



IPS ACADEMY- INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(An Autonomous Institute)

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Scheme of Examination as per AICTE Flexible Curricula

IV 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	BSC- FT 401	Statistics & Linear Programming	70	20	10	-	-	100	3	1	-	4
2	PEC- FT401	Professional Elective I	70	20	10	-	-	100	3	-	-	3
3	PCC- FT401	Fire Prevention & Protection Measures	70	20	10	60	40	200	3	-	2	4
4	PCC- FT402	Heavy Vehicle Automobile Engineering & Safety	70	20	10	60	40	200	3	-	2	4
5	PCC- FT403	Strength of Materials	70	20	10	60	40	200	2	1	2	4
6	PCC-FT404	Fire Fighting & Field Training	-	-	-	60	40	100	-	-	4	2
7	MC 4	Constitution of India	Non Credit Mandatory Course						2	-	0	0
		Total	350	100	50	240	160	900	16	2	10	21
Total Academic Engagement and Credits									28			21

Professional Elective Courses (PEC) -I	
PEC-FT401(A)	Safety In Textile Industry
PEC-FT401(B)	Safety In Nuclear Facility

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BSC-FT401	Statistics & Linear Programming	3L:1T:0P (04 hrs)	04 Credits
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Course Objective:

To understand the basic concept of probability, LPP, index number and perform the data analysis with suitable forecasting in research and project phases.

Module 1 **(10 Hrs)**

PROBABILITY: Probability, Types of Probability, Random Variable, Probability Function, Sampling: Purpose and Principle of Sampling, Methods of Sampling, Size of Sample, Merits and Limitations of sampling, Sampling Distribution, , Conditional probability, Baye's Theorem

Module 2 **(10 Hrs)**

CORRELATION AND REGRESSION ANALYSIS: Significance, Correlation & Causation, Types of Correlation, Methods of Studying Correlation, Multiple Correlation, Regression Analysis: Difference between Correlation and Regression, Linear Bivariate Regression Model, Regression Lines, Equations, Coefficients.

Module-3 **(8 Hrs)**

HYPOTHESIS TESTING: Concept of hypothesis, Types of error in testing, level of significance, Null and alternative hypothesis, Special tests of significance: The Chi (χ^2) Test, The Z-Score Test, The T-Test, Test for Proportion.

Module 4 **(10 Hrs)**

LINEAR PROGRAMMING: Linear Programming: General Linear programming problem (LPP), Standard and canonical form of LPP, Formulation of LPP, Graphical solution, Simplex method, Artificial variable techniques: Two Phase Method, M method. Duality: Definition of the dual problem, Dual simplex Method.

Module-5 **(10 Hrs)**

INDEX NUMBERS, FORECASTING AND TIME SERIES ANALYSIS: Use of Index Numbers, Unweighted Index Numbers, Weighted Index Numbers, Quantity Index Numbers, Volume Index Numbers, Time reversal Test, Factor reversal Test etc. Forecasting: Introduction, Steps in Forecasting, Methods of Forecasting, Time Series Analysis: Components of Time Series, Straight Line Trends, Non-Linear Trend.

Course Outcomes:

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

1. Apply fundamental concepts probability to Fire & Safety engineering problems.
2. Apply and explain the Correlation and Regression to Fire & Safety engineering projects.
3. Apply the various test of significance to structure engineering decision-making problems.
4. Apply various linear programming method to Fire & Safety engineering problem different on collected data.
5. Apply and analyze the index numbers, forecasting analysis and time series analysis on suitable classified data.

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List of Text/Reference Books:

