Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name : Advanced Diploma in Fire Safety Engineering

Programme Code : FS **With Effect From Academic Year: 2023 - 24**

Duration of Programme: One Year (Two Semesters) **Pattern : Semester (Full Time)** **Duration: 16 Weeks**

Semester: First **Scheme: I**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme													Grand Total
								Theory							Practical						
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total		
				L	T	P			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
a	b	c	d	e	f	g	h(e+f+g)	i	j	k	l	m	n(j+l)	o	p	q	r	s	t(p+r)	u	v(n+t)
1	Fire Engineering Science	FES	28114	4	1	--	5	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
2	Fire Service Organization	FSO	28019	3	--	2	5	--	--	--	--	--	**--**	--	50#$	25	50	25	**100**	50	**100**
3	Fire Safety	FSF	28115	4	1	--	5	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
4	Special Fire Hazards	SFH	28020	3	--	2	5	--	--	--	--	--	**--**	--	50#$	25	50	25	**100**	50	**100**
5	Fire Investigation	FGA	28034	4	--	2	6	--	--	--	--	--	**--**	--	50#$	25	50	25	**100**	50	**100**
6	Fire Fighting Drills	FFD	28022	--	--	6	6	--	--	--	--	--	**--**	--	50#	25	50	25	**100**	50	**100**
Total				**18**	**02**	**12**	**32**	--	**140**	--	**60**	--	**200**	--	**200**	--	**200**	--	400	--	**600**

Student Contact Hours Per Week: **32 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks: **600**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@Internal Assessment, # External Assessment, *# On Line Examination

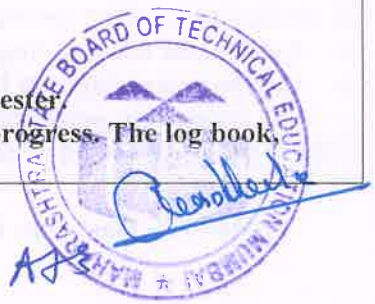
* The average of 2 test to be taken during the semester for the assessment.

#$ External PR ESE and average of 2 Skill tests / Practicals.

@$ Internal PR ESE and average of 2 Skill tests / Practicals.

If student remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE.

- **Candidates not securing minimum marks for passing the "PA" part of practical of any course is declared as "Detained" for that semester.**
- **During the Internship and Project period students shall attend Institute one day a week to meet the mentor and appraise about the progress. The log book, Project Diary, and Internship performance shall be recorded by the mentor for progressive assessment.**



Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name : Advanced Diploma in Fire Safety Engineering

Programme Code : FS **With Effect From Academic Year: 2023 - 24**

Duration of Programme: One Year (Two Semesters) **Pattern : Semester (Full Time)** **Duration: 16 Weeks**

Semester: Second **Scheme: I**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme													Grand Total
								Theory							Practical						
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total		
				L	T	P			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
a	b	c	d	e	f	g	h(e+f+g)	i	j	k	l	m	n(j+l)	o	p	q	r	s	t(p+r)	u	v(n+t)
1	Fire and Electrical Audits	FEA	28209	4	--	4	8	1.5	70*#	35	30*	00	**100**	50	50@	25	50	25	**100**	50	**200**
2	Fire Fighting Equipment & Rescue Techniques	FFE	28070	--	--	8	8	--	--	--	--	--	--	--	50#	25	50	25	**100**	50	**100**
3	Project	PFS	28085	--	--	4	4	--	--	--	--	--	--	--	50#	25	50	25	**100**	50	**100**
4	Fire Training	FAI	28086	--	--	10	10	--	--	--	--	--	--	--	100#	50	100	50	**200**	100	**200**
Total				**04**	**--**	**26**	**30**	--	**70**	--	**30**	--	**100**	--	**250**	--	**250**	--	**500**	--	**600**

Student Contact Hours Per Week: **30 Hrs. Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks: **600**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@Internal Assessment, # External Assessment, *# On Line Examination

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- **Candidates not securing minimum marks for passing the "PA" part of practical of any course is declared as "Detained" for that semester.**
- **During Internship and Project period students shall attend Institute one day a week to meet the mentor and appraise the progress. The log book, Project Diary, and Internship performance shall be recorded by the mentor for progressive assessment.**

Note : The Institute is required to sign MOU with related local authories for Fire Training

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : FIRST
COURSE TITLE : FIRE ENGINEERING SCIENCE
COURSE CODE : 28114

1. RATIONALE

This subject is basic of fires. Knowledge of basic fire chemistry and its properties to understand the hazards, and severity of the flammable solids, liquids and gases materials. To extinguish the fire, basic understanding of chemicals reactions and properties are very much useful in fire extinguishment, fire investigation, decision making, research & developments at the emergency site. It is the most useful in practical work of fire emergency.

2. COMPETENCY

To study

- Different types of combustible matters.
- Basics of fire chemistry.
- Different fire extinguishing method.
- Properties of extinguishing media or agent.
- Fluid mechanics.
- And design hydraulics and water supplies for fireman.

3. COURSE OUTCOMES

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

- Explain fire dynamics in enclosed and open fire situations.
- Explain fire propagation, smoke movement and its effect on surrounding.
- Know Fire Physics and Chemistry, Fire Propagation and Fire Dynamics
- Know the different physical and chemical properties of the violent material.
- Apply theory based knowledge to keep plant safe.
- Apply knowledge for life, property and environment saving.
- Solve problems in fire-related contexts by applying mathematics, mechanics, hydraulics, chemistry and electricity
- Use understanding of science to explain hazards and their potential effects
- Interpret data and carry out relevant calculations

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
4	1	-	5	1.5	70*#	35	30*	00	100	50	-	-	-	-	-	-	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours	Marks
I	**BASICS OF FIRE SCIENCE** • Definition of Fire, Fire Triangle, • Fire extinguishing methods, • Different types of extinguishing media. • Water as principal extinguishing media, it's properties & limitations. • Stages of Fire • Classification of Fires as per Indian Standards, • Common causes of fire & it's preventive measures • Tetrahedron of Fire, • Un-inhibition Chain reactions, • Combustion chain reaction involving a free radical mechanism with the example of combustion of hydrogen, • Exothermic Chemical reactions & Endothermic Chemical reactions	**10**	**10**
II	**COMBUSTION** • Definition of combustion, • Types of combustion, • Oxidation reactions, • Limits of flammability, • Flash point, fire point, ignition temp., Auto ignition temp, Specific gravity, vapor density, Latent heat of vaporization & latent heat of fusion, Shouldering	**08**	**12**

Unit	Topic and Contents	Hours	Marks
	• Explosive range, • Flammable properties of combustible materials. • Basic combustion process, • Specific surface and rate of combustion, • Effects of humidity, temperature and atmospheric pressure on combustion		
III	**TRANSMISSION OF HEAT** • Heat and Temperature, BTU • Temperature conversion formulae • Heat transmission processes- Conduction, Convection, Radiation & it's fire risk • Specific Heat, Calorie, Volatile liquids • Basic ways where heat may be generated spontaneously (Without external heating)	**08**	**12**
IV	**PRODUCTS OF FLAME** • Definition of flame, • Types of Flames: Premixed flame and the Diffusion flame. • Laminar and turbulent gas flows • Practical examples of premixed flames and diffusion flames • The Bunsen Burner & A candle flame • Explosions. Burning velocity. **FLAME HAZARDS** • Flash over, Back Draught, Boil Over, Spill over, • Unconfined Vapor Cloud Explosion (U.V.C.E.), Boiling Liquid Expanding Vapor Explosions (B.L.E.V.E.), • Deep-seated fires, • Jet & flash fire, • Fire cloud & Fire ball	**10**	**12**
V	**DIFFERENT COMBUSTIBLE MATTER** • The Ideal Gas Law • Vapor pressure & boiling point • Types of combustible matter, Elements • Chemical compounds • Properties of matter **PROPERTIES AND HAZARDS OF COMMON VOLATILE SUBSTANCES** • Alcohols, Xylene, Aniline, Solvent Naphtha, Ether (DI-Ethyl Ether), Ethyl Acetate, Toulon or toluene, • Carbon Disulfide, Nitro Benzene, Propylene, Oxide, • Inorganic and Organic Oxidizers, Inorganic peroxides, Hydrogen peroxide, Organic peroxides, Cyclohexanone peroxide, Methyl Ethyl Ketone Peroxides, • Charcoal, Pyrophoric carbon, • Sulphur, Phosphorous, Naphthalene, • Cotton. Paper, Jute, Wool, Wood, Rubber, Plastic,	**14**	**12**

Unit	Topic and Contents	Hours	Marks
	• Petrol and fuel oils, Drying oils, Mineral oils, Heavy Fuel Oils, • Kerosene and Diesel Oils, • Linoleum, Coal, Coal-tar. • Paints, Varnish, Enamel, Lacquer • LPG, Hydrogen, Oxygen		
VI	**HYDRAULICS** • Meaning of hydraulics, • Relation between fluid pressure and water head, Concept of pressure head and numerical calculations, • Loss of pressure due to friction and numerical calculations, • Atmospheric Pressure concept, • Newton third law of motion • Jet Reaction, • Nozzles & back pressure , • Water Hammer and its effects • Water hammer control measures • Heights of effective jets with calculation, • Water Relays, • Fire department pumps, • Fire water capacity and Pumps requirement in industries. • Water Power, Brake Power, WHP and Pump Efficiency and numerical calculations, • Testing of pumps and pump maintenance.	**14**	**12**
Total		**64**	**70**

7. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basics of fire science	10	05	05	00	10
II	Combustion	08	05	05	02	12
III	Transmission of heat	08	05	05	02	12
IV	Products of flame	10	05	05	02	12
V	Different combustible matter	14	06	06	00	12
VI	Hydraulics	14	03	03	06	12
Total		**64**	**29**	**29**	**12**	**70**

Legends: *R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)*

Note*: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

8. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

List of Assignments

- Draw and explain fire triangle and tetrahedron with each elements.
- Draw and explain fire extinguishing methods.

