Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name: Diploma in Fire Service Engineering

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

Duration of Programme: Two Years (Four 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 - I	FES	28120	4	2	--	6	1.5	70*#	28	30*	00	**100**	40	--	--	--	--	--	--	**100**
2	Fire Service Organization - I	FSO	28029	4	--	2	6	--	--	--	--	--	--	--	50#$	20	50	20	**100**	40	**100**
3	Fire Safety - I	FRF	28121	4	2	--	6	1.5	70*#	28	30*	00	**100**	40	--	--	--	--	--	--	**100**
4	Special Fire Hazards - I	SFH	28030	4	--	2	6	--	--	--	--	--	--	--	50#$	20	50	20	**100**	40	**100**
5	Fire Fighting Drills - I	FFD	28031	--	--	6	6	--	--	--	--	--	--	--	50#	20	50	20	**100**	40	**100**
Total				**16**	**04**	**10**	**30**	--	**140**	--	**60**	--	**200**	--	**150**	--	**150**	--	300	--	**500**

Student Contact Hours Per Week: **30 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks: **500**

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

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

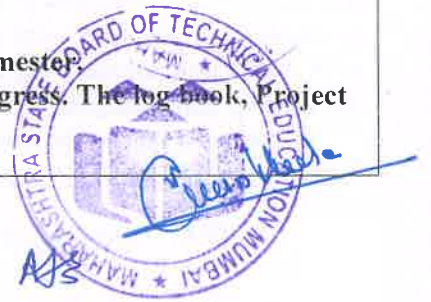
* The average of 2 test to be taken during the semester for the assessment.

#$ 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 in 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.**



Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name: Diploma in Fire Service Engineering

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

Duration of Programme: Two Years (Four 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 Engineering Science - II	FES	28212	4	2	--	6	1.5	70*#	28	30*	00	**100**	40	--	--	--	--	--	--	**100**
2	Fire Service Organization - II	FSO	28081	4	--	2	6	--	--	--	--	--	--	--	50#$	20	50	20	**100**	40	**100**
3	Fire Safety - II	FRS	28213	4	2	--	6	1.5	70*#	28	30*	00	**100**	40	--	--	--	--	--	--	**100**
4	Special Fire Hazards - II	SFH	28082	4	--	2	6	--	--	--	--	--	--	--	50#$	20	50	20	**100**	40	**100**
5	Fire Fighting Drills - II	FFD	28083	--	--	6	6	--	--	--	--	--	--	--	50#	20	50	20	**100**	40	**100**
Total				**16**	**04**	**10**	**30**	--	**140**	--	**60**	--	**200**	--	**150**	--	**150**	--	**300**	--	**500**

Student Contact Hours Per Week: **30 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks : **500**

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 Internship and Project period students shall attend Institute one day in 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.**

Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name: Diploma in Fire Service Engineering

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

Duration of Programme: Two Years (Four Semesters) **Pattern : Semester (Full Time)** **Duration: 16 Weeks**

Semester: Third **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	28306	4	--	4	8	1.5	70*#	28	30*	00	**100**	40	50@	20	50	20	**100**	40	**200**
2	Fire Investigation	FRT	28307	4	2	--	6	1.5	70*#	28	30*	00	**100**	40	--	--	--	--	--	--	**100**
3	Fire Fighting Equipments - I	FFE	28720	--	--	8	8	--	--	--	--	--	--	--	50#	20	50	20	**100**	40	**100**
4	Rescue Techniques - I	RTI	28721	--	--	8	8	--	--	--	--	--	--	--	50#	20	50	20	**100**	40	**100**
Total				**08**	**02**	**20**	**30**	--	**140**	--	**60**	--	**200**	--	**150**	--	**150**	--	**300**	--	**500**

Student Contact Hours Per Week: **30 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks: **500**

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

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

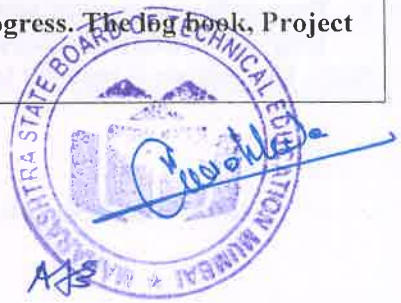
* The average of 2 test to be taken during the semester for the assessment.

#$ 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 in 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.**



Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name: Diploma in Fire Service Engineering

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

Duration of Programme: Two Years (Four Semesters) **Pattern : Semester (Full Time)** **Duration: 16 Weeks**

Semester: Fourth **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 Fighting Equipments - II	FFE	28742	--	--	8	8	--	--	--	--	--	--	--	50#	20	50	20	**100**	40	**100**
2	Rescue Techniques - II	RTII	28743	--	--	8	8	--	--	--	--	--	--	--	50#	20	50	20	**100**	40	**100**
3	Project	PFR	28744	--	--	4	4	--	--	--	--	--	--	--	50#	20	50	20	**100**	40	**100**
4	Fire Training	FAI	28745	--	--	10	10	--	--	--	--	--	--	--	100#	40	100	40	**200**	80	**200**
			Total	--	--	**30**	**30**	--	--	--	--	--	--	--	**250**	--	**250**	--	**500**	--	**500**

Student Contact Hours Per Week: **30 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Mark: **500**

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 in 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 : DIPLOMA IN FIRE SERVICE ENGINEERING

PROGRAMME CODE : FR

SEMESTER : FIRST

COURSE TITLE : FIRE ENGINEERING SCIENCE - I

COURSE CODE : 28120

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 learn about the different types of combustible matters.
- To learn about the basics of fire chemistry.
- To study different fire extinguishing methods.
- To learn about the properties of extinguishing media or agent.
- To learn fluid mechanics.
- To learn how to manage hydraulics and water supplies at fire ground.

