1	**Name of Course**	**Professional Diploma in Rolling Stocks and Operations**
2	**Max no. of Students**	30
3	**Duration**	1 Year
4	**Course Type**	Full Time
5	**No. of Days per week**	6 days
6	**No. of hours per day**	6 Hrs
7	**Space require**	66 m^2 classroom and 66 m^2 Laboratory
8	**Entry qualification**	Diploma Mechanical Engineering/Automobile Engineering/ Production Engineering/ FE-Mechanical
9	**Objective of syllabus**	1. To introduce students about Railway Organization, Standards and Coding's. 2. To study Construction and working of Railway Rolling Stocks and its components. 3. To analyze various Mechanism sand Systems in Railways. 4. To apply skills for advancement in Railways
10	**Employment opportunities**	Students can be placed in Government and Private organizations of Railways
11	**Teachers Qualification**	ME/ M.Tech/Ph.D

12 **Teaching Scheme :**

Sr. No	Subject	Subject Code	Theory (Hr)	Credit	Practical(Hr)	Credit	Total
1	Rolling Stocks	RMEPCC-01	60	4	90	3	7
2	Systems and Mechanisms of Railway	RMEPCC-02	45	3	90	3	6
3	Permanent Way, Signal System and Overhead Equipment's	RMEMDM-03	45	3	90	3	6
4	Rolling Stock and Railway Operations	RMEPP-04	45	3	90	3	6
5	Reliability, Availability, Maintainability &Safety in Railway	RMESEC-05	45	3	90	3	6
6	Capstone Project (Industry-Oriented)	RMECC-06	-	-	390	13	13
		Total	**240**	**16**	**840**	**28**	**44**

13 **Examination Scheme – Final Examination will be based on a syllabus of One year.**

Sr. No	Subject	Subject Code	Theory				Practical			Total	
			Duration (Hr.)	Max	Min	Int	Duration (Hr.)	Max	Min	Min	Max
1	Rolling Stocks	RMEPCC-01	3	80	32	20	-	-	-	40	100
2	Systems and Mechanisms of Railway	RMEPCC-02	3	80	32	20	-	-	-	40	100
3	Permanent Way, Signal System and Overhead Equipment's	RMEMDM-03	3	80	32	20	-	-	-	40	100
4	Rolling Stock and Railway Operations	RMEPP-04	-	-	-		3	100	40	40	100
5	Reliability, Availability, Maintainability &Safety in Railway	RMESEC-05	-	-	-		3	100	40	40	100
6	Capstone Project (Industry-Oriented)	RMECC-06	-	-	-		-	100	40	40	100
Total											600

Note: For Paper I, II, III

Internal Examinations of Total Marks: 20

Pattern / Examination nature may be as follows (Any Two of Following): Written test/ Seminar/ PPT Presentation/ Open book examination / Field Work report / Project Report etc.

RMEPCC-01: Rolling Stocks

Duration: 60 hrs Theory + 90 hrs Practical

Course Objectives

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

1. To provide fundamental knowledge of railway rolling stock including locomotives, coaches, wagons, and metro cars.

2. To understand the construction, working principles, and functions of major rolling stock components and subsystems.

3. To familiarize students with traction, braking, suspension, and coupling systems used in rolling stock.

4. To develop an understanding of maintenance practices, safety features, and performance requirements of rolling stock.

5. To enable students to apply engineering principles for selection, operation, and improvement of rolling stock systems.

Course Outcomes
After completing this course, the learner will be able to:

CO1: Identify and classify different types of railway rolling stock and explain their applications.
CO2: Describe the construction and working of locomotives, coaches, wagons, and metro rolling stock.
CO3: Explain the functioning of traction systems, braking systems, suspension, and couplers used in rolling stock.
CO4: Analyze basic performance parameters such as speed, load, braking distance, and energy efficiency of rolling stock.
CO5: Apply standard inspection and maintenance practices to ensure safe and reliable rolling stock operation.
CO6: Interpret relevant railway standards, safety rules, and maintenance procedures related to rolling stock.

