of journals. The Journal consists of prologue, certificate, table of contents, handwritten write-up of each assignment (Title, Objectives, Problem Statement, Theory concept, Outcomes, Conclusion), and printouts of the code written using coding standards, sample test cases etc. To support Go-green, printouts should be asked to any 2 students from each batch. However, all students must submit the soft copy in the form CD/DVD and should be maintained by the batch teacher. - Oral Examination will be based on the ISR theory and practical assignments. - Students are expected to know the theory involved in the experiment. - The oral examination should be conducted if and only if the journal of the candidate is complete in		

5. All respects and certified by concerned faculty and head of the department.
6. All the assignments mentioned in the list must be conducted.



K. K. Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VII - Information Technology 2308404: Laboratory Practice – II		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical: 02 hrs./week	01	Term work: 25 Marks Practical: 25 Marks
Prerequisite Courses: Basics of Computer Networks and Programming languages C++, Java		
Course Outcomes: On completion of the course, students will be able to		
CO	Course Outcome	Bloom's Level
CO1	Design responsive web pages using HTML, CSS, and Bootstrap.	3- Apply
CO2	Apply client-side scripting using JavaScript for form validation and dynamic content.	3- Apply
CO3	Develop server-side programs using PHP/Node.js/Python for database interactions.	4- Analyse
CO4	Implement database connectivity and perform CRUD operations.	4- Analyse
CO5	Develop and deploy a basic smart contract using Solidity.	3- Analyse
CO6	Integrate web application components and deploy the system with proper documentation.	6- Create
List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	(a) Design a professional Department Information webpage using HTML5 semantic tags. The webpage should include department overview, faculty, laboratories, vision & mission, and contact information using appropriate headings, paragraphs, and lists. (b) Apply suitable text formatting, colors, font styles, lists, and hyperlinks. Add images, multimedia, internal/external links, and navigation within the webpage. (c) Ensure the webpage follows HTML5 standards with proper semantic structure and accessibility guidelines. Validate the webpage using an online HTML validator. (d) Debugging Challenge: Identify and fix at least 10 HTML errors (broken links, missing tags, invalid nesting, duplicate IDs, missing alt text, etc.) provided by the instructor.	CO1
2	(a) Design a professional class timetable using HTML tables with rowspan, colspan, captions, and proper table formatting. Display university infrastructure information in a structured	CO1

	layout. (b) Redesign the same webpage using <div> and elements instead of table-based layouts. Embed audio, video, and other multimedia content. (c) Develop a responsive page layout with header, navigation, content area, sidebar, and footer using HTML and CSS. (d) Debugging Challenge: Correct layout issues related to table structure, alignment, rowspan/colspan, and broken page formatting.	
3	(a) Develop an interactive registration form with JavaScript validation for all input fields. Display meaningful error messages and prevent invalid form submission. (b) Implement DOM manipulation features such as dynamic content updates, theme switching, countdown timer, hidden sections, and text formatting. (c) Use JavaScript events to improve user interaction and provide real-time feedback during data entry. (d) Debugging Challenge: Identify and fix logical, event-handling, validation, and DOM manipulation errors in the provided JavaScript program.	CO2
4	Create a dynamic Event Explorer using JavaScript arrays/JSON objects. Display event cards dynamically and provide functionalities such as keyword search, category filter, date filter, sorting, and "No Results Found" handling. Ensure all updates occur without refreshing the webpage.	CO2
5	Connect the registration form to the backend and store user data in the database (MySQL/MongoDB).	CO3
6	Develop an admin login page and dashboard where the admin can manage event details (CRUD operations).	CO3
7	Develop and deploy a basic smart contract using Solidity.	CO5
8	Deploy the web application on a local or cloud server (optional: GitHub Pages, Heroku) and prepare detailed documentation and a demo video.	CO6
Guidelines for Student's Lab Journal		
1. The laboratory assignments are to be submitted by students in the form of a journal. 2. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory Concepts in brief, algorithm, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.		
Guidelines for Term work Assessment		
1. Continuous assessment of laboratory work shall be based on the overall performance of a student. 2. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10).		



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

Final Year B.Tech.			
Pattern 2023 Semester: VII Information Technology			
2308405A:Introduction to DevOps			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03hrs./week		03	Continuous Comprehensive Evaluation:20Marks InSemExam:20Marks EndSem Exam:60Marks
Prerequisite Courses: Software Engineering and Project Management			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom'sLevel
CO1	Understand the fundamental concepts of DevOps.		2-Understand
CO2	Link the background of DevOps with other technologies.		3-Apply
CO3	Comprehend the concept of continuous integration and continuous delivery.		2-Understand
CO4	Compare various stages of continuous deployment and test strategies.		4-Analyze
CO5	Justify the importance of monitoring systems, reliability engineering and modern DevOps tools.		5-Evaluate
COURSE CONTENTS			
UnitI	Introduction to DevOps and the Culture	(08hrs.)	CO Mapped-CO1
What is DevOps? Role of DevOps Engineer, Developer responsibility, Introduction to Continuous Integration and Continuous Delivery Policies, DevOps Culture: Dilution of barriers in IT departments, Process automation, Agile Practices, Reason for adopting DevOps, What and who are involved in DevOps? Changing the Coordination, Introduction to DevOps pipeline phases, Defining the Development Pipeline, Centralizing the Building Server, Monitoring Best Practices, Best Practices for Operations.			
Unit II	Microservices Architecture and Cloud Native Development	(07hrs.)	CO Mapped-CO2
Monolithic applications, Introduction to micro service architecture, Implementing a micro services Architecture, Pros and Cons, Characteristics of micro service architecture, Monolithic applications and micro services compared, micro services best practices, Deployment strategies, Introduction to cloud computing, cloud computing deployment models, service models, why to use cloud.			
Unit III	Continuous Integration and Test-Driven Development	(07hrs.)	CO Mapped - CO3
Introduction to continuous integration, time to market and quality, Build in a Continuous Integration Scenario, Code Repository Server, Continuous Integration Server, Introduction to Continuous Delivery and chain, Differentiate Continuous Integration and Continuous Delivery, Strategies for Continuous Delivery, Building Continuous Integration and Continuous Delivery Pipelines, Continuous Database Integration, Preparing the Build for Release, Identifying the			

Code in the Repository, Creating Build Reports, Putting the Build in a Shared Location, Releasing the Build			
Unit IV	Continuous Deployment and Orchestration	(07hrs.)	CO Mapped - CO4
Implementing a testing Strategy: Types of Tests, Integration testing, managing defect backlogs, what is Continuous Deployment? Changes moving through the deployment pipeline, Trade-offs in the deployment pipeline, Basic Deployment pipeline, Deployment pipeline practices & Commit stage, Automated Acceptance Test Gate, Subsequent test stages, preparing to release, Implementing a deployment pipeline.			
Unit V	Continuous Monitoring and Site Reliability DevOps Case Studies	(07hrs.)	CO Mapped - CO5
What is a monitoring system? Factors involved in monitoring systems, why monitoring is important, white-box and black-box monitoring, building a monitoring system, monitoring infrastructure and applications. SRE and DevOps, roles, and responsibilities of SRE, common tools used by SREs, Continuous Development/ Version Control: Git, Serverless orchestration: Case Study: Kubernetes, Container Technology: Docker, Continuous Integration: Jenkins, Continuous delivery: Jenkins, Continuous Deployment: Ansible, Continuous Testing: Selenium, Monitoring: Prometheus, Bug tracking tool: Jira			
Text books			
1. PierluigiRiti, “Pro DevOps with Google Cloud Platform”, Apress, ISBN: 978-1-4842-3896-7 2. Katrina Clokie, “A Practical Guide to Testing in DevOps”, Lean Publishing published on 2017-08-01 3. Jez Humble and David Farley, “Continuous Delivery”, Pearson Education, Inc, ISBN: 978–0–321–60191–9			
Reference Books			
1. Jennifer Davis and Katherine Daniels, “Effective DevOps: Building a Culture of Collaboration, Anity, and Tooling at Scale”, O’Reilly Media, Inc., ISBN: 978-1-491-92630 2. Sanjeev Sharma and Bernie Coyne, “DevOps for Dummies”, John Wiley & Sons, Inc., 2nd IBM Limited Edition, ISBN: 978-1-119-04705-6 3. Viktor Farcic, “The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline with Containerized Microservices”			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr.No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1&2,Unit5	06
2	One Test onUnit-3&4	04
3	LMS Test on each Unit	10
	Total	20