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 effects on surrounding.
- Know about the Fire Chemistry, Physics, Fire Propagation and Fire Dynamics.
- Know the different physical and chemical properties of the material.
- Apply the theory-based knowledge to keep premises & its surrounding safe.
- Apply knowledge for saving life, property, and environment safety.
- Solve problems in fire-related contexts by applying mathematics, mechanics, hydraulics, chemistry, and electricity.
- Understanding & use of fire engineering 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	2	-	6	1.5	70*#	28	30*	00	100	40	-		-		-	-

(*): 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 min. 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-I** • Atoms & molecules theory, • 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	**10**	**10**
II	**BASICS OF FIRE SCIENCE-II** • 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**	**12**
III	**COMBUSTION** • Meaning 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. • Explosive range, • Catalysts and inhibitors, • Flammable properties of combustible materials. • Basic combustion process, • Specific surface and rate of combustion, • Effects of humidity, temperature, and atmospheric pressure on combustion,	**12**	**12**

Unit	Topic and Contents	Hours	Marks
IV	**FIRE RESISTANCE & FIRE LOAD CONCEPT** • Fire tests like Fire Resistance, Flame Spread, Reaction to Fire, Flammability test etc. • Factors for determining fire resistance. • Fire load concept, calorific value • Calculations of fire load • Grading of occupancies based on fire load	12	12
V	**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)	10	12
VI	**GAS LAWS** • Boyle's Law, Charles's Law, Law of Pressures, The General Gas Law • Principles of thermal expansion: Solids, The coefficient of linear expansion, Nickel-iron alloy (Invar), Expansion in metal structures, Thermostats, The coefficient of superficial and cubical expansion of solids, Liquids, Cubical expansion. • Critical temperature, Sublimation.	10	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 - I**	10	04	04	02	10
II	**Basics Of Fire Science - II**	10	06	04	02	12
III	**Combustion**	12	08	04	00	12
IV	**Fire Resistance Concept**	12	06	00	06	12
V	**Transmission Of Heat**	10	08	04	00	12
VI	**Gas Laws**	10	08	04	00	12
Total		**64**	**40**	**20**	**10**	**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 element.
- Draw and explain fire extinguishing methods.
- Classification of fire.
- Exothermic and Endothermic reactions
- Common causes of fire & fire spread.

- Properties of combustible materials.
- Explain Fire load concept with formula.
- Calculate fire load for your classroom area.
- Draw and explain heat transfer elements.
- Impacts of heat transfer on building fire with example's
- Explain the terms Auto-ignition temperature, thermal runaway,
- Spontaneous heating, and ignition.

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	---	NFPA
4	Chemistry of Fire Engineering	Kngsley	---
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 & Media - Physics and Chemistry for Firefighters,	---	TSO
8	Fire Service Manuals Volume 1: Fire Service Technology, Equipment and Media - Hydraulics, Pumps and Water Supplies,	Halliday etal,	TSO
9	Fundamentals of Physics	Wiley and Sons	---
10	The Chemistry of Combustion,	J. Newton Friend	published by Bibliolife
11	Dynamics for Firefighters	Ben Walker	published by Pavilion

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 : DIPLOMA IN FIRE SERVICE ENGINEERING

PROGRAMME CODE : FR

SEMESTER : FIRST

COURSE TITLE : FIRE SERVICE ORGANIZATION - I

COURSE CODE : 28029

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 training 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
4	-	2	6	-	-	-	-	-	-	-	50#$	20	50	20	100	40

(*): 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	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	Features of good organization structure.
6	Meaning of leadership and its good qualities.
7	Different leadership styles and most useful in fire safety.
8	The benefits of effective communication for the organization.
9	Communication and message at fire ground.
10	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 ORGANISATION** • Definition of organisation. • Fire brigade purpose, scope and equipment's, Fundamentals of fire station management, • Structure of city fire service organisation, • Fire service organisation and its hierarchy, • The role of fire service organisation, • Role of State fire services, • Role of local and Municipal fire services, • Wings of fire service organisation,	12
II	**FIRES SERVICE ADMINISTRATION** • Station administration, • Mandatory documents and operational records, Station discipline, • Features of good organisation structure	08
III	**FIRE SERVICE ORGANISATION & MANAGEMENT** • Management, Different Management theories, POSDCORB, (Planning, organizing, staffing, Directing, Co-ordinating, Reporting & Budgeting)	10

Unit	Topic and Contents	Hours
	• The differences between management and leadership. • The importance of encouraging staff participation in decision making, • Qualities of leadership,	
IV	**LEADERSHIP STYLES** • Functions of leadership • Different leadership styles, • Useful leadership style in fire service, • 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	12
V	**FIRE SERVICE DISCIPLINE MOTIVATION** • Meaning of discipline, • Essentials of good discipline, • Characteristics of good discipline, • Need of motivation of subordinates for fire & safety, • Motivational Theories of experts. • An effective intrinsic motivation technique. • Incentive schemes as motivation, • Meaning of decision making, • Importance of decision making in fire incidence. • Conflict & its resolutions.	12
VI	**FIRES SERVICE COMMUNICATION** • Importance of communication in fire emergency at all industries, • The different types of organization structures and lines of communication vertical, lateral and horizontal, • The different methods and skills of communication, reporting and receiving feedback in the workplace, The benefits of effective communication for the organization	10
Total		**64**

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	---
4	Fire Service Administration	Grant	---
5	Fire Fighting Strategy & Leadership	Charles	---
6	Fundamentals of Modern Management	James Brodio	---

Sr. No.	Title of Book	Author	Publication
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/

PROGRAMME NAME : DIPLOMA IN FIRE SERVICE ENGINEERING

PROGRAMME CODE : FR

SEMESTER : FIRST

COURSE TITLE : FIRE SAFETY - I

COURSE CODE : 28121

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.
- To learn about the evacuation procedure and means of escape during emergency in high-rise structures.
- To learn about automatic fire detection in different types of occupancies.
- To learn about first aid firefighting equipment's, their working principles and periodic maintenance.
- To learn about 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 prevention & protection in relation to different structures 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
4	2	-	6	1.5	70*#	28	30*	00	100	40	-	-	-	-	-	-

(*): 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 min. 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 - I** **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	**10**	**10**
II	**BUILDING CONSTRUCTION - II** **Elements of structures their functions** ✓ Columns, ✓ Structural steel columns; Hollow & Solid protection	**08**	**12**

