



IPS ACADEMY- INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(An Autonomous Institute)

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Scheme of Examination as per AICTE Flexible Curricula

V Semester Bachelor of Technology (B.Tech.)

[Fire Technology & Safety Engineering]

S. No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
			Theory			Practical			L	T	P	
			End Sem	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1	PCC- FT501	Hydraulic in Fire Service Equipments	70	20	10	60	40	200	2	1	2	4
2	PCC -FT502	Pumping Machinery & Fluid Mechanics	70	20	10	60	40	200	2	1	2	4
3	PCC -FT503	Rescue Equipments & Techniques	70	20	10	60	40	200	3	-	2	4
4	PEC- FT501	Professional Elective II	70	20	10	-	-	100	3	-	-	3
5	POEC-FT501	Open Elective-I	70	20	10	-	-	100	3	-	-	3
6	PCC- FT504	Fire Fighting Practices	-	-	-	60	40	100	-	-	4	2
7	PCC -FT505	Matlab Programming	-	-	-	60	40	100	-	-	4	2
8	Internship	Evaluation will be done on completion of internship in VI sem.										
		Total	350	100	50	300	200	1000	13	2	14	22
Total Academic Engagement and Credits									29			22

Professional Elective Courses (PEC) -II	Suggestive Professional Open Electives Courses from Chemical/Chemistry
PEC- FT501 (A) Disaster Management	POEC-FT501 (A) Environment Protection & Waste Management
PEC- FT501 (B) Salvage Evaluation of Fire Situation	POEC-FT501 (B) Principles of Chemical Reaction

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PCC-FT501	Hydraulic in Fire Service Equipments	2L:1T:2P (05 hrs)	04 Credits
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Course Objective:

1. To learn about the fire hose pipes and appliances with different fire stream patterns.
2. To teach about the types, operation, maintenance and fire ratings of portable fire extinguishers.
3. To learn about the principles of water supply and its distribution in fire service.
4. To teach about the fundamentals of pumping and pump hose associated with water line distribution in fire fighting.
5. To learn about the types of fire pump and evaluation of pump power with their efficiency.

Module 1 **(10 Hrs)**

WATER SUPPLY AND DISCHARGE MEASUREMENT: Water Supply Principles in Fire Service, Source and Treatment Process, Water Storage and Distribution, Fire Hydrant Inspection, Maintenance, Fire Hydrant Class with Flow capacity and color code, Discharge Measurement Devices, Pitot Tube, Venturi meter, Quantity Meter, Rota meter and V-Notch Concepts - Bernoulli's Theorem and Applications, Hazen-Williams Formula, Pressure Loss at Fittings, Discharge from Nozzles, Discharge Coefficient, Theoretical Discharge.

Module 2 **(10 Hrs)**

RELAY PUMPING AND FIRE PUMPS: Drafting and Relay Pumping, Basics of Drafting, Drafting Equipments, Water Lift and Altitude, Drafting Procedure, Need for Relay Pumping, Capacity of Pumpers, Types of Fire Pumps, Piston Pumps, Centrifugal Pump, Rotary Pumps, Pump Panel and its Components.

Module-3 **(8 Hrs)**

FIRE SERVICE PUMP HOUSE: Pump House, Operation of Main, Standby and Jockey Pump, Multistage of Pumps, Pump Power- Water Horsepower (WHP), Brake Horsepower (BHP), Efficiency of the Pump, Prime Movers and Pressure setting of Pumps, Continuity Equation and different forms of Energy, Loss of Head in Pipes.

Module 4 **(10 Hrs)**

FIRE HOSE AND FOAM APPLIANCES: Hose Damage Types and General Care, Fire Hose Couplings and Hose Appliances Tools, Hose Rolls types and Basic Hose Loads, Types of Supply Hose lays, Nozzle Discharge formula, Nozzle Reaction, Fire Stream Patterns and Nozzles- Solid Stream, Fog Stream and Broken Stream, Maintenance of Nozzle, Foam Proportioners, Delivery Devices and Generating Systems, Foam Hazards and Foam Application Techniques. foam application method, Description, number and placement of foam application devices, Selection of foam agent, Rate of application of foam solution, Rate of foam concentrate, Rate of water application, Duration of discharge, Quantity of foam and water.