- Explain the terms Limits of flammability, Flash point, fire point, explosions, Catalysts and inhibitors.
- Explain Fire load concept with formula, Calculate fire load for your class room area.
- Explain heat transfer elements and what the actual impacts on building fire?
- Explain the terms Auto-ignition temperature, thermal runaway, Spontaneous heating, and ignition due electric spark.
- Draw and explain flame, Non-luminous flames, Diffusion flame, premixed flame, Pre-mixed flames, and explosions.
- Explain U.V.C.V. and B.L.E.V.E
- Explain the Ideal Gas Law, Vapour pressure & boiling point.
- Explain the properties of matters.
- The Newton's third law of motion and relation with jet reaction.
- Explain Water Hammer and its effects and control measures.

9. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Fire Technology Chemistry and Combustion	David M. Wharry and Ronald Hirst,	IFE , UK
2	Cases of Combustion, Flame & Explosion	B.lewis & G.Ven, Elbe,	Academic Press
3	National Fire Protection Association Volume-II	---	Arkose Press
4	Basic Chemistry for Fire Engineers	William Kingsley	Hodgetts, 1947
5	Handbook of Fire Technology	R. S. Gupta	Orient Longman
6	Fire Fighting the Essential Handbook, Volume-	Barendra Mohan Sen	UBS
7	Fire Service Manual Volume 1: Fire Service Technology, Equipment and Media - Physics and Chemistry for Firefighters	---	HM Fire Service Inspectorate Publications Section London: The Stationery Office
8	Fire Service Manuals Volume 1: Fire Service Technology, Equipment and Media - Hydraulics, Pumps and Water Supplies	Great Britain: H.M. Fire Service Inspectorate	The Stationery Office
9	Fundamentals of Physics	David Halliday, Robert Resnick, Jearl Walker	Wiley
10	The Chemistry of Combustion,	J. Newton Friend	Bibliolife Reproduction Series
11	Dynamics for Firefighters	Benjamin Walker	Pavilion Publishing

10. SOFTWARE/LEARNING WEBSITES

- https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=550
- https://en.wikipedia.org/wiki/Fire_safety
- https://www.udemy.com/course/fire-and-life-safety-concepts/
- https://www.ife.org.uk/

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : FIRST
COURSE TITLE : FIRE SERVICE ORGANIZATION
COURSE CODE : 28019

1. RATIONALE

This subject will be appropriate for individuals working in the fire sector who hold roles requiring management and leadership skills and who need to appreciate the wider context of organisation's operations. The persons train in firefighting processes must also know about fire service organizations and their functioning. They must also know the duties and responsibilities of fire service people and also the procedures to be followed in the evet of a fire or disaster.

2. COMPETENCY

- Demonstrate knowledge and skills in the area of Basic Concepts and Techniques of Safety Management.
- To familiarize with different roles in fire safety organization.
- To understand the importance of Safety Education and Training needs of an Organization. To know the management functions.
- To learn different types of documentation handling by the fire service organization and importance.
- To know the different types of organizations and its functions.

3. COURSE OUTCOMES

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

- Explain good practice in relation to leadership and management.
- Assess the role of leadership and management in delivering organization objectives.
- Assess the role of policy and procedures in delivering organization objectives.
- Explain the contribution of leaders and managers to health and safety.
- Understand the purpose of planning and performance management.
- Understand the contexts and constraints relevant to service delivery.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme												
				Theory							Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	2	5	-	-	-	-	-	-	-	50#$	25	50	25	100	50

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
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***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

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5. LIST OF PRACTICALS/ EXERCISES/ ASSIGNMENTS/ CASE STUDIES

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
1	Concept of Organization with structures.
2	The duties of station administration.
3	Fire service documentations and importance of record maintenance.
4	Importance Fire station discipline.
5	Describe different Fire Service Equipment.
6	Features of good organization structure.
7	Meaning of leadership and its good qualities.
8	Different leadership styles and most useful in fire safety.
9	Importance of Motivation and **FIRE FIGHTING EQUIPMENTS** in fire service organization.
10	The benefits of effective communication for the organization.
11	Communication and message at fire ground.
12	Importance of Training in Fire Service Organization.
13	Different Types of Ladders used in Fire Service Organization.
14	Role of the Fire Officer at various incidents.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours
I	**FIRE SERVICE ORGANIZATION** • Definition of organization. • Fire brigade purpose, scope and equipment's, Fundamentals of fire station management, • Structure of city fire organization,	08

Unit	Topic and Contents	Hours
	• Fire service organisation and its hierarchy, • The role of fire service organization, • Role of State fire services, • Role of local and Municipal fire services, • Wings of fire service organization **FIRES SERVICE ADMINISTRATION** • Fire Station administration, • Mandatory documents and operational records, Station discipline, • Features of good organization structure	
II	**FIRE SERVICE LEADERSHIP** • Meaning of leadership, • Types of Leadership, • The differences between management and leadership, • The importance of encouraging staff participation in decision making, • Qualities of leadership, • Useful leadership style in fire service • Functions of leadership, • Leadership styles may be applied to encourage, motivate and support team members, • Leadership Function of the Fire Officer (Fire Ground). • The importance of planning, organizing and coordinating skills, and to recognize achievement	**08**
III	**FIRE SERVICE DISCIPLINE, MOTIVATION & COMMUNICATION** • Meaning of discipline • Characteristics of good discipline • Need of motivation for fire & safety • Motivational Theory of experts. • An effective intrinsic motivation technique is job enrichment. • Incentive schemes as motivation • Meaning of decision making • Importance of decision making in fire incidence. • Importance of communication in fire emergency at all industries, • The different types of organisation structures and lines of communication vertical, lateral and horizontal, • The different methods and skills of communication, reporting and receiving feedback at the workplace • The benefits of effective communication for the organisation	**08**
IV	**FIRE SERVICE TRAINING** • Introduction, Education Vs Training • Objectives of Training • Needs to training as a first responders • Types of training • Elements of training cycle Mobilizing • Training programs and resources • General training needs in fire service	**08**

Unit	Topic and Contents	Hours
	• Methods of instructions • Training Methodology • Methods of Instructions. • Successful Training evaluation and certification • Attendance sheet, format and purpose	
V	**FIRE INCIDENT CONTROL** • Incident Command & Control System • Fire calls handling procedure • Importance of design aspects in control room • Mobilizing board meaning and importance • Role of logistic, safety & information officer • Fire service watch room • Fire service communication & co-ordination system • Duties & responsibilities of Mobilization /Duty officer	**06**
VI	**FIRE GROUND OPERATIONS AND EQUIPMENTS** • Standard Operating Procedures. • Duties & responsibilities of Incident Commander officer, • Pre- Incident planning, Size-Up, Strategic Plan • Deployment and organisation, Life Safety, Extinguishment, salvage operation, First Aid, TRIAGE and mass causality. • Qualities of a Good fire personnel to control fire incidence. • Role of control post • Ground communication • MARG • Life safety ropes and lines. • Hydrant Gears & connections • Hose & hose fittings • Ladders: Types of ladders, Conventional, Turn Table Ladder and Snorkel, Hydraulic platform, Aerial ladder platform • Small and special gears • Water tenders	**10**
Total		**48**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Memorandum of Emergency Fire Brigade Organization	---	HMSO
2	Management in Fire Service	---	NFPA
3	Principles of Management	BS Mathur	Bio-green Books
4	Fire Service Administration	Grant, Nancy K., Hoover, David	Jones & Bartlett Learning
5	Fire Fighting Strategy and Leadership	Charles V. Walsh, Leonard G. Marks	McGraw-Hill Inc

Sr. No.	Title of Book	Author	Publication
6	Fundamentals of Modern Management	J. S. Dugdale	James Brodie
7	Fire Service Manuals	---	Akademia Books International Pvt. Ltd.

8. SOFTWARE/LEARNING WEBSITES

- https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=550
- https://en.wikipedia.org/wiki/Fire_safety
- https://www.udemy.com/course/fire-and-life-safety-concepts/
- https://www.ife.org.uk/
- https://www.ife.org.uk/write/MediaUploads/Exams/Leadership_and_Management_Booklet.pdf
- https://www.ife.org.uk/write/MediaUploads/Exams/Management_and_Administration.pdf

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : FIRST
COURSE TITLE : FIRE SAFETY
COURSE CODE : 28115

1. RATIONALE

This subject will be appropriate for individuals who provide fire safety advice and/or carry out fire safety assessments/audits in any of the following contexts: commercial office premises, retail premises, factories and other places of work, places of public entertainment including cinemas, theatres, dance halls and premises, alcohol licensed premises, hotels and other sleeping accommodation premises, health and other care-related premises, sports grounds, flats/high-rise residential buildings, safe storage of combustibles materials – prevention and control of fires large outdoor events, caravan and camping site safety, petrol filling stations, animal premises and stables.

