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B.SC (Hons)(FIRE AND INDUSTRIAL SAFETY)

SEMESTER- I

FUNDAMENTALS OF FIRE SAFETY

Semester -1

Fundamentals of Fire Safety

Semester - 1	Course Title
Unit - 1	Basics of Fire
Unit - 2	Chemistry of Fire
Unit - 3	Fire Propagation (Flame Spread and Fire Growth)
Unit - 4	Smoke and Its Effects

UNIT 1 : [illegible]

Structure

1.0 **Objectives**
1.1 **[illegible]**
1.2 **[illegible]**

- 1.2.1 [illegible]
- 1.2.2 [illegible]
- 1.2.3 [illegible]
- 1.2.4 [illegible]
- 1.2.5 [illegible]
- 1.2.6

1.3 [illegible]
1.4 Summary

UNIT 2 : [illegible]

Structure

2.0 [illegible]
2.1 [illegible]
2.2 [illegible]

- 2.2.1 [illegible]
- 2.2.2 [illegible]
- 2.2.3 [illegible]
- 2.2.4 [illegible]
- 2.2.5 [illegible]
- 2.2.6 [illegible]
- 2.2.7 [illegible]
- 2.2.8 [illegible]
- 2.2.9 [illegible]
- 2.2.10 [illegible]

- 2.2.1.1 Autoignition / Ignition Point

  2.3 Terminology, Semantics

  2.4 Summary

  2.5 Questions for Practice

- 2.5.1 Write detailed answers to the following questions.
- 2.5.2 Write short answers to the following questions.
- 2.5.3 Write the answers to the following questions from the options given below.

  2.6 Fieldwork

  2.7 Reference Books

  2.8 References for Content

UNIT 3 - Fire Propagation (Flame Spread and Fire Growth)

Structure

3.0 Objectives
3.1 Introduction
3.2 Subject - Interpretation

- 3.2.1 Spread of Flames in Solids
- 3.2.2 Spread of Flames in Liquids
- 3.2.3 Jets in Fire Propagation
- 3.2.4 Three Dimensional Fire Propagation

  3.3 Terminology, Semantics

  3.4 Summary

  3.5 Questions for Practice

- 3.5.1 Write detailed answers to the following questions.
- 3.5.2 Write short answers to the following questions.
- 3.5.3 Write the answers to the following questions from the options given below.

  3.6 Fieldwork

  3.7 Reference Books

  3.8 References for Content

UNIT 4 - Smoke and Its Effects

Structure

4.0 Objectives

4.1 Introduction

4.2 Subject Interpretation

- 4.2.1 Smoke and its Constituents
- 4.2.2 Principles of Ignoring Severity of Smoke
- 4.2.3 Smoke Movement
- 4.2.4 Toxicity of Smoke
- 4.2.5 Effect of Harmful Agents on Smoke
    - i. Carbon Monoxide
    - ii. Carbon Dioxide
    - iii. Nitrogen Oxides
    - iv. Sulphur Dioxide
- 4.2.6 Effects of Smoke Inhalation

4.3 Terminology, Semantics

4.4 Summary

4.5 Questions for Practice

- 4.5.1 Write detailed answers to the following questions.
- 4.5.2 Write short answers to the following questions.
- 4.5.3 Write the answers to the following questions from the options given below.

4.6 Fieldwork

4.7 References/Books

4.8 References for Content

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SEMESTER-I

FUNDAMENTALS OF INDUSTRIAL SAFETY

Semester -1

Fundamentals of Industrial Safety

Semester - 1	Course Title
Unit - 5	Safety Culture
Unit - 6	Industrial Hygiene
Unit - 7	Welfare Facilities
Unit - 8	Behaviour-Based Safety (BBS)

UNIT 5 : Safety Culture

Structure

5.0 Objectives
5.1 Introduction
5.2 Subject : Interpretation

- 5.2.1 Introduction to Safety Culture
- 5.2.2 Positive & Negative Safety Culture
- 5.2.3 Benefits of Positive Safety Culture
- 5.2.4 Safety Culture Assessment and Improvement
  5.3 Terminology, Semantics
  5.4 Summary
  5.5 Questions for Practice
  5.6 Fieldwork
  5.7 Reference Books
  5.8 References for Content

UNIT 6 : Industrial Hygiene

Structure

6.0 Objectives
6.1 Introduction
6.2 Subject : Interpretation

- 6.2.1 Definition and Importance
- 6.2.2 Occupational Health & Occupational Safety
- 6.2.3 Introduction to Personal Hygiene
- 6.2.4 Housekeeping and Maintenance
  6.3 Terminology, Semantics
  6.4 Summary
  6.5 Questions for Practice
  6.6 Fieldwork
  6.7 Reference Books
  6.8 References for Content

UNIT 7 : Welfare Facilities

Structure:

7.0 Objectives
7.1 Introduction
7.2 Subject – Interpretation

- 7.2.1 Sanitary Conveniences
- 7.2.2 Drinking Water
- 7.2.3 Changing and Storage Facilities
- 7.2.4 Rest and Eating Facilities
- 7.2.5 Arrangement for Vulnerable Persons
- 7.2.6 First Aid Provisions & Occupational Health Centre (OHC)

7.3 Terminology, Semantics
7.4 Summary
7.5 Questions for Practice
7.6 Fieldwork
7.7 References/Books
7.8 References for Content

UNIT 8 : Behaviour Based Safety (BBS)

Structure:

8.0 Objectives
8.1 Introduction
8.2 Subject – Interpretation

- 8.2.1 Definition of BBS
- 8.2.2 Importance of Safety in and Safety at Workplace
- 8.2.3 Role of Safety Officer in BBS
- 8.2.4 Basics of Human Behaviour & Safety
- 8.2.5 Monitoring of Behaviour Based Safety Observations
- 8.2.6 Implementing a BBS in Industries
- 8.2.7 Role of Supervisors and Safety officers in Motivations

8.2.8 Concept of Reward & Recognition
8.3 Terminology, Semantics
8.4 Summary

Semester -1

Practical - 1

Sr. No	Practical
1	Operation of Dry Chemical Powder Fire Extinguishers
2	Operation of CO2 Chemical Powder Fire Extinguishers
3	Inspection of Fire Extinguisher
4	Operation of Fire Hydrant System

Practical - 2

Semester – I	Practical
1	Measurement of Cold Environmental Condition at Work place
2	Measurement of Hot Environmental Condition at Work place
3	Conduct Behaviour Based Safety Audit
4	Demonstrate the Use of Fire Proximity Suit