Unit	Topic and Contents	Hours	Marks
	✓ Beams, ✓ Walls, Various types of walls ✓ Stairways, ✓ Doors, ✓ Windows, ✓ Ceilings, ✓ Roofs. ✓ Floors		
III	**FIRE PREVENTION SYSTEMS-I** Meaning of prevention, • Importance of BMS & Third-party integration with Fir detection and Alarm system • Ventilation (HVAC) systems integration, Emergency exits integration, AHU integration, Detection systems integration, Door access integration, emergency lights, Generators, integration of Smoke vent system, fire curtain, Automatic kitchen suppression system, cooking gas valve, Deluge valve system, Elevator, Pressurization system, Drencher system etc. • Cause & effect matrix • The principles of means of escape in case of fire- Management control, ✓ Occupancy, ✓ Construction, ✓ Time of evacuation, ✓ Exits, ✓ Travel distance, • Assembly area, • Dead end, • Protected route, • Emergency signage's, • Use of Safety poster, (IEC)	**12**	**12**
IV	**FIRE PREVENTION SYSTEMS-II** • Emergency evacuation plan • Emergency Plan layout, • Purpose & objectives of evacuation/ mock drill, • Structure of evacuation/ Mock drill • Emergency response teams: Roles & Responsibilities. • Importance of entry/ exit registers, • Personal Emergency Evacuation Plan (PEEP), • Role of security personnel in an emergency, • Fire notices/ orders and its importance. • Preparation of Onsite and off-site emergency plan.	**10**	**12**
V	**FIRE PROTECTION SYSTEMS-I** • Meaning of protection. • **Meaning of Active and Passive fire protection system.** • **Water based suppression:** ✓ Water hydrant system (internal & external) with design principle. ✓ Water Sprinkler systems with design principle. ✓ Drencher, ✓ Rising mains-Wet, Dry, Down comer ✓ Hose reels,	**12**	**12**

Unit	Topic and Contents	Hours	Marks
	✓ Foam systems, ✓ Deluge system. ✓ Pre action sprinkler system ✓ Water mist system • Care & Maintenance of water based extinguishing systems. **Fire Extinguishers:** • Principle of stored pressure & Cartridge based. • MAP concentration • Water, DCP, Foam, CO_2, and clean agents, • Difference Between FM-200 and Novec 1230 Fluid • Fire Extinguishers: Inspection, Maintenance, And Testing Procedures • Refilling & Hydraulic pressure testing		
VI	**FIRE PROTECTION SYSTEMS-II:** **Fire Detection and Fire alarm systems-** • Principles of automatic fire detection • Types of fire detectors and its principle of operations • Fire warning alarm systems- Analogue and addressable. • MCP, Hooters, Importance of audio-Visual hooters & disability. • Different errors in and alarms & Disadvantages. • Testing standards and frequency and documentation. • Care & Maintenance of Detection and Alarm systems. • PA system and importance. • Graphic user Interface • Auto Dialer • Gas Leak detectors and alarm system • System logic Passive Fire protection System: • Compartmentation • Fire door • Flame retardant application • Fire seal • Smoke seal • Pressurization system • Fire doors • Fire walls • Fire floors • Emergency exit lights • Dampers • Flame shields • Intumescent paint/Strip • Mortar coating • Mineral fibre matting • Protection of muster/refuge points	**12**	**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 - I**	10	4	4	2	10
II	**Building construction - II**	08	4	4	4	12
III	**Fire prevention systems I**	12	0	6	6	12
IV	**Fire prevention systems-II**	10	0	4	8	12
V	**Fire protection systems I**	12	4	4	4	12
VI	**Fire protection systems-II**	12	8	4	0	12
Total		**64**	**20**	**26**	**24**	**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.
- Onsite 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 handbook	R. Craig Schroll,	CRC Press London
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

Sr. No.	Title of Book	Author	Publication
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 Handbook, Volume- I and II	--	NFPA,

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 : DIPLOMA IN FIRE SERVICE ENGINEERING

PROGRAMME CODE : FR

SEMESTER : FIRST

COURSE TITLE : SPECIAL FIRE HAZARDS - I

COURSE CODE : 28030

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
4	-	2	6	-	-	-	-	-	-	-	50#$	20	50	20	100	40

(*): 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** • Meaning of explosives, • Applicable Act, for explosives in 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, • Preventive measures of explosives.	**12**
II	**DUST** • Meaning of dust fire explosion, • Factors Influencing Dust Explosions, • Nature and behaviour of dust, and hazards, Preventive methods for dust explosion, • Causes of dust explosion fires and safety precautions,	**10**
III	**FIRE RISK AT BUILDINGS-I** • Meaning of low, high rise and super high-rise buildings. **Causes of fire and safety precautionary measures to be taken in following buildings:** • Under Construction buildings.	**10**

Unit	Topic and contents	Hours
	• Under Ground Structures, • High Rise Buildings, • Super High-Rise Buildings, • Hotels, • Schools • Colleges Educational Buildings.	
IV	**FIRE RISK AT BUILDINGS-II** • Hospitals and Nursing Home, • Cinema Theatres, • Offices and Banks, • Supermarkets, • Departmental Stores, • Covered shopping malls, • Assembly buildings • Store House, • Workshops and Garages. • Explosives storage buildings • Firework Manufacturing Units and Warehouses.	12
V	**FIRE RISKS AT AIRPORTS-I** Various categories of Airports, Types of Aircrafts Aircraft construction, classifications of hangars, types of fuels used in aircraft, Nature of aircraft crashes, Meaning of Jettison, Passenger seat belt, Access and egress in aircraft, Rescue and evacuation from Aircraft, Critical Area Concept.	10
VI	**FIRE RISKS AT AIRPORTS-II** Airport Fire Hazards, Cause of fire in the aircraft, Aircraft Fire Safety, Post-Accident Activities it the Crash Site, Fire Fighting in Aircraft Accident, Rescue and firefighting equipment's at airport, Preplanning for Aircraft Accident Emergencies, Protection of Hangars, Fueling and Defueling Risks.	10
Total		**64**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Manual of Firemanship Book 4 Incidents involving Aircraft, shipping & Railways	---	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://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 : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : FIRST
COURSE TITLE : FIRE FIGHTING DRILLS - I
COURSE CODE : 28031

1. RATIONALE

Firefighting drills is a core practical subject which gives practice to use various firefighting equipment and accessories which is useful in job.

