Indicative Syllabus	
Post Code	005
Name of Post	Fire Officer – Trainee
Minimum Educational Qualification	Regular B.E./B.Tech. Degree in Fire Engineering from National Fire Service College, Nagpur or University/ Institute approved by AICTE/ UGC.

1. **Fundamentals of Fire Engineering: - Fire Engineering Science**: - Mathematics, Physical properties of matter, Mechanics, Heat, Heat transmission, Thermal expansion, Hydraulics, Chemistry of Fire, Electricity; **Fire Prevention: -** Elements of Construction, Elements of Structure, Fixed Installations– Fire doors, Smoke Ceiling, compartmentation, pressurization, etc., Fire Safety Practice, Fire Safety Management; **Fire Protection: -** Fire Alarm & Detection Systems, Fire Extinguishers, Fire Hose reels, Fire Hose Cabinets, Fire Hydrants, Fire Pumps, etc., Fire Sprinkler systems, Fire Suppression systems, Kitchen Fire Safety, etc.; **Fire Fighting: -** Incident Command, Use of Compressed Air Breathing Apparatus at Incidents, Rescue, Fire Fighting, Ventilation, Salvage, Application and Equipment, Rope and Lines, Extension Ladders; **Application of Fire Engineering in different industries: -** Oil and Gas industries, pharmaceuticals industries, Buildings, Fertilizer industries, Steel industries, Coal industries, Ports and Airports.

2. **Fire Dynamics: - Fuels and the combustion process-** the physical chemistry of combustion in fire, thermodynamics of combustion – stoichiometry, thermo chemistry, chemical equilibrium, analysis of the structure of the reaction zone and flame temperature; **Limits of Flammability**, including flammability diagrams: their measurement and interpretation, Thermal theory of the limits. The structure of a premixed flame, Heat losses from premixed flames, Measurement of burning velocities. Introduction to diffusion flame, structure of diffusion flame, Gaseous jet flame, burning of condensed phases, burning of droplet clouds, diffusion flame height; **Steady Burning of Liquid and Solid Fuels -** Burning of liquids, Burning of solids. Simple thermal model for the steady burning of liquids and solids. Measurement of the rate of heat release using oxygen depletion calorimetry. Combustion efficiency; **Ignition of liquids and solids** - Classification of liquids. Flash points and their relationship to flammability limits. The wick effect and its relevance to the ignition of high flashpoint liquid pools. Application of the concepts of flash point and fire point to the ignition of solids. Spread of Flame in solid; **The Pre-Flashover Compartment Fire** - The growth period and the definition of flashover, Growth to flashover. The Post-Flashover Compartment Fire: - Regimes of burning, Fully-developed fire behavior, Temperatures achieved in full-developed fire, Fire resistance and fire severity, Methods of calculating fire resistance, Projection of flames from burning compartments, Spread of fire from a compartment; **Description of smoke**, Smoke Production, average plum temperature, volumetric plump flow,
   Hazard of smoke, Principal of smoke movement, Flow through openings, Stack Effect, Influence of floor and partition, Wind effect, Smoke management, Computational tool for design.

3. **Fire Service Hydraulics: - Water Supply Analysis Overview** – History, Consumption, Water Source, Treatment Process, Water Distribution System, Fire Hydrants system, Storage Tanks; **Basic Principles of Hydraulics** – Pascal's Law and its application in machines, Hydraulic press, accumulator, intensifier, Hydraulic ram, lift, crane; **Pressure Loss in pipes and Fittings,** Hazen-Williams Formula, Moody chart. Flow through compound pipes, Equivalent pipes, flow through parallel pipes, flow through branched pipes, pipe networks; **Power Transmission Through Pipeline**: Condition for maximum power transmission through a given pipeline (single pipe); **Nozzle** – Flow through nozzles, power

transmitted through nozzle, condition for maximum transmission, nozzle reaction, relation between nozzle and pipe diameter; **Mass Momentum equation**, Impact of Jet- Force exerted by jet on stationary flat plate, moving plate, hinged plate and curved plate; **Hydraulic Machines** – Pelton wheel, Francis turbine and Kaplan turbines; **Positive Displacement Pump, Reciprocating Pumps** – Introduction, main parts of a reciprocating pump, working of a reciprocating pump, slip of reciprocating pump, Variation of velocity and acceleration in suction and delivery pipes due to acceleration of piston, effect of velocity on friction in suction and delivery pipe, introduction of air vessels, reciprocating & ejector primer; **Centrifugal Pumps** – Introduction, main parts of centrifugal pumps, Velocity Diagram, work done by centrifugal pumps on water, minimum speed for starting a centrifugal pump, multistage centrifugal pumps, priming of a centrifugal pump, model testing, cavitation, suction height, net positive suction head, capacity calculation, maintenance of pump.

