# Second Year BSc. (Fire & Safety)

## IMPLEMENTATION-2016-17

## Semester-3

ELECTIVE COURSE (EC-3) **Credit: 2**

**Paper No: EC-201 SAFETY IN DOCKS AND SHIP BREAKING INDUSTRY**

**Unit-1: Safety in Docks**

1. Management of health and safety in docks
2. Safe system of work
3. Organisation for safety and health
4. Safety of Lifting appliances
   - Planning and control
   - Safe use
   - Care and maintenance

**Unit-2: Introduction to Ship breaking industry**

1. What is ship breaking industry and principle of breaking process
2. Existing standards and practices for India
3. Ship breaking industry characteristic
4. Some general hazard associate with ship breaking industry
5. Management of hazardous substance

**Unit-3: Occupational Safety and Health management**

1. Current situation in ship breaking industry
   - Safety
   - Health
   - Environment
2. General environment, health and safety concerns
3. Effect of substance present
4. Occupational safety and health policy

5. Hazard identification and risk assessment
6. Response to hazard and risk- prevention and protection measures
7. Planning, implantation and emergency preparedness
8. General provision for reporting and recording

**Unit-4: General prevention and protection measures:**

1. General provisions
2. Means of access and egress
3. Means of escape in case of fire or other dangers
4. Housekeeping
5. Scaffolds and ladders
6. Precautions against the fall of persons and materials
7. Fire prevention and fire-fighting
8. Dangerous atmospheres and confined spaces
9. Signs, notices and color codes
10. Prevention of unauthorized entry
11. Personal protective equipment

## Paper No: EC-201 SAFETY IN DOCKS AND SHIP BREAKING INDUSTRY

### Reference book list for Safety in Docks and Ship Breaking Industry


- Fundamental of Industrial Health and Safety- K U Mistry
- Safety and Health in Ship breaking, guidelines for Asian Countries and Turkey, International Labour Office, Geneva

ELECTIVE COURSE (EC-3) **Credit: 2**

## Paper No: EC-201 Professional Growth in Safety Organisation

### UNIT – 1 HUMAN PSYCHOLOGY

1. Psychology as a science of behaviour.
2. Achievement Motivation Theory.
3. Importance of Human Resource Management (HRM).
4. Selection test.
5. Areas of Training.
6. Types of Training.
7. Need of Training.
8. Behaviour of fire fighter and fire victims from psychologists viewpoints.

### UNIT – 2 MANAGEMENT AND WISDOM

1. Time Management.
2. Consequences of Stress.
3. Stress Management.
4. Sources of Recruitment.
5. Method of Recruitment.
6. Campus Recruitment (CR).
    - Common mistake made in CR.
    - Guidelines for CR.
7. Interviewing mistakes.
8. Fire fighting as a team work.

### UNIT – 3 CAREER GUIDELINES

Define Leadership, Types.

1. Leadership Qualities.

2. Communication in Organization.
3. Ways of effective communication.
4. Purpose of Transfer.
5. Discipline, Causes of Indiscipline.
6. Promotion and Demotion.
7. Report writing, Order and Instructions.

## UNIT – 4 PERSONALITY DEVELOPMENT

1. Role of public in fire and safety.
2. Women at work.
3. Positive Thinking.
4. Life and Change.
5. Secrets of Personality Development.

## Paper No: EC-201  Professional Growth in Safety Organisation

## Reference book list for Professional Growth in Safety Organisation

- Human Resource management- V S P Rao

FOUNDATION COURSE (FC-3) **Paper No: FC 201** **Credit: 2**

- **GENERAL ENGLISH: (As prescribed by Gujarat University)**

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CORE COURSE 1 (CC-1) **Credit: 4**

## Paper No: 201 Fire Protection System

**Unit 1: Introduction to various fire protection system**

1. Introduction
2. Why fire protection systems are needed.
3. Passive fire protection systems
    a. Fire doors
    b. Fire proofing materials
    c. Dampers
    d. Wired glass windows
4. Position of extinguishers, fire blankets, fire buckets and hose reel hose.

