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

Curriculum

Final Year B.Tech.

Information Technology

w.e.f.: AY 2025-2026

(2022 Pattern)

SEMESTER-VII

Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks								Credits			
			TH	TU	PR	INSEM	ENDSEM	CCE	TU	TW	PR	OR	TOTAL	TH	TU	PR	TOTAL
INT224001	DCC	Distributed Computing and Systems	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
INT224002	DCC	Information Storage and Retrieval	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
INT224003	DCC	Laboratory Practice - I	-	-	2	-	-	-	-	25	25	-	50	-	-	1	1
INT224004	DCC	Laboratory Practice - II	-	-	2	-	-	-	-	25	25	-	50	-	-	1	1
INT224005A INT224005B	DEC	Introduction to DevOps / Software Testing and Quality Assurance	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
INT224006A INT224006B	DEC	Blockchain Technology / Usability Engineering.	2	-	-	20	30	-	-	-	-	-	50	2	-	-	2
INT224007	ASM	Research Methodology	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
INT224008	LHSM	Startup and Entrepreneurship	2	-	-	-	-	50	-	-	-	-	50	2	-	-	2
INT224009	PSI	Project Work	-	-	8	-	-	-	-	100		50	150	-	-	4	4
Total			**16**	**00**	**12**	**100**	**270**	**130**		**150**	**50**	**50**	**750**	**16**	**-**	**6**	**22**

SEMESTER-VIII

Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks								Credits			
			TH	TU	PR	INSEM	ENDSEM	CCE	TU	TW	PR	OR	TOTAL	TH	TU	PR	TOTAL
INT224011	DCC*	Deep Learning	3	-	-	-	60	40**	-		-	-	**100**	3	-	-	**3**
INT224012A INT224012B INT224012C	DEC*	Natural Language Processing / Business Intelligence and Analytics / Computer Vision	3	-	-	-	60	40**	-	-	-	-	**100**	3	-	-	**3**
INT224013	LHSM*	Digital & Social Marketing	2	-	-	-	-	50	-	-	-	-	**50**	2	-	-	**2**
INT224014	PSI	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.

SEM-VII

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

Final Year B. Tech.
Pattern 2022 Semester: VII Information Technology
INT224001: Distributed Computing and System

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: Operating System, Computer 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	(07 hrs.)	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	(07 hrs.)	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	(06 hrs.)	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**	**(06 hrs.)**	**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, TheX.500 Directory Service, Bit Torrent			
Unit V	**Recent Trends in Distributed System**	**(06 hrs.)**	**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 by 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
(Autonomous from Academic Year 2022-23)

Final Year. B. Tech.
Pattern 2022 Semester: VII Information Technology
INT224002: 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 Objectives:

1. To understand the concepts of information retrieval.
2. To understand the role of clustering in information retrieval.
3. To learn different indexing structures and searching techniques.
4. To evaluate the performance of the IR system and understand user interfaces for searching.
5. To understand information sharing on the web.

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	(06 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	(06 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	(06 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	(06 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	(08 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, Beautiful Soup.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. Subrahamanian, 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 Korfh age, 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, 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
(Autonomous from Academic Year 2022-23)

Final Year B.Tech. **Pattern 2022 Semester: VII Information Technology** **INT224003: Laboratory Practice-I**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 02 hrs./week	**02**	**Oral: 25 Marks** **Term work: 25 Marks**

Prerequisite Courses: Operating Systems, Computer Network Technology, Web Application Development, Data Structures and Files, Database management systems.

Course Outcomes:

CO1-Demonstrate Knowledge of the core concept and teaching in Distributed System.
CO2-Learn how to apply principles of state-of-art Distributed system in practical.
CO3-Design, build and test application program on Distributed system.
CO4-Understand information retrieval concepts and study various clustering techniques and apply tools to analyze web data and extract image features and static website.
CO5-Apply indexing to retrieval text and multimedia data. Analyze and evaluate the performance of information retrieval system

Distributed Computing System: 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 Open MP. 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

1	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**
2	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**

3	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**
4	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 Open CV and Image Hash for basic content-based image retrieval demonstrations.	**CO5**
5	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**
6	Design a hands-on assignment to develop a simple search engine for a static website using Python.	**CO4**

Guidelines for Instructor's Manual

The faculty member should prepare the laboratory manual for all the laboratory assignments, and it should be made available to the students and laboratory instructor/Assistant.