Module-5 **(10 Hrs)**

FIRE EXTINGUISHER AND RATINGS: Portable Fire Extinguishers, Types and Means of Agent Expelling, Pump Type, Stored Pressure, Water mist Stored, Wet Chemical Stored and Clean agent type Fire Extinguishers, Fire Extinguisher Rating System for A,B,C, D and K class fire, Multiple marking means, Selection and Method of Application, Maintenance Procedures and filling of different types of Fire Extinguisher.

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Course Outcomes:

At the end of this course student will be able to:

1. Calculate nozzle reaction, discharge rate and fire stream patterns in fire hose pipe.
2. Perform operation and maintenance of portable fire extinguishers.
3. Demonstrate fire fighting operation using foam and foam making equipment.
4. Design capacity of fire pumps and arrangement of fire pumps in pump house.
5. Explain water supply principles its storage and distribution in fire service

List of Text/Reference Books:

1. Paul Spurgeon, Fire Service Hydraulics and Pump Operations, Penn Well Corporation-2012.
2. Essentials of Fire Fighting International fire Service Training Association.
3. G.C.Mishra, Concept and Calculation: Fire Service Hydraulics PPA Publications.
4. N. Sessa Prakash, Manual of Fire Safety CBS Publishers & Distributors Pvt. Ltd

List of Experiment:

1. To perform and practice the water based fire fighting operations using different hand held branch pipe with the help of multipurpose fire tender.
2. To perform and practice the foam based fire fighting operations using 5X foam making branch pipe and medium expansion foam generator with the help of multipurpose fire tender.
3. To perform and practice the foam based fire fighting operations using 10X foam making branch pipe, foam proportioners and high expansion foam generator with the help of multipurpose fire tender.
4. To Perform hydrostatic burst pressure test on hose pipes of different material using test procedure in accordance with IS 443.
5. To perform the abrasion resistance test on hose pipes of different material using hose pressure testing machine.
6. To perform and practice the transformer fire extinguishment using water mist store pressure type portable fire extinguisher.
7. To perform and practice the filling and refilling procedure for Gas Cartridge water and foam types Fire Extinguishers.
8. To perform and practice the filling and refilling procedure for Gas Cartridge Dry Chemical Powder type Fire Extinguisher.

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PCC-FT502	Pumping Machinery & Fluid Mechanics	2L:1T:2P (05 hrs)	04 Credits
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Course Objective:

To understand the properties of fluids, statics, kinematic and dynamic behavior through various laws of fluids and familiar the working and performance characteristics of various pumps and hydraulic machines.

Course Content:

Module 1 (10 Hrs)

PUMPING MACHINERY: Pumps- Reciprocating pump, types, working principle, Centrifugal pump types, working principle, Ejector pump, Air lift pump, Hydraulic Crane, Hydraulic Press, Jet pump, Hydraulic lift. Impact of Jets-force executed by fluid jet on fixed flat plate, curved plate, moving vans, Velocity Diagram, Work done by impact.

Module 2 (08 Hrs)

FLUID STATIC'S: Properties of the fluids. Pressure Measurement -Pressure at a point, Pascal's Law, pressure variation in static fluid, Absolute and gauge pressure, manometers, Hydrostatic forces- Forces on plane and curved surfaces, Buoyancy and Flotation: buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Module 3 (06 Hrs)

KINEMATICS OF FLOW : Types of flow-ideal & real, steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes-continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow net & its applications, method of drawing flow nets.

Module 4 (08 Hrs)

DYNAMICS OF FLOW: Euler's equation. of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vans and other applications. Fluid Measurements: Velocity measurement (Pitot tube, current meters etc.)- flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturi-meter, weirs and notches).