Module	Module Title & Topics	Hours
Module 1	**Locomotives** History of locomotives, types of locomotives- Diesel Mechanical, Diesel Electric and Diesel Hydraulic locomotives, Working of Steam, Diesel electric and Electric Locomotive.	**10**
Module 2	**Railway Coaches & Wagons** Types of coaches - IRS, ICF & LHB, Types of wagons - Open wagon, Covered wagon, Tank wagon, Flat wagon, Hopper wagon, components and assembly of coaches & wagons, Carriage and Wagon Bogie Maintenance in Workshops.	**10**
Module 3	**Bogies** Bogies Requirements from a Bogie, Types of bogies- CASNUB bogie, ICF bogie, FIAT bogie, Bogie Frame, Axle Guide Arrangement, Components and assembly of bogies.	**10**
Module 4	**Engineering Vehicles** Types of Engineering Vehicle, Cranes: General Arrangements, Types of cranes, Components and assembly of Cranes.	**10**
Module 5	**General Codes, Conditions of Indian Railway** Standards and specifications for Railway zones, Railway stations – Terminal, Centre, Junction & Station, Railway Platform- Types & Codes, Rolling Stocks-Locomotive, Coaches & Wagons	**10**
Module 6	**Engineering Enrollment in Railways** PPP policy. Organizations for Metro and Monorails, Railway recruitment Processes in Railways- RRB, RRC, UPSC, PSUs	**10**

Practical List

1. Assignment on Locomotives
2. Assignment on Railway Coaches & Wagons.
3. Assignment on Bogies.
4. Assignment on Engineering Vehicles.
5. Assignment on General Codes, Conditions of Indian Railway.
6. Assignment on Engineering Enrollment in Railways.
7. Case study on Locomotives.
8. Case study on Railway Coaches
9. Case study on Bogies.
10. Case study on Engineering Vehicles
11. Case study on General Codes, Conditions of Indian Railway.
12. Case study on Engineering Enrollment in Railways.

Reference Books & Resources

Books:

- *ChristosN. Pyrgidis, Railway Transportation Systems: Design, Construction and Operation, Oxford, New York, Philadelphia.*
- *Principles of Railway Engineering, S.C.Rangawala,Charotar Publication,2015.*
- *A Text Book of Railway Engineering, Dhanpat Rai& Sons.*

RMEPCC-02: Systems and Mechanisms of Railway

Duration: 45 hrs Theory + 90 hrs Practical

Course Objectives

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

1.To provide comprehensive knowledge of the overall railway system and its major subsystems.

2. To understand the mechanisms and working principles of railway rolling stock, traction, braking, and coupler systems.

3. To familiarize students with track systems, signaling, and power supply mechanisms in railways.

4. To develop an understanding of railway operations, safety mechanisms, and maintenance practices.

5. To enable students to apply system-level thinking for improving efficiency, reliability, and safety of railway transportation.

Course Outcomes (COs)
After completing this course, the learner will be able to:

CO1: Explain the structure and functions of major railway systems and subsystems.

CO2: Describe the working principles of locomotives, coaches, wagons, and their mechanical mechanisms.

CO3: Explain traction, braking, suspension, and coupling mechanisms used in railway rolling stock.

CO4: Identify the basic features of track systems, signaling mechanisms, and power supply systems in railways.

CO5: Analyze railway operational processes including train movement, control, and safety mechanisms.

CO6: Apply fundamental railway engineering knowledge to identify system-level problems and suggest improvements.

Module	Module Title & Topics	Hours
Module 1	**Rails and Slippers** Rail gauges, Track fittings: Rail joints, Avoidance of rail joints, Types of rail joints- According to position of joints, According to position of sleepers, Requirements of an ideal fastening Fastenings for rails, Fish-plates- Purpose, Design of fish-plates Fish plates, Details, Compound or junction, Failures of fish-plates, Spikes, fang-bolts and hook-bolts, Spikes- Purpose of spikes, Types of spikes, Requirements of a good spike, Fang-bolts, Hook-bolts, Rail-cutting. Sleepers: Functions and Requirements of Sleepers, Sleeper Density and Spacing of Sleepers, Types of Sleepers.	**10**
Module 2	**Rail and wheel geometry** Track train dynamics, Forces on the rail, Adhesion and friction, Fatigue and failure, Material science approach, Safety approach. Coning of Rail and wheel. Blanking of track. Track changing mechanism. Points and Crossings: Important Term, Switches, Design of Tongue Rails, Crossing, number and Angle of Crossing, Reconditioning of Worn Out Crossings, Turnout, Turn out with Curved Switches, Layout of Turnouts.	**08**
Module 3	**Braking System:** Friction braking, Regenerative braking system, Utilization of generated power, roof-mounted braking resistors, electro pneumatic friction brakes outfitted with steel discs and sintered pads designed for high loads, linear eddy-current brakes. Selection of appropriate braking system. Auxiliary system including compressors, single phase to three phase converters, battery chargers etc.	**07**
Module 4	**HVAC System:** HVAC system in High-speed trains, minimizing heating and cooling needed, heat exchangers to preheat or pre cooling coming air. Saving energy.	**05**