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. 2. Oral Examination will be based on the ISR theory and practical assignments. 3. Students are expected to know the theory involved in the experiment. 4. 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
(Autonomous from Academic Year 2022-23)

Final Year B. Tech. **Pattern 2022 Semester: VII - Information Technology** **INT224004: 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 - Analyze
CO4	Implement database connectivity and perform CRUD operations.	4 - Analyze
CO5	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	Create static web pages like Home, About, Contact, Event List, and Registration form using HTML and CSS	**CO1**
2	Enhance the static pages to make them responsive across devices using Bootstrap framework or media queries.	**CO1**
3	Validate event registration forms (like name, email, mobile number, etc.) using JavaScript.	**CO2**
4	Display the list of events dynamically using JavaScript arrays and implement search and category filter options.	**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	Provide functionality for the admin to view the list of participants registered for each event.	**CO4**
8	Deploy the web application on a local or cloud server (optional: GitHub Pages, Heroku) and prepare detailed documentation and a demo video.	**CO5**

Guidelines for Laboratory Conduction
1. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility, and recent trends related to the topic. 2. The instructor may set multiple sets of assignments and distribute them among batches of students. It is appreciated if the assignments are based on real world problems/applications. 3. All the assignments should be conducted on multicore hardware and 64-bit open-source software.
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 2022 Semester: VII Information Technology
INT224005A: Introduction to DevOps

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

Prerequisite Courses: Software Engineering and Project Management

Course Objectives:

1. To understand the need of DevOps as software engineering practice.
2. To understand the background of DevOps Evolution.
3. To know and understand the concept of Continuous Integration Continuous Delivery (CICD).
4. To learn the concept of continuous deployment and test strategies.
5. To learn the monitoring system and reliability engineering and explore the emerging tools used in the DevOps lifecycle.

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

	Course Outcomes	**Bloom's Level**
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

Unit I	**Introduction to Dev Ops and the Culture**	**(08 hrs.)**	**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	**Micro services Architecture and Cloud Native Development**	**(07 hrs.)**	**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	(07 hrs.)	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**	**(07 hrs.)**	**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**	**(07 hrs.)**	**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			

Textbooks

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, 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
(Autonomous from Academic Year 2022-23)

Final Year B. Tech.
Pattern 2022 Semester: VII Information Technology
INT224005B: Software Testing and Quality Assurance

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: - 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**	**(07 hrs.)**	**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**	**(08 hrs.)**	**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**	**(08 hrs.)**	**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, Cost of. Case study: selenium, Cypress, playwright			
Unit IV	**Fundamentals of Software Quality Assurance**	**(07 hrs.)**	**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**	**(08 hrs.)**	**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 Assignments on Unit-1 & 2, 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
(Autonomous from Academic Year 2022-23)

Final Year B. Tech.
Pattern 2022 Semester: Information Technology
INT224006A: Blockchain Technology

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 02 hrs./week	**02**	**InSem Exam: 20 Marks** **EndSem Exam: 30 Marks**

Prerequisite Courses: Computer Network & Security

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

	Course Outcomes	**Bloom's Level**
CO1	Understand the concept of cryptography and decentralization.	2-Understand
CO2	Acquire fundamental knowledge of Blockchain with issues, risk and applications associated with it.	2-Understand
CO3	Acquire knowledge of Ethereum Blockchain platform.	2-Understand
CO4	Understand hyper ledger fabric platform.	2-Understand
CO5	Acquire the knowledge regarding working of tokenization.	3-Apply

COURSE CONTENTS

Unit I	**Role of Cryptography in Blockchain**	**(05 hrs.)**	**COs Mapped – CO1**

Introduction to cryptography, Use of Cryptography in Blockchain, Cryptographic algorithm, cryptographic elements, cryptocurrency and its Benefits, introduction to decentralized system Security, Integrity, and Privacy Issues of a Decentralized System.

Unit II	**Introduction to Blockchain Technology**	**(07 hrs.)**	**COs Mapped – CO2**

What is bitcoin, Mechanics of Bitcoin, bitcoin transaction, Introduction of Block chain, History of Blockchain, Blockchain Technology Definition, Types of Blockchain, Peer to Peer Network, platform for decentralization, Transactional blocks, why use blockchain technology.Selection Criteria for Blockchain platform for Applications, Blockchain and Enterprise – A Technology of Coordination, Risks and Limitations of Blockchain: Privacy, Security Risks of Blockchain, Benefits of Blockchain in various scenarios.
1. Use Case: Blockchain for Supply Chain Financing
2. Use Case: Blockchain for Health Insurance

Unit III	**Blockchain Platforms: Ethereum**	**(06 hrs.)**	**COs Mapped – CO3**

Blockchain Platform introduction, what is Ethereum, Ethereum feature, Components of Ethereum Ecosystem, Ethereum Programming Languages, Runtime Byte Code, Blocks and Blockchain, How Smart Contracts Work. Introduction to Tokenization: What is token, technology behind tokenization, how Blockchain tokenization can help in enterprise systems,