Module 5 (06 Hrs)

DIMENSIONAL ANALYSIS : Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, Flow through Pipes -Friction losses in pipes losses due to sudden enlargement and contraction, energy gradient lines, siphon, pipes in series and parallel, branching of pipes, water hammer problem, Reynolds experiment & Reynolds number, laminar & turbulent flow, Introduction to Navier Stokes' Equation, relation between shear & pressure gradient.

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Course Outcome:

At the end of this course, student will be able to:

1. Application of pumping machineries and hydraulic systems.
2. Explain the types of fluids & its characteristics.
3. Measure the fluid pressure & its velocity.
4. Classify the fluid flow and solve problems of flow through pipes.
5. Define the properties of the fluids.

List of Text/Reference Books:

1. Streeter VL, Wylie EB, Bedford KW; Fluid Mechanics; Mc Graw Hills
2. FOX , McDonald Pritchard , Fluid Mechanics Wiley students edition
3. White ; Fluid Mechanics ; Mc Graw Hills
4. Cengal; Fluid Mechanics; Mc Graw Hills
5. R Mohanty; Fluid Mechanics; PHI
6. K L Kumar Fluid Mechanics
7. Fluid Mechanics & hydraulic Machines , Modi & Seth
8. CS Jog , Fluid Mechanics Volume II CAMBRIDGE IISc Series , Third Edition
9. Dr. D.S. Kumar; Fluid Mechanics and Fluid Power Engineering; S.K. Kataria & Sons
10. S. Ramamrutham ;Hydraulics Fluid Mechanics and Fluid Machines;Dhanpat Rai PublishingCompany(P) Ltd.
11. Dr. R. K. Bansal; Fluid mechanics and Hydraulic Machines;Laxmi Publication (P)Ltd.

List of Experiment:

1. To determine the meta centric height of a ship model.
2. To determine the Reynolds's number and the type of flow either laminar or turbulent flow.
3. To determine the co-efficient of discharge for orificemeter and venturimeter.
4. To determine the losses due to friction in pipes.
5. To determine the losses in pipe fitting sudden enlargement and sudden contraction.
6. To determine performance of reciprocating pumps and centrifugal pump
7. To verify the Bernoulli's Theorem.
8. To determine the co-efficient of pitot tube.

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PCC-FT503	Rescue Equipments & Techniques	3L:0T:2P (04 hrs)	04 Credits
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Course Objectives:

1. To give basic concepts of Rescue in Ordinary as well as special situations in Major Disasters.
2. To Understand the Respiratory and Non Respiratory Personal Protective Equipments used by Rescuer in Emergencies.
3. To learn about various types of Fire Dynamics in Fire Scenario.
4. To understand the basic Fundamentals of Fire Propagation.
5. To understand the Chemistry and Physics of fire.

Course Content:

Module 1

(06 Hrs)

CHEMISTRY AND PHYSICS OF FIRE: Principles of Fire, Heat Measurement and Heat Transfer, Fire Growth, Heat Release Rate, Fuel Loading, Classification of Fire, Theory of Fire Extinguishment with Water, Foam, DCP, Inert Gases and Halogenated Agents, Special Case of Fire Extinguishment.

Module 2

(06 Hrs)

FIRE PROPAGATION: Spread of flames in solids and liquids, linear and three dimensional fire propagation; Smoke, Constituents of smoke, quantity and rate of production of smoke, quality of smoke, smoke density, Visibility in smoke, principles of spreading quantity of smoke, smoke movement; Pressurization modeling of smoke movement; Toxicity of smoke- effect of harmful agents preventing escape and causing injury or death - CO, CO₂, Nitrogen oxide, Sulphur dioxide.