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VII Information Technology 2308405B: Software Testing and Quality Assurance			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03 hrs./week		03	Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks
Prerequisite Courses: - Software Engineering and Project Management			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom's Level
CO1	Test the software by applying testing techniques to deliver a product free from bugs.		3-Apply
CO2	Investigate the scenario and select the proper testing technique.		3-Apply
CO3	Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.		3-Apply
CO4	Understand how to detect, classify, prevent and remove defects.		2-Understand
CO5	Choose appropriate quality assurance models and develop quality.		2-Understand
COURSE CONTENTS			
Unit I	Software Testing Basics	(07hrs.)	COs Mapped – CO1
Testing as an engineering activity, Role of process in software quality, Testing as a process, Basic definitions, Software testing principles, The tester's role in a software development organization, Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer / Tester support for developing a defect repository. Case Study: Detect tracking tool, JIRA			
Unit II	Testing Techniques &Levels of Testing	(08hrs.)	COs Mapped – CO2
Using White Box Approach to Test design - Static Testing Vs. Structural Testing, Code Functional Testing, Coverage and Control Flow Graphs, Using Black Box Approaches to Test Case Design, Random Testing, Requirements based testing, Decision tables, State-based testing, Cause-effect graphing, Error guessing, Compatibility testing, Levels of Testing -Unit Testing, Integration Testing, Defect Bash Elimination. System Testing - Usability and Accessibility Testing, Configuration Testing, Compatibility Testing. Application using postman			
Unit III	Software Test Automation & Quality Metrics	(08hrs.)	COs Mapped – CO3

Software Test Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Requirements for a Test Tool, Challenges in Automation Tracking the Bug, Debugging. Testing Software System Security - Six-Sigma, TQM - Complexity Metrics and Models, Quality Management Metrics, Availability Metrics, Defect Removal Effectiveness, FMEA, Quality Function Deployment, Taguchi Quality, Automated framework design pattern: TDD, BDD, Hybrid framework function. Case study: selenium, Cypress, playwright.			
Unit IV	Fundamentals of Software Quality Assurance	(07hrs.)	COs Mapped – CO4
SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools.			
Unit V	Software Quality Assurance Models & Trends	(08hrs.)	COs Mapped – CO5
Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P-CMM. Software Process- PSP and TSP, OO Methodology, Clean-room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools, and their Effect on Software Quality. Agile, DevOps practices			
Textbooks			
1. Srinivasan Desikan, Gopalaswamy Ramesh, Software Testing: Principles and Practices Pearson 2. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Pearson Addison Wesley			
Reference Books			
1. Aditya P. Mathur, Foundations of Software Testing, Pearson 2. Paul Ammann, Jeff Offutt, Introduction to Software Testing, Cambridge University Press 3. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Auerbach Publications			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr.No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two AssignmentsonUnit-1&2,Unit5	06
2	OneTestonUnit-3&4	04
3	LMS Test on each Unit	10
	Total	20



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VII Information Technology 2308405C: Data Warehouse & Data Mining					
Teaching Scheme:		Credit Scheme:		Examination Scheme:	
Theory:03 hrs./week		03		Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks	
Prerequisite Courses: Database Management System					
Course Outcomes: On completion of the course, students will be able to					
	Course Outcomes			Bloom's Level	
CO1	Understand relational and object-oriented databases..			2-Understand	
CO2	Learn and understand of parallel & distributed database architectures.			2-Understand	
CO3	Learn the concepts of NoSQL Databases..			3-Apply	
CO4	Understand data warehouse and OLAP technologies			2-Understand	
CO5	Apply data mining algorithms and to learn various software tools.			3-Apply	
COURSE CONTENTS					
Unit I	Database Models and Advanced Database Concepts		(08hrs.)	COs Mapped – CO1	
Relational model concepts, Relational model constraints and relational database schemas, Update operations, anomalies, dealing with constraint violations, Types and violations. Overview of Object- Oriented Concepts – Objects, Basic properties. Advantages, examples, Abstract data types, Encapsulation, class hierarchies, polymorphism examples.					
Unit II	Parallel and Distributed Databases		(08hrs.)	COs Mapped – CO2	
Introduction to Parallel Databases, Architectures for parallel databases, Parallel query evaluation, Parallelizing individual operations, Parallel query optimizations. Introduction to distributed databases, Distributed DBMS architectures, storing data in a Distributed DBMS, Distributed catalog management, Distributed Query processing, Updating distributed data, Distributed transactions, Distributed Concurrency control and Recovery.					
Unit III	Data Warehousing and OLAP		(08hrs.)	COs Mapped – CO3	
Architectures and components of data warehouse, Characteristics and limitations of data warehouse, Data warehouse schema (Star, Snowflake), OLAP Architecture (ROLAP/MOLAP/HOLAP), Introduction to decision support system, Views and Decision support. Introduction to Data Mining, KDD seven step process, Architecture of data mining,					

Introduction to predictive and descriptive algorithms, Data mining software and applications			
Unit IV	Metadata, Data Mart and Partitioning Strategy	(08hrs.)	COs Mapped – CO4
Meta Data , Categories of Metadata , Role of Metadata – Metadata Repository , Challenges for Meta Management , Data Mart ,Need of Data Mart, Cost Effective Data Mart, Designing Data Marts, Cost of Data Marts, Partitioning Strategy , Vertical partition , Normalization ,Row Splitting , HorizontalPartition			
Unit V	Data Mining Concepts, Algorithms and Tools	(08hrs.)	COs Mapped – CO5
KDD process, Data Mining architecture, Classification techniques, Clustering techniques, Association rule mining, Predictive and Descriptive data mining algorithms, Data mining software tools and applications.			
Textbooks			
1.Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008. 2.Ralph Kimball, “The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling”, Third edition, 2013.			
Reference Books			
1. Paul Raj Ponniah, “Data warehousing fundamentals for IT Professionals”, 2012. 2.K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1& 2 and Unit-5	6
2	One Test on Unit 3 & 4	4
3	LMS Test on each Unit	10
	Total	20



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester VII: Information Technology 2308406A:Blockchain Technology					
Teaching Scheme:		Credit Scheme:		Examination Scheme:	
Theory:02hrs./week		02		InSem Exam: 20Marks EndSem Exam: 30Marks	
Prerequisite Courses: Communication Network, Cyber Security					
Course Outcomes: On completion of the course, students will be able to					
	Course Outcomes				Bloom's Level
CO1	Explain the fundamentals of Blockchain, decentralized systems, and cryptography in Blockchain.				2-Understand
CO2	Explain the fundamentals of cryptocurrencies, Bitcoin, and Blockchain transactions.				2-Understand
CO3	Acquire knowledge of Ethereum Blockchain platform.				3-Apply
CO4	Understand hyper ledger fabric platform.				3-Apply
CO5	Describe Blockchain security, scalability, and its applications in various domains.				2-Understand
COURSE CONTENTS					
Unit I	Introduction to Blockchain Technology			(06hrs.)	COs Mapped – CO1
Introduction to Centralized and Decentralized system: Security, Integrity, and Privacy Issues. What is Blockchain, Evolution, Characteristics of Blockchain, Introduction to cryptography, Use of cryptography in Blockchain, Types of Blockchain , Components, Blocks in Blockchain, Risks and Limitations and Benefits of Blockchain in various scenarios.					
Unit II	Cryptocurrency			(06hrs.)	COs Mapped – CO2
Cryptocurrency basics, Characteristics of Cryptocurrency, Crypto wallet, Types of Cryptocurrency, Cryptocurrency usage, What is Bitcoin, Mechanics of Bitcoin, Bitcoin transaction, Bitcoin Blockchain, Bitcoin mining, Bitcoin and Cryptocurrency.					
Unit III	Blockchain Platforms: Ethereum			(06 hrs.)	COs Mapped – CO3
Introduction to Blockchain Platform, What is Ethereum, Ethereum feature, Components of Ethereum Ecosystem, Ethereum Programming Languages, Runtime Byte Code, Blocks and Blockchain, How Smart Contracts Work. Introduction to Solidity, Basic Structure of a Solidity Program, Variables and Data Types. Introduction to Tokenization: What is token, Technology behind tokenization, How Blockchain tokenization can help in enterprise systems, Challenges to tokenization.					