4. **Fire Protection: - Fire Alarm System**, Automatic Fire Detectors, Notification Appliances, Fire Alarm System Interconnections, Gas and Vapor Detection Systems and Monitors; **Principles of Automatic Sprinkler System** Performance, Automatic Sprinklers, Automatic Sprinkler Systems; **Water Spray Protection**, Ultra-High-Speed Water Spray System, Water Mist Fire Suppression Systems, Standpipe and Hose Systems; **Carbon Dioxide and Application** Systems, Chemical Extinguishing Agents and Application Systems, Clean Agents and Systems, Applications of Gaseous Agents to Special Hazards Fire Protection, Explosion Prevention and Protection; **Uses and Limitations of Fire-Fighting Foams**, Types of Foam, Guidelines for Fire Protection with Foams, Delivering Foam from Fire Vehicles, Combined Agent or Twinned Equipment, Medium and High Expansion Foam Generating Equipment and Systems.

5. **Structural Fire Protection: - Study of different kinds of components of super-structures**, various common types of buildings with reference to relevant I.S.I. specifications, different types of walls, roofs and floors and their construction methods; **Fire safety in buildings**, process of fire development, fire behaviour, human behaviour, fire detection and control system, fire resistance, fire design time, controlling fire spread, Compartmentation, defend in place theory, Testing and Inspection of Fire doors & Firestop system, building construction for fire safety; **Fire severity**, fire resistance, equivalent fire severity, fire resistance test, fire resistance of assemblies – walls, floors, beams, columns, penetrations, Joints, fire doors, ducts and glasses, Design of structures exposed to fire - structural design at normal temperatures, loads, structural design in fire conditions, design equation, loads for fire design, structural analysis for fire design, material properties in fire, design of individual members exposed to fire, design of structural assemblies exposed to fire, Structural Steel Fire Protection; **Concrete structures** - behaviour of concrete structures in fire, concrete materials in fire, spalling of cover concrete, concrete and steel reinforcing temperatures, mechanical properties of concrete at elevated temperatures, design of concrete members exposed to fire – continuous slabs and beams, axial restraint; **Classification of buildings** based on occupancy and type of construction according to fire resistance as per NBC; Fire zone; General fire safety requirements applicable to all individual occupancies. General exit requirements as per NBC: Internal staircases; horizontal exits; fire tower, ramps: fire lifts; external fire

escape ladders; Planning of location and calculation of capacity. Number and width of exit as per NBC for different occupancy classification.

6. **Fixed Fire Fighting Installations: - Design and installation of automatic Detection and Alarm system**: Fire Alarm circuit design and control panel. Initiating device circuit's classification, Initiating device circuits classification, Alarm verification features, Signaling line circuits, Fire alarm control panel, Hardwired and multiplex fire alarm systems, Fire alarm system plan, calculating battery capacity. Inspection, Testing and Maintenance of Automatic Sprinkler Systems as per relevant national and international standards; **Design and installation of the Automatic sprinkler system**: standard automatic sprinkler system design, sprinkler system component and types, determine system types and configuration, Area protected, Branch line, maximum allowable distance between sprinkler. Hydraulic calculation of sprinkler systems, Sprinkler K- factor calculation. Testing and Maintenance of Automatic Sprinkler Systems as per relevant national and international standards; **Design and installation of the Water spray system**: Types of water spray system, Transformer Hazard, extinguishment and control mechanics, transformer protection design procedure, water spray piping design, Inspection, Design of Water Mist Fire Suppression Systems. Testing and Maintenance of Systems as per relevant national and international standards; **Design and installation of the carbon dioxide system**: CO2 storage, types of the carbon dioxide system, limitation of CO2 System, Design procure of CO2 System, total flooding CO2 system design procedure numerical calculations; **Dry chemical and wet chemical extinguish system design**: Dry chemical system component, Types and application of dry chemical system. Testing and Maintenance of Systems as per relevant national and international standards; **Design and installation of the low expansion foam system**: Expansion ration, component of the foam, types of foam system, proportioning methods, seal protection of floating roof tank, subsurface injection low expansion foam system calculation. Dike protection low expansion foal system, foam system for aircraft hangar & truck loading rack protection. High expansion foam system design: Application, Design of high expansion foam system, components, determine the foam quantity, discharge rate, number of the generator required numerical.

