Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA

PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in

शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्याससमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

SU/BOS/Science/61 **Date: 09/01/2024**

To,

The Head
Department of Mathematics
Shivaji University, Kolhapur.

Subject: Regarding syllabi of M.Sc Tech. Mathematics under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of degree programme under the Faculty of Science and Technology.

1.	M.Sc Tech Mathematics Part III

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020 (Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR

Established: 1962

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Structure and Syllabus in Accordance with

National Education Policy - 2020

with Multiple Entry and Multiple Exit

M. Sc. Tech. (Industrial Mathematics with Computer Application)

Part III (Semester V and VI)
under
Faculty of Science and Technology

(To Be Implemented From Academic Year 2024-25)

M. Sc. Tech. (Industrial Mathematics with Computer Application)

(Part III) (Semester V) (24 Credits)

Course Code	Title of course	Instruction hrs/week	Duration of Term end Exam	Marks Term end exam	Marks-(Internal) Continuous Assessment	Credits
MTT 501	Functional Analysis	4	3	80	20	4
MTT 502	Web Programming	4	3	80	20	4
MTT 503	Artificial Intelligence	4	3	80	20	4
MTT 504	Cyber Security	4	3	80	20	4
MTT 505	Departmental Elective 1. Compiler Techniques 2. Computer Networks 3. Cloud Computing 4. Machine Learning	4	3	80	20	4
MTT 506	Project	8	3	100	--	4

M. Sc. Tech. (Industrial Mathematics with Computer Application)

(Part III) (Semester VI) (25 Credits)

Course Code	Title of course	Duration of Term end Exam	Evaluation Schema(Marks)				Credits
				Internal	External	Total	
MTT 601	A. Industrial Project	1	Mid Term Viva	100	---	100	24
			Final Viva and Report	100	300	400	
	B. Technical Communication	1	Presentation	50		50	1
			Report	50		50	
Final Total				--	---	600	25

M. Sc. Tech. (Industrial Mathematics with Computer Application) (Part III) (Semester V)
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Functional Analysis

Total Credits: 04

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Understand the fundamental topics, principles and methods of functional analysis.
2. Demonstrate the knowledge of normed spaces, banach spaces, hilbert space.
3. Define continuous linear transformations between linear spaces, bounded linear functionals.
4. Apply finite dimensional spectral theorem.
5. Identify normal, self adjoint, unitary, normal operators.

Unit I: 15 Lectures

Normed linear spaces, Banach spaces, quotient spaces, continuous linear transformations, equivalent norms, finite dimensional normed spaces and properties, conjugate space and separability, The Hahn-Banach theorem and its consequences

Unit II: 15 Lectures

Second conjugate space, the natural embedding of the normed linear space in its second conjugate space, reflexivity of normed spaces, the open mapping theorem, projection on Banach space, the closed graph theorem, the conjugate of an operator, the uniform boundedness principle.

Unit III: 15 Lectures

Hilbert spaces: examples and elementary properties, orthogonal complements, the projection theorem, orthogonal sets, the Bessel's inequality, Fourier expansion and Perseval's equation, separable Hilbert spaces, the conjugate of Hilbert space, Riesz's theorem, the adjoint of an operator.

Unit IV: 15 Lectures

Self adjoint operators, normal and unitary operators, projections, eigen values and eigenvectors of an operator on a Hilbert space, the determinants and spectrum of an operator, the spectral theorem on a finite dimensional Hilbert space.

Recommended Book:

1. G. F. Simmons, Introduction to Topology and Modern Analysis, Tata McGraw Hill, 1963.

Reference Books:

1. Erwin Kreyszig, Introductory Functional Analysis with Applications, John Wiley and Sons, 1978
2. A. E. Taylor, Introduction to Functional analysis, John Wiley and sons,1958.
3. J. B. Convey, A course in Functional Analysis, Springer-Verlag, 1985.
4. G. Bachman and L. Narici, Functional Analysis, Academic Press, 1972.
5. B. V. Limaye, Functioned Analysis, New age international, 1996.