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SEMESTER- II

INDUSTRIES AND ERGONOMIC PRACTICES

Semester -2

Industries and Ergonomic Practices

Semester - 2	Course Title
Unit – 9	Hazards in Industries
Unit – 10	Introduction to Ergonomics
Unit – 11	Ergonomic Injuries
Unit – 12	Manual Handling injuries

Unit 9: Hazards in Industries

- Structure
- 9.0 Objectives
  - 9.1 Introduction
  - 9.2 Subject - Interpretation
    - 9.2.1 Introduction to Hazard
    - 9.2.2 Physical Hazards
    - 9.2.3 Chemical Hazards
    - 9.2.4 Ergonomical Hazards
    - 9.2.5 Environmental Hazards
    - 9.2.6 Organizational Hazards
    - 9.2.7 Miscellaneous Hazards
  - 9.3 Terminology, Taxonomy
  - 9.4 Taxonomy
  - 9.5 Questions for Practice
  - 9.6 Activities
  - 9.7 Reference Books
  - 9.8 References for Content

Unit 10: Introduction to Ergonomics

- Structure
- 10.0 Objectives
  - 10.1 Introduction
  - 10.2 Subject - Interpretation
    - 10.2.1 Definition of Ergonomics
    - 10.2.2 Benefits of Ergonomics in Industries
    - 10.2.3 Man Machine Relations (Jan)
    - 10.2.4 Effect of Working Postures on Different Parts of the Body
    - 10.2.5 Ergonomics During Setting Up of Computer Workstations
  - 10.3 Terminology, Taxonomy
  - 10.4 Taxonomy
  - 10.5 Questions for Practice
  - 10.6 Activities
  - 10.7 Reference Books
  - 10.8 References for Content

Unit 11: Ergonomic Injuries

- Structure
- 11.0 Objectives
  - 11.1 Introduction
  - 11.2 Subject - Interpretation
    - 11.2.1 Ergonomic Injuries in Industries
    - 11.2.2 Hazards in Sitting Jobs
    - 11.2.3 Musculoskeletal Injuries
    - 11.2.4 Work-Related Injuries

Unit 12: Manual Handling Injuries

- Structure

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SEMESTER- II

GENERAL SAFETY IN INDUSTRIES

Semester -2

General Safety in Industries

Semester - 2	Course Title
Unit – 13	Introduction to Workplace Safety
Unit – 14	Permit To Work System
Unit – 15	Non-Respiratory Personal Protective Devices
Unit – 16	Respiratory Personal Protective Devices

Unit 13: Introduction to Workplace Safety

- Structure
- 13.0 Objectives
  - 13.1 Introduction
  - 13.2 Subject - Interpretation
    - 13.2.1 Introduction to Philosophy of Control
    - 13.2.2 Importance & Examples
    - 13.2.3 Heinrich Safety Pyramid Theory
    - 13.2.4 Introduction to Accident Causation Theories
  - 13.3 Terminology, Semantics
  - 13.4 Summary
  - 13.5 Questions for Practice
  - 13.6 Feedback
  - 13.7 Reference Books
  - 13.8 References for Content

Unit 14: Permit To Work System

- Structure
- 14.0 Objectives
  - 14.1 Introduction
  - 14.2 Subject - Interpretation
    - 14.2.1 Definition of Work Permit
    - 14.2.2 Importance of PTW
    - 14.2.3 Different Work Permits and Precautions
      - Height Work
      - Hot Work
      - Cold Work
      - Confined Space
      - Electrical Isolation
      - Excavation
    - 14.2.4 Responsibilities of Owner, Core Authorized Managers & Safety Officer in Issuing of Work Permits
    - 14.2.5 Limited Digital CLOTOs System
  - 14.3 Terminology, Semantics
  - 14.4 Summary
  - 14.5 Questions for Practice
  - 14.6 Feedback
  - 14.7 Reference Books
  - 14.8 References for Content

Unit 15: Non-Regulatory Personal Protective Devices

- Structure
- 15.0 Objectives
  - 15.1 Introduction
  - 15.2 Subject - Interpretation
    - 15.2.1 Introduction

Unit 10: Respiratory Personal Protective Devices

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SEMESTER- II

SAFETY LEADERSHIP

Semester -2

Safety Leadership

Semester : 2	Course Title
Unit – 17	Managing Safety
Unit – 18	Management's Safety Responsibilities
Unit – 19	Safety Education
Unit – 20	Safety Officers & Committee

Unit 17: Managing Safety

Structure

Unit 18: Management's Safety Responsibilities

Structure

Unit 19: Safety Education

Structure

Unit 20: Safety Officer & Committee

Structure

Semester -2

Practical - 3

Sr. No	Practical
1	Identify the size of particulates in workplace
2	Measurement of Noise level from various sources
3	Measurement of Frequency of Noise
4	Assessment of Height work and issue the Height work permit

Practical - 4

Sr. No	Practical
1	Measurement of whole-body vibration from accelerator
2	Identification of source of vibration
3	Conduct PPE Audit
4	Preparation of a safety Inspection Check List for 5S in Industries

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SEMESTER- III
INDUSTRIAL HEALTH

Semester -3

Industrial Health

Semester - 3	Course Title
Unit – 21	Occupational Health
Unit – 22	Health Effects to Infection
Unit – 23	Health Effects from Radiation
Unit – 24	Work-Life Balance

Unit 21: Occupational Health

Structure

21.0 Objectives
21.1 Introduction
21.2 Subject - Interpretation
21.2.1 Activities of Occupational Health Centre
21.2.2 Pre-Employment and Post-Employment Medical Examinations
21.3 Terminology, Semantics
21.4 Summary
21.5 Questions for Practice
21.6 Fieldwork
21.7 Reference Books
21.8 References for Content

Unit 22: Health Effects in Industries

Structure

22.0 Objectives
22.1 Introduction
22.2 Subject - Interpretation
22.2.1 Health Effects from Physical Hazards
- Noise
- Vibration
- Dust
- Non-Ferrous
- Inorganic Substances
22.3 Terminology, Semantics
22.4 Summary
22.5 Questions for Practice
22.6 Fieldwork
22.7 Reference Books
22.8 References for Content

Unit 23: Health Effects from Radiation

Structure

23.0 Objectives
23.1 Introduction

Unit 24: Work-related Stress

Structure

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SEMESTER- III

ENVIRONMENTAL MANAGEMENT

Semester -3

Environmental Management

Semester - 3	Course Title
Unit – 25	Environmental Chemistry
Unit – 26	Environmental Pollution
Unit – 27	Climate Change
Unit – 28	Environmental Sustainability