Module 5	**Traction System:** Three Phase AC-AC Locomotive Drive System, Types of drives, torque-speed requirements, design of rectifier, three phase inverters, V/F control and field vector control.	**07**
Module 6	**Suspension System:** Suspension systems of Diesel locomotives and effect on tractive effort, High Adhesion Bogie. **Coupling System:** Types- Screw, CBC and Janney coupler. Working principle of coupling systems.	**08**

Practical List

1. Assignment on Rails and Slippers
2. Assignment on Rail and wheel geometry.
3. Assignment on Braking System.
4. Assignment on HVAC System.
5. Assignment on Traction System.
6. Assignment on Suspension System and Coupling System.
7. Case study on Rails and Slippers.
8. Case study on Rail and wheel geometry
9. Case study on Braking System.
10. Case study on HVAC System
11. Case study on Traction System.
12. Case study on Suspension System and Coupling System.

Reference Books & Resources

Books:

- *A Text Book of Railway Engineering, Dhanpat Rai& Sons.*
- *Principles of Railway Engineering, S.C.Rangawala, Charotar Publication, 2015.*
- *Railway Engineering, M.M.Agrawal, Prabha & Co.,New Delhi.*
- *A Text Book of Railway Engineering, S.C.Saxena, S.P.Arora, Dhanpat Rai Publications (p) Ltd.-new Delhi, 2010.*

RMEMDM-03: Permanent Way, Signal System and Overhead Equipment's

Duration: 45 hrs Theory + 90 hrs Practical

Course Objectives

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

1. To provide fundamental knowledge of Permanent Way components, their design, construction, and maintenance practices.

2. To introduce the principles and functioning of railway signaling systems used for safe and efficient train operations.

3. To develop an understanding of Overhead Equipment (OHE) and electric traction power supply systems in railways.

4. To familiarize students with inspection, maintenance, and safety practices related to track, signaling, and OHE.

5. To enable students to apply engineering principles and standards for improving reliability, safety, and operational efficiency of railway infrastructure.

Course Outcomes (COs)

After completing this course, students will be able to:

CO1: Describe the components, functions, and types of Permanent Way including rails, sleepers, ballast, and track fittings.

CO2: Explain basic principles and working of railway signaling systems, including interlocking, block systems, and modern signaling concepts.

CO3: Identify and explain the components and operation of Overhead Equipment (OHE) and electric traction systems.

CO4: Apply standard inspection and maintenance practices for track, signaling, and OHE to ensure safe railway operations.

CO5: Analyze common defects and failures in permanent way, signaling, and OHE and suggest corrective measures.

CO6: Interpret relevant railway standards, rules, and safety regulations related to infrastructure and electrical systems.

Module	Module Title & Topics	Hours
Module 1	**Permanent way: Permanent way components–** Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast – Rail Fastenings.	**05**
Module 2	**Creep of Rails:** Theories related to creep, Adzing of Sleepers, Sleeper density, Rail joints techniques. Track failure.	**05**
Module 3	**Railway Signals: Turnouts & Controllers:** Track layouts, Switches, Design of Tongue Rails, Crossings, Turnouts, Layout of Turnout, Double Turnout, Diamond crossing, Scissors crossing. Signal Objectives, Classification, Fixed signals, stop signals, signaling systems, Mechanical signaling system, Electrical signaling system, System for Controlling Train Movement, Interlocking, Modern signaling Installations.	**10**
Module 4	**Signal System and OHE:** Signaling and General Provisions, Description of fixed signals, Equipment of signals, Working of Signals and Points, Hand Signals and Detonating Signals, Flare Signals, Defective signals and points, Interlocking, Modern Signaling system, Overhead catenaries.	**10**
Module 5	**Organization in Indian Railway:** History of Indian Railway, Indian Railway organization structure, Railway Boards: Roles and responsibilities, Railway Zones, Railways technical institutes, Railways research institutes, Railway production units, Workshop Management & Production Control Organization (PCO).	**08**
Module 6	**Standards of Indian Railway**: Signal System- Manual and Automatic Signal Systems, Horns-Types &Codes of Horns. Track side symbols. Codes of Mechanical Department (Workshop). Rail gauge- Broad Gauge, Meter gauge & Narrow gauge.	**07**