M. Sc. Tech**. (Industrial Mathematics with Computer Application) (Part III) (Semester V)**
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course : Advanced Web Technology

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Develop windows form application using C#
2. Understand client-server architecture
3. Develop web form application using ASP.NET
4. Develop application using MVC

Unit I: 15 Lectures

Introduction: .NET framework and its architecture, CLR, JIT, CTS, Metadata, .NETRevolution, Characteristics of C#, Programming structure of C#, scope of variables, boxing & unboxing, Nullable Data types, Conditional statements, Arrays, Loops, Procedures and functions, Exception handling, Windows form controls, containers, Data Controls, Dialog Controls, sample application development, Deployment of C# application

Unit II: 15 Lectures

ASP.NET: Page Life Cycle, Standard controls, Data Controls, Sample Application Development, Web services, Server side Validation Controls, Working with ADO.NET, Data Binding using DataBound Control, Working With GridView Control, Working With DetailsView Control, Working With FormView Control, Working With Repeater, Connected architecture, Disconnected architecture. Microsoft SQL Server: Creation of Table, Views, Stored Procedures

Unit III: 15 Lectures

ASP.Net State Management: Server side State management, Client Side state management. Caching in ASP.NET: Page caching, data caching, fragment caching AJAX: Introduction to AJAX, Calendar Extender, Always Visible Control Extender, Confirm Button Extender, Filtered text Box extender, Password Strength, Drag Panel Extender.

Unit IV: 15 Lectures

Introduction to MVC, Benefits of using ASP.NET MVC, Role of Model, View, and Controller, ASP.NET MVC Works, Naming conventions, Creating views, Defining controllers, Defining a data model, Creating strongly-typed views, Creating strongly-typed views Razor View Engine:Razor Basics, Razor design goals, Implementation of Razor view, Razor syntax, Accessing Model Data in Razor views

Reference Books:

1. Asp.Net: The Complete Reference, by Matthew MacDonald
2. Microsoft Visual C# 2013 - Microsoft Press, by John Sharp
3. Jesse Liberty, “Programming C#”, 4th Edition, O’Reilly Media
4. A Beginners Guide, ASP.NET 3.5 by William B. Senders
5. Professional ASP.NET MVC 5, By Jon Galloway, Brad Wilson, K. Scott Allen, David Matson

M. Sc. Tech **. (Industrial Mathematics with Computer Application) (Part III) (Semester V) (NEP-2020)**

(Introduced from Academic Year 2024-25)

Title of Course : Artificial Intelligence

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Apply problem solving by intelligent search approach.
2. Represent knowledge using AI knowledge representation techniques.
3. Design Machine Learning solution to real life problems.
4. Derive solutions for problems with uncertainty using Fuzzy theory.
5. Define a NLP problem and find a suitable solution to it.
6. To develop a good understanding of all aspects of Natural Language Processing (NLP) and Genetic algorithm

Unit I: 15 Lectures

Introduction of AI and Problem Solving: Artificial Intelligence, AI Problems, AI Techniques, The Level of the Model, Criteria For Success. Defining the Problem as a State Space Search, Problem Characteristics , Search and Game Playing: Breadth first search, depth first search, hill climbing, heuristic search, Best first search, A* algorithm, AO* algorithm, Minmax & game trees, refiningminmax, Alpha – Beta pruning, constraint satisfaction

Unit II: 15 Lectures

Knowledge Representation Introduction, Propositional Logic, Syntax and Semantics, Interpretations, Properties, Predicate Calculus, WFF, Free and Bound Variables, Normal Forms, Inference Techniques, Resolution, Unification, Modes Pones, Frames, Frame Representation Language, Conceptual Dependency, CD Theory, Script, Semantic Net, Conceptual Graph, Rule Based Representation, Forward and Backward Reasoning

Unit III: 15 Lectures

Neural Networks:Introduction, Basic Concepts of Neural Networks, Model of an Artificial Neuron, Activation Functions, Feedforward Network, Recurrent Network, Learning Methods, deep learning and deep neural network.Fuzzy Set Theory, Fuzzy Membership, Fuzzy Operations, Fuzzy Logic Systems.