It will be of interest to:

- Fire Safety/Protection Officers working in Fire and Rescue Services
- Fire Risk Assessors
- Fire/Safety Officers/Managers working in premises in the contexts listed above
- Individuals working in areas such as construction, building design and fire safety equipment design and manufacture.

2. COMPETENCY

- To learn about the
- Fundamentals of buildings and their classifications.
- Evacuation procedure and means of escape during emergency in tall structures.
- Automatic fire and gas detection in different types of occupancy.
- First aid firefighting equipment's, their working principles and periodic maintenance.
- Ideal fire and life safety requirement based on different types of buildings.

3. COURSE OUTCOMES

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

- Explain fire resistance in relation to different buildings and building materials.
- Explain the operation of fire protection measures and equipment and assess the effectiveness of protection options in different situations.
- Explain and apply fire safety principles and practices in diverse contexts.
- Assess risks in different situations and identify appropriate action to improve safety.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme											
				Theory						Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
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Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

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5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours	Marks
I	**BUILDING CONSTRUCTION** **Building materials and their behavior in fire -** • Timber • Stone • Cement • Bricks, • Steel, Protected and unprotected steel • Other Metals • Glass and fire-rated glazing systems, • Building boards, • Insulating materials, • Paints • plastics • Concrete, • Building slabs • Sandwich panels, • Fire retardant/fire resisting materials that can be applied in different contexts, • External cladding. • Different loads in the buildings • Elements of structures their functions ▪ Columns,	14	10

Unit	Topic and Contents	Hours	Marks
	▪ Structural steel columns: Hollow & Solid protection ▪ Beams. ▪ Walls, Various types of walls ▪ Stairways, ▪ Doors, ▪ Windows, ▪ Ceilings, ▪ Roofs. ▪ Floors		
II	**FIRE PREVENTION SYSTEMS** Meaning of prevention, • Importance of BMS & systems integration- Ventilation systems integration, Emergency exits integration, AHU integration, Detection systems integration, emergency lights, Generators integration. • Thc principles of means of escape in case of fire- . Management control, ▪ Occupancy, ▪ Construction, ▪ Time of evacuation, ▪ Exits, ▪ Travel distance, • Assembly point, • Dead end, • Protected route, • Different safety signage's • Use of Safety poster, (IEC) • Emergency evacuation plan layout, • Fire doors rating and requirements, • Fire emergency plan contents, • Emergency fire evacuation drills practice and use, Role of emergency response teams (ERT) in an organizations, • Role of first aider • Importance of entry/ exit registers. • Personal Emergency Evacuation Plan (PEEP), • Role of Security personnel's in an emergency, • Fire orders, fire notices and its importance. • On site and off site emergency plan. • MARG	14	12
III	**FIRE PROTECTION SYSTEM-I** • Meaning of protection, • **Water based suppression:** ▪ Water hydrant system (internal & external) with design principle. Rising mains-Wet, Dry, Down comer and its components ▪ Water Sprinkler systems with design principle. ▪ Drencher, ▪ Foam systems,	12	12

Unit	Topic and Contents	Hours	Marks
	▪ Deluge system. • Care & Maintenance of the water based suppression system. **Fire Extinguishers:** • Definition & its various types. • Principle of stored pressure & Cartridge based extinguishers. • MAP concentration • Extinguishing properties of Water, ABC Powder,Foam, Clean agents • Difference Between FM-200 and Novec 1230 Fluid • CO_2 and NOVEC • Sand buckets • Care & Maintenance of fire extinguishers systems. • Inspection checklist and maintenance records. • Importance of SOP, numbering, location, signages, Layout placing. **Detection and Alarm systems: -** • Systems with principles- Smoke, Heat, Beam detector, Flame fire detection systems, Multi sensors, • Very Early Smoke Detection (VESDA), • Fire warning alarm systems- Analogue and addressable, Wiring importance and principle. • Different control modules, battery • Control keys and operations • MCP, Hooters, Importance of audio Visual hooters & disability. • Importance of frequency setting in industries. • Different errors in an alarms & Disadvantages. • Testing standards and frequency and documentation. • Care & Maintenance of Detection and Alarm systems. • PA system and importance.		
IV	**FIRE SUPPRESSION SYSTEMS** • Water, CO_2, DCP & Foam flooding fire suppression systems. • Aerosol fixed Fire suppression systems (NOVEC, Inert gas, FE36, Clean agents), • Water spray projector systems, • Water mist systems, • Nitrogen purging system. (Inert Gas)	**06**	**12**
V	**NATIONAL BUILDING CODE PART-IV** • Classification of buildings • **Legal documents-** ▪ Provisional & Final NOC documentation & plans layout requirements, process and final certification process. ▪ Project contractor & AMC service contractor selection criteria.	**12**	**12**

Unit	Topic and Contents	Hours	Marks
	▪ Form B Certification process and requirements. Online & Offline Form –"A" & Form "B" certification • Fire compartmentation • Refuge area / Fire check floor • Staircases requirements as per occupancies. • AHU, Pressurization & its Importance (Lobby, staircases etc.) • Fireman's lift. • Ventilation and smoke control. • Fire or smoke dampers • Fire Zones. • Temporary buildings or structures. • Service ducts and shafts and fire stop material. • Electrical installations. • Lightening arrestors • Glazing, • Surface Interior Finishes, • Fire Command Centre (FCC). • Basement, • Ramps. • Gas Supply lines, • Hazardous Areas, • Gaseous, Oil Storage Yard, • Table:7-Minimum requirements for firefighting installations. • Fire Officer qualification and requirements. • Role of fire officer in industries. • Fire drill and orders. • Static water storage tanks. • Firefighting pumps. • Guidelines for fire drill and evacuation procedures for high rise buildings, • Commercial kitchens. • Basement and Car parking facilities.		
VI	**TRANSPORTATION AND HAZMAT MANAGEMENT** • The Motor vehicle Act, 1989 (Section 129 to 137) • Guidelines of United Nations in Transportation • HAZCHEM Code • EIP- Emergency information panel • TREAMCARD • Material Safety Data Sheet (MSDS)	**06**	**12**
	Total	**64**	**70**

7. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Building construction	14	04	04	02	10
II	Fire prevention systems	14	04	04	04	12
III	Fire protection system	12	04	04	04	12
IV	Advanced fire suppression systems	06	04	04	04	12
V	National building code Part-IV	12	04	04	04	12
VI	Transportation and hazmat management	06	08	04	00	12
Total		**64**	**28**	**24**	**28**	**70**

Legends: *R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)*

Note*: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

8. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

List of Assignments

- Benefits and difference between Analogue and addressable alarm system.
- Importance of building construction with respect to fire.
- Emergency fire evacuation drills practice, frequency and benefits.
- On site and Off site emergency plan and importance in fire emergency.
- Draw flow diagram and explain Very Early Smoke Detection (VESDA).
- Draw and explain NOVEC suppression system.
- Draw and explain Water mist system.
- Draw flow diagram for Firefighting pump house, explain different firefighting pumps.
- Draw and explain lightening protection importance.
- Prepare fire order to control fire emergency.
- Draw and explain Hazchem Code.
- Explain MSDS elements and importance in hazardous chemicals transportation emergency.

9. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Industrial Fire Protection hand Book	R. Craig Schroll	CRC Press London

Sr. No.	Title of Book	Author	Publication
2	Fire Protection of Buildings Book 9	Manual of Firemanship	Her Majesty Stationary, London
3	Fundamentals of Fire Protection	Arthur E. Cote, P.E.	NFPA
4	Fire Protection and Prevention	Barendra Mohan Sen,	UBS
5	Fire Suppression & Detection System	Bryan	---
6	National Building Code of India 2016, Part-IV.	---	---
7	Fire Protection Hand Book, Volume- I and II	---	NFPA

10. SOFTWARE/LEARNING WEBSITES

- https://mahafireservice.gov.in/fire-act.php
- https://www.mpcb.gov.in/sites/default/files/hazardous-waste/rules/DGCPL_Rules2013.pdf

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : FIRST
COURSE TITLE : SPECIAL FIRE HAZARDS
COURSE CODE : 28020

1. RATIONALE

This subject is helpful to control special types of fire. Recently new types of industries have come up such as petrochemical, atomic, gas stations etc. In summer season fires due to dust and dry wood occur. These are special types of fires. There are also incidences of gas/petrol leakage causing fire and accidents. The study of this subject will enable the students to acquire relevant knowledge.

2. COMPETENCY

- Identify various special hazards in various industries.
- To select preventive and protection measures on special hazards.
- To list out various firefighting equipment's on special hazards.
- To observe nature & behavior of special hazards.
- To find the cause of fire in special hazards.