Practical List

1. Assignment on Permanent way.
2. Assignment on Creep of Rails.
3. Assignment on Railway Signals.
4. Assignment on Signal System and OHE.
5. Assignment on Organization in Indian Railway.
6. Assignment on Standards of Indian Railway.
7. Case study on Permanent way.
8. Case study on Creep of Rails
9. Case study on Railway Signals.
10. Case study on Signal System and OHE
11. Case study on Organization in Indian Railway.
12. Case study on Standards of Indian Railway.

Reference Books & Resources

Books:

- *Christos N. Pyrgidis, Railway Transportation Systems: Design, Construction and Operation, Oxford, New York, Philadelphia.*
- *Principles of Railway Engineering, S.C.Rangawala, Charotar Publication,2015.*
- *A Text Book of Railway Engineering, Dhanpat Rai & Sons.*

RMEPP-04: Rolling Stock and Railway Operations

Duration: 45 hrs Theory + 90 hrs Practical

Course Objectives

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

1. To provide fundamental knowledge of **railway rolling stock** including locomotives, coaches, wagons, and multiple-unit trains.
2. To understand the **construction, working principles, and functions** of major rolling stock systems such as traction, braking, suspension, and coupling.
3. To introduce the principles of **railway operations**, including train movement, scheduling, capacity, and safety.
4. To familiarize students with **performance parameters, maintenance practices, and operational constraints** of rolling stock.
5. To develop awareness of **railway rules, standards, and safety practices** for efficient and reliable train operations.

Course Outcomes (COs)

After completing this course, the learner will be able to:

CO1: Identify and classify different types of railway rolling stock and explain their applications.
CO2: Describe the construction and working of locomotives, passenger coaches, wagons, and multiple-unit trains.
CO3: Explain the functioning of traction, braking, suspension, and coupling systems used in rolling stock.
CO4: Analyse basic train performance parameters such as speed, tractive effort, haulage capacity, braking distance, and energy consumption.
CO5: Explain the fundamentals of railway operations, including train movement, scheduling, and control.
CO6: Apply standard inspection and maintenance practices to ensure safe and reliable rolling stock operation

Module	Module Title & Topics	Hours
Module 1	**Introduction to Rolling Stock** Definition and classification of rolling stock Types: Locomotives, coaches, wagons, EMU, MEMU, metro Gauge classification and applications Overview of railway vehicle layout Load carrying capacity and speed classification	**07**
Module 2	**Locomotives and Traction Systems** Types of locomotives: Diesel, Electric, Dual traction**,** Main components of locomotives**,** Diesel engine basics for locomotives**,** Electric traction system overview**,** Traction motors and transmission**,** Power control and auxiliaries**,** Comparison of diesel vs electric traction	**08**
Module 3	**Coach and Wagon Construction** Passenger coach construction, Underframe, body shell, doors, seating arrangement, Freight wagons: Types and applications, Bogie construction and types, Suspension systems (primary and secondary) Coach amenities and safety features	**08**
Module 4	**Braking, Coupling and Safety Systems** Purpose and requirements of braking systems, Air brake system: Components and working, Emergency braking Coupling systems: Screw coupling, CBC, Buffers and draft gear Safety devices in rolling stock	**08**
Module 5	**Railway Operations and Performance** Basics of train operation**,** Speed, tractive effort, haulage capacity**,** Train resistance, Braking distance, Energy consumption**,** Schedule and turnaround time	**07**
Module 6	**Maintenance and Safety Practices** Types of maintenance: Preventive, corrective, predictive Rolling stock inspection methods Common defects and failures Workshop and depot practices Safety rules related to rolling stock Introduction to RAMS concepts	**07**

