



IPS ACADEMY- INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(A UGC Autonomous Institute, affiliated to RGPV)

Rajiv Gandhi Pradyogiki Vishwavidyalaya, Bhopal

Scheme of Examination as per AICTE Flexible Curricula

VI Semester Bachelor of Technology (B.Tech.)

[Fire Technology & Safety Engineering]

S. No	Course Type	Course 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	FT13	Paramedics	60	25	15	-	-	100	2	1	-	3
2	PCC	FT14	Hydraulic in Fire Service Equipments	60	25	15	-	-	100	2	1	-	3
3	PCC	FT15	Safety, Health & Environment Laws	60	25	15	-	-	100	2	1	-	3
4	PCC	FT16	Disaster Management	60	25	15	-	-	100	3	-	-	3
5	HSMC	HS06	Humanities and Social Sciences Open Courses - II	60	25	15	-	-	100	2	-	-	2
6	IOC	IO-01	Interdisciplinary Open Course I	60	25	15	-	-	100	3	-	-	3
7	LC	FT13(P)	Paramedics Laboratory	-	-	-	60	40	100	-	-	2	1
8	LC	FT14(P)	Hydraulic in Fire Service Equipments	-	-	-	60	40	100	-	-	2	1
9	LC	FT15 (P)	Safety Analytics with Applied MATLAB Programming	-	-	-	60	40	100	-	-	2	1
10	SBC	FT04(P)	Advance Fire Fighting	-	-	-	60	40	100	-	-	4	2
11	LLC	LLC03	Liberal Learning Course III	-	-	-	-	100	100	-	-	2	1
12	MLC	MLC04	Intellectual Property Rights	-	-	-	-	-	-	1	-	-	Audit
13	PROJ	FT01	<i>To be completed anytime during Fifth/Sixth semester. Its evaluation/credit to be added in Seventh Semester</i>										
Total				360	150	90	240	260	1100	15	3	12	
Total Academic Engagement and Credits										30			23

Interdisciplinary Open Course (IOC)-I, FT01 (Any One Course)

- (a) Metro System and Engineering
- (b) JAVA
- (c) Data Science
- (d) Basics of Python
- (e) Artificial Intelligence
- (f) Higher Mathematics (Operation Research)

Humanities and Social Sciences Open Courses (HSMC) – III, HS06 (Any One Course)

- (a) Industrial Psychology
- (b) Personnel Psychology
- (c) Engineering Economics
- (d) Finance for Engineers
- (e) Stress Management
- (f) Business Communication
- (g) Industrial Safety Psychology

Liberal learning Course (LLC)-III, LLC03 (Any One Course)

- (a) Sociology
- (b) Interior Design
- (c) Graphic Design
- (d) Animation
- (e) Corporate Culture

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PCC-FT 13	Paramedics	2L:1T:0P (03 hrs)	03 Credits
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Course Objective:

1. To learn about the human body & its various system.
2. To learn about the handling of human casualty, its diagnosis & treatment.
3. To learn about the burn, shock and their types with paramedic care.

Module 1 **(08 Hrs)**

INTRODUCTION: Definition; qualities of duties, tasks, Study of the human body and its various systems: Skeleton system, Digestive system, Respiratory system, Circulatory system, Central Nervous system & their functions, Practical study of this part to include demonstrations of the human body with structural details of its various parts as seen externally and examination of its internal functions such as pulse, breathing, movements of the chest and abdomen, movements of various joints of the body with structural changes in the body parts while making three movements.

Module 2 **(08 Hrs)**

CASUALTY HANDLING-I: Including history taking, making of a diagnosis based on symptoms as Narrated by the casualty and signs as observed by the paramedic. Checking temperature pulse, respiration, blood pressure, swellings, discoloration of the skin, wounds, deformities etc/to confirm the diagnosis. Study of various types of burns and their complications in the indoor cases in burn ward in the local government hospitals. Study of maintenance of various charts related to such casualties and their importance.

Module-3 **(08 Hrs)**

CASUALTY HANDLING-II: Study of specific injuries to body parts controlling their functions with external and internal injuries of head chest and abdomen including causes and consequences of external and internal bleeding. Paramedical care of various types of Casualties and their injuries such as wounds, burns, injuries of bones and joints, disturbances in vital function including cardiopulmonary resuscitation, artificial respiration by manual and instrumental methods, bandages, splints, correction of shock, arrest of bleeding, treatment of hyperpyrexia, use of anti/shock fluids and their administration, Observation and maintenance of such casualties.