3. COURSE OUTCOMES

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

- Identify the hazards and risk analysis of the special types of industries.
- Identify hazards, preventive and protection measures for the special types of manufacturing units.
- Design fire alarm system with fire and gas detection instruments.
- Demonstrate first aid firefighting appliances and performed periodic care and maintenance for the same.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	-	-	-	-	-	-	-	50#$	25	50	25	100	50	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

Legends: ***L****-Lecture,* ***T*** *– Tutorial/Teacher Guided Theory Practice,* ***P*** *–Practical,* ***ESE*** *-End Semester Examination,* ***PA*** *- Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ ASSIGNMENTS/ CASE STUDIES

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
1	Storage, packing and transportation precaution of explosives.
2	General hazards, prevention and protection measure in Residential high rise buildings.
3	General hazards, prevention, and protection measures in Public Assembly & Hospital buildings.
4	Describe various Airport Emergencies and role of different emergency response teams.
5	Fueling and Defueling – Its hazards, prevention, and protection measures at airports.
6	Impacts of Forest Fires on Environment.
7	Refrigeration/cold storage Plants design, hazards, and fire protection.
8	Hazards, preventive, and protection measures in marine safety.
9	Alfa, Beta, and Gamma radiations, its hazards and preventive, as well as protection measures.
10	Dust Explosion, its hazards and preventive/mitigation measures.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours
I	**EXPLOSIVES** • The Explosive Act,1884 of India • Types of explosives, • Uses of explosives in industries, • General classification of explosives as per Act, Examples of Low Explosives & High Explosives, Packing and storage of explosives, • Transportation of explosives, • Fire Preventive & protection measures for explosives. **Dust:** • Dust explosion Pentagon • Factors Influencing Dust Explosions. • Causes of dust explosion and safety precautions. • Nature and behaviour of dust & hazards. • Preventive methods for dust explosion.	**08**
II	**FIRE RISK AT BUILDINGS**	**10**

Unit	Topic and Contents	Hours
	• Meaning of low, high rise and super high rise buildings as per the NBC and DCPR 2034. **Causes of fire and safety precautions measures in following buildings:** • Under Construction buildings. • Under Ground Structures, • High Rise Buildings, • Super High Rise Buildings, • Hotels, • Schools, Colleges Educational Buildings. • Hospitals and Nursing Home. • Cinema Theatres. • Offices and Banks. • Supermarkets. • Warehouses. • Covered Shopping Malls. • Store House. • Workshops and Garages. • Explosives and Fire Works Manufacturing Units.	
III	**FIRE RISKS AT AIRPORTS** • Various categories of Airports, • Air Craft construction • Hangers • Aviation fuel, storage and its dangers • Nature of aircraft accidents, • Meaning of Jettison, • Passenger seat belt, • Access and egress in aircraft, • Rescue and evacuation from Aircraft, • Critical Area Concept. • Airport Fire Hazards, • Aircraft Fire Safety, • Post-Accident Activities on Crash Site, • Fire Fighting in Aircraft Accident, • Rescue and firefighting equipment's at airport, • Pre-planning for Aircraft Accident Emergencies, • Fuelling and Defueling Risks,	**08**
IV	**FIRE RISK AT FOREST FIRES** • Types of Forest Fires, • Causes of fire in forest areas, • Hazards and preventive measure to prevent forest fires, • Difficulties of firefighting in rural and forest fires, Appliances/ equipment required to tackle forest fires. • Impacts of Forest Fires on Environment.	**06**
V	**FIRE RISK IN SPECIAL INDUSTRIES - Causes of fire and safety precaution in following special industries:** • Electric Generating stations	**08**

Unit	Topic and Contents	Hours
	• Oil & petroleum Refineries, • LPG bottling plant, • Chemical Industries, • Automobile Industry • Steel Industry • Refrigeration Cold Storage Plants, • Dock Yard • Electronics & IT Industry • Textile Industry • Construction Industry	
VI	**RADIOACTIVITY** • Definition of radioactivity, • Radioactive materials, • Half-life (decay) period, • Alfa, Beta and Gamma radiations, • Hazards of Radiations to fireman • Factors causing Biological Damages, • Safety precautions from the harmful radiations, • Instruments for Detection and Measurements of radiation, • Fire- fighting, Protection in radioactive materials / establishments. • Handling of Radioactive Materials	**08**
	Total	**48**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Manual of Foremanship	--	Her Majesty's Stationary Office, London
2	NFPA Volume I & II	--	NFPA
3	Fire Protection and Prevention	Barendra Mohan Sen	UBS
4	BIS	National Building Code of India 2005	--
5	E.N.C.J. Bird	Fire in Building	--
6	Egan	Concept in Building Fire Safety	--
7	Institution Of Engineers	Relevant Code of practices for Fire safety of Building	I.S.I.

8. SOFTWARE/LEARNING WEBSITES

- https://peso.gov.in/web/explosives-act-1884
- http://mptownplan.nic.in/act%20&%20Rules/NationalBuilding%20Code%20Part-IV%20(Fire%20Safety).pdf

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : FIRST
COURSE TITLE : FIRE INVESTIGATION
COURSE CODE : 28034

1. RATIONALE

This subject focuses on the understanding and technical knowledge required by those who investigate the cause of fire. It is intended for Watch and Crew Managers in the Fire and Rescue Service in charge of operational fire appliances and also for fire safety specialists. The qualification covers the scientific principles that underpin the dynamics of fire as well as the process of investigation for smaller fire/explosion scenes. It provides a basis for progression to Fire Investigation specialist roles.

2. COMPETENCY

- To understand the basic principle of fire investigation.
- To the purpose of fire investigation.
- To understand the process of investigation.
- To understand the practical lifesaving first aid methods.
- Introduction to Fire Forensic Science, Terminologies, Fire and Arson investigation etc.
- Understanding Fire Development, Factors Affecting Fire Growth, Compartment Fires, fire Spread, Human behaviour in fire.

3. COURSE OUTCOMES

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

- Apply fire science principles in carrying out fire investigations at straightforward fire scenes and arrive at a conclusion
- Explain the preparations and procedures to investigate an incident involving fire and/or explosion
- Explain and apply the principles that underpin the collation and analysis of evidence
- Analyses information to produce conclusions based on evidence and relevant fire science
- Prepare a more complex scene for handover to a specialist investigator understand and Apply the protocols for working safely at a fire scene and with associated evidence.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
4	-	2	6	-	-	-	-	-	-	-	50#$	25	50	25	100	50	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

(#$) or (@$) : Under the practical ESE - 50 Marks (100%)
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ ASSIGNMENTS/ CASE STUDIES

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
1	Importance and different processes of fire investigation.
2	Prepare a detail Investigation report on Arson Fire.
3	Importance of preservation of burnt materials for forensic lab.
4	Describe Primary & Secondary fire damage.
5	Describe different salvage equipment and its importance.
6	Importance of first aid during an Emergency.
7	Describe usage and importance of advanced automatic defibrillator.
8	Prepare a detail Investigation report on Fire occurred at Kumbakonam School, Tamilnadu.
9	Prepare a detail Investigation report on Fire occurred at Kamala Mill, Mumbai on Dec.2017.
10	Prepare a detail Investigation report on Fire occurred at Sunrise Hospital of Dreams Mall, Bhandup, Mumbai.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours
I	**FIRE INVESTIGATION** • The importance fire investigation, • Frequent causes of fire: • Sources of ignition, • Establishing the known and unknown causes, • Organizations involved in fire investigations, • Education and training of fire investigation personnel	**10**
II	**DETECTION OF ARSON FIRE** • Meaning of Arson, • Detection of Arson, • The reasons for suspecting arson, • Motives of Arson,	**10**

Unit	Topic and Contents	Hours
	• Indicators of Arson, • Action by the Fire Brigade.	
III	**THE PROCESS OF INVESTIGATION- I** • Initial action, • Conducting the investigation. • The reconstruction and failure analysis process, Examinations of the scene, • Collection of background data, • Testing, • Reconstruction and analysis, • Failure analysis	12
IV	**THE PROCESS OF INVESTIGATION- II** • **The interviewing of witnesses and others:** General, The attitude of those questioned, Methods of questioning, Information required. • **Investigation on site:** Temperature reached, Establishing the point of ignition, time if ignition, • **The sources of ignition.** Identifying burnt material by forensic lab.	12
V	**SALVAGE CONTROL** • Meaning of salvage, • Primary & Secondary fire damage, • Tactical Consideration-Forcible entry, • Ventilation, Application of water, • Dewatering etc., Salvage equipment.	10
VI	**FIRST AID** • Meaning of first aid, General rules for first aid, Priority of Treatment by a first aider. • Dressing & Bandaging, Wound injury and first aid, Injury related to bleeding and first aid, • Shock. • Fracture (Injuries of bones), Injuries to muscles and joints • Unconsciousness • Burns and Scalds, Degree of burns, Different type's burns • Snakebite, Heat stroke, Poisoning, Contents of First Aid Box. • Triage and mass causality. • Manual and automatic Resuscitation – Principles of resuscitation, Mouth to mouth, Schafer's Method, Sylvester's Method, Holger-Nielson Method, External chest compression, CPR- Cardio Pulmonary Resuscitation, • Rescue techniques by fire brigade and rescue team- Rescue with one rescuer, Rescue with More than two rescuers,	10
Total		**64**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Kirks Fire Investigation	John D De Haan and David J Icove	NFPA
2	A Guide to Firc Investigation (IFE 02)	Patrick G Cox	Published by IFE as IFE02
3	Fire Investigator – Principles and Practice to NFPA921 and 1033	Published by Jones and Bartlett	---
4	NFPA 921 Guide for Fire and Explosion Investigation	---	National Fire Protection Association, USA.
5	Fire Investigation	---	Published by publication UK
6	Forensic Fire Science Reconstruction	David J Icove, JohnD DeHaan	Published by Pearson/ Prentice Hall
7	Principal of Fire Behavior	James G Quintiere	Published by Delmer

8. SOFTWARE/LEARNING WEBSITES

- https://maiif.org/wp-content/uploads/2017/08/Guide-for-Conducting-Marine-Fire-Investigations-Chapter-4.pdf
- https://www.indianredcross.org/publications/FA-manual.pdf

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : FIRST
COURSE TITLE : FIRE FIGHTING DRILLS
COURSE CODE : 28022

1. RATIONALE

Firefighting drills is a core practical subject which gives practice to use various firefighting equipment and accessories which is useful in job. The hands-on drills through this practical will help to handle the live situations effectively and efficiently.