Tokenizing Shares and Fund Raising, challenges to tokenization.			
Unit IV	**Blockchain Platforms: Hyper ledger**	**(06 hrs.)**	**COs Mapped – CO4**
What is Hyper ledger, features of a Hyper ledger Blockchain, How Does Hyper Ledger Fabric Work, The Architecture of Hyper ledger Fabric System, Benefits of Hyper ledger Fabric, Differences Between Ethereum And Hyper ledger			
Unit V	**Introduction to Tokenization**	**(06 hrs.)**	**COs Mapped – CO5**
Introduction to Tokenization: What is token, technology behind tokenization, how Blockchain tokenization can help in enterprise systems, Tokenizing Shares and Fund Raising, challenges to tokenization, Consensus Mechanism. Case Study: Bitcoin			

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

Reference Books

1. Kumar Saurabh, Ashutosh Saxena, "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, 1491920491 eText 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
(Autonomous from Academic Year 2022-23)

Final Year B. Tech.
Pattern 2022 Semester: VIII Information Technology
INT224006B: Usability Engineering

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 02 hrs./week	**02**	**InSem Exam: 20 Marks** **EndSem Exam: 30 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**	**(07 hrs.)**	**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**	**(07 hrs.)**	**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**	**(07 hrs.)**	**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	(07 hrs.)	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**	**(07 hrs.)**	**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.			

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

Final Year B. Tech.
Pattern 2022 Semester VII: Information Technology
INT224007: Research Methodology

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: -

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	(06 hrs.)	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	(06 hrs.)	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	(06 hrs.)	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**	**(06 hrs.)**	**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**	**(06 hrs.)**	**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 Katz D.
3. Foundation of Behavioural Research -Kerlinger F. 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
(Autonomous from Academic Year 2022-23)

Final Year B. Tech.
Pattern 2022 Semester: VIII Information Technology
INT224008: Start-up and Entrepreneurship

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 02 hrs./week	**02**	**Continuous Comprehensive Evaluation: 50 Marks**

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**	**(06 hrs.)**	**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**	**(06 hrs.)**	**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**	**(06 hrs.)**	**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**	**(06 hrs.)**	**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-tofind-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=6y3WIrgp_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-todeveloping-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-practicesfor-startups/?sh=2e55af9e3de

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

Final Year B. Tech. Pattern 2022
Pattern 2022 Semester: VII Information Technology
INT224009: Project Work

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 08 hrs./week	04	Term work: 100 Marks Oral: 50 Marks

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:

1. There shall be **FOUR** reviews in Project phase –II by the review committee.
2. 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 PBL (in their previous years).
3. Student needs to justify the Algorithm / Model used for implementation.
4. 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.
5. Students need to note down the queries raised during review(s) and comply the same in the next review session.
6. 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.
7. Project group needs to present/publish **ONE** paper.
8. Paper must be checked for Plagiarism.
9. Project report must also be checked for Plagiarism.
10. 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
(Autonomous from Academic Year 2022-23)

Final Year. B. Tech.
Pattern 2022 Semester: VIII - Information Technology
INT224011: Deep Learning

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs./week	**03**	**Continuous Comprehensive Evaluation: 40 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses: Machine Learning, Mathematics

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**	**(07 hrs.)**	**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**	**(07 hrs.)**	**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**	**(08 hrs.)**	**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**	**(08 hrs.)**	**COs Mapped – CO4**
Under complete Auto encoders, Regularized Auto encoders-Sparse Auto encoders, Stochastic Encoders and Decoders, De noising Auto encoders, Contractive Auto encoders, Applications of Auto encoders.			
Unit V	**Representation Learning**	**(07 hrs.)**	**COs Mapped – CO5**

Greedy Layer wise 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, Yoshua Bengio 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
2. Deep Neural Networks” Apress, 201
3. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
4. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017
5. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017
6. 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
(Autonomous from Academic Year 2022-23)

Final Year B. Tech.
Pattern 2022 Semester: VIII Information Technology
INT224012A: Natural Language Processing

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs. /week	**03**	**Continuous Comprehensive Evaluation: 40 Marks** **End Sem 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**	**(07 hrs.)**	**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**	**(08 hrs.)**	**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**	**(08 hrs.)**	**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**	**(07 hrs.)**	**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**	**(08 hrs.)**	**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 Language Processing 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, Second edition 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 2022 Semester: VIII Information Technology
INT224012B: Business Analytics and Intelligence

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs./week	**03**	**Continuous Comprehensive Evaluation: 40 Marks** **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**	**(06 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.)**	**Cos Mapped – 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 2022 Semester: VIII Information Technology
INT224012C: Computer Vision