7. **Fire Laws: - Introduction**, The Law & Fire Service, Indian Judicial System, The Law Suit Process, General Principles of Law of Evidence and Criminal Procedure, Code and Code Enforcement, Doctrine of Sovereign Immunity. List of various standards, codes, byelaws, bills to be covered; **The doctrine of Sovereign immunity**, Governmental liability in India with reference to the Indian Constitution, General Principles of Law of Evidence and Criminal Procedure (Relevant Provisions only), Code and code enforcement, Standards and the Law; **Court of Laws** - Introduction, Procedure in Law Courts, summoning witnesses, Preparation of cases, Formalities in appearing before the court of Presiding Officer, Methods of giving evidence, Importance of Fire Reports, Perjury, Structures of some related sections of the Indian Penal Code. **Fire Safety Legislation & Inspection**- Acts, Rules and Regulations pertaining to existing Fire Preventive Legislation in Industries- 1. Petroleum Act, 2. Petroleum Rules. 3. Gas Cylinder Rules, 4. Explosive Rules, 5. Explosive Act, 6. Factories Act, 7. Static Mobile Pressure Vessel Rules (Unfired), 8. PNGRB Regulations, 9. BOCW Act, 10. Indian Electricity Act, 11.

Manufacture Storage & Import of Hazardous Chemical Rules, 12. Indian Boiler Act, 13. Dock Workers (Safety, Health & Welfare), 14. Disaster Management Act, 15. Model Fire Service Bill, 16. Water Pollution Act, 17. Environment Protection Act, 18. Central Motor Vehicle Rules

8. **Paramedics: - Introduction to Emergency Medical Services (EMS)** systems, specific statutes and regulations in your state regarding the EMS system, importance of body substance isolation (BSI), Structure and Function of Human Body Basic, Medical & Ethical Issues. **Structure and Function of Human Body Basic**- Topographic terms: medial, lateral, proximal, distal, superior, inferior, anterior, posterior, midline, right and left, mid-clavicular, bilateral, and mid-axillary, Baseline Vital Signs and SAMPLE History; **Basic Life Support**- Principles of basic life support, Fundamentals of early defibrillation. **Bio Medical Waste Management**- disposal of bio-medical waste, colour coding, types of containers, transportation of waste, etc, **Airway**- adequate breathing and inadequate breathing, **Trauma** - Bleeding and Shock, Soft Tissue Injuries and Burns, Musculoskeletal Care, Injuries to The Head and Spine, Abdominal & Genital injuries; **Patient Assessment** - Scene Size up, Initial Assessment, Focused History & physical exam Trauma patients, Focused History & physical exam medical patients, Detailed Physical Exam, Operations - Ambulance Operations, Gaining Access, Mass casualty incident; **Medical Emergencies**- Respiratory Emergencies, Cerebrovascular Emergencies, Diabetes/ Altered Mental Status, Allergies, Environmental emergencies, Behavioural Emergencies, Pediatric Emergencies, Geriatric Emergencies, Gynecologic/ Obstetric Emergencies, Abdominal Emergencies, Poisoning/Overdose, Oxygen therapy; **Lifting and Moving Patients**, body mechanics, guidelines and safety precautions that need to be followed when lifting a patient, safe lifting of cots and stretchers, correct and safe carrying procedures on stairs, guidelines for pushing and pulling, Stretcher: Wheeled Ambulance, Portable Ambulance, Scoop, Basket, flexible, etc., Stair chair, long spine board.