Module 3

(08 Hrs)

FIRE DYNAMICS: Introduction- temperature, heat, specific heat, flash point, fire point, ignition, combustion; Ignition pilot ignition, spontaneous ignition, ignition sources; Types of combustion- rapid, spontaneous, explosion; Product of combustion- flame, heat, smoke, fire gases. Development of fire-incipient, smoldering, flame and heat stages; Diffusion flames-zones of combustion, smoldering combustion, characteristics of diffusion flame; Premixed flames-burning velocity, limits of flammability, explosion and expansion ratios, deflagration and detonation, characteristics of premixed flame; Explosion- physical explosion, chemical explosion; Special kinds of combustion- Flash fire, Pool fire, Deep seated fire, Spillover, Boilover, Slopover, Dust explosion, BLEVE, UVCE; Classification of fire based on material.

Module 4

(09 Hrs)

RESCUE EQUIPMENTS: Head protection, Eye & Face Protection, Hand and Arm Protection, Foot and Leg Protection, Body Protection, Safety Belt and Harness, Ear Protection- The IS specification with types and testing procedure for Head protection, Eye & Face Protection, Hand and Arm Protection, Foot and Leg Protection, Body Protection, Safety Belt and Harness, Ear Protection Equipment. General, Selection, Care & Special precaution for respiratory PPE's, Canister type Respirators (IS 8523-1977), Chemical Cartridge Respirators (IS 8522-1977), Filter Type Particulate Respirators (IS 9473- 1980), Compressed Air Line Breathing Apparatus (IS 10245 Part-V -1982), Self Contained Breathing Apparatus (IS 10245 Part-II- 1982)

Module 5

(05 Hrs)

RESCUE OPERATION: Rescue by ordinary means, Special and unusual type of rescue, Rescue work during major disaster such as high rise building, Highway accident, Water, Sewer and Mines, Nuclear radiation & poisonous gas environment.

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Course Outcome:

At the end of this course student will be able to:

1. Demonstrate Rescue Operations by means of Special and unusual type.
2. Apply the proper use of Respiratory and Non Respiratory Personal Protective equipments in emergencies.
3. Explain fire dynamics in enclosed and open fire situations.
4. Explain fire propagation, smoke movement and its effect on surrounding.
5. Know Fire Physics and Chemistry, Fire Propagation and Fire Dynamics.

List of Text/Reference Books:

1. AERB Safety Guideline for Personal Protective Equipments (Govt. of India)
2. Fire Protection Handbook Vol.I Section-I Basics of Fire and Fire Scenario
3. Elementary principles of rescue by Got. Of India, ministry of Home Affairs
4. Relevant ISI special appliances and equipments
5. Gupta R.S., A Hand Book of Fire Technology,
6. Raymond Friedman Principles of Fire Protection chemistry, National Fire Protection Association, 1996

List of Experiment:

1. To perform the filling operation of breathing apparatus using Self contained breathing apparatus (SCBA) refilling machine
2. To determine the effective working duration of self contain breathing apparatus in a rescue operation
3. To Prepare & construct different types of hitches & knots used in rescue given sample of rope
4. To perform rope rescue operation using safety harness at rescue tower within given duration of time.
5. To determine the incline burning characteristics of fabric with the help of Flammability Tester (Incline Plate)
6. To perform & practice rope climbing and pole climbing operation at rescue tower using appropriate personal protective equipment
7. To demonstrate the different classes of fire and extinguishing techniques.
8. To perform the digital high voltage test for different type of PPE.
9. To perform the shock absorption & penetration test of safety helmet.

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PEC-FT501(A)	Disaster Management	3L:0T:0P (03 hrs)	03 Credits
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Course Objectives:

To understand the fundamentals approaches of disaster risk reduction & relationship between vulnerability, disaster, disaster prevention and risk reduction.

Course Content:

Module 1 **(08 Hrs)**

NATURAL HAZARDS : potentially hazardous natural phenomena – earthquakes – landslides – flooding – cyclones – hazards in arid and semi-arid areas – nature of the hazard – hazard management activities – disaster mitigation – natural hazard prediction – emergency preparedness – disaster, rescue and relief – post disaster rehabilitation and reconstruction – education and training activities – vulnerable elements to be considered in the development planning for natural hazard management – applications of remote sensing and GIS in disaster management.