2. COMPETENCY

- To learn about the how to perform evacuation drill.
- To learn about fire extinguisher drill.
- To learn about Identification, Selection, Operation and Maintenance of Fire Extinguishers.
- To learn about the perform firefighting hose drill.
- To learn about 3-man hydrant drills.
- To learn about 4-man hydrant drills.

3. COURSE OUTCOMES

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

- Perform hydrant drill.
- Able to conduct fire evacuation drills.
- Able to perform Fire engine drill.
- Apply hose drill performance and practice in firefighting operation.
- Apply 3 and 4 man hydrant 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#	20	20	20	100	40

(*): 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	Fire Service Discipline and importance of uniformity
2	Squad Drill Attention, stand at ease.
3	Samne se Tej chal and different Salutes which is applicable in fire Services
4	Fire drill crew formation and crew numbers as per drill requirements.
5	Fire Hose drill, different type of hose rolling techniques, lowering carrying of hose and lifting techniques
6	Fire Hose drill, different type of Hose laying techniques with demonstration of use of dividing and collecting breaching.
7	Performing different type of hose fitting and its uses in the fire service.
8	3 -man Hydrant Drill: Drill procedure with application of Hose and Hydrant Fittings with adding and removing one, two lengths hoses.
9	4 -man Hydrant Drill: Drill procedure with application of Hose and Hydrant Fittings: Add one length of hose, remove one length of hose.
10	Testing of ladders and use lf different type of ladders
11	4 man ladder drill and crew formation and location of crew
12	4 man ladder drill and demonstration of ladder extensions.
13	Foam drill and Equipment identification of Foam drill
14	Foam drill Crew formation and how to use foam equipment during Fire

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. Fire panel, ARV
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, F key
3	Sprinkler module with branches, Down word, upward, side wall nozzles. Pressure gauge, Butterfly valve, Drain line with valve, ARV, different Sprinkler heads Detection system- Smoke, Heat detectors (2 Nos each), VA speaker, Control module, Monitor module Conventional panel, MCP, Audio visual display Hooter, Multi detector, Response indicator VESDA panel, Beam Detector, Addressable panel, 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. Clean Agent and Kitchen type fire Extinguisher
5	Different foam making branches. Water monitor. Foam concentration AFFF, FFFP

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	Firefighting Drill Manual	NFSC, Nagpur	---
4	Fire Fighters Drill Manual by (Agni Seva)	A.S. Khan	Prakashan, Shikohabad

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/

PROGRAMME NAME : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : SECOND
COURSE TITLE : FIRE ENGINEERING SCIENCE - II
COURSE CODE : 28212

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 learn about the different types of combustible matters.
- To learn about the basics of fire chemistry.
- To study different fire extinguishing methods.
- To learn about the properties of extinguishing media or agent.
- To learn fluid mechanics.
- To learn how to manage hydraulics and water supplies at fire ground.

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 effects on surrounding.
- Know about the Fire Chemistry, Physics, Fire Propagation and Fire Dynamics.
- Know the different physical and chemical properties of the material.
- Apply the theory-based knowledge to keep premises & its surrounding safe.
- Apply knowledge for saving life, property, and environment safety.
- Solve problems in fire-related contexts by applying mathematics, mechanics, hydraulics, chemistry, and electricity.
- Understanding & use of fire engineering 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	2	-	6	1.5	70*#	28	30*	00	100	40	-	-	-	-	-	-	

(*): 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 min. one per unit based on the curriculum.

6. THEORY COMPONENTS

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

Unit	Topic and Contents	Hours	Marks
I	**PRODUCTS OF FLAME** • Definition of flame, • Zones of combustion of flames, • Cause of luminosity of flame, • Non-luminous flames, • Diffusion flame, pre-mixed flames, • Explosions. Burning velocity.	10	10
II	**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
III	**DIFFERENT COMBUSTIBLE MATTER** • Vapor pressure & boiling point • Types of combustible matter, • Chemical compounds, • Properties of matter, **Properties and hazards of common volatile substances:** • Alcohols, Petrol and fuel oils, Xylene, Aniline, Solvent, Naphtha, Ether (DI-Ethyl Ether), Ethyl Acetate, Toluol or toluene, Carbon Disulphide, Nitro Benzene, Propylene, • Oxide, Inorganic and Organic Oxidizers, Inorganic peroxides, Hydrogen peroxide, Organic peroxides, Cyclohexane, peroxide, Methyl Ethyl Ketone Peroxides, • Charcoal, Pyrophoric materials, Sulphur, Phosphorous, • Naphthalene, Drying oils, Mineral oils, Kerosene and Diesel Oils, Heavy Fuel Oils, Linoleum, • Coal, Paints, Varnish, enamel, Lacquer.	14	12
IV	**HAZARDS OF SOLID AND GASES**	08	12