Practical List

1. **Identification of Rolling Stock Components**
   Locomotive, coach, wagon parts (using models / charts)
2. **Study of Locomotive Systems**
   Diesel or electric locomotive layout and components
3. **Bogie and Suspension System Study**
   Identification of bogie parts and suspension elements
4. **Study of Air Brake System**
   Components, schematic diagram, and working principle
5. **Coupling and Buffer System Study**
   Types of couplers and their functions
6. **Coach Layout and Safety Features**
   Emergency devices, doors, fire safety equipment
7. **Performance Calculation – Tractive Effort**
   Simple numerical problems
8. **Braking Distance Calculation**
   Based on speed and braking force
9. **Maintenance Schedule Preparation**
   Preventive maintenance plan for a coach or wagon
10. **Defect Identification in Rolling Stock**
    Common defects and corrective actions
11. **Railway Operation Case Study**
    Train operation, scheduling, or depot operation
12. **Industrial Visit / Video Demonstration & Report**
    Railway workshop, depot, or metro facility

Reference Books & Resources

Books:

- *Christos N. Pyrgidis, Railway Transportation Systems: Design, Construction and Operation, Oxford, New York, Philadelphia.*
- *Principles of Railway Engineering, S.C.Rangawala, Charotar Publication,2015.*
- *A Text Book of Railway Engineering, Dhanpat Rai & Sons.*

RMESEC-05: Reliability, Availability, Maintainability & Safety in Railway

Duration: 45 hrs Theory + 90 hrs Practical

Course Objectives

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

1. To introduce the fundamental concepts of **Reliability, Availability, Maintainability, and Safety (RAMS)** as applied to railway systems.
2. To develop an understanding of RAMS requirements for **rolling stock, signaling, traction, track, and railway operations**.
3. To familiarize students with **failure modes, maintenance strategies, and safety management practices** in railways.
4. To enable students to apply RAMS principles to improve **system performance, safety, and lifecycle cost** of railway assets.
5. To create awareness of **railway standards, regulations, and risk assessment methods** used in ensuring safe and reliable rail operations.

Course Outcomes

After successful completion of the course, students will be able to:

CO1: Explain the concepts and importance of **Reliability, Availability, Maintainability, and Safety** in railway systems.

CO2: Identify common failure modes and reliability issues in **railway rolling stock and infrastructure**.

CO3: Analyse system availability and maintainability using basic RAMS calculations and maintenance data.

CO4: Apply preventive and corrective maintenance strategies to improve **railway system performance and safety**.

CO5: Assess safety risks in railway operations using basic **hazard identification and risk assessment techniques**.

CO6: Interpret and apply relevant **railway RAMS standards and safety regulations** in engineering practice.

Module	Module Title & Topics	Hours
Module 1	**Introduction of RAMS:** RAM Mathematics, Probability theory, Conditional Probability, Venn Diagram, Mutually exclusive and Independent events, Boole an Algebra, Axioms and Theorems, RAM Basics, Detailed explanation of Reliability, Availability, Maintainability and associated parameters Relationship between Different parameters, Constant failure at e-model And bathtub curve, Different types of Maintenance, Different types of Availability, RAM Modeling, Reliability block diagrams, Series and parallel systems, Decomposition method of RBD solution, Markov chain analysis for repairable systems, Fault tolerance and Redundancy, Systematic and Random faults.	**10**
Module 2	**System Engineering Principles:** Introduction of System, System engineering Elements of Systems, System Life cycle, Black box analysis, System engineering application the railway, Whole life costs, Life cycle cost modelling, Value Engineering.	**05**
Module 3	**Railway Standards:** Hazard, Hazard Analysis and Risk Acceptance, System, product safety assessment, SIL levels, CENELEC standards and Common safety methods, Safety Engineering Techniques, Hazard Log Management, FMECA- Safety analysis, Fault tree analysis, Event tree analysis, Safety targets compliance, Risk acceptance through Common safety methods.	**05**
Module 4	**System Assurance process:** Introduction to system assurance regime, Risk based assurance, Self-assurance regime, Progressive Assurance, Planning of system assurance processes, System assurance audits, Assurance management, System assurance attitude.	**10**

Module 5	**Application of RAMS:** Hardware and Software, Common cause failures, FMECA- RAM analysis, Software reliability, Preliminary RAM analysis, RAM targets and their apportionment, Final RAM analysis, Availability Modelling.	**08**
Module 6	**Application System Assurance process**: System Assurance qualities- Safety consciousness, transparency, integrity, trust, Project stage-based evidence maturity, Risk management through assurance, Commitment to reputation, Success through collaboration: Client, supplier and Assurance, Hand over to O&M-process, Delivering Efficiency through reliability centered maintenance.	**07**