Unit IV: 15 Lectures

Natural Language Processing: Introduction, Syntactic Processing,Semantic Analysis, Discourse and Pragmatic Processing. Genetic Algorithm:Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, the Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm

Reference Book

1. Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw Hill, 2002.
2. Nils J Nilson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers , Inc., San Francisco, California, 2000.
3. R. Akerkar, Introduction to Artificial Intelligence, Prentice-Hall of India, 2005
4. Winston P.H, “Artificial Intelligence”, Addision Wesley (1993)
5. B. Yegnanarayana, Artificial Neural Networks, Prentice-Hall of India, 2006
6. Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, S. Rajasekaran, G. A. VijayalakshmiPai, Prentice-Hall of India, 2003

M. Sc. Tech **. (Industrial Mathematics with Computer Application) (Part III) (Semester V)**
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course : Cyber Security

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Realize the need for Cyber Security
2. Understand the need for Security in day to day communications
3. Understand the vulnerabilities in the Network and Computer System
4. Understand the cyber law and Cyber Forensics

Unit-I **15 Lectures**

Introduction to Cyber Security: Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Cyber Security Vulnerabilities-Overview, Cyber Security Safeguards- Overview, Access control, Biometrics, Denial of Service Filters, Ethical Hacking, Response, Scanning, Security policy, Threat Management.

Unit-II **15 Lectures**

Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, RSA, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Protocols:-security at the Application Layer- PGP and S/MIME

Unit –III **15 Lectures**

Securing Web Application, Services and Servers: Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Intrusion Detection and Prevention: Intrusion, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

Unit –IV **15 Lectures**

Cyberspace and the Law: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.Cyber Forensics: Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

References:

1. Preston Gralla, How Personal and Internet Security Work, Que Publications
2. Alfred Basta and Wolf Halton, Computer Security Concepts, Issues and Implementation, Cengage Learning
3. Digital Defense: A Cybersecurity Primer by Joseph Pelton , Indu B. Singh
4. Cryptography and Network Security: Principles and Practice by William Stallings
5. Computer and Information Security Handbook by John R. Vacca .
6. Cyberlaw: The Law of the Internet and Information Technology by Brian Craig .
7. Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners 2nd Edition by Jason Andress (Author), Steve Winterfeld (Author)

M. Sc. Tech **. (Industrial Mathematics with Computer Application) (Part III) (Semester V)**
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Compiler Techniques

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Initiate an understanding of phases of compiler and lexical analysis.
2. Understand how compiler performs syntax analysis using grammar.
3. Explore how intermediate code generated and syntax directed translation occurs.
4. To understand the code optimization and code generation techniques.

Unit I: **15 Lectures**

Introduction to compilation and lexical analysis: Compiler, phases of compiler, compiler construction tools, role of lexical analysis, input buffering, specification of tokens, finite automata implications, designing a lexical analyzer generator.

Unit II: **15 Lectures**

Syntax analysis: Role of syntax analyzer/parser, context free grammar (CFG), top-down parsing – introduction, recursive descent parsing, problems in recursive procedures, bottom-up parsing – actions of shift reduce parser, construction of parse tree, operator precedence parsing, components of operator precedence parsers, parsing action, LR parsing, simple LR parser and LALR parsers.

Unit III: **15 Lectures**

Intermediate code generation and syntax directed definitions: Need for intermediate code generation, intermediate forms, implementation of three address code, syntax directed translation – introduction, syntax directed translation for declaration, assignment, Boolean and control flow statements, syntax directed translation for procedure calls.

Unit IV: **15 Lectures**

Code optimization and code generation: Introduction, Flow graphs, principle sources of optimization, optimization of basic blocks, issues in code generation, the target machine, runtime storage management, code generation from Directed acyclic graphs and the dynamic code generation algorithm.

Reference Books:

1) Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia.
2) Compilers-Principles, Techniques and Tools, Aho A.V., Sethi R. and Ullman J.D., Addison Wesley.
3) The Theory of Parsing, Translation and Compiling- Volume I: Parsing, Aho A. V. and Ullman J. D., Prentice Hall
4) “Compiler Construction”, Dhamdere, Mc-Millan.
5) Compiler Design , Sadasivam, G. Sudha, Scitech Publications (India) Pvt Limited.