Module 4 **(08 Hrs)**

CASUALTY HANDLING-III: Casualty handling including observation, maintenance of observation charts, treatment administered, temperature-pulse-respiration records, application of suction, appropriate positioning of casualties affected by head injuries, chest injuries, abdominal injuries, bleeding, shock, asphyxia etc. Transportation of casualties on stretchers, across plain ground, through obstacles, stretcher drill, loading and unloading of casualties in stretchers and ambulances, Ambulance installations and their use in casualties during transportation etc.

Module-5 **(08 Hrs)**

CAUSALTY HANDLING-IV: Casualties affected by heat and cold, drowning, poisoning, pressure, altitude, inebriations, sound, explosions, nuclear radiations etc. Prevention, protection of effects on human bodies and their paramedical care. Bites of animals such as snakes, dogs and various insects and their paramedical care.

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Course Outcomes:

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

1. Explain the various systems of human body.
2. Evaluate various parameter concerning to human causality during emergency.
3. Demonstrate respiratory and non respiratory first aid to human causality.
4. Carryout first aid to human causality affected by heat and cold burn.
5. Conduct first aid to human causality affected by head , chest and abdominal injuries.

List of Text/Reference Books:

1. Edward T Dickinson , Fire Service emergency care, , Braddy.
2. L.G Gupta & Abhitabh Gupta , First Aid, Jaypee Brothers.
3. Watson Jones Fractures and Joint Injuries :
4. Cantlie, James, First Aid to injured, St John Ambulance Association
5. First Aid Manual by Indian Red Cross Society

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PCC-FT-14	Hydraulic in Fire Service Equipments	2L:1T:0P (03 hrs)	03 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

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PCC-FT 15	Safety, Health & Environment Laws	2L:1T:0P (03 hrs)	03 Credits
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Course Objectives:

1. To teach the significance of Factories Act and Rules in Safety Engineering.
2. To learn the provisions related fire prevention and protection in different laws, related to Safety, Health & Environment.
3. To teach the provisions and rules related to pollution control in important legislations.
4. To learn the other important legislations from safety, fire prevention and protection point of view.
5. To learn the provisions related to fire prevention and protection in fire service act and rules

Course Content:

Module 1 **(06 Hrs)**
Objective, Definition, Application including chapter-IV, Chapter-IVA, Chapter-IX of Factories Act 1948 and Chapter IX, Chapter-X of M.P. Factories rules 1962, Madhya Pradesh Control of Industrial Major Accident Hazard Rules 1999..

Module 2 **(06 Hrs)**
Objective, Definition, Application & provisions related to safety, fire prevention and fire protection in Laws such as Indian Explosive Act 1884, Gas Cylinder Rules 2004, Static and Mobile Pressure Vessel Rules, Petroleum Act 1934 with Rules 2002, Calcium Carbide Rules 1987.

Module 3 **(08 Hrs)**
Objective, Definition, Application provisions and rules related to control of pollution in important legislation such as Water (Prevention and Control of Pollution) Act, Air (Prevention and control of pollution) Act, Environment (Protection) Act 1986 with MSIHC Rules, Chemical Accident (EPPR) Rules 1996

Module 4 **(09 Hrs)**
Objective, Definition, Application & provisions related to safety, fire prevention and fire protection in Other Important Legislations like-Boilers Act 1923, Electricity Act 2003 with rules, Dock workers (Safety, Health & Welfare) Act & Rules. Safety & Health provisions of Building & other construction workers (R.E.C.S.) Act 1986 and central rules 1998 and Mines Act.

Module 5 **(05 Hrs)**
Provisions related to fire prevention and protection in Delhi fire service Act 2007 and Delhi fire service rules 2010, fire insurance assessment, Public liability insurance Act 1991 with Rules. Objective, Definition, Application, Provisions and Rules related to accidents, Occupational Diseases and Compensation in Employees State Insurance Act..

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Course Outcome:

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

1. Explain significance of Factories Act and Rules in Safety Engineering.
2. Explain provisions related fire prevention and protection in different laws.
3. Explain provisions and rules related to pollution control in important legislations.
4. Know other important legislations from safety, fire prevention and protection point of view.
5. Explain provisions related to fire prevention and protection in fire service act and rules..