1. Connor, L R And Morreu, A J H, Statistics In Theory And Practice, Pitman, London, 1964.
2. Mode, E B, Elements Of Statistics, Prentice Hall, New Jersey Naiman, Rosenfeld, Zirekel (1972): Understanding Statistics, Mcgraw Hill, Usa, 1961.
3. Wannacott And Wannacott, Introductory Statistics, John Wiley & Sons, New York, 1969.
4. Willams, Ken (Ed), Statistics And Urban Planning, Charles Knight & Co. Ltd, London, 1975.
5. Yamane, Taro, Statistics – An Introductory Analysis, Harper, New York, 1964.
6. A. Ravindran, D. T. Phillips And James J. Solberg, Operations Research- Principles And Practice, John Wiley & Sons, 2005.
7. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 9th Edition, 2010.
8. F.S. Hillier, G.J. Lieberman, Introduction To Operations Research- Concepts And Cases, 9th Edition, Tata Mcgraw Hill, 2010.
9. S. P. Gupta And M. P. Gupta, Business Statistics, Sultan Chand & Sons, New Delhi, 2005.
10. C. Chatfield, The Analysis Of Time Series - An Introduction, Sixth Edition, Chapman And Hall, 2004.
11. Peter J. Brockwell And Richard A. Davis, Introduction To Time Series And Forecasting, Second Edition, Springer, 2002.

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PEC-FT401(A)	Safety In Textile Industry	3L:0T:0P (03 hrs)	03 Credits
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Course Objective:

To understand and identify the hazards associated in textile industry with their safety management system.

Course Content:

Module 1 **(10 Hrs)**

INTRODUCTION: Introduction to process flow charts of short staple spinning, long staple spinning, viscose rayon and synthetic fibre, manufacturer, spun and filament yarn to fabric manufacture, jute spinning and jute fabric manufacture-accident hazard, guarding of machinery and safety precautions in opening, carding, combing, drawing, flyer frames and ring frames, doubles, rotor spinning, winding, warping, softening/spinning specific to jute.

Module 2 **(08 Hrs)**

TEXTILE HAZARDS I: Accident hazards, sizing processes- cooking vessels, transports of size, hazards due to steam, Loom shed shuttle looms and shuttless looms, knitting machines, non-wovens.

Module 3 **(06 Hrs)**

TEXTILE HAZARDS II: Scouring, bleaching, dyeing, punting, mechanical finishing operations and effluents in textile processes.

Module 4 **(08 Hrs)**

HEALTH AND WELFARE: Health hazards in textile industry related to dust, fly and noise generated-control measures-relevant occupational diseases, personal protective equipment-health and welfare measures specific to textile industry, Special precautions for specific hazardous work environments..

Module 5 **(06 Hrs)**

SAFETY STATUS: Relevant provision of factories act and rules and other statues applicable to textile industry – effluent treatment and waste disposal in textile industry.

Course Outcome:

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

1. Understand major process associated with textile industry.
2. Identify the hazards associated with steam shuttless looms and knitting machines with preventive measures.
3. Identify the hazards associated with major textile process with preventive measures.
4. Understand occupational diseases and PPEs for preventing in specific hazardous work environments.
5. Familiar with factory act provisions and applicable rules in textile industry..

List of Text/Reference Books:

1. 100 Textile Fires – Analysis, Findings And Recommendations Lpa
2. Groover And Henry Ds, Hand Book Of Textile Testing And Quality Control
3. Quality Tolerances For Water For Textile Industry, Bis
4. Shenai, V.A.,. A Technology Of Textile Processing, Vol.I, Textile Fibres
5. Little, A.H.,Water Supplies And The Treatment And Disposal Of Effluent
6. Safety In Textile Industry Thane Belapur Industries Association, Mumbai.

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PEC-FT401(B)	Safety In Nuclear Facility	3L:0T:0P (03 hrs)	03 Credits
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Course Objectives:

1. To teach basic concept and fundamentals of Radioactivity and its effect.
2. To learn about the special nuclear materials and their fire extinguishing guide lines.
3. To teach different types of reactors and their Engineered Safety Features in Nuclear Power Plant.
4. To learn the Radioactivity dispersion and its absorption with remedial plans.
5. To study the major nuclear power plant accident in past.

Course Content:

Module 1 **(08 Hrs)**
RADIATION TERMS- Radioactivity, Alpha, Beta, Gamma Rays, Ionizing Effect, Radiation Exposure, Biological Effects, Radiation Protection Factors, Radioactive Placard and Label Requirement, Fixed site Storage Vessels for Medical Isotopes, Radiation Monitoring Equipment- Geiger- Muller (GM) Counter, Pocket Chamber Dosimeters, Survey meters, Radiation Detection, Devices..