**Unit 2: Hydrant system**

1. Introduction & legal implications and standards used in India and abroad
2. Use of hydrant system
3. Ring mains
4. Layout of system from pump house to hydrant post
5. Outdoor hydrant system designing and indoor riser designing
6. Dry and wet risers
7. Main pump, booster pump, jockey pump.
8. Piping: above ground/ underground.
9. Testing of pipes welding joints: holiday (radiography test) and electrical test.

**Unit 3: Sprinklers, Spray, deluge valve, HVWS and MVWS**

1. Introduction and development, legal Implications and standards used.
2. Hydrant Vs sprinkler system
3. Use and working of sprinklers
4. Types of sprinklers heads: pendent, upright and wall type.
5. Types of sprinklers system by operation & layout
6. Nozzle description.
7. Activation temperature
8. Operation and alarm valve description.
9. What is spray system and its use
10. DV introduction and its uses
11. Drenchers, water curtains and tank protection
12. MVWS and HVWS – Intro and use.
13. Description of nozzle diameter.

**Unit 4: Gaseous and DCP system**

1. Introduction to types of gaseous systems
    a. CO2
    b. FM 200
    c. Inergen
    d. Halon
2. Application and properties and operation of gaseous systems.

    **HFC-227ea brief introduction**

    **Novec 1230 brief introduction**
3. Application and properties and operation of DCP systems.

## Paper No: 201 Fire Protection System

## Reference book list for Fire Protection System

- Fire protection manual- tariff Advisory Committee
- Design of water based fire protection system- Robert M. Gagnon
- Fire protection engineering in building design- jane l. Lataille.
- Fire Detection and Alarm system- M. M. Bhuskute

CORE COURSE 2 (CC-2) **Credit: 4**

## Paper No: 201 Hydraulics & Pumps

**Unit-1 Basics of Hydraulics**

Fire Hydraulics & its application, Fluid Properties, Flow & types of flow, Pressure & its measurement, velocity measurement, Discharge measurement.

**Unit-2 Flow through Pipe**

Pipe, Head losses in pipes, Series & Parallel Pipes, Water hammer Effect, Friction loss, C-factor, Valves, Types of Valves.

Calculation of Water velocity in Pipes, Hazen Williams pressure loss formula, K – factor formula, Bernoullis Theorem, Hydrostatics and hydraulic calculation

**Unit-3 Pumps**

Pumps, Types of Pumps, Reciprocating Pump, Centrifugal Pump, Difference between Reciprocating & Centrifugal Pump, Pump Priming, Cavitaion.

**Unit-4 Hydraulic Machines**

Hydraulic Machines, Hydraulic Crane, Hydraulic Lift, Hydraulic Ram, Torque Converter, Air lift Pump, Jet Pump.

## Paper No: 201 Hydraulics and Pumps

## Reference book list for Hydraulics and Pump

- Fluid mechanics and hydraulics machines- R K Bansal

CORE COURSE 3 (CC-3) **Credit: 4**

## Paper No: 201 Safety in Various Industries

**Unit 1: Construction Industry**

1. What is construction industry and its work
2. Equipments and tools
3. Man power and material utilization
4. Fatal accidents case studies
    1. Construction Equipments
        a. Ladders and scaffolding
        b. Working platforms
        c. Working on roofs
    2. Working underground
        a. Excavation
        b. Drilling, blasting and trenching

**Plant siting and house keeping**

- Plant sitting and safe design
    b. Needs for planning and criteria for sitting
    c. Plant layout and design
    d. Ergonomic consideration for plant design and layout
- Housekeeping
    e. Meaning of housekeeping
    f. Methods of good housekeeping and its benefits
    **g.** Management of good housekeeping

**Piping and material storage**

1. Piping layout and u/g piping.
2. Loading and unloading of material

3. Transfer of material
4. Hazards in construction industry

**Demolition**

**Selection & Control of Contractors**

**Unit 2: Hydrocarbon Industries**

**General awareness of industry and MAH units**

1. Introduction: Significance of Hydrocarbon/ Petrochemicals & Allied Industries In all walks of life and importance of Safety including declaration of Company Safety Policy
2. Hazard Awareness, Risk Assessment & Loss Prevention
3. Appraisal on Material Safety Data Sheets (MSDS)
4. Industrial Hygiene and Occupational Health with reference to Chemical units
5. Appraisal on MAH categorization with reference to Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHCR)
6. Notification of Hazards and sharing of Safety Information among all stake holder
7. On-site and Off-site emergency preparedness and response Plan
8. Specific Statutory provisions