Unit	Topic and Contents	Hours	Marks
	• Cotton. Paper, Jute, Wool, Wood, Rubber, Coal-tar. • Plastic, • LPG, Hydrogen. Oxygen, Carbon monoxide, Carbon di oxide, Nitrogen & its role in fire chemistry, Chlorine, Ammonia, Sewer gases, Acetylene, Natural Gas & its various forms.		
V	**HYDRAULICS-I** • Meaning of hydraulics, Different types of water flows. • 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, • Jet Reaction, • Nozzles & back pressure	**10**	**12**
VI	**HYDRAULICS-II** • Water Hammer and its effects & its control measures, • Heights of effective jets with calculation, • Water relays • Various pumps used in Fire service, • Various shaped water tanks calculations (Mensuration) • Waterpower, Brake Power, Water horsepower, pump efficiency and numerical calculations, • Pumps: Definition, operating principle & its types, testing & its maintenance. • Primers: Definition, operating principle & its types.	**12**	**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	**Products of flame**	10	06	04	00	10
II	**Flame Hazard**	10	06	06	00	12
III	**Different combustible matter**	14	06	06	00	12
IV	**Hazards of solid and gases**	08	06	06	00	12
V	**Hydraulics-I**	10	04	04	04	12
VI	**Hydraulics-II**	12	04	04	04	12
Total		**64**	**32**	**30**	**08**	**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 element.
- 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 classroom 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, Vapor 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	---	NFPA
4	Chemistry of Fire Engineering	Kngsley,	---
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 & Media - Physics and Chemistry for Firefighters,	---	TSO
8	Fire Service Manuals Volume 1: Fire Service Technology, Equipment and Media - Hydraulics, Pumps and Water Supplies,	Halliday etal,	TSO
9	Fundamentals of Physics	Wiley and Sons	---
10	The Chemistry of Combustion,	J. Newton Friend,	published by Bibliolife
11	Dynamics for Firefighters	Ben Walker	published by Pavilion

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/
- https://www.ife.org.uk/write/MediaUploads/Exams/39_Formula_Booklet_-_Fire_Engineering_Science_v3.0_for_2020_21.pdf

PROGRAMME NAME : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : SECOND
COURSE TITLE : FIRE SERVICE ORGANIZATION - II
COURSE CODE : 28081

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 organization's operations. The persons training 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 the procedures to be followed in the evet of a fire or disaster.

2. COMPETENCY

- Demonstrate knowledge and skills in 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
4	-	2	6	-	-	-	-	-	-	-	50#$	20	50	20	100	40

(*): 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 of Training in Fire Service Organization.
2	Duties and Responsibilities of Incident Command officer at various Incidents
3	Various Mutual Aid agencies and its role in handling different emergencies.
4	Leadership and its qualities, its importance in handling various emergencies.
5	Characteristics of discipline in fire service organization.
6	Importance of communication in fire service organization.
7	Qualities of a First Responders to control various incidents.
8	Role of Logistic officer at different emergencies.
9	Describe different Fire Service Equipment.
10	Describe Respiratory and non-respiratory personal protective equipment's with examples.

6. THEORY COMPONENTS

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

Unit	Topic and Contents	Hours
I	**FIRE SERVICE TRAINING - I** • Introduction, Education Vs Training • Aim & Objectives of Training • Types of training • Needs of training as a first responders.	10
II	**FIRE SERVICE TRAINING - II** • Elements of training cycle • Training programs and resources • Importance of training in fire service • Methods of instructions • Training Methodology • Successful Training evaluation and certification Brain storming refresher training	10
	FIRE INCIDENT CONTROL:	

Unit	Topic and Contents	Hours
III	• 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,	12
IV	**FIRE GROUND OPERATIONS - I** • Standard operating procedures. • Duties & responsibilities of Incident Commander officer, • Pre- Incident planning, Size-Up, Strategic Plan • Deployment and organization, 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	12
V	**FIRE SERVICE EQUIPMENTS:** • 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
VI	**PERSONAL PROTECTIVE EQUIPMENTS (PPE)** • Respiratory type –SCBA, Chemical Cartridge Type • Non-respiratory personal protective equipment's. • PPE & its Importance • Care and maintenance of PPE's,	10
Total		**64**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Memorandum of Emergency Fire Brigade Organisation	---	HMSO
2	Management in Fire Service	---	NFPA
3	Principles of Management	BS Mathur	---
4	Fire Service Administration	Grant	---
5	Fire Fighting Strategy & Leadership	Charles	---
6	Fundamentals of Modern Management	James Brodio	---

Sr. No.	Title of Book	Author	Publication
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/

PROGRAMME NAME : DIPLOMA IN FIRE SERVICE ENGINEERING

PROGRAMME CODE : FR

SEMESTER : SECOND

COURSE TITLE : FIRE SAFETY - II

COURSE CODE : 28213

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.
- To learn about the evacuation procedure and means of escape during emergency in high-rise structures.
- To learn about automatic fire detection in different types of occupancies.
- To learn about first aid firefighting equipment's, their working principles and periodic maintenance.
- To learn about 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 prevention & protection in relation to different structures 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
4	2	-	6	1.5	70*#	28	30*	00	100	40	-	-	-	-	-	-

(*): 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 min. 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	**ADVACED FIRE SUPPRESSION SYSTEMS - I** • Water, CO_2, DCP & Foam flooding fire suppression systems. • Aerosol fixed Fire suppression systems (NOVEC, Inert gas, FE36, Clean agents),	08	10
II	**ADVACED FIRE SUPPRESSION SYSTEMS - II** • Water spray projector systems, • Water mist systems, • Nitrogen purging system. (Inert Gas) • Automatic Kitchen Fire Suppression System • Water curtain / Drencher system	08	12
III	**NATIONAOL BUILDING CODE (2016)-I:** • **Legal documents-** ✓ Provisional & Final NOC documentation & plans layout requirements, process, and final certification process. ✓ Project contractor selection criteria, ✓ AMC service contractor selection criteria, ✓ Form B Certification process and requirements. Online & Offline Form B certification • Classification of buildings, • Fire compartments, • Refuge area, • Staircases, • Pressurization, • Fireman's lift, • Fire Stop,	14	12

Unit	Topic and Contents	Hours	Marks
	• Air Handling Units, • Ventilation and smoke control, • Fire or smoke dampers • Fire Zones,		
IV	**NATIONAOL BUILDING CODE (2016) -II:** • Temporary buildings or structures, • Service ducts and shafts, Electrical installations, Lightening protection of buildings, • Glazing, • Surface Interior Finishes, • Fire Command Centre (FCC), • Basement, • Ramps, • Gas Supply lines, • Hazardous Areas, Gaseous, Oil Storage Yard, etc.	**12**	**12**
V	**NATIONAOL BUILDING CODE (2016)-III:** 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 pump house, Guidelines for fire drill and evacuation procedures for high rise buildings, Commercial kitchens, Car parking facilities,	**12**	**12**
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 TREMCARD Material Safety Data Sheet (MSDS)	**10**	**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	**Advanced fire suppression systems - I**	08	04	04	02	10
II	**Advanced fire suppression systems - II**	08	04	04	04	12
III	**National building code I:**	14	04	04	04	12
IV	**National building code-II:**	12	04	04	04	12
V	**National building code-II:**	12	04	04	04	12
VI	**Transportation and hazmat management**	10	10	02	00	12
Total		**64**	**30**	**22**	**18**	**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.
- Onsite 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 handbook	R. Craig Schroll,	CRC Press London
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 Handbook, Volume- I and II	---	NFPA