Unit 25: Environmental Chemistry

Structure

Unit 26: Environmental Pollution

Structure

Unit 27: Climate Change

Structure

Unit 28: Environmental Sustainability

Structure

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SEMESTER- III

INDUSTRIAL PROCESS SAFETY

Semester -3

Industrial Process Safety

Semester - 3	Course Title
Unit – 29	Introduction to Process Safety
Unit – 30	Elements of a Process Safety Management System
Unit – 31	Operation Safety in Chemical Industry
Unit – 32	Gas Detection System

Unit 28: Introduction to Process Safety

Structure

28.0 Objectives
28.1 Introduction
28.2 Safety : Interpretation
28.2.1 Definition and Importance of Process Safety
28.2.2 Historical Incidents Highlighting the Need for Process Safety
28.3 Terminology, Semantics
28.4 Summary
28.5 Questions for Practice
28.6 Feedback
28.7 Reference Books
28.8 Bibliography for Learners

Unit 29: Elements of a Process Safety Management System

Structure

29.0 Objectives
29.1 Introduction
29.2 Subject : Interpretation
29.2.1 Key Elements of a Process Safety Management System
29.2.2 Implementation in Industries
29.2.3 Challenges of MSMS and its Benefits
29.3 Terminology, Semantics
29.4 Summary
29.5 Questions for Practice
29.6 Feedback
29.7 Reference Books
29.8 Bibliography for Learners

Unit 30: Operation Safety in Chemical Industry

Structure

30.0 Objectives
30.1 Introduction
30.2 Subject : Interpretation
30.2.1 Hazardous Area Classification (HAC)
30.2.2 Layers of Protection Analysis (LOPA)
30.2.3 Role of Human Factor in Safety and Risk Management Systems

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Unit 12: Gas Detection System

Structure:

Semester -3

Practical - 5

Sr. No	Practical
1	Measurement of Light absorbed by different chemicals at specified wavelength
2	Assessment of Confined space entry and fill the confined space work permit
3	Measurement of IC engine exhaust gas levels to identify the gases causing the human health hazards
4	Demonstration use of LEL Detector

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SEMESTER- IV
FIRE AND SAFETY STRATEGIES FOR VARIOUS INDUSTRIES

Semester -4

Fire and Safety Strategies for Various Industries

Semester - 4	Course Title
Unit – 33	Hazards in Mining
Unit – 34	Safety in Food Industries
Unit – 35	Safety in Textile Industry
Unit – 36	Safety in Thermal Power Plant

Unit-III: Hazards in Mining

Structure

3.0 Objectives
3.1 Introduction
3.2 Subject – Interpretation
3.2.1 Introduction to Mining Safety Management
3.2.2 Mining Underground: Metalliferous and Tunnelling
3.2.3 Explosives – For Underground Coal & Metal Mining
3.2.4 Blasting Practices in Mines
3.2.5 Mines Materials Storage and Handling
3.2.6 Mining Risk and Hazard
3.2.7 Mine Environment
3.2.8 Transportation in Mines
3.2.9 Rock Mechanics, Strata Control and Ground Movements
3.2.10 Mines Disease
3.2.11 Mining Electrical Safety
3.3 Terminology, Semantics
3.4 Summary
3.5 Questions for Practice
3.6 Feedback
3.7 Reference Books
3.8 References for Content

Unit-IV: Safety in Food Industries

Structure

4.0 Objectives
4.1 Introduction
4.2 Subject – Interpretation
4.2.1 Food Safety Assessment
4.2.2 Food Safety Management Procedures
4.2.3 Principle of Safe Food Storage
4.2.4 Review of Food Safety
4.2.5 Evaluating HACCP Procedures
4.2.6 Workplace and Personal Hygiene and Product Safety
4.3 Terminology, Semantics
4.4 Summary
4.5 Questions for Practice
4.6 Feedback

34.7 Reference Books
34.8 References for Content

Unit 35: Safety in Textile Industry

Structure

35.0 Objectives
35.1 Introduction
35.2 Subject - Interpretation
35.2.1 Types of Textile Industry
35.2.2 Need of Safety in Textile Industry
35.2.3 Textile Process Hazards
35.2.4 Health Hazards in Textile Industry and Precautionary Measures
35.2.5 Health and Welfare Provisions in Textile Industry
35.3 Terminology, Semantics
35.4 Summary
35.5 Questions for Practice
35.6 Fieldwork
35.7 Reference Books
35.8 References for Content

Unit 36: Safety in Thermal Power Plant

Structure

36.0 Objectives
36.1 Introduction
36.2 Subject - Interpretation
36.2.1 Introduction to Thermal Power Plants & Furnace Oil Handling System
36.2.2 Boiler Operation
36.2.3 Steam and Feed Water Cycle
36.2.4 Coal Handling & Ash Handling System
36.2.5 Safety Statutory Provisions
36.3 Terminology, Semantics
36.4 Summary
36.5 Questions for Practice
36.6 Fieldwork
36.7 Reference Books
36.8 References for Content

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SEMESTER- IV

INDUSTRIAL WASTE MANAGEMENT

Semester -4

Industrial Waste Management

Semester – 4	Course Title
Unit – 37	Solid Waste Management
Unit – 38	Hazardous Waste Management
Unit – 39	Disposal Techniques of Hazardous Waste
Unit – 40	Radioactive Waste Management

Unit-07: Solid Waste Management

Structure

07.0 Objectives
07.1 Introduction
07.2 Subject – Interpretation
07.2.1 Classification and Management of Solid Waste
- Food Waste
- Dry Leaves Waste
- Paper Waste
- Glass
- Scrap Metals
- Biomedical Waste
- Industrial Waste
- Radioactive Waste
- Plastic Waste
- Battery Waste
07.2.2 Concept of Utilization of Biodegradable Wastes
07.3 Terminology, Semantics
07.4 Summary
07.5 Questions for Practice
07.6 Fieldwork
07.7 Reference Books
07.8 References for Content

Unit-08: Hazardous Waste Management

Structure

08.0 Objectives
08.1 Introduction
08.2 Subject – Interpretation
08.2.1 Characteristics of Hazardous Waste
08.2.2 Generation, Collection, and Handling Methods
08.2.3 Storage and Transportation of Hazardous Wastes
08.2.4 Various Categories of Hazardous Waste
08.3 Terminology, Semantics
08.4 Summary
08.5 Questions for Practice
08.6 Fieldwork