Module 2 **(08 Hrs)**
SPECIAL NUCLEAR MATERIALS, RADIOACTIVE PYROPHORIC METALS- Uranium, Plutonium, Thorium with Fire Extinguishing guide lines, Radioactive material Emergency Response- Hazard Identification, Action Plan, Zoning, Managing the Incident, Assistance and Termination. .

Module 3 **(09 Hrs)**
NUCLEAR POWER PLANT SAFETY- Overview and brief description of Pressurized Water Reactor (PWR), Boiling Water Reactor (BWR) and Pressurized Heavy Water Reactor (PHWR-CANDU), Components and Equipments, Engineered Safety Features in each Reactors. Nuclear Power Plant Operating States and Accident Classification as per code of federal regulation, Large break LOCA typical sequence in Nuclear Power Plant.

Module 4 **(08 Hrs)**
DISPERSION OF RADIOACTIVITY Releases from Nuclear Power Plant, Phenomena of Releases, Diffusion of Radioactive Plume at different heights and temperature condition. Simple Evaluation Techniques, Special Case of Radioactive Iodine release, Biological Absorption and Remedial Plans.

Module 5 **(07 Hrs)**
MAJOR NUCLEAR POWER PLANT ACCIDENTS: Case Studies, Causes and sequence of events, Consequences & follow up actions in Three Mile Island unit-2 Accident, Chernobyl Accident, Fukushima Station Accident and Davis Basse Accident..

Course Outcome:

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

1. Explain radiation terminology and their measurement.
2. Describe special nuclear materials, radioactive pyrophoric metals.
3. Understand the types of nuclear reactors and their engineered safety features.
4. Demonstrate dispersion of radioactivity through different source models.
5. Analyze major nuclear power plant accidents through case studies.

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List of Text/Reference Books:

1. J. Misumi, B. Wilpert And R.Miller, Nuclear Safety: A Human Factors Perspective, Taylor & Francis.
2. Gianni Petrangeli, Nuclear Safety, Elsevier-2006
3. John C. Lee And Morman J. McCormick, Risk And Safety Analysis Of Nuclear Systems, Wiley-2011
4. Joe Varela, Hazardous Materials Handbook For Emergency Response, International Thomson Publishing.

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PCC-FT401	Fire Prevention & Protection Measures	3L:0T:2P (05 hrs)	04 Credits
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Course Objectives:

- To learn about the fundamentals of buildings and their classifications.
- To teach about the evacuation procedure and means of escape during emergency in tall structures.
- To learn about automatic fire and gas detection in different types of occupancy.
- To teach about first aid fire fighting equipments, their working principles and periodic maintenance.
- To learn about ideal fire and life safety requirement based on different types of buildings.

Course Content:

Module 1 (08 Hrs)

BUILDING STUDIES Basic Terminology, Elements of Structure, Fire Test, Standard time, Temperature relationship, Non combustibility test, Ignitibility test, Fire Propagation test, Performance criteria for fire resistance, Fire resistance rating of structural elements, Type of Building construction, Classification of building based on occupancy, Fire zones..

Module 2 (09 Hrs)

MEANS OF ESCAPE General requirements for evaluation facilities, Principle factors for design consideration, evacuation time, Occupancy load, Occupancy, Travel distance, Design for evacuation routes, evacuation route quantification, requirement of stairs ways, phased evacuation in tall buildings, Life Safety Consideration refuse area, Exit Route, Assibilate of fire fighting approach evacuation facility or disable people, use of lifts & air lifting, safe evacuation time.

Module 3 (08 Hrs)

FIRE AND GAS DETECTION Fire Alarm system basic, classification of fire alarm system, Basic consideration for instation, Automatic fire detectors, heat detector, Smoke detector, Gas sensing fire detector, Radiant energy sensing fire, detectors, detector installation, maintenance & testing, Inspection, Testing & maintance shuetuting for Fire alarm system & its component gas & vapour fixed detection system, Sensers portable gas mainting instrument.

Module 4 (10 Hrs)

FIRE EXTINGUISHMENT Basic concept of fire fighting with water, carbon dioxide, dry chemical powder, foam and inert gases, Extinguishing Properties of Water, Droplet size, Smoothing, Heat absorbing capacity, Surface tension and waiting agent additives and its limitations, Properties of inert gases as extinguishing agent, properties of foam, Expansion, Concentration, bubbles size, Extinguishing properties of Dry chemical powder, Composition, Particle size, Radiation shielding, Chain breaking mechanism, Description, working principle and Operation methods of portable Fire Extinguishers, Care inspection and maintenance of portable Fire Extinguisher, Performance criteria of different types of Fire Extinguisher as per relevant Indian Standard.