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 : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : SECOND
COURSE TITLE : SPECIAL FIRE HAZARDS - II
COURSE CODE : 28082

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
4	-	2	6	-	-	-	-	-	-	-	50#$	20	50	20	100	40

(*): 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	Hazards and Preventive Measures in Forest Fires.
2	Causes of Fire and its Preventive Measures in Petroleum Refineries.
3	Causes of Fire and its Preventive Measures in Power generation Plant using coal as a fuel.
4	Causes of Fire and its Preventive Measures in Construction industry.
5	Causes of Fire and its Prevention Measures in LPG bottling plant.
6	Procedure of handling incident involving Radioactive Materials.
7	Procedure of handling incident involving Radioactive Materials.
8	Causes of Fire and its Preventive Measures in chemical industry.
9	Difficulties of Fire Fighting in Rural and Forest Fires with case study.
10	Causes of Fire and its Preventive Measures in Steel Industry.

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 RISK AT FOREST FIRES** • Types of Forest Fires, • Causes of fires in forests, • Hazards and preventive measure to prevent forest fires, • Difficulties of firefighting in rural and forest fires, Normal appliances equipment attending a forest fire, • Impacts of Forest Fires on Environment.	12
II	**FIRE RISK IN SPECIAL INDUSTRIES-I** **Causes for fire and safety precaution in following special industries:** • Electric Generating Plants, • Petroleum Refineries, • LPG bottling plant, • Petroleum Depots and Terminals, • Chemical Industries,	10
III	**FIRE RISK IN SPECIAL INDUSTRIES-II** **Causes for fire and safety precaution in following special industries:** • Automobile Industry • Steel Industry • Refrigeration Cold Storage Plants, • Transportation of Hazardous Materials & Chemicals, • Dock Yard	10

Unit	Topic and Contents	Hours
IV	**FIRE RISK IN SPECIAL INDUSTRIES-III** **Causes for fire and safety precaution in following special industries:** • Marine Fire Safety, • Electronics & IT Industry • Textile Industry • Construction Industry	10
V	**RADIOACTIVITY – I** • Meaning of radioactivity, • Radioactive materials, • Half-life (decay), • Alpha, Beta and Gamma radiation, • Radiation detectors, • Hazards of Radiations, • Biological effect of radiation, • Factors causing Biological Damages,	12
VI	**RADIOACTIVITY – II** • Safety precautions from the harmful radiations, Instruments for Detection and Measurements of Radiation, • Fire Protection, • Preplanning for protection from Radiation Hazards and Handling Fires, • Facilities Handling and Using Radioactive Materials,	10
Total		**64**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Manual of Foremanship, Practical Firemanship III	--	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://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 : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : SECOND
COURSE TITLE : FIRE FIGHTING DRILLS - II
COURSE CODE : 28083

1. RATIONALE

Firefighting drills is a core practical subject which gives practice to use various firefighting equipment and accessories which is useful in job.

2. COMPETENCY

- To learn about the different instruction of firefighting appliance drill.
- To learn about lifting, carrying, rolling and unrolling of firefighting hose.
- To learn about three men and four men hydrant drill.
- To learn about the application and different ladder drill.
- To identify the errors in various firefighting drill.

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#	20	50	20	100	40	

(*): 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	Fire Evacuation Drill and Deployment of members
2	Fire Evacuation drill and Demonstration about how to conduct the drill
3	Demonstration of Fire tender and operation of tender.
4	Portable Fire pump drill
5	Water tender fire pump drill and how to connect suction hose.
6	Fire tender drill 6 man and location of every crew in fire tender.
7	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.
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 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
11	Physical challenged, old age and expectant mother Evacuation through Evacuation chair from staircase
12	Search and rescue operation and reporting to the fire officer.
13	Rural fire and basic technique to stop the spread of fire and other techniques to extinguish the fire.
14	Trailer Pump drill and how to use suction hoses while taking water from rivers or well

6. 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	Firefighting Drill Manual	NFSC, Nagpur	---
4	Fire Fighters Drill Manual by (Agni Seva	A.S. Khan	Prakashan, Shikohabad

7. 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 : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : THIRD
COURSE TITLE : FIRE AND ELECTRICAL AUDITS
COURSE CODE : 28306

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 section aims to provide a standard procedure and format for Auditors to conduct Fire & Life Safety Audit.

In current scenario fire rate ratio is rising day by day, so to control the rate of fire accidents and emergencies/incidents, 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 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, behavior 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, fire 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 electrical audits in residential and industrial buildings.
- Apply knowledge to conduct the Fire audits in residential and industrial buildings.

- Apply knowledge to conduct inspections in industries.
- Apply knowledge to conduct 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*#	28	30*	00	100	40	50@	20	50	20	100	40

(*): 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.
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.