2. COMPETENCY

To learn about

- How to perform evacuation drill.
- Fire extinguisher drill.
- Different instruction of firefighting appliance drill.
- Lifting, carrying, rolling and unrolling of firefighting hose.
- Three men and four men hydrant drill.
- Application and different ladder drill.
- How to identify the errors in various firefighting drill.

To Understand the

- Breathing apparatus and how to use in case of emergency.
- Foam and foam making branches, their uses in case of emergency.

3. COURSE OUTCOMES

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

- Demonstrate different world of command used in appliance drill.
- Apply hose drill performance and practice in firefighting operation.
- Apply hydrant drill performance and practice in firefighting operation.
- Apply trailer pump drill performance and practice in firefighting operation.
- Apply ladder drill performance and practice in firefighting operation.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	6	6	-	-	-	-	-	-	-	50#	25	50	25	100	50	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
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***Legends:** L-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ ASSIGNMENTS/ CASE STUDIES

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
1	Squad drill and basic discipline which need to maintain in fire services.
2	Various type of salute and their significance.
3	Use of tackles and pulleys during firefighting and vertical rescue operations.
4	To understand purpose of evacuation drill and how should conduct the same. What is role of each member and their deployment at particular locations, head count and other relevant information about evacuation drill?
5	How to preform Fire extinguisher drill, Basics of fire, Classification of fires, Types of extinguishers, Fire extinguishing methods, Operating principle of extinguishers, firefighting on fire, require checklist and how to fill the same.
6	Practical demonstration about how to conduct fire hydrant drill for 3 man. Hose Drill Actions: Lifting hose, lowering hose, carrying hose, laying hose, connecting hose, disconnecting hose, under running, Remove the kink, Rolling. Identification of different types of hose fittings and their uses.
7	Practical demonstration about how to conduct fire hydrant drill for 4 man. Hose Drill Actions: Lifting hose, lowering hose, carrying hose, laying hose, connecting hose, disconnecting hose, under running, Remove the kink, Rolling. Identification of different types of hose fittings and their uses.
8	Understand the types of breathing apparatus set and time calculations as per actual air availability inside Cylinder. BACO role and its responsibility.
9	Practical demonstration of Breathing apparatus set, breathing apparatus different parts and its working, different types of wearing of BA set.
10	To Carry Out Four Men Ladder Drill, Formation of crew, individual working procedure on get to work command, ladder pitching, climbing, rescue operation, firefighting, ventilation procedure, ladder carrying, drill report.
11	Demonstration of fire Tender Drill 6 -man Water Tender Drill: Mounting procedure, dismounting procedure, Individual working procedure like -working with ladder, Application of different types of signals applied during pump operation, working with B.A. set, Soft suction, Hard suction.
12	Demonstration of trailer pump operation and how to use suction hose while taking water from well or river.
13	Foam , Foam Making branches and information about form making solutions.
14	Four man portable Fire pump drill and practical demonstration.
15	To understand and practical demonstration about how to make knots like Bow line, Running Bow line, bow line on the bight, Chair Knot Self Rescue Knots: Slippery Hitch & Draw Hitch, Other Knots, loop, bends, hitch: loop, half hitch, thumb knot, figure of eight, Clove hitch, rolling hitch, round turn two half hitch, fisherman's hitch, fisherman's knot, waterman's hitch, timber hitch, cat's paw, sheep shank,

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
	single sheet bend, double sheet bend, reef knot, midshipman hitch, Construction, and application.
16	Four man foam drill and how to use foam making branches.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications
1	Water capacity 10000 lit, 100 mm Hydrant line, Hydrant post, Pump 7.5 hp x 180 lpm, Butterfly valve, Starter, NRV, PRV, Pressure gauge, Pressure switch.
2	Hydrant post with accessories, Hose pipes 15m x 2 no's, Hose box, Hammer, Uncontrolled branch 1 no, Hose reel, Fire service inlet (Two way), Dividing Breeching, Collecting breeching,
3	Sprinkler module with branches, Down word, upward, side wall nozzles. Detection system- Smoke, Heat detectors (2 Nos each), Conventional panel, MCP, Audio visual display Hooter, Different auto glow signages, evacuation plan. Samples of jackets. PPE's
4	Extinguishers Water, Foam, 9 lit, DCP 4 kg, (Stored pressure & Cartridge type each), Sand bucket, Co_2 Extinguisher 4.5 kg, MS Tray, Fuel.
5	Extension Ladder
6	Rope
7	Breathing Apparatus Set (Carbon Fiber), Different types of masks, gloves, ear plugs, ear muffs, chemical cartridge mask, Harness, belts
8	Fireman Axe, Ceiling Hook, Drag Hook, Fire Beater, Door Breaker, Steel shod lever, Pad Lock Remover, Persuader, Spreader, Cutter, Bending Bar, Quick Release Knife, Shears, Bolt cutter, Search light, Focusing light. Study of hydraulically operated small gears and their use in Rescue
9	First Aid Box, AMBU bag, Stretcher
10	Manikin for CPR
11	Different foam making branches. Water monitor.

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Drill Manual for Fire Services	Govt. Of India.	---
2	Fire Fighters Skill Drill Manual	NFPA.	---
3	Fire Fighting Drill Manual	NFSC, Nagpur	---
4	Fire Fighters Drill Manual by (Agni Seva)	A.S. Khan	Prakashan, Shikohabad

8. SOFTWARE/LEARNING WEBSITES

- https://www.youtube.com/watch?v=hv26EHgdlxs
- https://www.youtube.com/watch?v=0NH7y7CvLQ0
- https://www.youtube.com/watch?v=At2jHpw5buk
- https://www.youtube.com/watch?v=HtQahU-5_Rg
- https://www.youtube.com/watch?v=ApzANyz15KI
- https://www.youtube.com/watch?v=HG6DI6WBWJE
- https://www.youtube.com/watch?v=-SAke-__xYA
- https://dir.indiamart.com/impcat/stair-chair.html

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : SECOND
COURSE TITLE : FIRE AND ELECTRICAL AUDITS
COURSE CODE : 28209

1. RATIONALE

This subject will give knowledge to prepare competent professionals to undertake Fire and Life Safety Audit. Through training and capacity development of personnel in collaboration with other stakeholders, this course aims to provide a standard procedure and Format in India for Auditors to conduct Fire & Life Safety Audit

In current scenario fire rate ratio is in resining day by day so to control the rate of fire accidents and emergencies audit knowledge is very much essential.

Subject will be able to,

- Acquire Practical learning through industrial visits, assignments and research industrial reports/projects.
- Apply in-depth knowledge in their core elective area of specialization like Fire Risk Assessment and Management, Risk Mitigation, Various National and International Acts, Codes and Standards, Techniques of Electrical, Fire and life safety audits etc., to be able to solve the complex challenges of Audits.
- Understand and develop core competence in conducting audits related to Fire and Life Safety and preparation of reports.

2. COMPETENCY

- The objectives of Electrical, and Life Safety Audit are,
- To understand basics of fire chemistry, behaviour of fire and its effects on structural elements.
- To understand philosophy of effective fire prevention and protection design.
- To understand the Acts, Rules, with respect to the electrical, fire and life safety.
- To study and compare different National and International legal requirements with respect to fire and life safety.
- To understand the concepts of industrial fire safety risk assessment and management concepts of risk reduction.
- To understand the concept of performance based design and its role in fire and life safety management and audits.
- To understand the basics of electrical, fir and life safety audits.
- To develop competence in subject of Electrical, fire and life safety audit.

3. COURSE OUTCOMES

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

- The separate electrical audits in residential and industrial buildings.
- The separate Fire audits in residential and industrial buildings.
- Inspections in industries.
- Risk assessment.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme											
				Theory						Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	4	8	1.5	70*#	35	30*	00	100	50	50@	25	50	25	100	50

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ ASSIGNMENTS/ CASE STUDIES

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
1	Outline the Principles of Fire Risk Audit.
2	Outline the Principles of Electrical Audit.
3	Explain the methodology of fire Risk Audit.
4	Explain the methodology of Electrical Audit.
5	Prepare Report of Fire Risk Audit considering 4 floor schools's building for Nursery to 10th Standard.
6	Prepare report of Electric Audit considering 60 years old School building.
7	Explain the different types of Fire Hazards and its control measures.
8	Explain the different types of Electrical Hazards and its control measures.
9	Prepare Report of Fire Risk Audit considering High Rise Residential building.