9. **Fire Modelling: - Introduction, definition of the stiffness matrix**, derivation of the stiffness matrix for a spring element, spring assemblage, assembling the total stiffness matrix by superposition (direct stiffness method), boundary conditions, potential energy approach to derive spring element equations; **Introduction, basic concepts of plane stress and plane strain**, derivation of the constant-strain triangular element stiffness matrix and equations, derivation of the Linear-Strain Triangular Element Stiffness, Matrix and Equations, finite element solution of a plane stress problem, Practical Considerations in Modeling; **Introduction, derivation of the basic differential equation**, heat transfer with convection one dimensional heat transfer with mass transport, finite element formulation of heat transfer with mass transport by Galerkin's method; Thermal Stress- Formulation of the Thermal Stress Problem and Examples; **Approaches to fire modeling**, open and compartment fire behaviour, zone models, field models, detector models, egress model, concept of design fire, heat release rate of a fire, height and size of a flame, flow of hot gases in a room, temperatures in the hot gas layer and in the room. Simulation of Burner Fire, Air Movement, Smoke layer height and heat flow through a door, Room fire using software; **Principles and Practice of Evacuation Modeling (PPEM)**, building evacuation models, theory of occupant behavior during building fires, RSET-models that are commonly used in guidelines and regulations, describe different theories of human behaviour in fire (e.g. role-rule

model, affiliation, social influence, affordances, help in emergencies, panic, etc.), basic assumptions behind evacuation models (space representation, modeling methods, uncertainties, verification and validation) and understand their main strengths and limitations, use of evacuation models for the simulation of evacuation scenarios.

10. **Fundamentals of Industrial Safety and Health: - Industrial Safety Management**: Introduction, Role of Management in Industrial Safety, Organising for safety, Directing Safety, Communication, National Policy on SHE at Workplace, Safety- Education and Training, Employee Participation in Safety, Behaviour Based Safety (BBS), Conflict & Frustration, Management Information System (MIS), Accident Prevention; **Safety in Engineering Industries**: - Machine Operation and Guarding, Safety in the use of Machines, Safety in the use of Machines, Hand Tools and Power Tools, Hazards at Workplace, Material Handling and Storage: Manual and Mechanical, Plant Layout Design and Housekeeping, Boiler Operations, Thermal Fluid Heaters Operations, Electrical Hazards at Workplace, Static Electricity, Lightning arrestors, Introduction to safety aspects in Engineering Industries, Hazards at workplace, Safety in Textile industry, Agro-Industry/ Sugar Industry, Docks Operations, Destructive Testing, Non Destructive Testing and Heat Treatment, Safety in IT and Electronic Industry and Service Sector; **Construction Safety**: - Safety in Construction Industry, Types of Construction Activity, General Safety Measures, Special works, Project management in constructions safety, Special precautions for works of engineering construction, Safety in Demolition Operations Chemical and Process Safety Management: - Process Safety Management (PSM), Enhancing safety in chemical industries, Unit operations and process hazards, safe handling of chemicals, Safety in plant operation and maintenance, pressure vessels, pressure system hazards and controls, corrosion causes and protection; **Environment Management**: - Environment Management System, Concept of Common Effluent Treatment Plant (CETP), Environmental Important Regulations, Environmental Monitoring, Waste Management, Global Warming, Energy Conservation, Sustainability Reporting; **Quality Control in Occupational Safety & Health**: - Safety appraisal & control techniques, Permit to Work systems, Accident/ Incident/ Near-miss/ Dangerous occurrence reporting, investigations, Major Accident Hazards (MAH) Control System, Emergency Preparedness and Response Plans; **Industrial Hygiene and Occupational Health**: - Ventilation and Heat Stress, Industrial Lighting & Illumination, Noise and Vibration, Industrial Hygiene, Personal Protective Equipment, Occupational Health, Occupational Health Hazards & Occupational Diseases, Introduction to Ergonomics, Physiology at Work.

11. **Fire Code & Standards:- Fire Fighting Equipment & Systems** - Indian/International Specifications and Technical parameters of Fire Equipment like Fire Extinguishers, Fire Pumps, Hose & Hose Fittings, Hose Reel, Hydrants, Monitors, Small & Special Gears, Fire Detection & Alarm System, Ladders, Automatic Sprinkler System, Water Mist System, Gas Suppression System, Foam and Foam Making Equipment's etc.; **Personal Protective Equipment** - Code, Standard and specification concerning to safety of firefighting personnel like Helmet, Safety Belts, Eye Protectors, Ear Protectors, Gloves, Safety Shoes, Breathing Apparatus, Fire Suits, Safety gears and other devices; **Firefighting Appliances** -

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Indian/ International Code & Standard for various Fire Fighting Appliances like Water Tenders (Type A, B & X), Crash Fire Tender (CFT), Emergency Rescue Tender (ERT), Dry Chemical Powder Tender (DCP) , Small Foam Tender, Hose Laying Lorry, Towing Tender, Hydraulic Platform, Turn Table Ladder (TTL), HAZMAT and Control Van for fire brigade etc.; **Industrial Fire Protection Codes & Standard** - Code, Standard and byelaws concerning Industrial life safety & fire protection measures like Petrochemical, Construction, Fertilizer, Steel, Mines, Ports, Airport etc.; **Municipal & State Life Safety Codes and Standard** - Code, Standard and byelaws concerning Municipal and State life safety & fire protection measures.