**Characteristic of chemicals and process hazards**

1. Classification of Petroleum Products as Petroleum Act and Safety aspects for different types storages (In Bulk & Not in Bulk)
2. Guidelines for Loading/ Unloading/ Pipe Line transfer
   Safety aspects with respect to Gas Cylinder storage, handling, filling transportation
3. Important statutory provisions, including Oil Industry Safety Directorate (OISD)
4. Salient safety specific design features of plant equipments
5. Control techniques against process hazards including instrumentation and automation
6. Safety in Chemical analysis laboratories

7. Appraisal on Different types of Safety relevant monitoring instruments ) (combustible gas indicators, Toxic gas analysers, Oxygen meters etc.)

**Maintenance of equipment and Documentation**

1. Various inspection techniques (Non Destructive –NDT) and Destructive and their applications
2. Statutory testing and reporting by "Competent" personnel
3. Predictive and Preventive maintenance
4. Corrosion prevention/ control techniques
5. Shut down/ start up procedures including application of "Permit-to-work" System
6. Formulation of Fire Protection Manual

**Fire risk management in chemical industry**

1. Introduction to Fires/ Explosion hazards in Chemical process units
2. Area Classification
3. Active and Passive Fire Protection Features
4. Fire prevention/ suppression features
5. Specific statutes on Fire Safety for Chemical Industries
6. Permit-to-work system (Hot work/ Confined space entry/ Excavation etc)

**Unit 3: Safety in Engineering Industries**

- Need of safety in Engineering Industries
- Introduction to hot & cold processes
- Steel manufacture, Hazards and Safety Measures
- Hazards and safety measures
- Hot working of Metals
- Health Hazards and Safety Measures
- Hot Rolling Mill operations
- Forging operations
- Preventive Maintenance of forging machines
- Cold working of metals
    - Hand & foot operated process
    - Power process
    - Hydraulic & pneumatic process
    - Press brakes
    - Metal shears & slitters
    - Forming rolls

        - Bending & forming machine
        - Metal cutting machine
        - Cold rolling mills
        - Wire drawing operations
- Safety in use of Machine Tools
        - Turning Machine
        - Boring or Drilling
        - Milling Machine
        - Grinding Machines
        - Planning & Shaping Machines
        - Broaching Machines
        - Slotting Machine

**Unit 4: Safety in Chemical Industries**

- Need of safety in chemical industries
- Inevitable place of chemical industry
- Type of chemical Industries
- Type of chemical Hazards & Control
- Material (Property) Hazards & Control
- Storage hazards & control
- Process hazards & control
- Utility hazards & control
- Pollution hazards & control
- Safe transfer of chemicals
- Safe transportation of chemicals
- Specific instruments
        - Gas detector
        - Metal detector
        - Electronic Flasher
        - Electronic Air cleaner
        - Alcohol detecting instruments
        - Similar detecting instruments
        - Flameproof equipment

## Paper No: 201 Safety in Various Industries

## Reference book list for Safety in Various Industry

- Fundamental of Industrial safety and Health – K U Mistry.

# Practical: - S.Y. B.Sc. (Fire & Safety)

## SEMESTER 3

CORE COURSE-1 (CC 1): **Credit: 3**

### Paper No: CC-1-Prac.-202

### PRAC. Fire Protection System

1. Study of pipe fittings and types of fittings standards and its selection.
2. Study and performance of four men foam drill.
3. Study of hydrant system, pressurization of wet hydrant system & its components.
4. Study of alarm and PA system.
5. Study of fire detection system (conventional type).
6. To study different types of strainers and working principle of deluge valve.
7. Study of sluice valves, air release valve, non-return valves & its applications for specific purposes.
8. To study MVW spray system and its application for cable galleries.

CORE COURSE-2 (CC 2): **Credit: 3**

## Paper No: CC-2-Prac.-202
## PRAC. Hydraulics & Pumps

1. To study the types of fluid flow.
2. To study types of Pressure and calibration of U –Tube Manometer.
3. Measurement of flow rate and discharge co-efficient by Venturimeter.
4. To study of Pitot tube and measurement of flow velocity.
5. To study of Reciprocating pump.
6. To study of Centrifugal Pump.
7. To find out the frictional factor of flow through pipe as per IS 12231-1987.
8. To determine Co-efficient of Viscosity of given fluid.