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
10	Prepare Report of Electrical Audit considering High Rise Residential building.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications
1	Measure Tape
2	Volta meter
3	Calculator
4	Compass

7. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours	Marks
I	**THE ELECTRICAL AND FIRE ACTS** • **Introduction & Silent features of:** ▪ The Maharashtra Fire Prevention and Life Safety Measures Act. 2007 and Rules ▪ The Development Control Planning Regulation-2034 ▪ The Disaster Management Act, 2005 ▪ The Indian Electricity Act, 2003 and Rules ▪ The Electrical safety and national electrical code 2011	12	12
II	**BUILDING CODES AND STANDARDS** • **Introduction & Silent features of:** ▪ The National Building Code, 2016 Part-IV ▪ National electrical code. ▪ CEA Safety regulation-2010 ▪ DCPR 2034 • IS 2190: 2010 Selection, installation and maintenance of first-aid fire extinguishers. • IS 2189: 2008 Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System. • IS 15908: 2021 Selection installation and maintenance of control and indicating equipment's for fire detection and alarm system • IS 908: 1975 Specification for Fire Hydrant, Stand Post Type • IS 14851: 2000 Maintenance of Fire Hose - Code of Practice • IS 15105: 2002 Design and Installation of Fixed Automatic Sprinkler • IS 15301:2003 Installation and Maintenance of firefighting pumps.	14	12

Unit	Topic and Contents	Hours	Marks
	• IS 732 Wiring installation, IS 3043 Earthing system, IS 15652 Insulation mats,		
III	**BASIC OF ELECTRICITY** • Definition of electricity & its types, AC, DC, Current, Conductance, Resistance, Voltage, Power & its units, Basic theory related to electricity, Lightening, • Generation, Transmission & distribution of electricity & its hazards, • Transformer, its types & hazards. • Motors and starters, • Ohm's Law application, formula & numerical. • Series, parallel and composite circuits. • Joules Law & its effects. • Static electricity & its hazards, • Earthing & its significance, • Protective devices and safety requirements, • Electrical hazards and their causes,	**10**	**10**
IV	**ELECTRICAL APPLIANCES** • Arching and overheating in electrical systems, Origins of electrical fires in buildings, • Building wiring design and protection. • Electrical household appliances, • Industrial commercial equipment's, • Electrical equipment's for outdoor use, • Location expose to moisture and noncombustible dusts, • Signaling and communications systems, Emergency systems, • Control of electrostatic ignition sources. • Lightening protection systems. • Emergency and standby power supplies.	**10**	**12**
V	**FIRE RISK ASSESSMENT** • Meaning of fire risk analysis, • Meaning of hazards, Risk, • Uses of data from real fires, • Risk estimation and risk evaluation, • Overview of risk analysis, • General characteristics and fire types, • Cost effects on business analysis. • Fire risk assessment steps. • Practical example of risk assessment study.	**10**	**12**
VI	**AUDITING SYSTEMS AND REPORTS** • Audit terms definitions, • Audits required documentation as per the legal provision. • NBC Fire Audit checklists, • Audit process, Client request, Pre-audit visit requirements, Documents review, Preparation, on site visits, Audit report, Audit follow up,	**08**	**12**

Unit	Topic and Contents	Hours	Marks
	• Audit Assessment. • Report preparation		
	Total	**64**	**70**

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	The Electrical And Fire Acts	12	06	04	00	10
II	Building Codes And Standards	14	06	06	00	12
III	Basic Of Electricity	10	06	04	02	12
IV	Electrical Appliances	10	04	04	04	12
V	Fire Risk Assessment	10	04	04	04	12
VI	Auditing Systems And Reports	08	03	03	06	12
Total		**64**	**29**	**25**	**16**	**70**

Legends: *R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)*

Note*: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

9. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Provisions of the Maharashtra Fire Prevention and Life Safety Measure Act, 2006
2. Provisions of the Indian Electricity Act, 2003
3. Provisions of the National Building Code, 2016 Part-IV
4. Importune of Indian Standards and guidelines to conduct in Electrical and Fire Audits.
5. Draw and explain Importance of lightening arrestor and static electricity
6. Importance of annual testing's and measurements in electrical and fire safety audits.
7. Draw and explain importance of earth pits.
8. Importance of electrical and fire risk assessment.
9. Data collection for the electrical and fire risk assessment and audits.
10. Visit to any of the residential building and conduct electrical and fire audit with report.
11. Prepare own presentation and perform in your class. (Time: 8-10 min)
12. Scientific methodology for the Electrical and Fire Audits.

10. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Fire and Life Safety Acts, Rules, Local Building Bye Laws	---	Published by Government of Delhi, Maharashtra, etc.
2	NBC 2016.	---	

Sr. No.	Title of Book	Author	Publication
3	IS Codes and Standards	---	BIS
4	Bryman (2003) Social Research Methods	---	Oxford University Press, UK
5	National Disaster Management Plan and Policy	---	---
6	Fire Safety Management Audit, Specification.	---	British Safety Council.
7	Management System, ISO 19011,	---	Published by International Standards.
8	Disaster Management, Deep and Deep Publications.	Goel, S. L. and K. Ram (2001)	---

11. SOFTWARE/LEARNING WEBSITES

- https://cercind.gov.in/Act-with-amendment.pdf
- https://archive.org/details/nationalbuilding01
- https://www.mcgm.gov.in/irj/go/km/docs/documents/EODB/Construction%20Permit/Related%20Circulars/DCPR-%202034%20and%20Notification.pdf
- https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=551

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : SECOND
COURSE TITLE : FIRE FIGHTING EQUIPMENT & RESCUE TECHNIQUES
COURSE CODE : 28070

1. RATIONALE

Firefighting Equipment & Rescue Techniques is a core practical subject which gives practice to use various firefighting equipment and accessories which is useful in job. Rescue of people caught in fire or in disaster is very important. The hands-on practice through this practical will help to handle the live situations effectively and efficiently.

2. COMPETENCY

The students will be able to:

- To give basic concepts of Rescue in Ordinary as well as special situations in Major Disasters.
- To Understand the Respiratory and Non-Respiratory Personal Protective Equipment's used by Rescuer in Emergencies.
- To learn about fire service equipment.
- To give basic training about special hydraulic rescue appliances and understand where they need to be used.
- To give basic training about special battery-operated rescue appliances and understand where they need to be used.
- To learn about evacuation chair operation and how to use in staircase.
- To understand how to operate manually operated rescue equipment.
- To understand the search and rescue operation and its techniques.
- To give basic training about pneumatic rescue tools and its uses.

3. COURSE OUTCOMES

The students may able to,

- Demonstrate Rescue Operations by means of Special and unusual type.
- Apply the proper use of Respiratory and Non-Respiratory Personal Protective equipment's in emergencies.
- Apply different types of fire service equipment.
- Demonstrate Rescue tools of hydraulic and battery operated.
- Demonstrate pneumatic rescue tools and it uses.
- Search and rescue operation in case of special conditions.
- Evacuation chair and it operation while using at staircases.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	8	8	-	-	-	-	-	-	-	50#	25	50	25	100	50	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ ASSIGNMENTS/ CASE STUDIES

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
1	To understand and practical demonstration about how to make knots like Bow line, Running Bow line, bow line on the bight, Chair Knot Self Rescue Knots: Slippery Hitch & Draw Hitch, Other Knots, loop, bends, hitch: loop, half hitch, thumb knot, figure of eight, Clove hitch, rolling hitch, round turn two half hitch, fisherman's hitch, fisherman's knot, waterman's hitch, timber hitch, cat's paw, sheep shank, single sheet bend, double sheet bend, reef knot, midshipman hitch, Construction, and application.
2	Understand the types of breathing apparatus set and time calculations as per actual air availability inside Cylinder. BACO role and its responsibility.
3	Practical demonstration of Breathing apparatus set, breathing apparatus different parts and its working, different types of wearing of BA set.
4	Fire service hose fittings and branches inlet and its uses, dividing breaching, collecting breaching.
5	Bandages and their respective uses in case of medical emergency happened, also live demonstration about bandages.
6	Demonstration of different type of manual fireman lifting techniques and various manual rescue techniques.
7	Foam , Foam Making branches and information about form making solutions
8	Understand the how hydrant will be operate and what relevant requirements can be sue while operating hydrants.
9	Brief information about hydraulic rescue appliance, connection and dismantling of hydraulic hoses, equipment.
10	Brief, purpose, operating procedure, demonstration of battery-operated tools.
11	Demonstration of Evacuation chair operation and how to use in case of emergency. How to handle evacuation chair at staircase.
12	Brief, purpose, operating procedure of special manually operated rescue equipment's.