Unit IV	Blockchain Platforms: Hyperledger	(05 hrs.)	COs Mapped – CO4
What is Hyperledger, features, Benefits, Components of Hyper ledger Fabric network, Creating Hyperledger environment on windows, Security aspects in Hyperledger Fabric, Differences Between Ethereum and Hyperledger.			
Unit V	Security and Applications of Blockchain	(05 hrs.)	COs Mapped – CO5
Security and privacy challenges of Blockchain, Security aspects in Bitcoin, Performance and scalability, Safeguarding Blockchain smart contract. Applications of Blockchain: Blockchain in banking and finance, Blockchain in Health Insurance, Blockchain in real-estate.			
Textbooks			
1. Imran Bashir, “Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks”, Packt Publishing Limited, ISBN-13: 978-1787125445 2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies”, Princeton University Press, ISBN: hardcover: 9780691171692 eBook: 9781400884155 3. Chandramouli Subramanian, Asha A George, Abhilash K A and MeenaKarthikeyan, “BlockchainTechnology”,Universities Press,ISBN 978-93-89211-63-4			
Reference Books			
1. Kumar Saurabh, AshutoshSaxena, “Blockchain Technology: Concepts and Applications”, Wiley publication, First Edition, ISBN: 978-8126557660 2. Melanie Swan, “Blockchain Blueprint for a New Economy”, O'Reilly Media, Print ISBN: 9781491920497, 1491920491eText ISBN: 9781491920459, 1491920459			
E Books / E Learning References			
1. BLOCKCHAIN, Cybrosys Limited Edition, E-book https://www.studocu.com/co/document/universidad-eia/calculo-integral/cybrosys-limitededition-e-book-criptomonedas/14736261 2. Online Course by NPTEL https://nptel.in/courses/106104220 https://drive.google.com/file/d/1PtYaDmWYaqPVGjKDnMYGWO5eoI5wMPtJ/view			



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester VII: Information Technology 2308406B :Human Computer Interaction					
Teaching Scheme:		Credit Scheme:		Examination Scheme:	
Theory:02hrs./week		02		InSem Exam: 20Marks EndSem Exam: 30Marks	
Prerequisite Courses: -					
Course Outcomes: On completion of the course, students will be able to					
	Course Outcomes			Bloom's Level	
CO1	Explain importance of HCI study and principles of user-centered design (UCD) approach.			2-Understand	
CO2	Develop understanding of human factors in HCI design.			2-Understand	
CO3	Develop understanding of models, paradigms, and context of interactions. .			2-Understand	
CO4	Design effective user-interfaces following a structured and organized UCD process.			2-Understand	
CO5	Evaluate usability of a user-interface design.			3-Apply	
COURSE CONTENTS					
Unit I	Introduction and Understanding the Human Interaction			(05hrs.)	COs Mapped – CO1,CO2
What is HCI?, Disciplines involved in HCI, Why HCI study is important? The psychology of everyday things Donald A. Norman, Principles of HCI, User-centered Design. Measurable Human factors. Input-output channels, Human memory, Human emotions, Individual differences, Psychology. Ergonomics, Human errors, Models of interaction, Paradigms of Interactions, Interaction styles, Interactivity, Context of interaction, User experience..					
Unit II	HCI Models and Theories			(07hrs.)	COs Mapped – CO3
User Profiles, categorization of users, Goal and task hierarchy model, Linguistic model, Physical and device models, GOMS, Norman's 7 stage model, Cognitive architectures, Hierarchical task analysis (HTA), Uses of task analysis, Diagrammatic dialog design notations.					
Unit III	Design Process			(06 hrs.)	COs Mapped – CO3
Design Rules : Principles that support usability, Design standards, Design Guidelines, What is interaction design?, The software design process, User focus, Scenarios, Navigation Design, Screen Design, Prototyping techniques, Wire-Framing, Understanding the UI Layer and Its Execution Framework, Model-View-Controller(MVC) Framework					

Unit IV	HCI Guidelines and Evaluation Techniques	(06 hrs.)	COs Mapped – CO4
Using toolkits, User interface management system (UIMS), Goals of evaluation, Categorization of Evaluation techniques, Choosing an Evaluation Method. DECIDE, Heuristic Evaluation, cognitive walk through, Usability testing			
Unit V	Future Trends	(06 hrs.)	COs Mapped – CO5
Ubiquitous Computing, Design thinking, Finding things on web, Augmented Reality, Virtual Reality , Challenges in designing interfaces for smart homes, smart devices, handheld devices, smart wristwatch, Future of HCI			
Text books			
1. Alan Dix (2008). Human Computer Interaction. Pearson Education. ISBN 978-81-317-1703-5. 2. Ben Shneiderman; Catherine Plaisant; Maxine Cohen; Steven Jacobs (29 August 2013). 3. Designing The User Interface: Strategies for Effective Human-Computer Interaction. Pearson Education Limited. ISBN 978-1-292-03701-1.			
Reference Books			
1 .Gerard Jounghyun Kim (20 March 2015). Human–Computer Interaction: Fundamentals and Practice. CRC Press. ISBN 978-1-4822-3390-2. 2. Donald A. Norman (2013). The Design of Everyday Things Basic Books. ISBN 978-0-465-07299-6. 3. Jeff Johnson (17 December 2013). Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Guidelines. Elsevier. ISBN 978-0-12-411556-9. 4. Alan Cooper; Robert Reimann; David Cronin; Christopher Noessel (13 August 2014). About Face:The Essentials of Interaction Design. Wiley. ISBN 978-1-118-76658-3			
E Books / E Learning References			
1. https://developer.android.com/guide/practices/ui_guidelines/index.html 2. iOS Human Interface Guidelines -- https://developer.apple.com/ios/human-interfaceguidelines/overview/design-principles/ 3. MacOS Human Interface Guidelines ---- https://developer.apple.com/library/content/documentation/UserExperience/Conceptual/OSXHIGuidelines/ 4. www.baddesigns.com			



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VII Information Technology 2308406C: Augmented Reality & Virtual Reality					
Teaching Scheme:		Credit Scheme:		Examination Scheme:	
Theory:02 hrs./week		02		InSem Exam: 20Marks EndSem Exam: 30Marks	
Prerequisite Courses: Computer Graphics					
Course Outcomes: On completion of the course, students will be able to					
	Course Outcomes				Bloom's Level
CO1	Analyze how Virtual Reality systems work.				2-Understand
CO2	Understand the representation of Virtual world				2-Understand
CO3	Describe the importance of motion and tracking in VR systems.				3-Apply
CO4	Analyze how AR systems work and list the applications of AR				2-Understand
CO5	Identify the working of various AR components and AR devices.				2-Understand
COURSE CONTENTS					
Unit I	Introduction to Virtual Reality			(08hrs.)	COs Mapped – CO1
Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality					
Unit II	Representing the Virtual World in VR			(08hrs.)	COs Mapped – CO2
Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR, Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations					
Unit III	Visual Perception, Motion and Tracking in VR			(07hrs.)	COs Mapped – CO3
Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models. Motion in Real and Virtual Worlds, Tracking- Tracking 2D & 3D Orientation					
Unit IV	Introduction to Augmented Reality			(07hrs.)	COs Mapped – CO4
What Is Augmented Reality - Defining Augmented Reality, history of augmented reality, The					

Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience, Applications of Augmented Reality			
Unit V	Augmented Reality Components and Devices	(07hrs.)	COs Mapped – CO5
Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion. Types of AR devices			
Textbooks			
1.Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016 2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)”. Morgan Kaufmann Publishers, San Francisco, CA, 2002 3. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494			
Reference Books			
1. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009. 2. Burdea, Grigore C and Philippe Coiffet, “Virtual Reality Technology”, Wiley Interscience, India, 2003. 3. SanniSiltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0			



K. K. Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester VII: Information Technology 2308407: Research Methodology			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03 hrs./week		03	Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks
Prerequisite Courses: -			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom's Level
CO1	Understand the foundational concepts, nature, objectives, and processes of research, including key terminologies and research metrics.		2-Understand
CO2	Apply techniques to formulate a research problem through effective literature review, problem identification, and synthesis of scholarly sources.		3-Apply
CO3	Apply appropriate research design, sampling strategies, and scaling techniques to support empirical investigations.		3-Apply
CO4	Apply data collection methods, design structured questionnaires, and perform basic statistical analysis to interpret research data.		3-Apply
CO5	Understand the structure and methodology for developing research proposals, writing research papers, and preparing technical reports using standard conventions.		2-Understand
COURSE CONTENTS			
Unit I	Introduction to Research Methodology	(07hrs.)	COs Mapped – CO1
Introduction: Definition of Research, Characteristics of Research, Objectives of Research, Nature of Research, Importance of Research, Relevance of Research, Restrictions in Research, Research Process, Difference between Research Method and Research Process Literature: Primary, Secondary and Tertiary sources, Problem identification, Scholarly databases, Types of research papers. Research Metrics: Journal level Metrics and Author level metrics, Publication Identifiers, Abstracting Databases and Publishers. Terminology: Conference, Symposium, Congress, Seminar, Workshop, Colloquium, Patents.			
Unit II	Defining and Formulating a Research Problem	(07hrs.)	COs Mapped – CO2
Literature Review: Importance of a literature review, Functions of a literature Review, Process of a literature review, how to write a literature review, Types of sources for review. Concept of a Research Problem: The need for defining a research problem, Conditions and component of a research problem, identifying a research problem, Formulating a research			

problem.			
Unit III	Research Design, Sampling and Scaling	(08hrs.)	COs Mapped – CO3
Research Design: The need and features of research design, types of research design: research design for formulative research studies, research design for descriptive studies, research design for experimental studies, the components of research design. Sampling: concept, census versus sample survey, sampling design process, characteristics of a good sample design, determining sample size, errors in measurement and sampling errors, non-sampling errors, methods of sampling. Scaling: measurement scales, developing measurement tools, basic criteria of a good measurement tool, types of scaling techniques, bases of scale classification, techniques of scale construction.			
Unit IV	Data Collection, Questionnaire Design and Data Analysis	(08hrs.)	COs Mapped – CO4
Data Collection Techniques: Types of data, methods of primary data collection, methods of secondary data collection, factors affecting the selection of data collection methods. Questionnaire Designing: features of a well-designed questionnaire, errors in responses, steps of questionnaire designing, designing of an effective questionnaire. Data Analysis: concept of data processing, measures of central tendency, measures of dispersion, measures of skewness, measures of relationship, different charts used in data analysis.			
Unit V	Research Proposal, Research Paper and Research Report Writing	(08hrs.)	COs Mapped – CO5
Research Proposal: contents, objectives of the study, study design, problems and limitations. Research Paper:writing research papers, formatting, appendices, citation formats and style, general conventions, issues, plagiarism and copyrights, reference managers. Research Report: written report, oral presentations, integral parts of a report, use of research writing tools.			
Textbooks			
1. Research Methodology: A Step-by-Step Guide for Beginners Author: Ranjit Kumar Publisher: SAGE Publications 2. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches Authors: John W. Creswell and J. David Creswell Publisher: SAGE Publications			
Reference Books			
1. Kothari, C.R., 2004. Research methodology: Methods and techniques. New Age International 2. Research Methods in the Behavioural Science -Festinger L.and KatzD. 3. Foundation of Behavioural Research -KerlingerF.N.			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 & 4	04
3	LMS Test on each Unit	10
	Total	20



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester:VII Information Technology 2308408:Start-up and Entrepreneurship			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:02 hrs./week		02	Continuous Comprehensive Evaluation: 50Marks
Prerequisite Courses: -			
Course Outcomes: On completion of the course, students will be able to–			
	Course Outcomes		Bloom’s Level
CO1	Understand key concepts and framework of innovation and start-up ecosystem.		2-Understand
CO2	Gain knowledge of how to develop start up ecosystem, its key components and how to influence and manage dynamics between them and increase the productivity of ecosystem.		2-Understand
CO3	Understand the role of different stakeholders in ecosystem in building and supporting growth of start-ups.		2-Understand
CO4	Understand fundamental entrepreneurship.		2-Understand
CO5	Understand emerging market trends in entrepreneurship.		2-Understand
COURSE CONTENTS			
Unit I	Start-up Opportunity	(06hrs.)	COs Mapped – CO1
Identify business opportunity with problem identification, market size, existing pains for customers, existing alternatives, customer psychology, willingness to pay, customer segments.			
Unit II	Business Plan	(06hrs.)	COs Mapped – CO2
Value Proposition Canvas, problem-solution fit, brainstorming, feasibility study-types and methods, competition analysis, creating competitive advantage, sustainable differentiation, types of Business models, Lean Canvas, Risky assumptions related to product, market, business and execution capabilities, Minimum viable product, create and iterate, testing of MVP, customer feedback, validate risky assumptions, solution-market fit			
Unit III	Functional and Marketing Plan	(06hrs.)	COs Mapped – CO3
Manpower, Sales, Expenses, profitability projections, reality check, Funding plan, Pitch deck, Marketing Strategies: Importance of brand and branding strategy, positioning, market penetration strategy/plan, digital marketing, use of social media, customer acquisition Use of technology: for business scalability, effective execution, growth plan. case study: evaluation study of start up			
Unit IV	Fundamentals of Entrepreneurship	(06hrs.)	COs Mapped – CO4
Introduction, evolving concept of Entrepreneurship, what is entrepreneurship, Resource Organization and Value creation, entrepreneurial traits, difference between inventors and Entrepreneurs, big companies vs Start-ups misconceptions and myths about entrepreneurship			
Unit V	Entrepreneurship Development in Emerging Markets	(06 hrs.)	COs Mapped – CO5
Types of Start-ups, Intrapreneurship, Entrepreneurship as a career, why one becomes entrepreneur, Why Youth is suited for entrepreneurship, Female Entrepreneurship, small and			

medium business enterprises, international entrepreneurship, Mistakes Start-up make, Managing Start-ups During Downturn.