38.7 Reference Books
38.8 References for Content

Unit 39: Disposal Techniques of Hazardous Waste

Structure

39.0 Objectives
39.1 Introduction
39.2 Subject - Interpretation
39.2.1 Disposal Techniques
- Incineration
- Landfill
- Co-Processing
- Recovery
39.2.2 Safety Measures for Handling Hazardous Waste
39.2.3 Health Risks Associated with Hazardous Wastes
39.2.4 Environmental Challenges of Hazardous Waste
39.2.5 Pollution Control Board (PCB) Guidelines
39.3 Terminology, Semantics
39.4 Summary
39.5 Questions for Practice
39.6 Fieldwork
39.7 Reference Books
39.8 References for Content

Unit 40: Radioactive Waste Management

Structure

40.0 Objectives
40.1 Introduction
40.2 Subject - Interpretation
40.2.1 Overview of Radioactive Waste
40.2.2 Sources and Types of Radioactive Waste
40.2.3 Methods of Radioactive Waste Disposal
40.2.4 Environmental and Health Effects of Radioactive Waste
40.2.5 Safety Measures in Handling and Storage
40.3 Terminology, Semantics
40.4 Summary
40.5 Questions for Practice

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SEMESTER- IV

SAFETY IN CONSTRUCTION INDUSTRIES

Semester -4

Safety in Construction Industries

Semester - 4	Course Title
Unit – 41	Construction Project Management
Unit – 42	Construction Machinery Safety
Unit – 43	Safety in Special Works
Unit – 44	Construction Safety Management

Unit 41: Construction Project Management

Structure

41.0 Objectives
41.1 Introduction
41.2 Subject - Interpretation
41.2.1 Mobilization of Men and Material
41.2.2 Medical Examination
41.2.3 Documentation of Workers
41.2.4 Construction Safety Manual
41.2.5 Safe Access
41.2.6 Basics of [illegible]
41.2.7 Signs and Indicators
41.3 Terminology Semantics
41.4 Summary
41.5 Questions for Practice
41.6 Fieldwork
41.7 Reference Books
41.8 References for Content

Unit 42: Construction Machinery Safety

Structure

42.0 Objectives
42.1 Introduction
42.2 Subject - Interpretation
42.2.1 [illegible]
42.2.2 Earth Moving Equipment
42.2.3 Railway Wagons
42.2.4 Motor Trucks
42.2.5 Materials Vehicles
42.2.6 Cranes
42.2.7 Tower Cranes
42.2.8 Lifting Gears
42.2.9 Hoists & Lifts
42.2.10 Temporary Power Supply
42.3 Terminology Semantics
42.4 Summary
42.5 Questions for Practice
42.6 Fieldwork
42.7 Reference Books
42.8 References for Content

Unit-10: Safety in Special Works

Structure

10.0 Objectives
10.1 Introduction
10.2 Subject - Interpretation
10.2.1 High-Rise Buildings
10.2.2 Bridges and Tunnels
10.2.3 Roads and Railways
10.2.4 Asphalting
10.2.5 Pneumatic Caissons
10.2.6 Electrical Installations and Lifts
10.2.7 Safety in Use and Handling of Explosives in Quarrying & Demolition Operations
10.3 Terminology, Semantics
10.4 Summary
10.5 Questions for Practice
10.6 Fieldwork
10.7 References Books
10.8 References for Content

Unit-11: Construction Safety Management

Structure

11.0 Objectives
11.1 Introduction
11.2 Subject - Interpretation
11.2.1 Construction Safety Management - Issues & Challenges
11.2.2 Daily TBT & Routine Trainings
11.2.3 PPEs Used in Construction Activities
11.3 Terminology, Semantics
11.4 Summary
11.5 Questions for Practice
11.6 Fieldwork
11.7 References Books
11.8 References for Content

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SEMESTER- IV

OCCUPATIONAL DISEASES

Semester -4

Occupational Diseases

Semester - 4	Course Title
Unit – 45	Introduction to Occupational Diseases
Unit – 46	Notifiable Occupational Diseases
Unit – 47	Occupational Hazards in Radiation Industries
Unit – 48	Occupational Psychology

Unit III: Occupational Diseases

Structure

Unit IV: Identifiable Occupational Diseases

Structure

Unit 07: Occupational Hazards in Radiation Industries

Structure

Unit 08: Occupational Psychology

Structure

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SEMESTER- V

SAFETY IN ELECTRICAL SYSTEMS

Semester -5

Safety in Electrical Systems

Semester - 5	Course Title
Unit – 40	Electrical Safety
Unit – 50	Electrical Hazards and Accidents
Unit – 51	Protection System and Prevention of Shocks
Unit – 52	Electrical Overload and Protection

Unit 09: Electrical Safety

Structure:

09.0 Objectives
09.1 Introduction
09.2 Subjects : Interpretation
09.2.1 Static Electricity
09.2.2 Electrical Risks from Improper Portable Appliances
09.2.3 Electrical Measures
09.2.4 Use of Portable Equipment
09.2.5 Electrical Safety in Power Generation, Transmission, and Distribution
09.2.6 Lightning Arrestors
09.2.7 Circuit Protective Devices and Installation
09.3 Terminology, Semantics
09.4 Summary
09.5 Questions for Practice
09.6 Feedback
09.7 References & Books
09.8 Relevant Links for Courses

Unit 10: Electrical Hazards and Accidents

Structure:

10.0 Objectives
10.1 Introduction
10.2 Subjects : Interpretation
10.2.1 Primary and Secondary Electrical Shocks
10.2.2 Characteristics of Electric Shock
10.2.3 Probability of Sustaining a Shock
10.2.4 Three Phase AC System Shock
10.2.5 Shocks from Bipolar DC Systems
10.2.6 AC vs. DC System
10.2.7 Effects of Electrical Flow Across the Human Body
10.2.8 Heating Effects
10.2.9 Electrical Burns
10.2.10 Severity of Electric Shock
10.2.11 Burns, Scalds, Flash Hazards, and Blast Hazards
10.2.12 Electrical Causes of Fire and Explosion
10.2.13 Lightning Hazards
10.3 Terminology, Semantics

Unit 11: Protection System and Prevention of Shocks

Structure

Unit 12: Electrical Overload and Protection

Structure

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SEMESTER- V

FIRE & SAFETY LEGAL COMPLIANCE

Semester -5

Fire & Safety Legal Compliance

Semester - 5	Course Title
Unit – 53	History of Safety
Unit – 54	Factories Act 1948
Unit – 55	Labour Welfare Acts and Rules
Unit – 56	Other Safety Legislations