M. Sc. Tech**. (Industrial Mathematics with Computer Application) (Part III) (Semester V)**
(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Computer Networks

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Understand basic computer network technology.
2. Identify the different types of network topologies and protocols.
3. Understand the basic protocols of computer networks, and how they can be used toassist in network design and implementation.
4. Understand and study transport layer protocols and basics of cellular network
5. Identify and study application layer protocols

Unit I: **15 Lectures**

Physical and Data Link Layer: Use of Application of networks, Network Hardware and Software, Reference Models: OSI,TCP/IP, Physical Layer: Transmission Media, Digital Modulation and Multiplexing, Direct link networks, hardware building blocks, encoding, error detection, reliable transmission, Ethernet (802.3), token rings (802.5,FDDI), wireless (802.11), network adaptors.

Unit II: **15 Lectures**

Network Layer: Packet switching, switching and forwarding, bridge and LAN switches, implementation and performance. InternetworkingIP,IPV4, IPV6, Address Mapping, routing, Routing Algorithms, Congestion control, congestion Avoidance End to end protocols, global internet, multicast, multiprotocol labels switching.

Unit III: **15 Lectures**

Transport Layer and Cellular Networks

UDP, TCP, RPC, Overview of Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks, Sensor Networks

Unit IV: **15 Lectures**

Application Layer

Network security, cryptographic algorithms, security mechanisms, Examples, Application DNS,SMPT, MIME, HTTP, SNMP, RTP, SDP, overloading network, End-to-End data representation, compression.

Recommended Reading:

1. Computer Networks by A. S. Tannenbaum.
2. Data Communications and Networking , Behrouz A Forouzan , Tata McGraw-Hill Co Ltd , Second Edition, ISBN: 0-07-049935-7

References Books:

1. data and computer communication by w. stalliys
2. computer networks –Peterson and Davis

M. Sc. Tech **. (Industrial Mathematics with Computer Application) (Part III) (Semester V) (NEP-2020)**

(Introduced from Academic Year 2024-25)

Title of Course: Cloud Computing

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Acquire knowledge of cloud computing and its usage.
2. Understand components and operations of cloud computing system.
3. Understand the concept of Virtualization and design of cloud Services
4. Enhance the skills for data management, storage and operations in cloud computing system.
5. Study recent trends in cloud computing.

Unit I: 15 Lectures

Fundamentals of cloud computing Evolution of cloud computing, characteristics of cloud computing, need of cloud computing, Components of cloud computing, cloud computing architecture, client server architecture, grid computing environment, Cloud computing vs. Cluster computing, types of cloud, major players in cloud computing, advantages and challenges of cloud computing.

Unit II: 15 Lectures

Virtualization Virtualization architecture and its needs, benefits and challenges, types of virtualization, Levels of Virtualization Implementation, virtualization of CPU, Memory and I/O devices, server virtualization, virtualization design requirements, virtualization structure, open source virtualization technology, Pros and cons of virtualization. Hypervisor, Virtual Machine Types, load balancing, Examples of cloud services- Microsoft azure, Google cloud, VMware, Amazon EC2.

Unit III: 15 Lectures

Cloud computing services & security Cloud services-IaaS, SaaS, PaaS, DaaS, MaaS, CaaS, DBaas, Implementation and Architecture of Eucalyptus, Nimbus &OpenNebula, cloud development techniques, cloud based storage, cloud backup, Cloud security - Cloud Security Challenges and Risks, disaster recovery, data integration, data transformation, data migration, challenges with data security

Unit IV: 15 Lectures

Recent trends in cloud computing Cloud standards, service oriented architecture (SOA) for cloud application, mobile cloud computing its application, architecture and working. MongoDB, MapReduce implementations for the Cloud.Multicloud approach, Role of AI in Cloud Computing, Hybrid and on- premise cloud.IoT cloud platforms.