Module 5 (06 Hrs)

MODEL FIRE AND LIFE SAFETY REQUIREMENT: Residential buildings, Educational buildings, Institutional buildings, Assembly buildings, Business buildings, Industrial buildings, Storage buildings and Hazardous buildings, Life Safety requirement in Underground structure, Basement protection, Fire Protection is Building under construction, Fire Control Room.

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Course Outcome:

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

1. Explain fire resistance rating of different structural elements and fire resistance test on building material.
2. Design evacuation routes and performed evacuation in tall buildings.
3. Design fire alarm system with fire and gas detection apparatus in different types of occupancy.
4. Demonstrate first aid fire fighting appliances and performed periodic care and maintenance for the same.
5. Present model fire and life safety requirement in different type of buildings. .

List of Text/Reference Books:

1. Barendra Mohan Sen, Fire Protection And Prevention The Essential Handbook, Ubs Publishers.
2. Dr. Than Singh Sharma, Fundamentals In Building Design.
3. Lon H. Ferguson, Fundamentals Of Fire Protection For The Safety Professional, The Scarecrow Press, Inc.
4. National Building Code Of India Part-Iv.
5. Fire Protection Hand Book Volume-Ii Section-Ix.

List of Experiment:

1. To measure the operating performance requirement for effective discharge time, fire rating suitability of water type fire Extinguisher on Class A Fire.
2. To measure the operating performance requirement for effective discharge time, fire rating suitability of Foam type Gas Cartridge fire Extinguisher on Class B Fire
3. To measure the burn back resistance time for different foam concentrates using film formation test apparatus.
4. To assess the effective time of film formation at fire surface for different foam concentrates using film formation test apparatus.
5. To Perform the Caking test on given sample of Dry Chemical Powder using procedures given in IS 4308.
6. To determine the moisture content for regular dry chemical powder using procedures given in IS 4308.
7. Determination of calorific value of diesel, petrol and LPG/Kerosene.
8. To determine the water repellency for regular dry chemical powder using water repellency test apparatus.

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PCC-FT402	Heavy Vehicle Automobile Engg. & Safety	3L:0T:2P (05 hrs)	04 Credits
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Course Objectives:

- To understand the basic concept of Engine classification and types gear box
- To understand the basic concept of differential systems
- To understand the basic concept of Electrical system of Heavy vehicle.
- To understand the Lubrication system of heavy vehicle and safety arrangements in automobiles.
- To study the Indian Motor Vehicle Act and Safety Systems in Automobiles..

Course Content:

Module 1

(08 Hrs)

ENGINES : Engine Classification, construction, details of Engine Components. Combustion in S.I. Engines, Combustion in C.I. Engines, Study of fuel system components. Function of carburetors, construction details, Type of Study of diesel fuel feed systems. Carburation and mass distribution of mixture, supercharging, fuel injection and injection sections. Clutch, Types, Construction, Operation and Fault finding of clutches. Transmission assembly, Types of Gear box, Transfer of gear box, operation and maintenance of gear box.

Module 2

(08 Hrs)

DIFFERENTIAL: Necessity, Construction of differential systems. Axles, Types and Application. Brakes, Types, Construction and Operation of Hydraulic, Pneumatic Brake Systems, Maintenance of Brakes. Suspension, Necessity, Types, Construction and operation, Shock absorber, Coil springs, Independent suspension, Hotchkiss drive, Torque tube drive. Steering, Systems, Constructional details, types of steering gear box, steering geometry, caster, camber, king pin inclination, Effect of steering geometry on directional stability, Power steering

Module 3

(06 Hrs)

ELECTRICAL SYSTEM. Ignition Systems, Magnet ignition, Battery Ignition, Electronic Ignition, Merits and Demerits, Working, Self Starter, Dynamo voltage regulator, Battery construction, operation and maintenance. Pollution. Air-Pollution, Euro norms, Pollution Control techniques.