Practical List

1. Assignment on Introduction of RAMS.
2. Assignment on System Engineering Principles.
3. Assignment on Railway Standards.
4. Assignment on System Assurance process.
5. Assignment on Application of RAMS.
6. Assignment on Application System Assurance process.
7. Case study on Introduction of RAMS.
8. Case study on System Engineering Principles.
9. Case study on Railway Standards.
10. Case study on System Assurance process.
11. Case study on Application of RAMS.
12. Case study on Application System Assurance process.

Reference Books & Resources

Books:

1. ChristosN.Pyrgidis,Railway Transportation Systems: Design,Construction and Operation, Oxford, New York, Philadelphia.
2. A Text Book of Railway Engineering, Dhanpat Rai& Sons.
3. A Text Book of Railway Engineering, S.C.Saxena, S.P.Arora, Dhanpat Rai Publications (p) Ltd.-new Delhi, 2010.

RMECC-06 Capstone Project (Industry-Oriented)

Duration: 40 hrs (Theory + Practical combined)

Course Objective

1. To provide students with hands-on exposure to real-world problems in railway rolling stock design, maintenance, and operations through industry-oriented projects.
2. To apply engineering principles in the analysis, design, testing, and optimization of locomotives, coaches, wagons, and railway systems.
3. To develop skills in system integration, safety, reliability, and operational efficiency related to rolling stock and railway operations.
4. To enhance understanding of industry standards, regulations, and best practices used in the railway sector.
5. To foster teamwork, project management, and professional communication skills required in the railway and transportation industry.

Course Outcomes (COs)

Upon completion, students will be able to:

CO1: Identify and define industry-relevant problems related to rolling stock systems and railway operations.

CO2: Apply engineering knowledge and modern tools to analyze and design solutions for rolling stock components, subsystems, or operational challenges.

CO3: Evaluate performance, safety, reliability, and maintainability aspects of rolling stock and railway operations using appropriate methods and standards.

CO4: Integrate multidisciplinary concepts (mechanical, electrical, control, operations, and safety) in the development of a comprehensive project solution.

CO5: Demonstrate effective project planning, execution, documentation, and teamwork in an industry-oriented environment.

CO6: Communicate technical findings clearly through reports, presentations, and reviews, adhering to professional and ethical practices.

Project Work Components (Suggested Breakdown)

Sr. No.	Project Component	Description	Hours
1	**Problem Identification & Project Selection**	Identification of a real-world problem related to rolling stock or railway operations. Project relevance to industry needs. Definition of objectives, scope, and expected outcomes.	**50**
2	**Literature Survey & Industry Study**	Study of existing rolling stock systems (locomotives, coaches, wagons). Review of maintenance practices, operational procedures, and safety norms Understanding of Indian Railways / Metro / Industry standards.	**40**
3	**System Description & Technical Analysis**	**Rolling stock components:** Bogie, braking system, suspension, couplers, doors Traction motors, power supply, control systems **Operational aspects:** Train scheduling, energy efficiency, safety systems Maintenance planning and depot operations	**70**
4	**Design / Modification / Improvement Proposal**	**Component design or redesign.** Operational improvement plan. Use of drawings, block diagrams, flowcharts, Simple calculations and design justification.	**150**
5	**Tools, Models & Simulations**	**Use of basic engineering tools:** AutoCAD / SolidWorks (drawings) Spreadsheet calculations Simple simulations or layouts Preparation of charts, tables, and graphs.	**45**
6	**Fabrication / Prototype / Case Study (as applicable)**	**Model or prototype (physical or virtual),** OR Detailed industry case study (maintenance issue, failure analysis, operation improvement) Demonstration of working principle	**20**
7	**Documentation & Presentation**	**Project report preparation:** Abstract, methodology, results, conclusion Oral presentation and viva-voce Use of drawings, photos, and diagrams	**15**
	Total		**390 Hours**

Assessment Scheme

Assessment Component	Weightage
Problem Definition & Requirement Analysis	10%
System Design & Architecture	15%
Implementation & Integration	40%
Testing & Validation	15%
Documentation & Presentation	20%