12. **Fire & Life Safety Audit: - Challenges to safety in built environment**, types of hazards likely to cause harm (fire, burns, electric shock, falls), natural disasters, fatalities involving hazardous environments. Important Case studies involving major incidents and their subsequent effect on safety outlook, Approach to addressing Fire & safety challenges, concept of industrial fire & life safety - need, nature and importance. Focus on Human resource, and concept of importance of 'man' as central theme in safety; **Fundamentals of structurally safe building design**, codes and standards for the built environment, systems approach to fire safe building design, Prescriptive and performance-based building designs; **Standard for determination of fire load for use in structural fire protection design** - fire load density – distributed fire loads – localized fire loads. Determination of calorific value by Bomb calorimeter, Calorific values of common materials - solid fuels, hydrocarbons, polymers, common solids, foodstuffs, properties, higher & lower calorific values, Comparison of calorific values of various solid, liquid and gaseous fuels; **Classification of building based on occupancy**, Classification of industrial & non industrial occupancies into different degree of hazards, General requirements of all individual occupancies, Life safety – general exit requirements, occupant loads, capacities of exists – horizontal exit allowance, arrangement of exit, number of exits, doorways, corridors and passageways, internal staircase, protected escape routes, external stairs, horizontal exits, fire tower, fire lifts, emergency and escape lighting, fire detection and warning; **Need of audit**, types of inspection, standard activities for audit, procedures – pre-audit preparation & meeting – opening meeting, verification of information – cross verification at site, writing audit report–report content – submission of report – advantages, specific limitations, closing meeting, Components of fire & life safety audit, audit model, audit process, organizational strength and recommendations for improvement, audit report and action planning, Standardization & quality assurance; **IS 14489:2018** - Overseas Industrial Technical, ISO 9001, ISO 140001 and ISO 450001, OISD 145; **Checklist for Audit and Inspection**.

13. **Fire Risk Assessment: - Basic risk concepts**, General Principles of fire risk assessment, Formal Definition of Risk, terminologies, Risk Assessment and Management, Causal Scenario, Risk-Aversion Mechanisms, Accident-Causing Mechanisms, safety quantification, safety by design, System Safety, Hazards, Mishap, and Risk. Fire Risk Scenarios, Fire Protection Measures as Fire Barriers, Qualitative and semi- quantitative risk assessment techniques, Hazardous area classification study; **Measurement and evaluation of Safety performance**: Indian standard IS-3786 and its salient features, definition of

terminology used-Accident, incident, near miss incident, dangerous occurrence, disabling (lost-time), injury, non-disabling injury, reportable lost-time injury, non-reportable lost-time injury, days of disablement (lost time). Safety Performance Indicators: Frequency rate, weighted frequency rate, severity rate, incidence rate, frequency-severity index, safe-T-score, fatal accidents frequency rate. Classification of industrial accidents and special cases according to IS-3786; **Study of IS 15656 (2006)**: Hazard identification and risk analysis. Risk Assessment:- Introduction, Basic quantitative risk assessment (QRA), Principles of QRA, Probability theory, set theory and Boolean algebra, Use of Boolean algebra and cut sets, Combination of frequencies, Logic tree approach, Fault Tree Analysis (FTA), Principles and Symbol and Procedure of FTA, bow tie, Event Tree Analysis (ETA), Quantification of event tree, Qualitative risk assessment, Criteria of risk acceptance, Types of consequences. consequence analysis methodologies and source models; **Introduction to HAZOP**, conducting a HAZOP study, Computerized reporting system, HAZOP of batch process, Extension of HAZOP, Application of HAZOP to human reliability, Failure mode and effect analysis (FMEA), Methodology of FMEA, critically analysis, Corrective action and preventive action and follow up. stages of process plant and risk analysis; **Quantification of risk**: Vulnerability analysis, accepted and imposed risk, perception of risk, risk indices, individual risk and societal risk, acceptance criteria for risk, as low as reasonably practicable (ALARP), Presentation of measures of risk-risk contour, F-N curve. Calculation of individual risk and societal risk. Human reliability analysis (HRA): factors leading to human error, characteristics of HRA techniques, Technique for Human Error Rate Prediction (THERP), Accident Sequence Evaluation Program (ASEP), Techniques using expert judgment, Operator Action tree (OAT).