Module 2 **(08Hrs)**

EMERGENCY PLANNING: on-site and off-site emergency plan – need of plan – possible approach – objectives of emergency plan. On-site emergency planning – formulation of the plan and emergency services – Identification of resources – actions and duties – emergency procedure – mock drills. Off-site emergency planning – objectives and elements of off-site plan – role of administrative machinery – role of major hazard works management – role of the local authority. Emergency preparedness at local level – Awareness and preparedness for emergencies at local level (APELL) – The process and its partners.

Module 3 **(08 Hrs)**

INDIAN LEGISLATIONS: Requirements of emergency plan as per Indian legislations like Factories Act, Manufacture, Storage and Import of Hazardous Chemicals Rules, Chemical Accidents (Emergency planning, Preparedness and Response) Rules. Emergency planning and preparedness in international standards like ISO 14001, OHSAS 18001 and OSHA's Process Safety Management System, Emergency Planning in Seve so II directive – elements of emergency planning in IS : 18001 – Hazardous Materials / Spills Emergencies – contingency plans for road transportation of hazardous chemicals – contingency plans for oil spills in marine environment.

Module 4 **(08 Hrs)**

DISASTER MANAGEMENT IN CHEMICAL INDUSTRY: Types of emergencies – major industrial disasters – causes and consequences of major industrial disasters like Flixborough, Seveso and Bhopal. Components of a major hazard control system – identification of major hazard control installations – purpose and procedures – safe operation of major hazard installations – mitigation of consequences – reporting to authorities. Implementation of major hazard control systems – group of experts – training – checklists – inspection – evaluation of major hazards – information to the public – manpower requirements – sources of Information.

Module 5 **(06 Hrs)**

DISASTER MANAGEMENT ACT AND INSURANCE: Role of Insurance in Disaster Management, Role of International co-operation (i.e. NGO & UN Agencies), Effect on environment due to disaster. Need for National Capacity Building and Disaster Knowledge Network The Disaster Management Act:: Need for technological input in disaster mitigation, community based disaster preparedness program; Preparation of Disaster Management; Plan Early Warning System; Role of Information Technology (IT).

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Course Outcome:

At the end of this course student will be able to:

1. Evaluate the principles and practices of disaster risk reduction and management.
2. Know the basic role of public, national/international organizations in disaster management.
3. Prevention, mitigation preparedness, response and recovery process in disaster management.
4. Understand distinguish between the different approaches needed to manage pre-during and post disaster periods.
5. Apply the knowledge in conducting independent DM study including data search and analysis from disaster case study.

List of Text/Reference Books:

1. Disaster Management Act 2005
2. Industrial Security Management S.C. Dey
3. Dangerous Properties of Industrial Material □ Irvin Sex.
4. Encyclopedia of occupational Health & Safety (OSHA) IV edition.
5. Safe Handling of Hazardous Chemicals by Rohatgi.
6. Industrial Fire Hazards Hand Book (NFPA)
7. Major Hazard Control I.L.O. Geneva.
8. What went wrong-Trevor Kletz.
9. Chemical process safety □ Daniel . A. Crawl, Joseph F Louver.
10. Madhya Pradesh Control of Industrial Major Accident Hazards rules 1999.

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PEC-FT501(B)	Salvage Evaluation of Fire Situation	3L:0T:0P (03 hrs)	03 Credits
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Course Objectives:

1. To teach the significance of salvage and smoke movement in fire investigation process.
2. To learn the fundamental of compartment fire and its application in fire investigation process.
3. To calculate the fire loss by different methodology and application of data in identification of fire trends.
4. To understand the evacuation process with different models of evacuation.
5. To learn the role of insurance agency in legal and claim aspect

Course Content:

Module 1 **(08 Hrs)**

SALVAGE AND SMOK CONTROL: Concept of salvage, salvage operation, equipments, apparatus and methodology used in salvage operations, case studies in different types of occupancies. Mass flow rate, temperature, soot protection. Smoke generation, smoke flow & dispersion, prediction of smoke flow patterns, scaling of smoke proportion, smoke impact in visibility, smoke control system, pressure differences in ventilation system, calculation of discharge rate of air blowers, smoke extraction.