Sr. No.	Name of Practical/ Exercise/ Assignment/ Case Study
13	Importance, purpose to know about search and rescue operation and how to conduct the same in case of emergency.
14	Brief information about how to use pneumatic rescue tools in case of emergency situation.
15	Demonstration of life saving techniques, CPR, Sylvester method, holger nielsen method, schafer method.
16	Fire lift operation in case of elevator mantrap and handling of fire lift during emergency situation.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications
1	Water capacity 10000 lit, 100 mm Hydrant line, Hydrant post, Pump 7.5 hp x 180 lpm, Butterfly valve, Starter, NRV, PRV, Pressure gauge, Pressure switch.
2	Hydrant post with accessories, Hose pipes 15m x 2 no's, Hose box, Hammer, Uncontrolled branch 1 no, Hose reel, Fire service inlet (Two way), Dividing Breeching, Collecting breeching,
3	Sprinkler module with branches, Down word, upward, side wall nozzles. Detection system- Smoke, Heat detectors (2 Nos each), Conventional panel, MCP, Audio visual display Hooter, Different auto glow signages, evacuation plan. Samples of jackets. PPE's
4	Extinguishers Water, Foam, 9 lit, DCP 4 kg, (Stored pressure & Cartridge type each), Sand bucket, Co_2 Extinguisher 4.5 kg, MS Tray, Fuel.
5	Extension Ladder
6	Rope
7	Breathing Apparatus Set (Carbon Fiber), Different types of masks, gloves, ear plugs, ear muffs, chemical cartridge mask, Harness, belts,
8	Fireman Axe, Ceiling Hook, Drag Hook, Fire Beater, Door Breaker, Steel shod lever, Pad Lock Remover, Persuader, Spreader, Cutter, Bending Bar, Quick Release Knife, Shears, Bolt cutter, Search light, Focusing light. Study of hydraulically operated small gears and their use in Rescue
9	First Aid Box, AMBU bag, Stretcher
10	Manikin for CPR
11	Different foam making branches. Water monitor.

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Anindita Basak	Environmental Studies	Pearson
2	J.N.B. Bell	Air Pollution and Plant Life	John Wiley and Sons, New Delhi
3	Christon J. Hurst, Ronald L. Crawford, Guy R. Knudsen,	Manual of Environmental Microbiology	2nd edition, ASM Press

Sr. No.	Title of Book	Author	Publication
	Michael J. McInerne		
4	Bruce Rittman, Perry L. McCarty	Environmental Biotechnology: Principles and Publications	McGraw-Hill
5	Stem	Air Pollution	---
6	C. S. Rao	Environmental Pollution Control Engineering	---
7	B.K. Sharma, and H. Kaur	Environmental Chemistry	---
8	D. A. Lynn	Air pollution — threat and response	---
9	N. Kumar; Mittal Publication	Air pollution and Environmental Protection Legislative policies, Judicial trend and Social Perceptions	---

8. SOFTWARE/LEARNING WEBSITES

- https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/pollution-control
- https://en.wikipedia.org/wiki/Pollution

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : SECOND
COURSE TITLE : PROJECT
COURSE CODE : 28085

1. RATIONALE

- Demonstrate the personal abilities and skills required to produce and present an extended piece of work
- Engage in personal inquiry, action and reflection on specific topics and issues
- Focus on, and demonstrate an understanding of, the areas of interaction
- Reflect on learning and share knowledge, views and opinions.

2. COMPETENCY

Students will be able to

- Plan the activities related to safety.
- Collect Information/Resources.
- select and Apply relevant Techniques.
- Analyse the Information.
- Organize the Written Work.
- Analyze the Process and Outcome.

3. COURSE OUTCOMES

- Creating an excellent product/outcome in response to the goal, global context and criteria
- Demonstrate excellent research skills
- Demonstrate excellent communication and social skills.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme												
				Theory							Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
-	-	4	4	-	-	-	-	-	-	-	50#	25	50	25	100	50

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

(#$) or (@$) : Under the practical ESE - 50 Marks (100%)
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

Legends: ***L****-Lecture,* ***T*** *– Tutorial/Teacher Guided Theory Practice,* ***P*** *–Practical,* ***ESE*** *-End Semester Examination,* ***PA*** *- Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. IMPLEMENTATION STRATEGY

Candidate should be assigned Project preferably individually or if at all not possible can form a group of maximum 3 members. Every candidate must maintain the weekly progress diary and the guide should review the progress and sign the diary regularly.

Every candidate has to submit **Synopsis Report** (of pages not more than 10) and deliver Two Presentations for the completion of the Project.

First Presentation of Synopsis - to the Internal Guide tentatively during Third Week of the Academic Term.

Second Presentation on complete Project - to be given to the Internal Guide during Second Class Test schedule.

Contents of the Synopsis - It should include the following points

1. Cover Page of the Synopsis (Title of the Project, Student and Guide Details, Institute Name, Academic Year, Maharashtra State Board of Technical Education, Mumbai)
2. Index
3. Introduction
4. Need of the Project and Objectives
5. Problem Definition
6. Methodology
7. Action Plan

Evaluation of Practical-PA will be the average of two presentations, synopsis report and weekly progress diary maintained by the candidate.

There should not be any sort of typographical, diagrammatic and any other mistake/s in the final bound copy of the project report submitted by the candidate.

PROJECT REPORT CONTENTS

The Project report should essentially consists of the following details.

- COVER PAGE OF THE PROJECT
- CERTIFICATE FROM THE INSTITUTE
- ACKNOWLEDGEMENT
- TABLE OF CONTENTS
- ABSTRACT
- INTRODUCTION
- METHODOLOGY OF PROJECT
- RESULTS
- CONCLUSION AND FUTURE SCOPE

- ABOUT THE ORGANISATION / COMPANY (IN CASE OF INDUSTRY BASED PROJECTS)
- REFERENCES / BIBLIOGRAPHY

GUIDELINES FOR PREPARING THE PROJECT REPORT

Project work is a basic requirement for the award of Advanced Diploma. Project should be prepared based on any one of the subjects of the Programme.

Suggested Topics (Any One)

- Lighting installation used in any Industry (LPG Bottling plant / Steel plant / Explosive plant / Chemical or petro-chemical plant / Engineering plant / Refinery / Textile Industry etc.)
- Project work on installation, servicing and maintenance of portable fire extinguisher installed in industry/buildings/malls.
- Project work on any city fire brigade service.
- Project work on Fire Safety for storage of Hazardous goods in Industry.
- Project work on fire prevention and protection procedures adopted in an industry for handling, storage and processing of hazardous chemicals.
- Project work on "On Site Emergency Plan of a Steel Industry".
- Project work on study of fire hazards associated in industrial process / activities and safety precautions taken for these hazards.
- Project work on "On Site Emergency Plan of a Chemical / Explosive / Steel Industry".
- Project work on "Disaster Management Plan of an Industry".
- Project work on Documentation and Fire and Electrical safety Audits with 10 numbers of case studies.
- Project work on Pharmaceutical Industry.
- Project work on Construction Industry.
- Project work on Chemical, Petrochemical and Refinery Industry.
- Project work on Radiation Industry.
- Project work on Fire Works and Explosive manufacturing Industry.
- Project work on Dock and Marine Industry.
- Project work on in Automobile Industry.
- Project work on Electronics and IT Industry.
- Project work on case studies of Fire Investigations.
- Project work on Advanced fire Prevention, Protection Systems and Development.

The project work should be comprehensive and cover all fire aspects including environmental impacts.

COVER PAGE OF THE PROJECT

The Cover Page of the Project Report must include Title of the Project, Student and Guide Details, Institute Name, Academic Year, Maharashtra State Board of Technical Education, Mumbai.

CERTIFICATE FROM THE INSTITUTE

Certification from Project Guide, HOD, Principal and final signature of External Examiner during final examination.

ACKNOWLEDGEMENT

It should appear on the third page and the report writer should acknowledge the guidance provided by the project guide. Here the author may also acknowledge other persons who might have rendered help or supplied the required data or information for completion of the project. It should be brief and crisp. Generally, one page should suffice for acknowledgement.

TABLE OF CONTENTS

It must consist column heading as Chapter No., Name of the Chapter and Page Number.

ABSTRACT

Abstract should describe the entire project work with its aim, objectives and methodology and conclusion. The abstract should be limited to one or two pages.

INTRODUCTION

Give brief description of need, significance and applications of the Project. It is recommended to limit the description to about 2 to 5 pages.

METHODOLOGY OF PROJECT

This is the most important part of the project report and forms the main body of the project report. It needs very comprehensive coverage of all aspects of safety in the plant, industrial hygiene, environmental conservation, safety in storage and transportation, etc. It will usually require about 60 to 100 pages. However, do not try to increase the number of pages by giving unnecessary or irrelevant details or too much of theory. Write-up should include the following points:

- SHE policy of the company and its implementation.
- Fire policies.
- Provisional fire NOC
- Final fire NOC
- Form B certifications
- Building OC certificate.
- Building structural audit reports.
- Fire and electrical audit reports.
- CAPA
- Electrical annual testing reports.

- Fire pumps testing reports, Quarterly, half yearly, yearly equipment's servicing reports.
- Diesel, Petrol, Kerosene PESO licenses.
- LPG, PNG, Hazardous chemicals licenses.
- Canteen licenses, Local authority permissions,
- Approved plant layouts, fire hydrant, sprinklers, detection, VESDA drawings.
- Mutual aid agreements.
- Fire safety equipment's and list summery.
- Fire orders and procedures.
- Emergency contact list.
- Fire brigade communication procedure.
- Emergency evacuation floor layouts.
- Fire safety organisation
- Role of management in promoting fire safety and striving for continual improvement
- Accident and near-miss incidents reporting system.
- Accident and near-miss incident investigation system.
- Accident analysis (using data of previous five years at least)
- Case-studies (discuss at least five cases of different types of accidents/near-misses)
- Selection and training of employees.
- Safety induction and fire safety training of employees and contractor personnel.
- Health and hygiene (including pre-employment and periodic medical examinations).
- Environmental conservation.
- Fire Safety in transportation and training of drivers.
- Trade union and its role in promoting fire safety.
- Plant layout
- Facilities and services.
- Storage and handling of chemicals.
- Building management system and integration with the systems.
- Instrumentation for fire safety of plant and personnel
- Fire prevention and fire-fighting measures
- Housekeeping (GHK)
- Personal protective equipment (PPE)
- Pollution control measures
- Various safety procedures (e.g., work permit system, etc.)
- Fire risk assessments.