CORE COURSE-3 (CC 3): **Credit: 3**

## Paper No: CC-3-Prac.-202

## PRAC. Safety in Various Industries

1. Safety Precautions while working with Ladders and Scaffoldings.
2. Safety precautions while using fork lift for material handling.
3. Study of precautions taken while working in flammable explosive areas (drilling, soldering, cutting)
4. Japanese concept of 5 `S' for good housekeeping.
5. Hazop study and its application in various industries
6. Study of MSDS & Transportation of hazardous goods
7. Study of onsite & offsite emergency plan in various industries
8. Study and use of various equipments and tools used in construction industry.

# Second Year BSc. (Fire & Safety)

## IMPLEMENTATION-2016-17

## Semester-4

ELECTIVE COURSE (EC-04) Credit: 2

### Paper No: EC-202 Gujarat Factories Act and Rules

**Unit 1: The Factory act 1948**

1. General duties of occupier
2. Safety of machinery by fencing
3. Safety for on or near machinery
4. striking gear and devices for cutting off power
5. hoist and lifts
6. pits, sumps, openings in floors
7. excessive weight
8. protection of eyes
9. precautions against dangerous fumes, gases etc,
10. precautions regarding use of portable electric light
11. precautions in case of fire
12. safety officers
13. safety of building and machinery
14. constitution of site appraisal committee
15. compulsory disclosure of information by the occupier
16. specific responsibility of the occupier in relation to hazardous processes
17. permissible limits of exposure of chemical and toxic substances
18. workers participation in safety management
19. right of workers to warn about imminent danger

**Unit 2: Gujarat factory rules for Fire Protection**

1. process, equipment, plant involving serious explosion and serious fire hazard
2. excess for fighting

3. protection against lighting
4. precautions against ignition
5. spontaneous ignition
6. cylinder containing compress gas
7. accumulation of flammable dust, gas, fume or vapour in air or flammable waste materials on the floors
8. fire exits
9. first aid, fire fighting arrangement
10. other fire fire fighting arrangement
11. Personnel in-charge of equipment for fire fighting and fire drills etc
12. Schedule I
13. Schedule II : equipment with trailer pump

**Unit 3: Gujarat factory rules 1968 for Safety-I**

1. employment of young person on dangerous machines
2. hoist examination
3. exceptions of certain hoist and lifts
4. lifting machines
5. passage ways for cranes
6. pressure vessels or plant
7. minimum dimensions of manholes
8. means of escape in case of fire

**Unit 4: Gujarat factory rules 1968 for Safety-II**

1. fragile roof
2. Safety committee
3. Site appraisal committee
4. Collection, development and dissemination of information
5. General responsibility of occupier
6. Notification of major accident
7. Schedule 6: information to be furnished regarding notification of major accident
8. Health and safety policy
9. Medical examination
10. Occupational health centres

## Paper No: EC-202 Gujarat Factories Act and Rules

## Reference book list for Gujarat Factories Act and Rules

- Gujarat Factories Act and Rules
- Factories Act – 1948 – Rajendra M Kapasi, Shri D D Dhru

## ELECTIVE COURSE (EC-04) Credit: 2

## Paper No: EC-202 AutoCAD, Engineering Drawing and Fire modelling

**Unit 1: AutoCAD - AutoCAD 2D Drafting**

1. Introduction about computer
   - Computer hardware
   - Computer software
2. Introduction about AutoCAD
   - Different versions of AutoCAD
   - Use of AutoCAD
   - AutoCAD use in 3 parts
     - 2D Drafting
     - Isometric views
     - 3D modeling
3. Practical Application
     - Chapter 1 – Starting to draw
     - Chapter 2 – Opening a drawing
     - Chapter 3 – Using a commands
     - Chapter 4 – Setting up a drawing
     - Chapter 5 – Drawing simple lines
     - Chapter 6 – Drawing curves and points
     - Chapter 7 – Editing your drawing with basic tools
     - Chapter 8 - Editing your drawing with advanced tools
     - Chapter 9 - Organizing drawings with layers, colors, line types, and line weights.
     - Chapter 10 – Creating text
     - Chapter 11 – Drawing dimensions
     - Chapter 12 – Creating dimension styles

**Unit 2: Engineering Drawing- I**

Basics of Engineering Drawing

Engineering Drawing & its Application, Instruments used in Engineering Drawing, Lines & types of lines, Scale & Dimensioning.