Module 2 **(08 Hrs)**

COMPARTMENT FIRE: Stage of fire development, fire induced flows, compartment flow dynamics, single room fire analysis, Model of enclosures fires, theory & concepts of zone models, Dynamics of enclosure fire: Heat release, fire generated flows, heat transfer & flow through openings. Zone modeling of pre flashover enclosures fire: Flame & burning object, source terms, fire plume source terms. Hot layer source terms, product of combustion source terms one zone modeling of pool flash fire.

Module 3 **(06 Hrs)**

FIRE LOSS INVESTIGATION: Fire Risk analysis methods, Quantitative Deterministic methods, Quantitative probabilistic methods, Monte Carlo Technique, Safety Index Method, Ranking method, Fire Risk Index Method, Initial observation and Examination of the Scene, Use of Fire Incident data, Approaches to fire data analysis, top down & topic driven analysis, analysis by fire causes and property type, Analysis of small data sets, application of data trends identification.

Module 4 **(08 Hrs)**

PYROLYSIS: Importance of Pyrolysis in Fires, Pyrolysis process, Physico Chemical Description of Pyrolysis Process, Pyrolysis of Cellulose, Pyrolysis of Hemicellulose, Pyrolysis of Lignins, Pyrolysis of Wood, Characteristics and location of fire causalities, nature of Injuries, causality rate per fire, Process of emergency evacuation, Evacuation modeling, model-1 EXIT, model-2 EGRESS, model-3 SIMULEX.

Module 5 **(08 Hrs)**

ECONOMICS AND INSURANCE: Computation of Loss, Fire Insurance Claims, Legal provisions for Fire Loss, Economics of Loss Prevention, Cost of Losses, Cost of Prevention, Level of Loss Prevention Expenditure, Insurance of Process Plant, Damage Insurance, Business Interruption Insurance, Other Insurance Aspects.,

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Course Outcome:

At the end of this course student will be able to:

1. Demonstrate salvage equipments and apparatus with evaluation of smoke control parameter in occupancy.
2. Design compartment fire zone and formulate the fire dynamics of given problem.
3. Explain fire loss investigation process and prepare fire investigation report.
4. Prepare evacuation plan of a given occupancy.
5. Explain the role of insurance agency in fire loss.

List of Text/Reference Books:

1. V.K. Jain. Fire Safety in Buildings. Taylor & Francis
2. D.J. Rasbash. Evaluation of Fire Safety, Willey.
3. Fire protection handbook volume-I section-III, NFPA.
4. Fire protection handbook volume-II section-IX, NPFA
5. Fundamental of fire fighting skills, NFPA
6. Scand Power. Handbook for Fire calculation and fire risk assessment in the process industry, AS Sintef-NBL.

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PCC-FT504	Fire Fighting Practices	0L:0T:4P (04 hrs)	02 Credits
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Course Objective :

To learn and teach about the standard practices associated with management, hydrant, hose, pumps and techniques as per foundation training of fire service manual.

Course Content:

Module 1 **(06 Hrs)**

MANAGEMENT OF STANDARD PRACTICES

PSP1- To mount the appliance with a crew of four.

PSP2 - To mount the appliance with a crew of five.

Module 2 **(06 Hrs)**

FOAM STANDARD PRACTICES

F1- To get a foam making branch to work with a crew of four.

F2- To get an Inline foam Generator to work with a crew of five (one delivery)

F3- To get an In line foam generator to work with a crew of five (two deliveries)

F4- To get an in line variable Inductor to work with a crew of five (one delivery)

Module 3 **(06 Hrs)**

HYDRANT/HOSE STANDARD PRACTICES

H1- To replace a burst length of hose with a crew of four.

H2- To divide a length of hose in to two using dividing breeching with a crew of five.

H3- To remove a dividing breeching from a line of hose with a crew of five.