Module 4

(08 Hrs)

LUBRICATING SYSTEM: Types, Components, Lubricating oil, Cooling System, Detail of Components, Study of Systems, Types, Miscellaneous, Spacial Gadgets and accessories for Fire Fighting vehicles, Automobile Accidents, CMV Rules regarding safety devices for Drivers, Passengers, Fire fighting vehicles & Appliances. Construction & operation of fire fighting vehicles & appliances Construction & Operation of Fire boats & other Water borne applications Rules & regulations of RTO. Laboratory testing of vehicles. Road testing of vehicles.

Module 5

(08 Hrs)

MOTOR VEHICLES ACT AND SAFETY SYSTEMS

Motor Vehicle Act, Driving License, Traffic signs & Light Signals, Driving techniques for Special Situations, Driving in emergency situations, Safety provisions, Active and Passive Safety Measures, Features for minimum injury during clash, State of the art Safety systems,

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Course Outcome:

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

1. Explain engines, their classifications and construction details.
2. Find the basic Faults in the different types of Engines and their operations with Construction of differential system, axles, brakes, gear box, steering system and lubrication system.
3. Identify the electrical faults in vehicle and also will understand the operation and construction of the electrical systems in fire fighting vehicles with applying its pollution control techniques.
4. Apply CMV rules regarding safety devices for drivers, passenger fire fighting vehicles and special type of appliances.
5. Have basic knowledge of operation of fire boats and rules and regulation of RTO with its testing.

List of Text/Reference Books:

1. Wills H. Crouse, Automobile Chassis And Body Construction, Operation And Maintenance, Tata Mcgraw Hill 1976
2. Dr. D.S. Kumar, Automobile Engineering, S.K. Kataria & Sons 2015
3. Arther V. Judge, Modern Petrol Engine 1975
4. A.T. Walford, Ergonomies Of Automation 1989
5. S.Adhey, Bormh Practical Automobile Engineering Illustrated, Asia Publishing House, 1983
6. G.B.S. Narrang, Automobile Engineering, Khanna Publisher
7. R.B. Gupta, Automobile Engineering, Satya Prakashan 2015
8. R.P. Sharma, A Course In Automobile”Engineering, Dhanpat Rai & Sons

List of Experiment:

1. To study Electrical System of a Heavy Vehicle.
2. To Study the Lubrication system of an Automobile
3. To Study the cooling system of an Automobile
4. To study the Suspension System of an Automobile.
5. To study the braking system of an Automobile.
6. To Study the Transmission system of an Automobile
7. To Study the Differential and Drive Axles of an Automobile
8. To study the fuel feed system of a Petrol Engine..

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PCC-FT403	Strength Of Materials	2L:1T:2P (05 hrs)	04 Credits
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Course Objective :

To familiarize the students with the fundamentals of deformation, stresses, strains in structural elements.

Course Content:

Module 1 **(10 Hrs)**

STRESS AND STRAIN: stresses in members of a structure, axial loading, normal stress, shear stress, analysis of simple structures, stepped rods, members in series and parallel: stress strain diagram, Hooke's law, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, fiber reinforced composite materials, strain energy under axial loads and stresses due to impact of falling weights. Transformation of stress and strain, principal stresses, normal and shear stress, Mohr's circle and its application to two and three dimensional analysis.

Module 2 **(08 Hrs)**

BENDING: Pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, shear force and BM diagram, relationship among load, shear and BM, shear stresses in beams, strain energy in bending, deflection of beams, equation of elastic curve, Macaulay's method and Area moment method for deflection of beams.

Module 3 **(07 Hrs)**

TORSION IN SHAFTS: Tensional stresses in a shafts, deformation in circular shaft, angle of twist, stepped and hollow transmission shafts.

Module 4 **(08 Hrs)**

THEORIES OF FAILURES: Maximum normal stress & shear stress theory; maximum normal and shear strain energy theory; maximum distortion energy theory; application of theories to different materials and loading conditions.

Module 5 **(07 Hrs)**

COLUMNS AND STRUTS: Stability of structures, Euler's formula for columns with different end conditions, Rankine's formula.