Textbooks

1. Entrepreneurship: Creating and Leading and Entrepreneurial Organization Arya Kumar, Pearson Education, ISBN: 978-81-317-6578-4
2. Entrepreneurship Ideas in Action, Cynthia L. Greene, Thomson

E Books / E Learning References

1. <https://www.forbes.com/sites/palomacanterogomez/2019/04/10/how-to-frame-a-problem-to-find-the-right-solution/?sh=13af54355993>
2. <https://hbswk.hbs.edu/item/how-entrepreneurs-can-find-the-right-problem-to-solve>
3. https://www.youtube.com/watch?v=6y3Wlrgp_NY
4. <https://hbr.org/2014/07/what-you-need-to-know-about-segmentation>
5. <https://www.youtube.com/watch?v=ReM1uqmVfP0>
6. <https://www.youtube.com/watch?v=w62zW30PKms>
7. <https://www.youtube.com/watch?v=FULiFueLGzE>
8. <https://www.youtube.com/watch?v=7o8uYdUaFR4>
9. <https://steveblank.com/2021/04/20/the-secret-to-the-minimum-viable-product/>
10. <https://www.youtube.com/watch?v=1hHMwLxN6EM>
11. <https://www.youtube.com/watch?v=4uGx14UVWPc>
12. <https://www.youtube.com/watch?v=OVnN4S52F3k>
13. <https://www.entrepreneur.com/article/251687>
14. <https://www.forbes.com/sites/forbesbusinessdevelopmentcouncil/2020/09/14/13-key-steps-to-developing-a-go-to-market-strategy/?sh=53023c476fc1>
15. <https://www.garyfox.co/business-model/business-model-channels/>
16. <https://www.forbes.com/sites/allbusiness/2019/05/25/small-business-websitetips/?sh=2c551a0421ad> Curriculum for Final Year of Information Technology (2019 Course), Savitribai Phule Pune University BE (Information Technology) Syllabus (2019 Course) 87
17. <https://www.forbes.com/sites/forbesagencycouncil/2020/10/08/digital-marketing-best-practices-for-startups/?sh=2e55af9e3de>

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Test on Each Unit 10 Marks	25
2	Presentation	25
	Total	50



K. K. Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VII Information Technology 2308409: Project Work		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 08 hrs./week	04	Term work: 100Marks Oral: 50Marks
Prerequisite Courses: Project Based Seminar		
Course Outcomes: On completion of the course, students will be able to		
	Course Outcomes	Bloom's Level
CO1	Apply engineering and mathematical knowledge to investigate / select proper technology / Algorithm suitable to solve the problem in hand.	3-Apply
CO2	Apply knowledge of statistics for analysis of results and express conclusion and justification for the same.	3-Apply
CO3	Design and conduct experiments, as well as analyze and interpret data or develop prototype model of the application.	4-Analyze
CO4	Communicate effectively.	3-Apply
CO5	Get broad education which is necessary to understand the impact of engineering solutions in a global, economic, environmental, ethically, and societal context.	3-Apply
CO6	Recognition of the need for, and an ability to engage in life-long learning.	3-Apply
COURSE CONTENTS		
Guidelines to Faculty and Students: - There shall be THREE reviews in Project work by the review committee. - The Project Review committee will be responsible for evaluating the timely progress of the projects. It is suggested to evaluate the skills learned by the students in their PBS (in their previous years). - Student needs to justify the Algorithm / Model used for implementation. - Every student of the project group shall make presentation on the progress made by them before the committee during each reviews. Each student/group is required to give presentation as part of review for 10 to 15 minutes followed by a detailed discussion and query session. - Students need to note down the queries raised during review(s) and comply the same in the next review session. - The record of the remarks/suggestions of the review committee (project dairy) should be properly maintained and should be made available at the time of final examination. - Project group needs to present/publish ONE paper. - Paper must be checked for Plagiarism. - Project report must also be checked for Plagiarism. - The examinee will be assessed by a panel of examiners of which one is necessarily an external examiner. The assessment will be broadly based on work undergone, content delivery, presentation skills, documentation, question-answers and report.		

Guidelines for Project Report

It is suggested to have only one Project report which includes work carried at Project Based Seminar as well.

Project report must have:

- i.** Certificate from the institute.
- ii.** Certificate sponsoring organization (If any).
- iii.** Acknowledgement.
- iv.** Abstract.
- v.** Contents.
- vi.** List of Abbreviations (As applicable).
- vii.** List of Figures (As applicable).
- viii.** List of Graphs (As applicable).
- ix.** List of Tables (As applicable).
- 1)** Introduction and aims/motivation and objectives.
- 2)** Literature Survey (with proper citation).
- 3)** Problem Statement/definition.
- 4)** Software Requirement Specification (In SRS Documentation only).
- 5)** Flowchart
- 6)** Project Requirement specification.
- 7)** Proposed system Architecture.
- 8)** High level design of the project (DFD, UML, ER Diagrams).
- 9)** System implementation-code documentation: Algorithm style, Description of detailed methodologies, protocols used etc..as applicable.
- 10)** Test cases.
- 11)** GUI/Working modules and Experimental Results in suitable format.
- 12)** Project Plan.
- 13)** Analysis and Conclusions with future work.
- 14)** Bibliography in IEEE format.

Appendices

- a)** Plagiarism Report of Paper and Project report from any open source tool.
- b)** Base Paper(s) [If any].
- c)** Tools used / Hardware Components specifications [If any].
- d)** Published Papers and Certificates (Both Papers).

Use appropriate plagiarism tools, reference managers, Latex for efficient and effective project writing.

Textbooks

1. UML2 Bible by Tom Pender, Wiley India Pvt. Limited 2011
2. Applying UML and Patterns Second Edition by Craig Larman, Pearson Education
3. UML 2 and the Unified Process, Second Edition, JIM Arlow, Ila Neustadt, Pearson
4. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Pearson
5. Design Patterns in Java Second Edition by Steven John Metsker, Pearson

SEM-VIII



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year. B. Tech. Pattern 2023Semester: VIII - Information Technology 2308411:Deep Learning			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03 hrs./week		03	Continuous Comprehensive Evaluation: 40Marks EndSem Exam:60 Marks
Prerequisite Courses: Machine Learning, Probability and Statistics			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom’s Level
CO1	Understand the theoretical foundations, algorithms, and methodologies of Deep Learning.		2-Understand
CO2	Apply the concepts of Convolution Neural Networks and use of popular CNN architectures.		3-Apply
CO3	Compare Feed Forward Neural Network and Recurrent Neural Network and learn modeling the time dimension using RNN and LSTM.		2-Understand
CO4	Elaborate unsupervised deep learning algorithms like Autoencoders.		2-Understand
CO5	Explore Representation Learning and Transfer Learning techniques using variants of CNN architecture.		3-Apply
COURSE CONTENTS			
Unit I	Fundamentals of Deep Learning	(07hrs.)	COs Mapped – CO1
What is Deep Learning?, Multilayer Perceptron, Feed forward neural, Back propagation, Gradient descent, Vanishing gradient problem, Activation Functions: RELU, LRELU, ERELU, Optimization Algorithms, Hyper parameters: Layer size, Magnitude (momentum, learning rate),Regularization (dropout, drop connect, L1, L2)			
Unit II	Convolution Neural Network	(07hrs.)	COs Mapped – CO2
Introduction to CNN, Convolution Operation, Parameter Sharing, Equivariant Representation, Pooling, Variants of the Basic Convolution Function, The basic Architecture of CNN, Popular CNN Architecture – AlexNet.			
Unit III	Recurrent Neural Network	(08hrs.)	COs Mapped – CO3
Recurrent Neural Networks: Types of Recurrent Neural Networks, Feed-Forward Neural Networks vs Recurrent Neural Networks, Long Short-Term Memory Networks (LSTM), Encoder Decoder architectures, Recursive Neural Networks			
Unit IV	Auto encoder	(08hrs.)	COs Mapped – CO4
Undercomplete Autoencoders, Regularized Autoencoders-Sparse Autoencoders, Stochastic Encoders and Decoders, Denoising Autoencoders, Contractive Autoencoders, Applications of Autoencoders.			
Unit V	Representation Learning	(08hrs.)	COs Mapped – CO5