Sr. 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	**10**	**12**
II	**BUILDING CODES AND STANDARDS** • **Introduction & Silent features of:** ✓ The National Building Code, 2016 Part-IV ✓ National electrical code. ✓ CEA Safety regulation-2010 • 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. • IS 732 Wiring installation, IS 3043 Earthing system, IS 15652 Insulation mats,	**12**	**12**
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, • Protectives devices and safety requirements,	**12**	**10**

Unit	Topic and Contents	Hours	Marks
	• Electrical hazards and their causes,		
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 exposes 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, • Identification of people at 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, • Audit Assessment, • Report preparation	**10**	**12**
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**	10	10	00	00	10
II	**Building codes and standards**	12	06	06	00	12
III	**Basic of electricity**	12	06	00	06	12
IV	**Electrical appliances**	10	06	06	00	12
V	**Fire risk assessment**	10	06	00	06	12
VI	**Auditing systems and reports**	10	06	00	06	12
Total		**64**	**40**	**12**	**18**	**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)

List of Assignments

- Provisions of the Maharashtra Fire Prevention and Life Safety Measure Act, 2006
- Provisions of the Indian Electricity Act, 2003
- Provisions of the National Building Code, 2016 Part-IV
- Importune of Indian Standards and guidelines to conduct in Electrical and Fire Audits.
- Draw and explain Importance of lightening arrestor and static electricity
- Importance of annual testing and measurements in electrical and fire safety audits.
- Draw and explain importance of earth pits.
- Importance of electrical and fire risk assessment.
- Data collection for the electrical and fire risk assessment and audits.
- Visit to any of the residential building and conduct electrical and fire audit with report.
- Prepare own presentation and perform in your class. (Time: 8-10 min)
- 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	---	---
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://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 : DIPLOMA IN FIRE SERVICE ENGINEERING

PROGRAMME CODE : FR

SEMESTER : THIRD

COURSE TITLE : FIRE INVESTIGATION

COURSE CODE : 28307

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 behavior in fire.

3. COURSE OUTCOMES

The students may 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				
					ESE		PA		Total		ESE		PA		Total	
L	T	P	(L+T+P)	Paper Hrs.	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	2	-	6	1.5	70*#	28	30*	00	100	40	-	-	-	-	-	-

(*): 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 min. 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	**FIRE INVESTIGATION:** • The importance fire investigation, • Frequent causes of fire: • Sources of ignition, Fuel and Oxygen • Establishing the known and unknown causes, • Organization involved in fire investigations, • Education and training of fire investigation personnel,	**10**	**10**
II	**DETECTION OF ARSON FIRE:** • Meaning of Arson, • Detection of Arson, • The reasons for suspecting arson, • Motives of Arson, • Indicators of Arson, • Action by the Fire Brigade.	**10**	**12**
III	**THE PROCESS OF INVESTIGATION:** • 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 • **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.	**14**	**12**
IV	**SALVAGE CONTROL:** • Meaning of salvage, • Primary & Secondary fire damage, • Tactical Consideration-Forcible entry,	**10**	**12**

Unit	Topic and contents	Hours	Marks
	• Ventilation. Application of water, • Dewatering etc., Salvage equipment.		
V	**FIRST AID – I :** • 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.	**10**	**12**
VI	**FIRST AID – II** • 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-Cardiopulmonary Resuscitation, • Rescue techniques by fire brigade and rescue team- Rescue with one rescuer, Rescue with More than two rescuers,	**10**	**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	**Fire investigation**	10	06	04	00	10
II	**Detection of arson fire**	10	06	06	00	12
III	**The process of investigation**	14	04	04	04	12
IV	**Salvage control**	10	04	04	04	12
V	**First aid - I**	10	02	02	08	12
VI	**First aid - II**	10	02	02	08	12
Total		**64**	**24**	**22**	**24**	**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

- Importance of fire investigation.
- Detail process and method of fire investigation.
- Design investigation format.
- Motives of Arson
- Investigation collection data.
- Importance of burnt material by forensic lab.

- Primary & Secondary fire damage,
- Draw and explain different salvage equipment.
- Importance of first aid in fire service and disaster.
- Draw and explain importance of advanced automatic defibrillator.
- Importance of Triage & CPR
- Select one of any accident and prepare fire investigation report, prepare your own presentation and perform in your class. (Time: 8-10 min)

9. 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 Fire 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

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 : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : THIRD
COURSE TITLE : FIRE FIGHTING EQUIPMENTS - I
COURSE CODE : 28720

1. RATIONALE

Handling of fire service equipment's is very much essential in fire emergency. Subject contains all fire service equipment's used by fire brigades. Equipment handling and practice will give confidence in students.

2. COMPETENCY

- To give basic training about four persons ladder drill.
- To understand the breathing apparatus how to use in case of emergency.
- To give basic knowledge about small gears which used in fire services.
- To give information about bandages and their respective uses.
- Basic resuscitation procedures and how to handle critical information.
- To shift casualty from one location to other location.

3. COURSE OUTCOMES

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

- Candidates able to perform evacuation drill.
- To handle any rescue operations where breathing apparatus will be used.
- Candidates can know about ladder drills.
- Candidates can be shift casualty from one locations.

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#	20	50	20	100	40	

(*): 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	Fire Service branches and its use at different locations as per fire scenario
2	Fire Service breaching inlet uses.
3	Fire tender equipments and its up keep.
4	Types of Fire hose and its construction
5	Wheelchair, Evacuation chair, stretchers uses.
6	Hose fittings and its uses
7	Suction hose and types of Suction hose
8	Portable pump and how to use in case of emergency.
9	Study of small gears and its use.
10	different types of Search lights and its use
11	Rescue tools - battery and hydraulic operated.
12	Foam and foam making branches
13	Fire fighting pumps - Jockey, main and standby pump

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	Extension Ladder
2	Rope.
3	Breathing Apparatus Set (Carbon Fiber), Different types of masks, gloves, ear plugs, earmuffs, chemical cartridge mask, Harness, belts,
4	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. Fire Proximity suit Study of hydraulically operated small gears and their use in Rescue
5	First aid box, Ambu bag, Stretcher
6	Mannequin for CPR

7. SUGGESTED LEARNING RESOURCES

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

8. SOFTWARE/LEARNING WEBSITES:

- https://www.youtube.com/watch?v=hv26EHgdlxs
- https://www.youtube.com/watch?v=0NH7y7CvLQ0

PROGRAMME NAME : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : THIRD
COURSE TITLE : RESCUE TECHNIQUES - I
COURSE CODE : 28721

1. RATIONALE

Rescue of people caught in fire or in disaster is very important. The hands on drills through this practical will help to handle the live situations effectively and efficiently

2. COMPETENCY

- 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's
- To learn about various types of Fire Dynamics in Fire Scenario.
- To understand the basic Fundamentals of Fire Propagation.
- To understand the Chemistry and Physics of fire.