Unit 13: History of Safety

Structure

Unit 14: Factories Act 1948

Structure

Unit 15: Labour Welfare Acts and Rules

Structure

Unit 56: Other Safety Legislations

Structure

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SEMESTER- V

SAFETY AUDIT AND MANAGEMENT SYSTEM

Semester -5

Safety Audit and Management System

Semester - 5	Course Title
Unit – 57	Codes on Safety
Unit – 58	International Labour Organization
Unit – 59	Introduction to ISO
Unit – 60	ISO 45001:2018 Audit

Unit 07: Codes on Safety

Structure

07.0 Objectives
07.1 Introduction
07.2 Safety : Interpretation
07.2.1 Safety Provisions in Occupational Safety and Health Administration (Rules)
07.2.2 Instruction to Various Standards of Safety and Health
07.3 Terminology, Terminology
07.4 Summary
07.5 Questions for Practice
07.6 Feedback
07.7 Reference Books
07.8 References for Learners

Unit 08: International Labour Organisations

Structure

08.0 Objectives
08.1 Introduction
08.2 Subject : Interpretation
08.2.1 History and Establishment of the ILO
08.2.2 Objectives and Functions/ activities of Framework
08.2.3 Key ILO Conventions (Conventions 81,87, 155)
08.3 Terminology, Terminology
08.4 Summary
08.5 Questions for Practice
08.6 Feedback
08.7 Reference Books
08.8 References for Learners

Unit 09: Introduction to ISO

Structure

09.0 Objectives
09.1 Introduction
09.2 Subject : Interpretation
09.2.1 Purposes and Principles of the World Trade
09.2.2 Benefits of ISO implementation

Unit 02: ISO 45001:2018 Audit

Structure

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SEMESTER- V

INDUSTRIAL FIRE PROTECTION

Semester -5

Industrial Fire Protection

Semester - 5	Course Title
Unit – 01	Codes on Safety
Unit – 02	International Labour Organization
Unit – 03	Introduction to ISO
Unit – 04	ISO 45001:2018 Audit

Unit-01: Introduction to Fire Protection Systems

Structure:

01.0 Objectives
01.1 Introduction
01.2 Subject - Interpretation
01.2.1 Importance of Fire Protection Systems
01.2.2 Classification of Fire Prevention, Passive and Active Systems
01.2.3 Fire Triangle, Understanding Fire and Combustion
01.2.4 Fire Hazards in Building and Industries
01.2.5 Overview of Fire Safety Regulations and Standards
01.3 Terminology, Definitions
01.4 Summary
01.5 Questions for Practice
01.6 Feedback
01.7 References/ Books
01.8 References/e-Content

Unit-02: Passive Fire Protection Systems

Structure:

02.0 Objectives
02.1 Introduction
02.2 Subject - Interpretation
02.2.1 Introduction to Passive Fire Protection
02.2.2 Fire Protection of Building and Means of Escape
02.2.3 Design Considerations for Escape Routes
02.2.4 Emergency Exits and Signage
02.2.5 Fire Doors: Types and Functions
02.2.6 Fire Walls: Purpose and Construction
02.2.7 Protection of Cable Ways Against Fire
02.2.8 Fire-proofing Materials: Types and Applications
02.3 Terminology, Definitions
02.4 Summary
02.5 Questions for Practice
02.6 Feedback
02.7 References/ Books
02.8 References/e-Content

Unit 63: Safety Fire Protection Systems

Structure:

63.0 Objectives
63.1 Introduction
63.2 Subject - Interpretation
63.2.1 Key Terms in System Components and Functioning
63.2.2 Detection Devices: Working Principles and Applications
63.2.3 Manual Alarm Devices: Usage in Fire Safety
63.2.4 Thermal Detectors: Characteristics and Effectiveness
63.2.5 Smoke Detectors: Types and Sensitivity Levels
63.2.6 Air Sampling Detectors: Early Fire Detection Mechanism
63.2.7 Automatic Sprinkler Systems: Types and Activation Process
63.3 Terminology / Semantics
63.4 Summary
63.5 Questions for Practice
63.6 Feedback
63.7 References / Books
63.8 Recommendations for Learners

Unit 64: Fire Extinguishment and Emergency Response

Structure:

64.0 Objectives
64.1 Introduction
64.2 Subject - Interpretation
64.2.1 Different Types of Fire Extinguishers and Their Uses
- Water-based Extinguishers
- Foam Extinguishers
- Dry Chemical Powder Extinguishers
- Carbon Dioxide Extinguishers
- Specialized Extinguishers
64.2.2 Inspection and Maintenance of Portable Fire Extinguishers
64.2.3 Distinction Between Extinguishers, Hydrants and Compliances
64.2.4 Role of Fire Brigades in Industrial Fire Emergencies
64.2.5 Firefighting Techniques and Equipment
64.2.6 Rescue Operations and Safety Protocols
64.2.7 Coordination with Emergency Response Teams
64.3 Terminology / Semantics
64.4 Summary
64.5 Questions for Practice

Semester-5

Practical - 6

Sr. No	Practical
1	Measurement of Light Intensity using lux meter
2	Develop the Standard (Safe) Operating Procedure (SOP) of related to handling of any equipment
3	Prepare the Scaffolding Inspection as per checklist
4	Prepare a MSDS on any of the two chemicals

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SEMESTER- VI

MANUFACTURING SAFETY PRACTICES

Semester -6

Manufacturing Safety Practices

Semester - 6	Course Title
Unit – 05	Machinery Safety
Unit – 06	Illumination & Noise
Unit – 07	Ventilation & Heat Control
Unit – 08	Manual Handling

Unit-III: Machinery Safety

Structure

Unit-IV: Illumination & Noise

Structure

Unit-V: Ventilation & Heat Control

Structure

Unit 08: Manual Handling

Structure:

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SEMESTER- VI

ENVIRONMENTAL SAFETY IN INDUSTRIES

Semester -6

Environmental Safety in Industries

Semester - 6	Course Title
Unit – 69	Waste Water Treatment
Unit – 70	Environmental Monitoring
Unit – 71	Environmental Impact Assessment
Unit – 72	Environmental Legislation

Unit 69: Waste Water Treatment

Structure

69.0 Objectives
69.1 Introduction
69.2 Subject - Interpretation
69.2.1 Different Sources of Wastewater
69.2.2 Operation and Maintenance of Different Wastewater Treatment Plants
- Effluent Treatment Plant (ETP)
- Sewage Treatment Plant (STP)
- Common Effluent Treatment Plant (CETP)
- Reverse Osmosis (RO) Systems
69.2.3 Introduction to Zero Liquid Discharge (ZLD) & [illegible]
69.3 Terminology, Remarks
69.4 Summary
69.5 Questions for Practice
69.6 Fieldwork
69.7 Reference Books
69.8 References for Content