**Unit-3 Engineering Drawing- II**

Projection System

Projection System, Types of Projection, Orthographic Projection, First Angle & Third Angle Projection System, Isometric Projection, Building Drawing Plan & its Application.

**Unit- 4: Fire Modelling**

1. Introduction to types of fire models
2. Benefits to users
3. CFAST zone modelling
4. Limitations of CFAST modelling
5. CFAST tutorial

## Paper No: EC-202 AutoCAD, Engineering Drawing and Fire modelling

### Reference book list for AutoCAD, Engineering Drawing and Fire modelling

- Engineering Drawing and Graphs- P J Shah
- CFAST Users' Guide
- Auto CAD 2009 & Auto CAD LT 2009 Bible
- Civil engineering drawings.

## FOUNDATION COURSE (FC-04): **Paper No: FC 202** **Credit: 2**

- **GENERAL ENGLISH: (As prescribed by Gujarat University)**

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## CORE COURSE 1 (CC 1): **Credit: 4**

## Paper No: 203 Safety Equipments & Documentation

**Unit 1: General Equipments Used in Workplace**

- Type of work equipment
- Suitability of work equipment
- Maintenance of be conducted safety
- Maintenance Hazards
- Typical hazards associated with maintenance operations
- Typical accidents
- Maintenance control measures
- The need for periodic examination & testing of pressure systems
- Importance of operation & emergency controls

**Unit 2: Manual & Machinery tools**

- Hazards & misuse of hand tools & controls for safe use
- Requirements for safe use
- Hazards of portable power tools & the means of control
- Mechanical hazards
- Hazards presented by a range of equipments
- Agricultural/ Horticultural Machinery
- Construction site machinery
- Protection from machinery hazards
- The principles, merits & limitations of protection methods
- Automatic guards

**Unit 3: Personal Protective Equipment**

- Need and limitations
- Non-Respiratory Equipments
- Respiratory equipments
- Training, maintenance, precautions & care
- Detection equipment
- Visual, qualitative inspection of performance of engineering controls
    - Visual Inspection
    - Smoke Tubes
    - Dust lamp
- Instruments for measuring air velocity
    - Hot wire anemometer
    - Swinging vane anemometer
    - Rotating vane anemometer
- The factors affecting the choice of personal protective equipment

**Unit 4: Permit & Other Workplace documentation**

- Types of permit * work permit for hazardous goods
- Audit
- Various forms & checklists
    - Accident report form
    - Accident investigation form
    - Accident costs form, Housekeeping
- Onsite – Offsite emergency plan
- Hazards & Risk Assessment Techniques
- Plant safety inspection
- Principles, objectives & documentation of a health & safety policy
- Forms & classification of hazardous substance

## Paper No: 203 Safety Equipments & Documentation

## Reference book list for safety Equipments & Documentation

- Fundamental of industrial safety and health – K U Mistry.

CORE COURSE 2 (CC 2): **Credit: 4**

## Paper No: 203 Automobile Engineering

**Unit-1 Basics of Automobiles**

Automobiles, Prime Movers, I.C. Engine & its Classification, Petrol engine, Diesel engine, Different between Two Stroke & Four Stroke Engine, Comparison of Petrol & Diesel Engines.

**Unit-2 Different parts of Automobiles**

Brakes, Clutch, Tyres, Wheel, Chassis, Axle & Differential, Fuel Supply Systems, Fuel Injection Systems, Supercharging.

**Unit-3 Different Operating Systems of Automobiles**

Fuel Injection System for Diesel Engines, Suspension System, Steering System, Automobile lubrication System, Automobile Cooling System,

**Unit-4 Features of Automobiles**

Power Take off, Ground Clearance, Angle of Approach & Departure, Grade ability, New Automobile Safety Features.