Greedy Layerwise Pre-training, Transfer Learning and Domain Adaption, Distributed Representation, Variants of CNN: DenseNet, Overview of Deep Learning Applications: Image Classification, Social N/w/ analysis, Speech Recognition, Recommender system, Natural Language Processing.
Textbooks
1. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017 2. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press, 2017 3. Nikhil Buduma, "Fundamentals of Deep Learning Designing Next-Generation Machine Intelligence Algorithms" O'Reilly
Reference Books
1. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2019 2. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012 3. Giancarlo Zaccane, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017 4. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017 5. Francois Chollet "Deep Learning with Python", Manning Publications, 2017

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Written Test/ LMS Test on each unit	40
	Total	40



K. K. Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VIII Information Technology 2308412A: Natural Language Processing			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03 hrs. /week		03	Continuous Comprehensive Evaluation: 40Marks EndSem Exam:60 Marks
Prerequisite Courses: Theory of Computation			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom's Level
CO1	Understand and analyze the natural language text and model.		2-Understand
CO2	Study the natural language syntactically and logically.		2-Understand
CO3	Process the natural language text based on relations and knowledge.		3-Apply
CO4	Evaluate the natural language text using models and apply modeling techniques for automatic document separation and text mining.		3-Apply
CO5	Apply information retrieval techniques.		3-Apply
COURSE CONTENTS			
Unit I	Introduction to NLP	(07hrs.)	COs Mapped – CO1
Overview and language Modeling: Overview: Origins and challenges of NLP- Language and Grammar Processing Indian Languages- NLP Applications Information Retrieval. Language Modeling: Various Grammar- based Language. Models-Statistical Language Model.			
Unit II	Word Level Analysis and Syntactic Analysis	(08hrs.)	COs Mapped – CO2
Word Level Analysis: Regular Expressions- Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing, Introduction, Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation Discourse Processing: Introduction, Cohesion, Reference Resolution, Discourse Coherence and Structure.Case study: Word embeddings, RNN, LSTM			
Unit III	Text Processing: Relations and Knowledge	(08hrs.)	COs Mapped – CO3

Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: In Fact System Overview, The GlobalSecurity.org Experience.			
Unit IV	Document Processing and Text Mining	(07hrs.)	COs Mapped – CO4
Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results. Evolving Explanatory Novel Patterns for Semantically Based Text Mining: Related Work, A Semantically Guided Model for Effective Text Mining.			
Unit V	Information retrieval and lexical resources	(08hrs.)	COs Mapped – CO5
Information Retrieval: Design features of Information Retrieval Systems-Classical, non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora. Model: Introduction to iSTART			
Textbooks			
1. U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008. 2. Anne Kao and Stephen R. Poteet (Eds), “Natural LanguageProcessing and Text Mining”, Springer-Verlag London Limited 2007. 3. Mastering Large Language Models, First edition 2024.ISBN:978-93-55519-658, Sanket Subhash Khandare.			
Reference Books			
1. Allen James, Natural Language Understanding, Pearson India, Secondedition ISBN: 9788131708958, 8131708950. 2. James H. Martin, Daniel Jurafsky, Speech and Language Processing Pearson, First edition, ISBN: 9789332518414. 3. Hobson Lane, Cole Howard, Hannes Hapke. 2019. Natural Language Processing in Action. Live Book.			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Written Test/ LMS Test on each unit	40
	Total	40



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

Final Year B. Tech. Pattern 2023 Semester:VIII Information Technology 2308412B: Business Intelligence and Analytics			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03 hrs./week		03	Continuous Comprehensive Evaluation: 40Marks EndSem Exam:60 Marks
Prerequisite Courses: Database Management System, Data Science and Big Data analytics			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom's Level
CO1	Understand conceptual knowledge on how Business Intelligence is used in decision making process.		2-Understand
CO2	Use modelling concepts in Business Intelligence.		2-Understand
CO3	Apply the concepts of business reports and analytics with the help of visualization for business performance management.		3-Apply
CO4	Comprehend the model-based decision making using prescriptive analytics.		3-Apply
CO5	Analyze the role of analytics and intelligence in Business its future impacts.		4- Analyze
COURSE CONTENTS			
Unit I	Introduction to Decision Making and Business Intelligence	(08 hrs.)	COs Mapped – CO1
Changing Business Environments, Decision Making & Simon's Decision-Making Process, Managerial roles in Decision Making, Information Systems Support for Decision Making, Framework for Computerized Decision Support: The Gorry and Scott-Morton Classical Framework, Decision support systems (DSS). Capabilities of DSS, DSS Classification, DSS Components. Business Intelligence (BI), Framework for BI, BI architecture, DSS - BI Connection, Goals of Business Intelligence, Business Intelligence: Tasks and Analysis Formats, BI use cases: Application in Patient Treatment, Application in Higher Education, Application in Logistics.			
Unit II	Modeling in BI	(07 hrs.)	COs Mapped – CO2
Models and Modeling in BI, Model Presentation, Model Building, Model Assessment and Quality of Models, Modeling using Logical Structures: Ontologies & Frames, Modeling using Graph Structures: Business Process Model and Notation (BPMN) & Petri Nets, Modeling using Probabilistic Structures, Modeling Using Analytical Structures. Models and Data: Data Generation, The Role of Time, Data Quality			
Unit III	Business reporting, Visual analytics, And Performance management	(08 hrs.)	COs Mapped – CO3
What Is a Business Report, Components of Business Reporting Systems, Data and Information Visualization, Types of Charts and Graphs, Visual Analytics, Performance			

Dashboards, Business Performance Management, Closed Loop BPM Cycle, Performance Measurement, Key Performance Indicators, Balanced Scorecards, The Four Perspectives of BSC? BI Tools: Tableau, Qlik, power BI, Dundas BI, Sisense, Webfocus, Oracle BI.			
Unit IV	Prescriptive Analytics & Model-Based Decision Making	(07 hrs.)	COs Mapped – CO4
What are Descriptive analytics, predictive analytics, and prescriptive analytics, Decision Support Systems Modeling, Structure of Mathematical Models for Decision Support, Certainty, Uncertainty, and Risk, Decision Modeling with Spreadsheets, Mathematical Programming Optimization, Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking, Decision Analysis with Decision Tables and Decision Trees, Multi-criteria Decision Making with Pairwise Comparisons			
Unit V	Role of Analytics and Intelligence in Business: Emerging Trends and Future Impacts	(08 hrs.)	CosMapped – CO5
The role of visual and business analytics (BA) in BI, ERP and Business Intelligence, BI Applications in CRM, Marketing, Logistics and Production, Banking, Telecommunications, Fraud Detection. Emerging Technologies, the critical success factors for implementing a BI strategy, Predicting the Future with the help of Data Analysis, BI Search & Text Analytics – Advanced Visualization – Rich Report, cloud computing and BI, Future beyond Technology. Impacts of Analytics in Organizations, Issues of Legality, Privacy, and Ethics, Location-Based Analytics for Organizations, spatial data analytics.			
Textbooks			
1. Wilfried Grossmann & Stefanie Rinderle-Ma “Fundamentals of Business Intelligence”, Springer, ISBN 978 3-662-46531-8 (eBook) 2. Business Intelligence and Analytics: Systems for Decision Support, Tenth edition, ISBN 978-0-133-05090 5, by Ramesh Sharda, DursunDelen, and Efraim Turban, published by Pearson Education, 2014.			
Reference Books			
1. Sabherwal, R. and Becerra-Fernandez, I. (2011). Business Intelligence: Practices, Technologies, and Management. John Wiley 2. Turban,E. and Volonino, L.(2011). Information Technology for Management: Improving Strategic and Operational Performance. Eighth edition, Wiley			
E Books / E Learning References			
1. https://www2.deloitte.com/us/en/pages/deloitte-analytics/articles/business-analytics-case-studies.html 2. https://www.blastanalytics.com/analytics-case-studies 3. BI Foundations with SQL, ETL and Data Warehousing Specialization (Coursera)			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Written Test/ LMS Test on each unit	40
	Total	40