Unit 70: Environmental Monitoring

Structure

70.0 Objectives
70.1 Introduction
70.2 Subject - Interpretation
70.2.1 Purpose & Benefits of Environmental Monitoring
70.2.2 Stack Monitoring
70.2.3 Ambient Air Quality
70.2.4 Air Pollution Monitoring Devices
70.2.5 Air Pollution Control Devices
70.2.6 Ground and Surface Water Quality Parameters
70.2.7 Noise Monitoring
70.2.8 Soil Monitoring
70.2.9 Discharge Standards of Treated Water
70.2.10 Frequency of Monitoring
70.2.11 Regulatory Reports and Legal Compliances
70.3 Terminology, Remarks
70.4 Summary
70.5 Questions for Practice

Unit 71: Environmental Impact Assessment

Structure

Unit 72: Environmental Legislations

Structure

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SEMESTER- VI
CHEMICAL HANDLING SAFETY

Semester -6

Chemical Handling Safety

Semester - 6	Course Title
Unit – VI	Chemical Hazards
Unit – VI	Chemical Entry to Human System
Unit – VI	Safety in Storage and Handling of Hazardous Chemicals and Gases
Unit – VI	Safety Provisions in Chemical Industry

Unit 7II: Chemical Hazards

- Introduction to Chemical Hazards
- Dangerous Properties of Chemicals
- Types of Chemical Hazards
    - Dust
    - Gases
    - Fumes
    - Mist
    - Vapours
    - Smoke
    - Aerosols

Unit 7III: Chemical Entry to Human System

- Routes of Entry to Human System
- Recognition, Evaluation, and Control of Route Hazards
- Concepts of Dose-Response Relationship
- Biochemical Action of Toxic Substances

Unit 7IV: Safety in Storage and Handling of Hazardous Chemicals and Gases

- General Considerations for Storage and Handling of Chemicals and Industrial Gases
- Safety During Pipeline Transport
- Safety in Chemical Laboratories

Unit 7V: Safety Provisions in Chemical Industry

- Safety Provisions
    - Level and Flow Indicators
    - Alarms and Trips
    - Protection of Drills, Columns, and Towers from Lightning

Colour Coding for Pipelines and Cylinders

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SEMESTER- VI

ADVANCED INDUSTRIAL MANAGMENT

Semester -6

Advanced Industrial Management

Semester - 6	Course Title
Unit – VI	Planning for safety
Unit – VII	Industrial Safety Requirements
Unit – VIII	Safety Policy
Unit – IX	[illegible]

Unit 07: Planning for safety

Structure

7.0 Objectives

7.1 Introduction

7.2 Subject : Interpretation

7.2.1 Planning

7.2.2 Effective Planning

7.2.3 Planning Process

7.2.4 Stages of planning

7.2.5 Terminologies, Documents

7.3 Summary

7.4 Questions for Practice

7.5 References Books

Unit 08: Industrial Safety Requirements

Structure

8.0 Objectives

8.1 Introduction

8.2 Subject : Interpretation

8.2.1 Safety Precautions

8.2.2 Employee Participation

8.2.3 Aspects of Industry Planning

8.3 Terminology

8.4 Summary

8.5 Questions for Practice

8.6 References Books

Unit 09: Safety Policy

Structure

9.0 Objectives

9.1 Introduction

9.2 Subject : Interpretation

9.2.1 Safety Organization

9.2.2 Cost of Policy

9.2.3 Safety Policy

9.2.4 Legal Obligations

9.3 Terminology

9.4 Summary

9.5 Questions for Practice

9.6 References Books

Unit 10: Major Accident Hazards (MAH)

Structure

10.0 Objectives

10.1 Introduction

10.2 Subject : Interpretation

10.2.1 MAH Acts

10.2.2 MAH Process

10.2.3 MAH's Hazards

10.2.4 Occurrence Area

Semester-6

Practical - 7

Sr. No	Practical
1	Conduct Machine Guarding Audit for different machines
2	Preparation of Onsite Emergency plan for a industry
3	Conduct Mock drill
4	Prepare checklist and conduct Safety Audit at workplace

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SEMESTER- VII

SAFETY RISK ASSESSMENT

Semester -7

Safety Risk Assessment

Semester - 7	Course Title
Unit – 01	Introduction to Risk Assessment
Unit – 02	Hazard Identification Methods
Unit – 03	Assessment Techniques
Unit – 04	Major Accident Hazards (MAH)

Unit 81: Introduction to Risk Assessment

Structure

77.0 Objectives
77.1 Introduction
77.2 Subject - interpretation
77.2.1 Importance and Objectives of Risk Assessment
77.2.2 Types of risk assessment
77.2.3 Limitations
77.3 Terminology
77.4 Summary
77.5 Questionnaire practice

Unit 82: Hazard Identification Methods

Structure

78.0 Objectives
78.1 Introduction
78.2 Subject - interpretation
78.2.1 Preliminary Hazard Analysis (PHA)
78.2.2 Hazard identification and Risk Assessment (HIRA) with example
78.2.3 Conclusions
78.3 Terminology
78.4 Summary
78.5 Questions practice

Unit 83: Assessment Techniques

Structure

79.0 Objectives
79.1 Introduction
79.2 Subject - interpretation
79.2.1 Failure Mode and Effect Analysis
79.2.2 Hazard and Operability (HAZOP) Study
79.2.3 Fault Tree Analysis (FTA)
79.2.4 Event Tree Analysis (ETA)
79.2.5 Cause Consequence Analysis (CCA)
79.3 Terminology
79.4 Summary
79.5 Questionnaire practice

Unit 84: Major Accident Hazards (MAH)

Structure

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SEMESTER- VII
INCIDENT INVESTIGATION

Semester - 7

Incident Investigation

Semester - 7	Course Title
Unit - 05	Introduction to incident investigation
Unit - 06	Theories of Loss Causation
Unit - 07	Root cause analysis
Unit - 08	Case studies of accident investigation

Unit 05: Introduction to Incident Investigation

Structure

Unit 06: Theories of Loss Causation

Structure

Unit 07: Root cause Analysis

Structure

Unit 88: Case studies of accident investigation

Structure

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SEMESTER- VII
ENVIRONMENTAL COMPLIANCE

Semester -7

Environmental Compliance

Semester – 7	Course Title
Unit – 10	Hazardous Waste and Other Wastes Rules
Unit – 11	Bio-Medical Waste Rules
Unit – 11	E-Waste Rules & Batteries Rule
Unit – 12	EPR Legislation (Plastic & E Waste)