- Electrical and mechanical preventive maintenance
- Fire service equipment's maintenance.
- Fire Safe operating procedures (SOPs) and operating manuals
- Safety manual, material safety data sheets (MSDS), Trem cards, etc.
- Internal fire safety checklists and inspections.

Various data presented in the form of tables and graphs (e.g., graphs for injury frequency rates, severity rates, frequency-severity indices, incident rates, investigation, fire statistics, etc.), work permit form, accident/near-miss incident report form, medical attention form, block diagrams, plant layout, relevant photographs, MSDS, etc., which are required to supplement your project report, should be included at the end as annexures with appropriate references in the main text of the project report. If an annexure is of more than one page, it should be provided with page numbering. Page numbering should be done individually for each annexure.

RESULTS

It should contain experimentation result of the Project.

CONCLUSION AND FUTURE SCOPE

Based on the project work, draw inferences and mention future scope. The future scope should be specific, relevant and practically implementable.

ABOUT THE ORGANISATION / COMPANY (IN CASE OF INDUSTRY BASED PROJECTS)

Should mention Organizational Structure, Product / Services (Limit to one or two pages)

REFERENCES / BIBLIOGRAPHY

Mention books, research papers, websites referred in the report in this section.

PROJECT REPORT FORMAT

Paper Size	-	A4
Printing	-	Only on one side of the sheet
Line Spacing of Paragraph	-	1 ½
Font Face	-	Times New Roman
FontSize	-	12 for Normal text, 14 for Sub-headings and 16 for Headings
No of Project Report copies	-	Two
Binding	-	Hard bound copies with Black cover (Golden Embossing)

PROGRAMME NAME : ADVANCED DIPLOMA IN FIRE SAFETY ENGINEERING
PROGRAMME CODE : FS
SEMESTER : SECOND
COURSE TITLE : FIRE TRAINING
COURSE CODE : 28086

1. RATIONALE

Fire Training course is introduced to Advanced Diploma in Fire Safety Engineering programme with the aim to imbibe the Fire industry culture and professional practices in the students before they enter into world of work. By exposing and interacting with the real-life Fire industrial setting, student will appreciate and understand the actual working of Fire industry, best practices adopted in Fire industry and other requirements in the Fire industry of training. The Fire industrial needs such as the Fire and Life Safety Management skill, Life skills and hands-on practices are intended to be inculcated in the students through this training. This short association with the Fire industry will be instrumental in orienting the students in transforming them to be Fire industry ready after completion of this diploma program.

2. COMPETENCY

This course is intended to develop the following competencies:

- Fire Safety Management Skills i.e. Firefighting, Fire prevention and Protection, Fire Risk assessment, Fire Audit, i.e. Communication, Presentation and others.
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others
- Hands-on Practices i.e. Fire station, administration, Parade, drills discipline, Fire equipment maintenance and on site Incident response management and Emergency preparedness Assurance aspects.

3. COURSE OUTCOMES

The Fire training is intended to acquire the competencies as mentioned above to supplement those attained through several courses up to fourth semester of the program:

- Communicate effectively (verbal as well as written) to execute the work.
- Prepare the Fire industry report of the executed work.
- Exercise time management and Fire safety in the work environment.
- Work in Crews for successful completion of task and fire and other disaster mitigation processes.
- Work on case studies/live Incidents.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme											
				Theory							Practical				
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
-	-	10	10	-	-	-	-	-	-	-	100#	50	100	50	200	100

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. GENERAL GUIDELINES FOR INDUSTRIAL TRAINING

The Industries/Organizations can be Government/Public limited/Hospital/or Private family enterprises.

- **Duration of Industrial Training:** 8 weeks in Final Semester as per the credits of the programme
- **Training Area:** Students should be trained in large and medium scale Industry / Organization. However, despite the best efforts by the institute, if large and medium scale Industry / Organization are not available to all students then, students can also be placed in small scale Industry / Organization.
- **Skill Knowledge Partner** : Students should identify one of the following sector from mentioned below list of industries to carry out Industrial Training.
  1. Fire Departments/ Fire Brigade
  2. MIDC Fire Department
  3. Maharashtra Fire Service
  4. Factories and Plants like Petrochemical, Steel, Fertilizers, BARC, Power plants, High Rise buildings, Facility Management companies

Note: If Student is employed in any of the above sector, he shall opt for training in his own organization.

6. EXPECTATIONS FROM SKILL KNOWLEDGE PARTNER (SKP)

Helping institute in developing the following competencies among students

- Soft Skills i.e. Communication, Presentation and others.
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others
- Hands-on Practices i.e. Shop floor Implementation and Quality Assurance aspects.

7. ROLE OF PARENT DEPARTMENT OF THE INSTITUTE

- Collecting information about Industry / Organization available for training along with capacity.
- Institutions have to enter into MOU with number of SKPs(Industries/ Organizations) for accommodating all the enrolled students for the mandatory
- Student and mentor allocation as per the slots available for in-.plant training (Desirable mentor- student ratio is 1:15).
- Communication with Industry / Organization available for training along with capacity and its confirmation
- Student enrollment for training.
- Issuing letter to the Industry / Organization for the training along with details of students and mentors.
- Principal/ HOD/ Faculty should address students about industrial safety norms, rules and discipline to be maintained in the Industry/ Organization during the training before relieving students for training.
- The faculty member during the visit to Industry/ Organization will check the progress of the student in the training, his/ her attendance, discipline and project report preparation.
- Mentors to carry out progressive assessment of the students during the training through Progressive Assessment (PA).
- End Semester Examination(ESE) assessment by mentor along with Industry / Organization expert as external examiner.

8. ROLES AND RESPONSIBILITIES OF THE STUDENTS

Following should be informed to students in the letter deputing them for the training, an undertaking for this should also be taken from them

- Students would interact with the mentor to suggest choices for suitable Industry / Organization. If students have any contact in Industry / Organization (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.
- Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the industry on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.
- He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Industry / Organization and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
- Students should know that if they break any rule of industry or do not follow the discipline then industry can terminate the training and send back the student.
- It is the responsibility of the student to collect information from Industry / Organization about quality assurance methods/specifications of machines and raw materials/maintenance procedures/ production planning/work ethics/professional practices/organizational structure etc.

- During the training period students have to keep daily record of all the useful information in Log book
- Maintain the Diary/Logbook and get it signed from mentor as well as Industry / Organization Training in-charge.
- In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
- Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as Industry / Organization training in-charge.

9. FORMAT FOR TRAINING REPORT

Following is the suggestive format for the training report, actual format may differ slightly depending upon the nature of Industry / Organisation. The training report may contain the following

- Title page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1. Organizational structure of Industry / Organisation and General Lay Out
Chapter 2. Introduction of Industry / Organisation (Type of products and services, history, turn over and number of employees etc.)
Chapter 3. Types of major equipment/instruments/ machines used in Industry/Orgainzation with their specification, approximate cost and specific use and their routine maintenance.
Chapter 4. Manufacturing Processes along with production planning and control methods and standard Operating procedures.
Chapter 5. Testing of raw materials, components and finished products along with quality assurance procedures.
Chapter 6. Major material handling product and procedures.
Chapter 7. Safety procedures followed
Chapter 8. Particulars of Practical Experiences in Industry / Organisation if any in Production/ Assembly/ Testing/Maintenance.
Chapter 9. Short report/description of the project (if any done during the training)
Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

- References /Bibliography

10. SUGGESTED LEARNING STRATEGIES

Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover etc. They should also refer the handbooks of the major machines and operation, testing, quality control and standard operating procedures and practices used in the industry. Students may also visit websites related to other similar industries as their learning resource.

11. TENTATIVE WEEK-WISE SCHEDULE OF INDUSTRIAL TRAINING

The industrial training is a common course to all programmes; therefore the industry / Organization selection will depend upon the nature of programme and its related industry. The training activity may vary according to nature and size of Industry / Organization. The details of activities to be completed during 8 week wise Industrial Training schedule should be planned by the Industry. The evaluation of Industrial training will be done on the basis of skills acquired by the student during this 8 weeks period.

EVALUATION SHEET FOR PA OF INDUSTRIAL TRAINING

Sr. No.	Enrollment Number	Name of Student	Marks by Mentor & Industry Supervisor jointly	Marks by Industry Supervisor	Marks by Mentor Faculty	Total Marks
			Out of 40 (A)	Out of 30 (B)	Out of 30 (C)	Out of 100 (A+B+C)

DISTRIBUTION OF END-SEMESTER-EXAMINATION (ESE) MARKS OF INDUSTRIAL TRAINING

Marks for Industrial Training Report	Marks for Seminar/ Presentation	Marks for Oral/Viva-voce	Total ESE Marks
25	25	50	100