List of Text/Reference Books:

1. Factories Act 1948, M.P. Factories rules 1962
2. Indian Explosive Act 1884, Gas Cylinder Rules 2004
3. Petroleum Act 1934, Petroleum Rules 2002
4. Environment (Protection) Act 1986
5. Boilers Act 1923
6. M.P. C.I.M.A.H. Rules 1999
7. Delhi Fire Service Act 2007 with Rules 2010.
8. Employee State Insurance Act & Rules.
9. Building & other Construction workers, (R.E., C.S.) Act. 1996
10. Other Important Laws related to Health Safety and Environment.

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PCC-FT 16	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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HSMC -HS 06	Humanities and Social Sciences Open Courses – II Industrial Safety Psychology	2L:0T:0P (02 hrs)	02 Credits
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Course Objective:

To learn the fundamental of industrial psychology and its applications in occupational health and safety management of an organization through appropriate Industrial Labour Legislations.

Course Content:

Module 1 **(06 hrs)**

SOCIAL AND INDUSTRIAL PSYCHOLOGY: Definition, Nature and Background, Social Perception: Non-Verbal Communication, theories of Attribution, Impression formation and impression management. Social Identity: Self Concept, Self-esteem, Self-efficacy, Self-monitoring and self focusing. Social Influence: Conformity, Compliance and Obedience.

Module 2 **(09 hrs)**

HISTORY OF OCCUPATIONAL HEALTH PSYCHOLOGY: The scope and nature of occupational health and safety- Safety, Welfare, Occupational or work-related ill-health, Environmental protection, Accident, Dangerous occurrence, Hazard and risk. Mental disorder- Alcohol abuse, Depression, Personality disorders, Schizophrenia. Workplace mistreatment- Workplace incivility, Abusive supervision, Workplace bullying, Workplace violence.

Module 3 **(07 hrs)**

OCCUPATIONAL SAFETY: Risk Factors in the Physical Work Environment, Occupational Health Psychology and Occupational Safety, Individual Antecedents of Safety Performance and Workplace Accidents and Injuries, Situational Antecedents of Safety Performance and Workplace Accidents and Injuries.

Module 4 **(08 hrs)**

INTERVENTIONS IN OCCUPATIONAL HEALTH PSYCHOLOGY: Primary Interventions to Improve Work–Life Balance, Secondary Interventions to Improve Work–Life Balance, Tertiary Interventions to Improve Work–Life Balance, Primary Interventions to Improve Physical Health and Safety, Secondary Interventions to Improve Physical Health and Safety, Tertiary Interventions to Improve Physical Health and Safety, Primary Interventions to Improve Psychological Health and Well-Being, Secondary and Tertiary Interventions to Improve Psychological Health and Well-Being.

Module 5 **(09 hrs)**

THE FUTURE OF OCCUPATIONAL HEALTH PSYCHOLOGY: Mental Health, Physical Health, Aggression in the Workplace, Organizational Climate and Leadership, Works–Family Balance, Interventions in the Workplace. Characteristics of behavior under psychological stress, stressful aspects, Industrial Labour Legislation- Labour Legislations in India-Principles Of Labour Legislation- Social Justice, Social Equity, National Economy. Classification Of Labour Laws- Purpose, Legislature, Period Of Enactment. The Factories Act, 1948-Main Provisions Of The Act, Health And Hygiene (Sec11-20), Safety Provisions (Sec 21- 41)

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Course Outcome:

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

1. Understand the basic concept of industrial psychology and its application in occupational safety management.
2. Describe fundamental theories and recent empirical research in the field of Occupational health psychology.
3. Apply scientific knowledge to practical health and safety issues in the modern Workplace.
4. Give design solutions to improve the quality of work life and promote workers' health.
5. Familiar with the nature of Industrial Labour Legislation

List of Text/Reference Books:

1. Ck Johri, Labour Law In India (2012) Kns1220 J71
2. Labour Laws - A Primer (2011 Ed.). Eastern Book Company. Pp. 1–224. Isbn 9789350281437
3. P. L. Malik's Industrial Law (Covering Labour Law In India) (2 Volumes With Free Cd-Rom) (2015 Ed.). Eastern Book Company. Pp. 1–3656. Isbn 9789351451808
4. Stavroulaleka And Jonathan Houdmont (2010) Occupational Health Psychology A John Wiley & Sons, Ltd., Publication
5. Probst, T. M., Gold, D., & Cabom, J. (2008). A Preliminary Evaluation Of Solve: Addressing Psychosocial Problems At Work. Journal Of Occupational Health Psychology, 13, 32-42.
6. Levi, I. (2000). Guidance On Work-Related Stress: Spice Of Life Or Kiss Of Death (100 Pages)

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IOC -IO 01	Interdisciplinary Open Course I	3L:0T:0P (03 hrs)	03 Credits
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Course Objectives:

1. To be familiar with all the OR Techniques and optimization methods.
2. To be familiar with various inventory control techniques.
3. To be familiar with waiting line models and Competitive strategy.
4. To clear idea of the decision making and meta-heuristic algorithm.
5. To understand project network analysis.

Course Content:

Module 1 **(08 Hrs)**

LINEAR SYSTEM AND DISTRIBUTION MODELS: Mathematical formulation of linear systems by LP, solution of LP for two variables, Simplex method, special cases of LP- transportation and assignment model and their graphical solution, Vogels Approximation Method (VAM) or penalty method, cell evaluation degeneracy.

Module 2 **(08 Hrs)**

INVENTORY MODELS: Necessity of inventory in process and safety stock, problem of excess inventory and cycle time, JIT/ Lean Mfg; basics of inventory models with deterministic demand, Classical EOQ Model, ABC, VED and other analysis based on shelf life, movement, size, MRP technique and calculations, lot sizing in MRP, linking MRP with JIT; evolution of MRP to ERP to SCM and e-business.

Module 3 **(06 Hrs)**

WAITING LINE MODELS: Introduction, Input process, service mechanism, Queue discipline, single server (M/M/1), average length and average time calculations, optimum service rate; basic multipleserver models (M/M/s), Competitive strategy: concept and terminology, assumptions, pure and mixed strategies, two person zero sum games, saddle point, dominance, graphical, algebraic and LP methods for solving game theory problems..

Module 4 **(08 Hrs)**

DECISION ANALYSIS: Decision under certainty, risk Probability and uncertainty, Hurwicz criterion AHP assigning weight and consistency test of AHP. Metaheuristics: definition of heuristic and metaheuristic algorithms

Module 5 **(08 Hrs)**

NETWORK ANALYSIS: Project Planning, Scheduling and Controlling; Project management; Network Techniques and its role in project management, Network logics, Fulkerson's Law, Merits and Demerits of AON Diagrams; Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Determination of critical path, Float/Slack.

Course Outcome:

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

1. Understand the concept of optimization and its application.
2. Understand the concept of various inventory control techniques used in industries.
3. Understand the concept of Queuing and Game Theory.
4. Understand the idea of the decision making and application of meta-heuristic algorithm
5. Implement project management concepts, tools and techniques in order to achieve project success

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Text Books :

1. Hillier FS and Liberman GJ; Introduction to Operations Research concept and cases; TMH , 8th Ed. 2008.
2. Heera and Gupta, Operation Research, S Chand Pub. reprint with corrections ,2017
3. Sharma JK; Operations Research; Macmillan 3rd Ed. 2006.
4. Heera and Gupta ,Problems in Operations Research Principles and Solutions, S Chand Pub, 4th Ed. 2015.

Reference Books:

1. Taha H; Operations research; PHI, 10th Ed.2019.
2. Jain, pandey & shrivastava; Quantitative techniques for management, New Age publishers.2019
3. Srinivasan G; Quantitative Models In Operations and SCM; PHI Learning, 2017
4. Sen RP; Operations Research-Algorithms and Applications; PHI Learning, 2009
5. Bronson R ;Theory and problems of OR; Schaum Series; TMH, 2016.