Unit 80: Hazardous Waste and Other Wastes Rules/Structure

Unit 81: Bio-Medical Waste Rules

Structure

Unit 82: Municipal Solid Waste Rules

Structure

Unit 83: Solid Waste Rules

Structure

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SEMESTER- VII

SAFETY IN OIL & GAS INDUSTRY

Semester7

Safety in Oil & Gas industry

Semester - 7	Course Title
Unit - 01	Introduction to Oil and Gas Industry
Unit - 04	Natural Exploration Licensing Policy
Unit - 05	Fire, Explosion in Oil & Gas Industry
Unit - 06	Emergency Response in Oil & Gas Industry

Unit 93: Introduction to Oil and Gas Industry

Structure

93.0 Objectives

93.1 Introduction

93.2 Subject Interconnections

93.2.1 Overview of the Oil and Gas Industry

93.2.2 Exploration and Extraction

93.2.3 Refining and Processing

93.2.4 Transportation and Distribution

93.3 Terminology

93.4 Summary

93.5 Questionnaire

Unit 94: Natural Exploration Licensing Policy

Structure

94.0 objectives

94.1 Introduction

94.2 Subject Interconnections

94.2.1 Policy Framework and Guidelines

94.2.2 Bidding Process and Criteria

94.2.3 Role of exploration concepts for exploration licenses under NELP

94.2.4 Rights of Government and Operators

94.2.5 Impact on Economic Growth

94.3 Terminology

94.4 Summary

94.5 Questions for practice

Unit 95: Fire Explosion in oil and gas Industry

Structure

95.0 Objectives

95.1 Introduction

95.2 Subject Interconnection

95.2.1 Fire Hazards in Oil and Gas Operations

95.2.2 Explosion Risks and Prevention Measures

95.2.3 Firefighting Equipment and Techniques

95.2.4 Training and Preparedness for Emergencies

95.2.5 Public and Regulatory Bodies Involved in Investigations

95.3 Terminology

95.4 Summary

95.5 Questions

Unit 96: Emergency Response in Oil & Gas Industry

Structure

96.0 objectives

96.1 Introduction

96.2 Subject Interconnections

96.2.1 Emergency Response Planning and Preparedness

96.2.2 Risk Assessment and Hazard Identification

96.2.3 Incident Command System (ICS) in Emergencies

96.2.4 Emergency Response Team (ERT) Roles

96.2.5 Firefighting and Explosion Control Measures

96.2.6 Evacuation Procedures and Safe Assembly Areas

96.2.7 Communication during Emergency Situations

Semester-7

Practical - 8

Sr. No	Practical
1	Determination of dissolved oxygen and bio-chemical oxygen demand
2	Conduct Safety Audit in Inspection
3	Conduct Inspection of SC/ST
4	Case studies on Mining Disasters & major fire accidents

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SEMESTER- VIII

FIRE RISK ASSESSMENT

Semester - 8

Fire Risk Assessment

Semester - 8	Course Title
Unit - 07	Fire Risk Assessment and Fire Audit
Unit - 08	Passive Fire Protection Systems
Unit - 09	Active protection
Unit – 10	Fire extinguishment

Unit VI: Fire Risk Assessment and Fire Audit

Structure

1.0 Objectives

1.1 Introduction

1.2 Considerations in the Assessment of Substances Capable of Forming a Flammable or Explosive Atmosphere

- Risk Classification
- Fire Hazards
- Different Steps in Fire Risk Assessment

1.3 Introduction to Fire Audit

- Fire Load Calculation

1.4 Summary

1.5 Questions for Practice

Unit VII: Passive Fire Protection Systems

Structure

1.0 Objectives

1.1 Introduction

1.2 Fire Protection of Building and Means of Escape

- Fire proof Doors
- Fire Walls
- Protection in Cable Galleries
- Fire proofing Materials

1.3 Summary

1.4 Questions for Practice

Unit VIII: Active Fire Protection Systems

Structure

1.0 Objectives

1.1 Introduction

1.2 Fire Detection System

1.3 Radiation Detectors

1.4 Ultraviolet Flame Detectors

1.5 Thermal Detectors

1.6 Smoke Detectors

1.7 Air Sampling Detector

1.8 Automatic Sprinkler Systems

1.9 Summary

1.10 Questions for Practice

Unit IX: Fire Extinguishers

Structure

1.0 Objectives

1.1 Introduction

1.2 Different Types of Fire Extinguishers

1.3 Inspection and Maintenance of Portable Fire Extinguishers

1.4 IS Codes on Fire Extinguishers

1.5 Role of Fire Brigades in Industrial Fire Emergencies

1.6 Summary

1.7 Questions for Practice

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SEMESTER- VIII

DISASTER RECOVERY & BUSINESS CONTINUITY PLANNING

Semester - 8

Disaster Recovery & Business Continuity Planning

Semester - 8	Course Title
Unit – 101	Introduction to Disaster Management
Unit – 102	Insurance in Disaster Management
Unit – 103	The Disaster Management Act
Unit – 104	Natural & Accident-related Disasters

Unit 1.0: Introduction to Disaster Management
Structure
1.1 Objectives
1.2 Introduction
1.3 Types and Consequences of Major Accidental Hazards
1.4 Role of Management, Local Authorities and Public
1.5 Disaster Management Needs/Disaster Cycle
- Prevention
- Mitigation
- Preparedness

1.6 Activities
1.7 Questions for Practice

Unit 2.0: Awareness in Disaster Management
Structure

2.1 Objectives
2.2 Introduction
2.3 Role of International Cooperation (ORDA & JICA Approach)
2.4 Effect on Environment Due to Disasters
2.5 Need for Training/Capacity Building
2.6 Disaster Knowledge Network
2.7 Awareness
2.8 Questions for Practice

Unit 3.0: The Disaster Management Act
Structure

3.1 Objectives
3.2 Introduction
3.3 Need for Technological Input in Disaster Mitigation
3.4 Community Based Disaster Preparedness Programs
3.5 Preparation of Disaster Management Plans
3.6 Early Warning System
3.7 Role of Information Technology (IT)
3.8 Conclusion
3.9 Questions for Practice

Unit 4.0: Natural & Accidental Disasters
Structure

4.1 Objectives
4.2 Introduction
4.3 Earthquake
4.4 Flood
4.5 Cloud and Other Natural Disasters
4.6 Dangerous Properties of Some Highly Hazardous Chemicals
4.7 Industrial Disasters Due to Toxic Gas Release
4.8 Fire & Explosion
4.9 Disaster Management Authorities
4.10 Summary
4.11 Questions for Practice