3. COURSE OUTCOMES

At the end of this course student will be 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's.
- 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.

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#	20	50	20	100	40

(*): 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	Perform fireman's lift and understand its Purpose, benefits, Position, Handling procedure, Handling technique., Carry at least 20ft height.
2	Use of tackles and pullyes during firefighting and vertical rescue operations.
3	Rescue of casualty through the staircase
4	Highrise rescue operation and how to use refuge areas for shelter and other requirements.
5	How to use Emergency Evacuation rescue chutes.
6	Rescue chair operation in staircase and its demonstration.
7	Search and rescue operation in dense smoke.
8	Use of foldable rescue stretcher in small area
9	Rescue tools hydraulic operated and its use
10	Rescue tools Battery operated and its use

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	Extension Ladder
2	Rope.
3	Breathing Apparatus Set (Carbon Fiber), Different types of masks, gloves, ear plugs, ear muffs, chemical cartridge mask, Harness, belts,
4	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
5	First aid box, Ambu bag, Stretcher
6	Mannequin for CPR

7. SUGGESTED LEARNING RESOURCES

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

PROGRAMME NAME : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : FOURTH
COURSE TITLE : FIRE FIGHTING EQUIPMENTS - II
COURSE CODE : 28742

1. RATIONALE

Rescue of people caught in fire or in disaster is very important. The hands-on drills through this practical will help to handle the live situations effectively and efficiently.

2. COMPETENCY

- To give basic concepts of how to use AED kit in case of medical emergency.
- To understand how to use Nebulizer.
- To understand how to give CPR and position.
- To learn about Form and form making equipment and how to use the same in case of emergency.
- To understand about hydrant system.

3. COURSE OUTCOMES

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

- Use of AED kit in case of medical emergency.
- Practical demonstration about the nebulizer operation.
- Perform to handle medical emergency wherever CPR is required.
- Foam making equipment and their uses in case of liquid fire.
- Uses of hydrant and how to operate 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
-	-	8	8	-	-	-	-	-	-	-	50#	20	50	20	100	40

(*): 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	Governments Fire fighting water provision at road side (Different types of Hydrant points)
2	First aid box and its uses
3	Use of nebulizer and its uses
4	Different Priming method for water suction
5	Fire Hydrant system in the building
6	Booster pump and intermediate pumps
7	Automatic Fire Sprinkler system in the building
8	Different Passive Fire protection systems
9	Rural Fire water transportation equipments
10	High rise Water tanks and other different water provisions
11	Using of Fire Proximity Suit
12	Different types of stretcher and its uses
13	Pneumatic Rescue bags and its uses

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	Extension Ladder
2	Rope.
3	Breathing Apparatus Set (Carbon Fiber), Different types of masks, gloves, ear plugs, ear muffs, chemical cartridge mask, Harness, belts,
4	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. Fire Proximity Suit Study of hydraulically operated small gears and their use in Rescue
5	First aid box, Ambu bag, Stretcher
6	Manikin for CPR

7. SUGGESTED LEARNING RESOURCES

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

8. SOFTWARE/LEARNING WEBSITES:

- https://www.redcross.org/take-a-class/aed/using-an-aed/what-is-aed
- https://www.healthdirect.gov.au/how-to-perform-cpr
- https://www.youtube.com/watch?v=s6gBPEaF-p0
- https://www.youtube.com/watch?v=fKzdiuseEIw

PROGRAMME NAME : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : FOURTH
COURSE TITLE : RESCUE TECHNIQUES - II
COURSE CODE : 28743

1. RATIONALE

Rescue of people caught in fire or in disaster is very important. The hands on drills through this practical will help to handle the live situations effectively and efficiently.

2. COMPETENCY

- To give basic training about special hydraulic rescue appliance and understand where they need to be used.
- To give basic training about special battery-operated rescue appliance 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's.
- To understand the search and rescue operation and its techniques.
- To give basic training about pneumatic rescue tools and its uses.

3. COURSE OUTCOMES

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

- 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#	20	50	20	100	40

(*): 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	Demonstration of rescue operation through ladder
2	Breathing apparatus Distress signal unit use and its operation
3	Crawling method and rescue operation through Crawling
4	Flood and rescue operation.
5	Blanket pull rescue method
6	Ropes and Knots, different types of knots which can be use in case of emergency.
7	Use of AED
8	CPR and demonstration of CPR from adults to child
9	Bandage and its use in case of emergency
10	Rope rescue Signaling during emergency

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	Extension Ladder
2	Rope.
3	Breathing Apparatus Set (Carbon Fiber), Different types of masks, gloves, ear plugs, earmuffs, chemical cartridge mask, Harness, belts,
4	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
5	First aid box, Ambu bag, Stretcher
6	Mannequin for CPR

7. SUGGESTED LEARNING RESOURCES

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

8. SOFTWARE/LEARNING WEBSITES:

- 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 : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : FOURTH
COURSE TITLE : PROJECT
COURSE CODE : 28744

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

- Planning and Development.
- Collection of Information/Resources.
- Choice and Application of Techniques.
- Analysis of Information.
- Organization of the Written Work.
- Analysis of the Process and Outcome
- Personal Engagement

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#	20	50	20	100	40	

(*): 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*

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".
- Documentation and Fire safety Audits.
- 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 High-Rise Building.
- Project work on Solar Panel system.
- Project work on in Automobile Industry.
- Project work on Electronics and IT Industry.
- Project work on chemical storage Warehouses.
- Project work on Passive and Active fire protection systems of Super High-rise building.
- Project work on Passive and Active fire protection system of Assemble building.

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

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 Diploma. Project should be prepared based on any one of the subjects of the Programme.

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 ponts:

- 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 : DIPLOMA IN FIRE SERVICE ENGINEERING
PROGRAMME CODE : FR
SEMESTER : FOURTH
COURSE TITLE : FIRE TRAINING
COURSE CODE : 28745

1. RATIONALE

Fire Training course is introduced to Diploma in Fire Service 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#	40	100	40	200	80	

(*): 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