## Paper No: 203 Automobile Engineering

## Reference book list for Automobile Engineering

- Automobile engineering – Anil Gupta

CORE COURSE 3 (CC 3): **Credit: 4**

## Paper No: 203 Fire Prevention & Protection

**Unit 1: Basic Philosophy of Fire Safety Management & Fire Prevention**

1. Fire prevention: Basic Philosophy.
2. Principals of fire prevention.
3. The importance of housekeeping & maintenance in general & fire protection in particular.
4. Plant fire fighting & facility supporting fire brigades & their effectiveness.
5. Appraisals, Analysis and process control.
6. Plant safety observations plant safety inspection, safety sampling, safety survey, incident recall technique (IRT), job safety analysis.
7. The concept of fire safety inspection, audit, and checklist.
8. Total loss control, damage control system.
9. Hazard analysis, system safety analysis techniques (THERP), RISK Tolerability.
10. Work permit system – definition, classification & procedure.

**Unit 2: Fire Safety Laws & legislations**

1. Fire Service Act 1947
2. OISD Standards for Fire Prevention
3. Petroleum Act - 1934
4. Gas cylinder rules – 1981 & inflammable substances act – 1992
5. OISD 115/116
6. Cinematography Act – 1992
7. Pandals and temporary structure Act
8. Life safety code
9. Gujarat Life Safety & Fire Prevention Act 2013

**Unit 3: hazards of fire propagation**

1. Hazard of fire propagation.
2. Concept of separation and compartmentalization. Possibilities of fire propagation through various features of buildings and Preventive measures through ducts and openings
3. Need, concept methods of segregation.

4. Concept of Fire rating of walls (As per BS), roofs and intermediate floors.
5. Concept and importance of fire proofing using mortar, RCC, fireproofing coating, fire paints / mastics. and others materials

**Unit 4: Fire insurance**

1. Introduction
2. Expenses caused
3. Losses and expenses not covered/perils properties not covered
4. Additional premiums for perils and expenses
5. Documents required by insurer
6. Fire loss management in industry
7. Fire loss control program
8. Sequence of risk control

## Paper No: 203 Fire Prevention & Protection

## Reference book list for Fire Prevention & Protection

- Compartment fires and tactical ventilation- HM fire services Publication
- Fire service manual
- Fire prevention and protection- an essential handbook.
- CIBSE Guide E

## Practical: - S.Y. B.Sc. (Fire & Safety)

# SEMESTER 4

CORE COURSE-1 (CC 1): **Credit: 3**

### Paper No: CC-1-Prac.-204

### PRAC. Safety Equipments & Documentation

1. Study and Use of various safety Documentations used in various industries
2. Use and working principle of toxicity measuring equipments
3. Practical use of Dosimeter & collecting radiation data from various industries/workshops
4. Practical use of Noise level meter and data collection of noise pollution for different workplaces
5. Use and working principle of Explosimeter, Various Gas Detectors and Hydrocarbon detectors
6. Practical use and how to conduct safety permit procedures at various industries
7. Preparing Plant safety Inspection reports for various industries
8. Preparing Health, Safety and Environment Policy for various industries

CORE COURSE-2 (CC 2): **Credit: 3**

## Paper No: CC-2-Prac.-204

## PRAC. Automobile Engineering

1. Study of different types of I.C. engines and its classification.
2. Introduction and comparison of petrol engines and diesel engines. Also consider existing car models for both kinds of engines.
3. Study and mechanism of Power Take Off (PTO) model.
4. Study the performance of ABS system, angle of approach & departure in automobiles.
5. Study the fire safety hazard in automobile industry and list out the precautions.
6. Study the mechanism of latest development in automobile i.e. hybrid cars and electric cars.
7. Study of new automobile safety features and their application.
8. Study the operating system and different parts of fire tender and their maintenance.

CORE COURSE-3 (CC 3): **Credit: 3**

## Paper No: CC-3-Prac.-204

## PRAC. Fire Prevention and Protection

1. Study of evacuation plan in high rise building
2. Study the FM 200 clean agents total flooding system
3. Study of foam pourer system
4. Study of smoke movement in high rise buildings of various fire fighting operation when high rise building collapses
5. Study of transportation of hazardous goods
6. Study various types of wrapping and coating for fire water lines.
7. To study performance six men pump drill
8. Study and performance of ladder drill.