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

Final Year B. Tech. Pattern 2023 Semester: VIII Information Technology 2308412C: Computer Vision			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory:03hrs./week		03	Continuous Comprehensive Evaluation: 40Marks EndSem Exam:60 Marks
Prerequisite Courses: Computer Graphics			
Course Outcomes: On completion of the course, students will be able to			
	Course Outcomes		Bloom's Level
CO1	Implement fundamental image processing techniques required for computer vision.		2-Understand
CO2	Apply feature extraction techniques.		3-Apply
CO3	Apply Hough Transform for line, circle, and ellipse detections.		3-Apply
CO4	Understand three-dimensional analysis techniques.		3-Apply
CO5	Develop skills to develop applications using computer vision techniques.		3-Apply
COURSE CONTENTS			
Unit I	Fundamentals of Digital Image Processing	(08hrs.)	COs Mapped – CO1
Introduction to Computer Vision?, Fundamentals Of Image Formation, Review of Digital image processing: Introduction, Origin, Applications and Examples of Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Digital Image Processing, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationship between pixels, image processing techniques: classical filtering operations, Thresholding techniques, edge detection techniques, corner and interest point detection, texture Analysis			
Unit II	Shapes and Regions	(07hrs.)	COs Mapped – CO2
Binary shape analysis, Connectedness, object labelling and counting, size filtering, distance functions and their uses, skeletons and thinning, Other Measures for Shape Recognition, Boundary pattern analysis: Boundary Tracking Procedures, Centroidal Profiles, Tackling the Problems of Occlusion, Accuracy of Boundary Length Measures, Object segmentation and shape models, Active Contours, Shape Models.			
Unit III	Research Methodologies in Diverse Disciplines	(08hrs.)	COs Mapped – CO2
Points and patches: Feature detectors, Feature descriptors, Feature matching, Feature tracking Application: Performance-driven animation, Edges: Edge detection, Edge linking, Application: Edge editing and enhancement, Vanishing points, Application: Rectangle detection			

Unit IV	Hough Transform	(08hrs.)	COs Mapped – CO3
Line detection – Hough Transform (HT) for line detection, the foot-of-normal method, Using RANSAC for Straight Line Detection, Hough-Based Schemes for Circular Object Detection, The Problem of Unknown Circle Radius, Overcoming the Speed Problem, Ellipse Detection, Applications, and case study: Human Iris Location, The Generalized Hough Transform (GHT), Use of the GHT for Ellipse Detection, A Graph-Theoretic Approach to Object Location, Possibilities for Saving Computation, Using the GHT for Feature Collation..			
Unit V	3D Vision and Motion	(07hrs.)	COs Mapped – CO4&CO5
The three-dimensional world, Methods for 3D vision, projection schemes for 3D vision, Shape from X : shape from shading, Photometric Stereo, Shape from texture, Shape from focus, The Assumption of Surface Smoothness, Shape from Texture, Use of Structured Lighting, 3D Reconstruction, active range finding, surface representations, point-based representation, volumetric representations, Structure from motion: triangulation, bundle adjustment, Dense motion estimation: translational alignment, parametric motion, spline based motion, Optical flow layered motion			
Textbooks			
1. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference,” Cambridge University Press, 2012 2. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Third edition, Pearson, ISBN: 978-81-317-2695-2			
Reference Books			
1. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012 2. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011 3. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third edition, Academic Press, 2012 4. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012 5. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012 6. Sudha Challa, “Fundamentals of Object Tracking”, Cambridge University Press, 2011			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Written Test/ LMS Test on each unit	40
	Total	40



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2022 Semester: VIII Information Technology 2308412D: User Interface & User Experience					
Teaching Scheme:		Credit Scheme:		Examination Scheme:	
Theory:03 hrs./week		03		Continuous Comprehensive Evaluation: 40Marks EndSem Exam:60 Marks	
Prerequisite Courses: Human Computer Interaction					
Course Outcomes: On completion of the course, students will be able to					
	Course Outcomes			Bloom's Level	
CO1	Justify the theory and practice of usability evaluation approaches, methods, and techniques.			2-Understand	
CO2	Compare and evaluate strengths and weaknesses of various approaches, methods and techniques for evaluating usability.			2-Understand	
CO3	Design and implement a usability test plan, based on modelling or requirements specification.			3-Apply	
CO4	Choose appropriate approaches, methods and techniques to evaluate the usability of a specified interactive system.			2-Understand	
CO5	To make aware of the current trends in usability engineering.			2-Understand	
COURSE CONTENTS					
Unit I	Introduction		(08hrs.)	COs Mapped – CO1, CO2	
What is Usability: Usability and Other Considerations, Definition of Usability, Example: Measuring the Usability of Icons, Usability Trade-Offs, Categories of Users and Individual User Differences. Generations of User Interfaces: Batch Systems, Line-Oriented Interfaces, Full-Screen Interfaces, Graphical User Interfaces, Next-Generation Interfaces, Long-Term Trends in Usability.					
Unit II	The Usability Engineering Life Cycle		(08hrs.)	COs Mapped – CO2, CO3	
The Usability Engineering Lifecycle: Know the User, Competitive Analysis, Goal Setting, Parallel Design, Participatory Design, Coordinating the Total Interface, Guidelines and Heuristic Evaluation, Prototyping, Interface Evaluation, Iterative Design, Follow-Up Studies of Installed Systems, Meta-Methods, Prioritizing Usability Activities, Be Prepared. Case study: Introduction to the latest user interface development tools e.g.Figma					
Unit III	Usability Heuristics		(08hrs.)	COs Mapped – CO4	
Usability Heuristics: Simple and Natural Dialogue, Speak the Users' Language, Minimize User Memory Load, Consistency, Feedback, Clearly Marked Exits, Shortcuts, Good Error Messages, Prevent Errors, Help and Documentation, Heuristic Evaluation, Case study: overview of AI –powered user interface development tool-Uizard					

Unit IV	Usability Testing	(07hrs.)	COs Mapped – CO5
Usability Testing: Test Goals and Test Plans, Getting Test Users, Choosing Experimenters, Ethical Aspects of Tests with Human, Subjects, Test Tasks, Stages of a Test, Performance Measurement, Thinking Aloud, Usability Laboratories. Usability Assessment Methods beyond Testing: Observation, Questionnaires and Interviews, Focus Groups, Logging Actual Use, User Feedback, Choosing Usability Methods. Case Study: Caching and replication in web Case Study: Usability Issues in Organizations, Organizational Roles and Structures, Ethics of Usability, Web Analytics.			
Unit V	Interface Standards	(07hrs.)	COs Mapped – CO4, CO5
Interface Standards: National, International and Vendor Standards, Producing Usable In-House Standards. International User Interfaces: International Graphical Interfaces, International Usability Engineering Guidelines for Internationalization Resource Separation, Multi-locale Interfaces. Future Developments: Theoretical Solutions, Technological Solutions, CAUSE Tools: Computer Aided Usability Engineering, Technology Transfer, Ubiquitous Computing, Intelligent User interfaces, Simulation and Virtual Reality. Case study: collaboration tools for sharing and iterating on designs with clients-web flow.			
Textbooks			
1. Jakob Nielsen, “Usability Engineering”, Morgan Kaufmann, An Imprint of Academic Press, Harcourt Science and Technology Company			
Reference Books			
1. Rosson, M. B., & Carroll, J. M. (2001), “Usability Engineering: Scenario-Based development of human-computer interaction”, Elsevier. 2. Mayhew, D. (1999), “The Usability Engineering Lifecycle: A Practitioner's Handbook for user interface design”, Morgan Kaufmann.			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Written Test/ LMS Test on each unit	40
	Total	40