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SEMESTER- VIII

EMERGENCY PLANNING & RESPONSE

Semester - 8

Emergency Planning & Response

Semester - 8	Course Title
Unit – 105	Introduction to Industrial Emergencies
Unit – 106	Emergency Planning
Unit – 107	Emergency Mock Drill
Unit – 108	Onsite Emergency Plan

Unit 135: Introduction to Industrial Emergencies

Structure

Unit 136: Emergency Planning

Structure

Unit 137: Emergency Work Drill

Structure

Unit 15B: Onsite Emergency Plans

Structure

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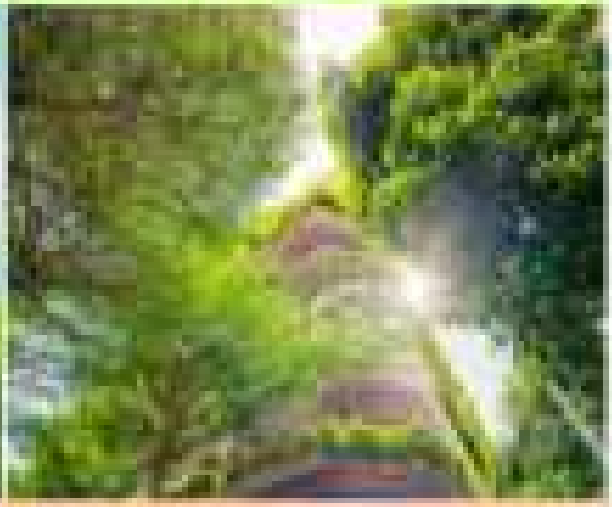

SEMESTER- VIII

ENVIRONMENTAL SUSTAINABILITY

Semester - 8

Environmental Sustainability

Semester - 8	Course Title
Unit – 110	Fundamentals of Sustainability
Unit – 111	Environmental Audits
Unit – 111	Introduction to CSR
Unit – 112	Global Reporting Initiative (GRI)

Unit 100: Fundamentals of Sustainability

Structure

Unit 110: Environmental Audits

Structure

Unit 111: Introduction to CSR

Structure

Unit 112: Global Reporting Initiative (GRI)

Structure

Semester-9

Practical - 9

Sr. No	Practical
1	Conduct Safety Risk Assessment of any workplace
2	Conduct Fire Risk Assessment
3	Conduct Root Cause Analysis for any incident
4	Fire Detection Systems Lab

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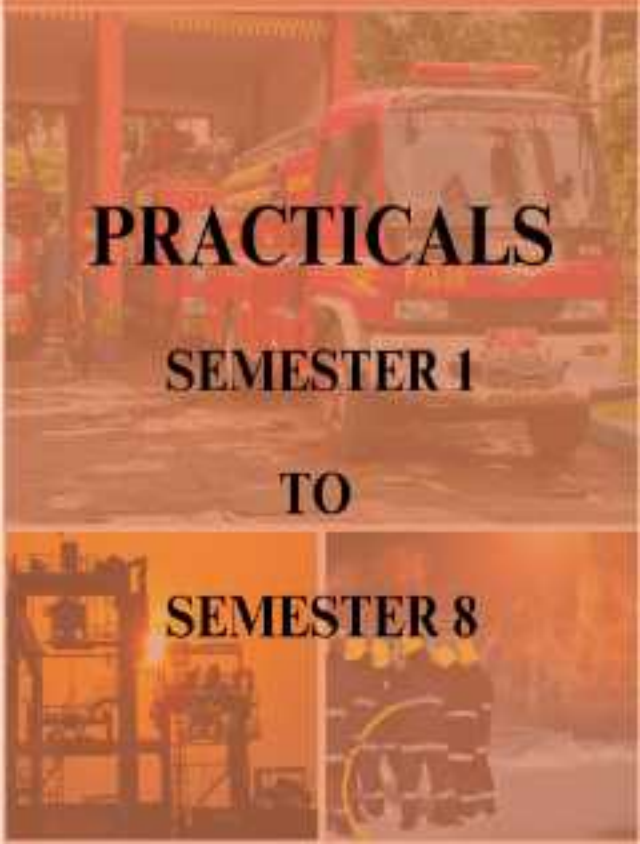

PRACTICALS

SEMESTER 1

TO

SEMESTER 8

INDEX

Semester	Course Title	Credits
Semester 1	Practical 1	[illegible]
	Operation of Dry Chemical Powder Fire Extinguisher	
	Operation of CO2 Fire Extinguisher	
	Conduct Safety Ladder Inspection	
	Operation of Fire Hydrant System	
	Practical 2	2
	Measurement of Cold Environmental Condition of Work place	
	Measurement of Hot Environmental Condition of Work place	
	Conduct Electrical [illegible] Safety Audit	
	Demonstrate the Use of [illegible] Safety Net	
Semester 2	Practical 3	[illegible]
	Identify the use of portable ladder in workplace	
	Measurement of Noise level from various sources	
	Measurement of Frequency of Noise	
	Assessment of height work and issue the Height work permit	
	Practical 4	2
	Measurement of whole body vibration from machineries	
	Identification of sources of vibration	
	Conduct PPE Audit	
	Conduct the 5S Audit at workplace	
Semester 3	Practical 5	2
	Measurement of light absorbed by different chemicals at specified wavelength	
	Assessment of the work activity and issue the work permit	
	Measurement of [illegible] of hazardous gas levels to identify the place causing the human health hazards	
	Demonstration use of LEL Detector	
Semester 4	Practical 6	2
	Measurement of Light Intensity using lux meter	
	Develop the Standard Operating Procedure (SOP) of material handling of any equipment.	
	Prepare the Scaffolding inspection as per checklist	
	Prepare a MSDS [illegible] of the [illegible] chemicals	
Semester [illegible]	Practical 7	2
	Conduct Machine Guarding Audit for different machines	
	Preparation of Onsite Emergency plan for a industry	
	Determination of dissolved oxygen and bio-chemical oxygen demand	
	Prepare Safety Audit Checklist and Conduct the Audit	
Semester [illegible]	Practical 8	2
	Conduct Mock drill	
	Inspection of fire [illegible]	
	Conduct inspection of [illegible]	
	Case studies on Mining Disasters & report the accidents	

Semester II	Practical II	2
	Conduct Safety Risk Assessment of any workplace	
	Conduct Fire Risk Assessment	
	Conduct Root Cause Analysis for any incident	
	Use Statistical Software Lab	
	Conduct Environmental Audit of any industry	