References Books:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, 2012, 1st Edition, Morgan Kaufmann Publishers.
2. Kailash Jauaswal, JagannathKallakurchi, Donald J. Houde, Dr. Deven Shah, “Cloud
3. Computing”, Black Book, Dreamtech , 2014
4. Barrie Sosinsky, “Cloud Computing Bible, “ Wiley India Pvt. Ltd. 2012
5. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing “A Practical Approach”

M. Sc. Tech **. (Industrial Mathematics with Computer Application) (Part III) (Semester V)**

(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Machine Learning

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. To understand fundamental concepts of machine learning and its various algorithms
2. To understand various strategies of generating models from data and evaluating them
3. To apply ML algorithms on given data and interpret the results obtained
4. To design appropriate ML solution to solve real world problems in AI domain

Unit-I **(15 hrs)**

Introduction to Machine learning, essential concepts in Machine learning, Machine learning basics: Key terminology, Key tasks of machine learning, choosing the right algorithm, Steps in developing a machine learning application. Supervised Learning : k-Nearest Neighbours classification algorithm, binary and multi-label classification.

Unit-II **(15 hrs)**

Creating scatter plots with Matplotlib, Normalizing numeric values. Decision tree, entropy and Gini index , Information gain, Tree construction, plotting trees in Python, Testing and storing the classifier, Naïve Bayesian decision theory, Conditional probability, classifying with conditional probabilities, Document classification with naïve Bayes, classifying text with python, classifying spam email with naïve Bayes.

Unit-III **(15 hrs)**

Support Vector Machines (SVM) - Introduction , goal of SVM, Working of SVM , Support Vectors , Hyperplane , Margin Model evaluation and improvement, Regularization, Bias Variance, Hyper- parameter Tuning , SVM Kernels: SVM Kernels, Polynomial Kernel, Radial Basis Function (RBF) Kernel, Pros and Cons of SVM Classifiers.

Unit-IV **(15 hrs)**

Recommender System: Introduction, Understanding Recommendation Systems, Content Based Filtering, User Based Collaborative Filtering, Item Based Collaborative Filtering, Methods and tricks of the trade, Issues in Recommendation Systems.

References:

1. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press (23 April 2020)
2. Tom M. Mitchell- Machine Learning - McGraw Hill Education, International Edition
3. Aurélien Géron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media, Inc. 2nd Edition
4. Illustrated edition Christopher M. Bishop Pattern Recognition and Machine Learning - Springer, 2nd edition
5. Trevor Hastie, Robert Tibshirani, and Jerome Friedman - The Elements of Statistical Learning: Data Mining, Inference, and Prediction - Springer, 2nd edition

M. Sc. Tech. **(Industrial Mathematics with Computer Application) (Part III) (Semester VI)**

(NEP-2020)
(Introduced from Academic Year 2024-25)

Title of Course: Industrial Project

A. Industrial Project

At the end of the sixth semester of study, a student will be examined in the course "Industrial Project".

1. Project work may be done individually or in groups in case of bigger projects. However, if project is done in groups, each student must be given a responsibility of a distinct module and care should be taken to see the progress of individual module.
2. Students should take guidance from an internal guide and prepare a Report on "Industrial Project" in 2 copies to be submitted to the Department.
3. The Project Report should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs and a list of output reports should be included.
4. The project Work should be of such a nature that it could prove useful or should be relevant from the commercial/management angle.
5. Project viva-voce (Mid-Term) by the internal examiner will be conducted during the period of the project. The Mid-Term work carries 50 marks for internal assessment.
6. The final project work carry 100 marks for internal assessment and 150 marks for external viva. The final viva shall be conducted by external and internal examiners.
7. Project viva-voce (final) by the external and internal examiner will be conducted after completion of 14 weeks training

B. Technical Communication — 15 Lectures

Written Communication: Letter Writing - Personal Letter, Business Letter and Letter for Application, Report Writing, Preparation of CV, Summarizing.

Oral Communication: Interview, Group Discussion, Professional Presentation and Public Speaking.

Examination pattern: Before the commencement of industrial project there shall be 100 marks examination (50 marks written examination + 50 marks oral) on Technical communication.