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs./week	**03**	**Continuous Comprehensive Evaluation: 40 Marks** **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**	**(08 hrs.)**	**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**	**(07 hrs.)**	**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**	**(08 hrs.)**	**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**	**(08 hrs.)**	**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**	**(08 hrs.)**	**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, Share 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
(Autonomous from Academic Year 2022-23)

Final Year B. Tech.
Pattern 2023 Semester: VIII Information Technology
INT224013: Digital and Social Marketing

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 02 hrs./week	02	Continuous Comprehensive Evaluation: 50 Marks

Prerequisite Courses: -

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

CO	Course Outcomes	Bloom's Level
CO1	Understand the evolution and importance of Digital Marketing.	2-Understand
CO2	Apply Email marketing and web tools for digital communication.	3-Apply
CO3	Understand multimedia content creation and social media data modeling.	2-Understand
CO4	Apply Social Media strategies for branding and reputation management.	3-Apply
CO5	Apply SEO Techniques and Google tools to enhance online visibility.	3-Apply

COURSE CONTENTS

Unit I	Digital Marketing	(06 hrs.)	COs Mapped –CO1

History of Digital Marketing, Importance of Digital Marketing, Effective use of Digital Marketing, Effects of wrong Digital Marketing, Digital Marketing to develop brands, Digital Marketing for sales, Digital Marketing for product and service development.

Unit II	Email Marketing and Web Tools	(06 hrs.)	COs Mapped – CO2

Techniques for effective email marketing and pitfalls, Various online email marketing platforms such as Campaign Monitor and Mail Chimp, Web content, web usability, navigation and design, Bookmarking and News Aggregators, Really Simple Syndication RSS), Google Alerts and Giga Alert (Brand, product and service monitoring online).

Unit III	Social Media Content and Multimedia Tools	(06 hrs.)	COs Mapped – CO3

Blogging, Live Chat, User Generated Content (Wikipedia, etc.), Multi-media - Video (Video Streaming, YouTube, etc.), Multi-media - Audio & Podcasting (iTunes, etc.), Multi-media - Photos/Images (Flickr, etc.), Crowdsourcing, Virtual Worlds.
Modelling Building in Social Media: Get an extensive social media database loaded. Create summary statistics for an extensive data of social media.

Unit IV	Social Media for a Real Marketing	(06 hrs.)	COs Mapped – CO4
Utilizing Facebook and LinkedIn's Advertising functionality and Applications, Brand reputation management techniques, Systems for 'buzz monitoring' for brands, products and services, effective Public Relations (PR) online and business development.			
Unit V	**Optimization Technique**	**(06 hrs.)**	**COs Mapped – CO5**
Search Engine Optimization (SEO), Search Engine Optimization (SEO) tips and techniques, Google Adwords, Google various applications such as 'Google Analytics', Maps, Places etc to enhance a brand's products, services and operations.			

Textbooks

1. Vandana Ahuja, Digital Marketing, Oxford Press, ISBN: 9780199455447, First edition
2. Email Marketing: An Hour a Day, Wiley, Jeanniey Mullen, David Daniels, David Gilmour- ISBN: 978-0-470-38673-6, First edition

Reference Books

1. The New Rules of Marketing and PR, David Scott, Wiley India, ISBN: 978-1-119-07048-1, First edition.

Guidelines for Continuous Comprehensive Evaluation of Theory Course	
Components for Continuous Comprehensive Evaluation	**Marks Allotted**
Assignments / LMS Test on each Unit (10 * 5)	50
Total	**50**

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

Final Year. B. Tech.
Pattern 2022 Semester: VIII Information Technology
INT224014: On-Job Training

Teaching Scheme:	Credit Scheme:	Examination Scheme:
	12	Term work: 200 Marks Oral: 100 Marks

Prerequisite Courses:

Course Objectives:

1. To encourage and provide opportunities for students to get professional/personal experience through internships.
2. To learn and apply the technical knowledge gained from academics /classroom learning in real life/industrial situations.
3. To get familiar with various tools and technologies used in industries and their applications.
4. To enable students to develop professional skills and expand their professional network with the development of employer-valued skills like teamwork and communication.
5. To apply the experience gained from industrial internship to the academic course completion project.
6. To nurture professional and societal ethics in students.
7. Understand the social, economic, and administrative considerations that influence the working environment of industrial organizations sharing on the web.

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

	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 an 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. The following guidelines are proposed to give academic credit for the internship undergone as a part of the Third Year Engineering curriculum.

Internship work Identification

Weekly review and monthly presentation (4-Presentation) Student may choose to undergo Internship at Industry/Govt./NGO/MSME/Rural Internship. 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 Seminar Presentation

The student will give a seminar based on his 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).