Course Outcomes:

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

1. Know the concepts of stress and strain.
2. Analyze the beam of different cross sections for shear force, bending moment, slope and deflection.
3. Understand the concepts of Torsion in Shafts through deformation, angle of twist and hollow transmission necessary
4. Understand the theory of failures in different material and loading condition.
5. Understand the concepts of stability of structures.

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List of Text/Reference Books:

1. Beer Fp, Johnson Mechanics Of Materials ,Sixth Edition ;Mc Graw Hills
2. Debabrata Nag & Abhijet Chanda :Strength Of Materials : Wiley
3. Rattan; Strength Of Materials;Second Edition , Mc Graw Hills
4. Nash William; Schaum's Outline Series; Forth Edition Strength Of Materials;Mc Graw Hills
5. Singh Arbind K; Mechanics Of Solids; Phi
6. Sadhu Singh; Strength Of Materials; Khanna Pub.
7. R Subramannian , Strength Of Materials Oxford University Press ,Third Edition .
8. S Ramamurthum , Strength Of Materials , Dhanpat Rai

List of Experiment:

1. Standard tensile test on MS and CI test specimen with the help of UTM
2. Direct/ cross Shear test on MS and CI specimen
3. Transverse bending test on wooden beams to obtain modulus of rupture
4. Fatigue test
5. Brinell Hardness tests
6. Vicker hardness test
7. Izod/Charpy test
8. Rockwell Hardness test

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PCC-FT405	Fire Fighting & Field Training	0L:0T:4P (04 hrs)	02 Credits
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Course Objectives:

- To learn about the different instruction of fire fighting appliance drill.
- To learn about lifting, carrying, rolling and unrolling of fire fighting hose.
- To learn about three men and four men hydrant drill.
- To learn about four men and six men trailer pump drill.
- To learn about the application and different ladder drill.

Course Content:

Module 1 **(08 Hrs)**

APPLIANCE DRILLS Instructions for officer incharge, Duty of drill incharge, Command and action meaning - crew number, Fall in, Fall out, Mount, Dismount, Get to work, Water ON, Knock-off, Make up, Carry ON, Stand from under, still, slip, Counter Balance, Step In, Step out, Extend, Lower, Pitch.

Module 2 **(08 Hrs)**

HOSE DRILLS Lifting a roll of delivery hose, Carrying of a roll delivery hose, Connecting a delivery hose, Unrolling a delivery hose, disconnecting a delivery hose, under- running delivery hose, Rolling up a delivery hose.

Module 3 **(08 Hrs)**

HYDRANT DRILL (THREE MEN) Requirement, Position of three crew members, Add one length of hose, Remove one length of hose, Replacing burst length of hose, Getting a branch to work, Dividing a line in to two line of hose, Collecting two hose line to make one line, Knock off and make off.

Module 4 **(08 Hrs)**

HYDRANT DRILL (FOUR MEN) Requirement, Position of four crew member, Function of individual crew member, Add one length of hose, Removing one length of hose, Replacing a burst length of hose use of dividing breeching, Use of collecting Breeching, Getting a branch to work, knock off and make up.

Module 5 **(08 Hrs)**

TRAILER PUMP DRILL (FOUR MEN AND SIX MEN) Requirement, Single delivery, Single suction, Double suction, Double delivery, Position of six crew members in trailer pump, Change round, Mount, Dismount, Close up position, Fall in position, Towing Tender, Ladder drill, Extension ladder, Position of four crew members, Position at Pitching, Fire Escape ladder drill requirement, close up position, Pitching.

Course Outcome:

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

1. Demonstrate different world of command used in appliance drill.
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. Apply ladder drill performance and practice in fire fighting operation.

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List of Text/Reference Books:

1. Drill Manual For Fire Services Of India By Govt. Of India.
2. Fire Fighters Skill Drill Manual By Nfpa.

List of Experiment:

1. To performed and practice different world of command used in appliance drill.
2. To performed and practice hose drill in a crew.
3. To performed and practice three men hydrant drill with hydrant post and hose pipe.
4. To performed and practice four men hydrant drill with hydrant post and hose pipe.
5. To performed and practice four men trailer pump drill with trailer pump, Suction pipe, hose pipe and hose fittings.
6. To performed and practice six men trailer pump drill with trailer pump, Suction pipe, hose pipe and hose fittings.
7. To performed and practice ladder drill and its application..