14. **Special Hazards: - Structural features of aircraft and helicopters**: basic fire hazards, air crash nature, emergency landings including belly leading etc., firefighters' access and prevention of trapped person problems, types of safety belts, ejection-seats, etc. & their release methods, emergency response strategies, aircraft & helicopter carrying ammunition, bombs, nuclear weapons, etc. rescue and firefighting issues. **Hazards in airport**: Protection of hanger, refueling &unloading in air cargo, provision of crash fire tenders including rapid intervening appliances, categorizations of airports, their extinguishing media, determination of the appliances for each category as per international standard. Case Studies; **Hazards in shipyard & port**: Constructional features of passenger and cargo ship, shipyard & port hazards and fire protection measures, preventive measures and strategic management. Fire protection facilities for ports handling hydrocarbons (OISD-STD-156). Case Studies. Hazards in trains: Structural features of passenger, goods train, yard, tunnels and railway station, accidents, preventive measures and strategic management. Case Studies; **Storage Standards, Occupancy Characteristics**, **Hazards Associated with Occupancy**, Operational Hazards and Fire Prevention Practices, Life Safety Considerations, Building Construction, Affecting Hazardous Conditions, Automatic Sprinkler Protection, Supplemental Fire Protection, Special Storage Facilities, Warehouse Fire-Fighting, Operations and Pre-Incident Planning Outdoor Storage; **Hazards in nuclear reactors**: A study on layout & planning, accidents, mitigation measures and strategic management of a nuclear center. Natural disasters: Types of natural disasters, disasters, prevention measures and strategic

management. Case Studies; **Transportation fire safety**: passenger vehicle fires, fire safety and commercial vehicle, MSDS, HAZCHEM code, Placard, TREM card, IS-13694 Fire safety in Iron and Steel Industries. IS- 15394 fire safety in Petroleum refineries and fertilizers plants. Hazards in Pharmaceutical industries, Coal based industries, thermal power plants (IS 3034:1983), rocket propellant. Case Studies.

15. **Fire and Arson Investigation: - Arson as a crime**: the crime of arson motive, the arson set, deductions from the interpretation of evidence (analytical reasoning, elimination of accidental and natural causes), other investigative topics: arson law, elements of proof, sources of information, chain of evidence, report writing, courtroom testimony, Mythology of arson investigations: development and promulgation of myths, alligatoring, crazed glass, depth & location of char, lines of demarcation, sagged furniture springs, spalling, fire load, low burning and holes in the floor, the angle of V, time and temperature; **Fire pattern development**: Flammability, Compartment fire, plume pattern development, ventilation-generated pattern, penetration through floors, Types of patterns; **Fire investigation Procedure**: Null hypothesis, Negative corpus methodology, Planning the investigation, Initial survey, Documentation, Reconstruction, Inventory, avoiding spoliation, origin determination, Evidence collection and preservation, Fatal fire, Hypothesis development and testing, Reporting Procedure, Record keeping; **Analysis of Ignitable Liquid Residues**: Evolution of separation techniques, analytical techniques, standard methods. Isolation the residue; **Analyzing the isolated ignitable liquid residue**: Identification of the gasoline, distillates and other class of the product. Evaluation of Ignition sources; **Basic electricity fires**, causes of electrical fires, protection devices, Overcurrent and short circuit, ignition sources by electrical means, electrical service distribution, electrical fire investigations on various electrical appliances, laboratory investigations on electrical fires. Fuel tanks, connections, injection systems, vehicle fuels, typical operating pressures of vehicle fuels, engine fuel system fires, considerations for fire investigations on automobiles, vehicle arson, protocol for fire vehicle examination, exterior examination; **Structure fire & their investigation**: elements of building construction, general principals of fire behavior, investigative information during suppression, examination of structure fire scene, documenting the fire scene. Sources of Error in fire investigation; **Case Studies**: Electric Fire, Chemical Fire, Gas, Structure & wild land fires, Heater Fire. Industrial Fire, Automobile Fire, Lighting Fire, Fluorescent light fire, Dryer Fire. Report writing.