Module 4 **(06 Hrs)**

PUMP STANDARD PRACTICES

P1- To get a pump to work from a hydrant using soft suction with a crew of five (two deliveries)

P2- To get a ground monitor to work with a crew of five.

P3- To get a portable pump to work from open water with a crew of five (two deliveries).

Module 5 **(06 Hrs)**

TECHNIQUES

T1- To effect a rescue using rope and associated equipments with a crew of three.

T2- To effect a rescue using five personnel, an extension ladder, rope and associated equipment.

T3- To define and implement the nine main protocols required to ensure the safe extrication of casualty from an entrapment situation.

T-4 To define and operate the one meter and two meter safe working area around a motor vehicle involved in a road traffic accident.

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Course Outcomes:

At the completion of this course, students will be able to:

1. Perform and operates standard practices associated with management, hydrant, hose, pumps and techniques as per foundation training of fire service manual.
2. Apply hose drill performance and practice in fire fighting operation.
3. Apply hydrant drill performance and practice in fire fighting operation.
4. Apply trailer pump drill performance and practice in fire fighting operation.
5. Form standard practices drill performance and practice in fire fighting operation.

List of Text/Reference Books:

1. Fire and Rescue Service Manual Volume-4, Foundation Training and Development, HM Fire Service
2. Inspectorate Publications Section.

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PCC-FT505	Matlab Programming	0L:0T:4P (04 hrs)	02 Credits
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Course Objectives:

1. To familiarize the student in introducing and exploring MATLAB programming.
2. To prepare the students how to 2D and 3D plots in MATALAB.
3. To prepare the students how to use the MATLAB GUI effectively.
4. To prepare the students how to write basic mathematical problems in MATLAB programming.
5. To provide a foundation in use of this software's for real time applications.

Course Content:

Module 1 (06 Hrs)
INTRODUCTION TO MATLAB SOFTWARE: MATLAB window, Command window, Workspace Command history, Setting directory, Working with the MATLAB user interface, Basic commands, Assigning variables, Operations with variables, Data files and Data types, Basic mathematics arithmetic operations, Operators and special characters, Mathematical and logical operators, Solving arithmetic equations, Operations on matrix.

Module 2 (06 Hrs)
INTRODUCTION TO PLOTTING: Plotting vector and matrix data, Plot labeling, curve labeling and editing. 2D Plots- Basic Plotting Functions, Creating a Plot, Plotting Multiple Data Sets in One Graph, Specifying Line Styles and Colors, Graphing Imaginary and Complex Data, Figure Windows, Displaying Multiple Plots in One Figure, Controlling the Axes 3D Plots- Creating Mesh and Surface, About Mesh and Surface, Visualizing Subplots.

Module 3 (06 Hrs)
GUI DESIGN: Introduction of Graphical User Interface, GUI Function Property, GUI Component Design, GUI Container, Writing the code of GUI Callback, Dialog Box, Menu Designing, Applications

Module 4 (06 Hrs)
MATLAB PROGRAMMING: Automating commands with scripts, Control statement programming, Conditional statement programming, writing programs with logic and flow control, Functions, Programming Example.

Module 5 (06 Hrs)
BASIC APPLICATIONS IN ACCIDENT/INCIDENT DATA:
Accident classification- Impact based, Plotting complex accident data, accident data analytics, Analysis of
Accident data- Accident forecasting, development of event evaluation algorithm.

Course Outcome:

At the end of this course student will be able to:

1. Find importance of this software for Lab experimentation.
2. Draw 2D and 3D plots in MATALAB.
3. Use the MATLAB GUI effectively.
4. Express programming & simulation for engineering problems.
5. Use of this software's for real time applications.

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List of Text/Reference Books:

1. “Modelling And Simulation Using Matlab- Simulink”,2011Dr Shailendra Jain, Willey India.
2. “MatlabProgramming”,Rudra prasad.
3. S. Swapna Kumar, S V B Lenina: MATLAB – Esay way of learning, PHI Learning, 2016
4. Amos Gilat ,” An Introduction with Applications ,4ed “ , wiley India