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LC-FT 13 (P)	Paramedics Laboratory	0L:0T:2P (04 hrs)	01 Credit
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List of Experiment:

1. To measure the bleeding time and clotting time of healthy adult person using vrigid splints.
2. To calculate the victim dressing time using various type of bandage by first aid responder.
3. To calculate the body mass index of an adult person by using surgical height measuring scale with digital weighting machine.
4. To calculate the blood pressure of an adults person using mercury sphygmomanometer and stethoscope apparatus.
5. To calculate the scale of burn.
6. To perform and practice the different methods of handling and transportation of Victim.
7. To perform and practice the first aid treatment of Fractures in different part of human body.
8. To measure the working efficiency of human lungs with lung testing apparatus

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LC-FT 14 (P)	Hydraulic in Fire Service Equipments	0L:0T:2P (04 hrs)	01 Credit
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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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LC-FT 15(P)	Safety Analytics with Applied MATLAB Programming	0L:0T:2P (02 hrs)	01 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.

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New Scheme & Syllabus Based on AICTE Flexible Curricula **(B. Tech)**
Fire Technology & Safety Engineering

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.

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

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SBC –FT 04 (P)	Advance Fire Fighting	0L:0T:4P (04 hrs)	02 Credits
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Course Objective:

To learn and teach about the basic firefighting equipment/apparatus installed in a factory and practice associated incident management strategies to control fire and other emergency situations.

Course Content:

Module 1 **(06 Hrs)**

PUMPS TYPES AND APPLICATION: Fire water pump characteristics, main and stand by fire pumps, booster fire water pumps, water mist fire water pumps, jockey pumps

Module 2 **(06 Hrs)**

PUMP INSTALLATION, PIPING ARRANGEMENT AND ACCESSORIES: Typical installation, pump separation, multiple pump installation. Pressure and flow control valves, Flow measurement. Fire sprinklers protection.

Module 3 **(06 Hrs)**

FIREWATER PUMP CONTROLLER: Controller power supplies, Firewater pump acceptance and flow testing- Safety precautions, Periodic performance test, weekly testing, Basic test procedure

Module 4 **(06 Hrs)**

MANAGING INCIDENTS: Incident Command Development- Fire ground command, Responsibilities and function of command, Establishing command, Command staff, General staff function, Post incident review

Module 5 **(06 Hrs)**

FIRE ATTACK AND FIRE STREAMS: Sizing up incidents- Lloyd Layman's size up process, Determining fire flow- Kimball rule of thumb, Action plan development – Incident and tactical priorities, scene safety. Solid Streams- Horizontal and Vertical reach, stream penetration, Non solid fire streams- Velocity Flow nozzle reaction.

Course Outcomes:

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

1. Demonstrates pumping arrangements and their layouts in a standard pump house.
2. Familiar with pump installation and piping accessories of water based installation.
3. Carry periodic test related to power supply and flow testing.
4. Develop Incident command for managing major fires.
5. Apply water streams based on fire scenarios.

List of Text/Reference Books:

1. Fire Fighting Pumping System at Industrial facilities- Dennis P. Nolan.
2. Fire Officer Principles and Practice- NFPA.
3. Fire Department Hydraulics- Evgene Mahoney.

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LLC – LLC03	Liberal learning Course III	0L:0T:2P (01 hrs)	01 Credit
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Liberal learning Course (LLC)-III, LLC03 (Any One Course)

1. Sociology
2. Interior Design
3. Graphic Design
4. Animation
5. Corporate Culture

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New Scheme & Syllabus Based on AICTE Flexible Curricula **(B. Tech)**
Fire Technology & Safety Engineering

MLC- MLC 04	Intellectual Property Rights	1L:0T:0P (01 hrs)	Audit
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Course Objective:

1. To be familiar with the concept of intellectual property.
2. To be familiar with Purpose and function of trademarks
3. To be familiar with Fundamental of copy right law
4. To clear idea of the trade Secrete.
5. To be familiar with latest development in the field of intellectual property.

Course Content:

Module 1 (06 Hrs)
INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Module 2 (06 Hrs)
TRADE MARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

Module 3 (06 Hrs)
LAW OF COPYRIGHTS: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

Module 4 (06 Hrs)
TRADE-SECRETS: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

Module 5 (06 Hrs)
NEW DEVELOPMENT IN INTELLECTUAL PROPERTY: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

Course Outcomes:

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

1. Understand the concept of intellectual property.
2. Understand what is trademark and its importance.
3. Understand the law of copyright.
4. Understand how trade secrete help in competitive market
5. Understand the latest trends in intellectual property.

List of Text/Reference Books:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.