K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year B. Tech. Pattern 2023 Semester: VIII Information Technology 2308413: Financial Management		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 02 hrs./week	02	Continuous Comprehensive Evaluation: 50Marks
Prerequisite Courses: -		
Course Outcomes: On completion of the course, students will be able to		
CO	Course Outcomes	Bloom's Level
CO1	Understand terminologies such as Capex, Opex, Return on Investment, profitability.	2-Understand
CO2	Interpret the Balance sheet of a Company for Small, Medium and Large Size	3-Apply
CO3	Understand information about formal courses on Finance and Accounting.	2-Understand
CO4	Analyze financial statements, their importance and impact on business.	3-Apply
CO5	Present a case study, based on their own findings and thereby learn importance of good Financial Management over and above Engineering and Technology.	3-Apply

COURSE CONTENTS			
Unit I	Basics of Accounting	(06 hrs.)	COs Mapped –CO1
Basics of Accounting Debit, Credit, Books of accounts ,Ledgers Cash flow statements, Assets and Liabilities, Understanding Balance Sheet and Profit & Loss Statement of Companies with Examples of actual Balance Sheets of Small, Medium, Large Size Companies.			
Unit II	Basics of Finance	(06 hrs.)	COs Mapped – CO1,CO2
Conceptual Understanding of Cost, Expense, Gross & Net Profit, ROI, Dividend, Depreciation, Taxes, Duties, Reserves, Insurance, Finance for Startups Bank Scrutiny for approvals			
Unit III	Project Budgeting	(06 hrs.)	COs Mapped – CO3
Project Budgeting, Capex, Opex and Importance of tracking cost of projects in execution, Key financial ratios, their interpretation, comparison of ratio areas etc..			
Unit IV	Financial Portfolio	(06 hrs.)	COs Mapped – CO4

Financial Portfolio Management with Govt and Private Agencies: Key Options of Savings Investment – Debt, Equity, Brief Introduction to Mutual Funds and Stock Market.			
Unit V	Case Study	(06 hrs.)	COs Mapped – CO5
Working Capital Management and Ratio Analysis			
Textbooks			
1.M. P. Narayanan, Vikram K. Nanda, “Finance for Strategic Decision-Making: What Non Financial Managers Need to Know (J-B-UMBS Series)”, 2004, University of Michigan Business School, ISBN: 978-0787965174 2. Karen Dillon , “HBR Guide to Finance Basics for Managers (HBR Guide Series)”, Harvard Business Review Press, ISBN: 9781422187302			
Reference Books			
1. Ramsden Philip, “ Finance for Non-financial Managers (Teach Yourself)”, Flash, 2008, ISBN: 978-0340972878 2. 2. H. George Shoffner, Susan Shelly, Robert Cooke, “The McGraw-Hill 36-Hour Course: Finance for Non-Financial Managers”, McGraw-Hill, ISBN: 978-0071425469.			

Guidelines for Continuous Comprehensive Evaluation of Theory Course	
Components for Continuous Comprehensive Evaluation	Marks Allotted
One Assignments on each Unit (4 * 5)	20
One MCQ test on each Unit (4 * 5)	20
One Case Study presentation	10
Total	50



**K.K.Wagh Institute of Engineering Education and Research, Nashik
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Final Year. B. Tech. Pattern 2023 Semester: VIII Information Technology 2308414:On-Job Training		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
	12	Term work: 200 Marks Oral: 100 Marks
Prerequisite Courses:		
Course Outcomes: On completion of the course, students will be able to		
CO	Course Outcomes	Bloom's Level
CO1	To develop professional competence through industry internship.	2-Understand
CO2	To apply academic knowledge in a personal and professional environment.	3-Apply
CO3	To build the professional network and expose students to future employees.	3-Apply
CO4	To Apply professional and societal ethics in their day to day life.	3-Apply
CO5	To become a responsible professional having social, economic and administrative considerations. To make own career goals and personal aspirations.	3-Apply
CO6	To make own career goals and personal.	3-Apply
COURSE CONTENTS		
Guidelines		
Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internships are far more important as the employers are looking for employees who are properly skilled and have awareness about industry environment, practices and culture. Internship is structured, short- term, supervised training often focused on tasks or projects with defined time scales. Core objective is to expose technical students to the industrial environment, which cannot be simulated/experienced in the classroom and hence create competent professionals in the industry and to understand the social, economic, and administrative considerations that influence the working environment of industrial organizations. Engineering internships are intended to provide students with an opportunity to apply theoretical knowledge from academics to the realities of the field work/training.		
Internship work Identification		
Weekly review and monthly presentation (4-Presentation) Student may choose to undergo Internship at Industry/Govt./NGO/MSME/Rural Internship/Innovation/IPR/Entrepreneurship. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/NGO's/Government organizations/Micro/Small/		

Medium enterprises to make themselves ready for the industry. Contacting various companies for Internship and Internship work identification process should be initiated in the 8th semester in coordination with training and placement cell/ industry institute cell/ internship cell. This will help students to start their internship work on time. Also, it will allow students to work during their vacation period after their 8th semester examination. Students can take internship work in the form of onsite work from any of the following but not limited to: Working for consultancy/ research project,

1. Participation in Events (Technical / Business)/in innovation related completions like
2. Hackathon, Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation
3. Council/ startups cells of institute / Learning at Departmental Lab/Tinkering Lab/ Institutional workshop,
4. Development of new product/ Business Plan/ registration of start-up,
5. Participation in IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business
6. Completion/ Technical Expos, Industry / Government Organization Internship,
7. Internship through Internshala/ AICT & SPPU portal
8. In-house product development, intercollegiate, inter department research internship.
9. Under research lab/group, micro/small/medium enterprise/only in internship, Research internship under professors, IISC, IIT's, Research organizations,
10. NGOs or Social Internships, rural internship,
11. Participate in open source development.

Internship Diary/Internship Workbook

Students must maintain Internship Diary/Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered, and suggestions given, if any. The training diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working. Internship Diary/workbook and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. Internship Diary/workbook may be evaluated on the basis of the following criteria:

- Proper and timely documented entries
- Adequacy & quality of information recorded.
- Data recorded.
- Thought process and recording techniques used.
- Organization of the information.

Every student is required to prepare a maintained documentary proof of the activities done by him as an internship diary or as a workbook. The evaluation of these activities will be done by Programme Head/Cell In-charge/ Project Head/ faculty mentor /faculty or Industry Supervisor based on- Overall compilation of internship activities, sub-activities, the level of achievement expected, evidence needed to assign the points and the duration for certain activities. Assessment and Evaluation is to be done in consultation with internship supervisor (Internal and External – a supervisor from place of internship).

Evaluation through Presentation

The student will give a presentation based on his/her training report, before an expert committee constituted by the department concerned as per the norms of the institute. The evaluation will be based on the following criteria:

1. Depth of knowledge and skills Communication & Presentation Skills Teamwork
2. Creativity

3. Planning& Organizational skills Adaptability
4. Analytical Skills
5. Attitude& Behavior at work
6. Societal Understanding
7. Ethics
8. Regularity and punctuality
9. Attendance record
10. Logbook
11. Student's Feedback from External Internship Supervisor

After completion of Internship, the student should prepare a comprehensive report to indicate what he/she has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/Faculty/TPO for assigning special topics and problems and should prepare the final report on the student's presence physically, if the student is found absent without prior intimation to the department/institute/concern authority/T & P Cell, entire training can be cancelled. The report shall be presented covering the following recommended fields but limited to, Title/Cover Page Internship completion certificate.

Internship Place Details- Company background-organization and activities/Scope and object of the study/personal observations Index/Table of Contents Introduction Title/Problem statement/objectives Motivation/Scope and rationale of the study Methodological details Results/Analysis /inferences and conclusion Suggestions/Recommendations for improvement to industry, if any Attendance Record Acknowledgement List of reference (Library books, magazines and other sources).