



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Institute of Medical Science and Healthcare
Semester-1

Subject: Fundamentals of Fire Engineering Science-PGDFI11501

Type of course: Major

Prerequisite: Basic knowledge of science, physics, chemistry, and general safety concepts.

Rationale: To develop fundamental knowledge of fire science, combustion, fire behaviour, fire hazards, prevention, protection, and emergency response, enabling students to understand fire risks and apply appropriate fire safety and protection measures in domestic, industrial, and public environments.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

Legends: CI-Class Room Instructions; T-Tutorial; P-Practical; C-Credit; ESE-End Semester Examination; MSE- Mid Semester Examination; V-Viva; CA-Continuous Assessment; ALA-Active Learning Activities.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Short Video Explainer Students have to record a 2 to 3 minute video explaining the fire triangle and tetrahedron, modes of heat transfer and classes of fire, and upload it on GMIU web portal.	10
2	Flammability Data Table Students have to compile a table of flash point, fire point, auto-ignition temperature and flammability limits for at least ten common fuels from standard references, add a short interpretation, and upload it on GMIU web portal.	10
3	Extinguisher Selection Matrix Students have to prepare a matrix matching classes of fire with suitable extinguishing agents, extinguishers and fire protection systems, and upload it on GMIU web portal.	10



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4	Evacuation Plan and Drill Report Students have to prepare an evacuation plan (escape routes, assembly points, responsibilities) for a building and a report on a fire drill, and upload it on GMIU web portal.	10
5	Fire Incident Reflective Journal Students have to write a reflective journal analyzing a real fire incident, linking its causes, protection failures and emergency response to the course content, and upload it on GMIU web portal.	10
Total		50

Course Content:

Sr. No	Course content	Hrs	% Weightage
1	Chapter: 1 Fundamentals of Fire Science - History of fire service - Definition and fundamentals of fire - Fire triangle and fire tetrahedron - Combustion and types of combustion - Heat, temperature and ignition - Modes of heat transfer: conduction, convection and radiation - Flame characteristics and fire behaviour - Classification of fires - Common causes and hazards of fire	15	25
2.	Chapter: 2 Fire Chemistry and Fire Behaviour - Basic chemistry of combustion - Fuels and their properties - Oxidation and combustion reactions - Ignition and auto-ignition - Flash point, fire point and ignition temperature - Flammability limits - Flame propagation and fire growth - Smoke and toxic products of combustion - Factors affecting fire development and spread	15	25
	Chapter: 3 Fire Protection and Fire Suppression		



3	- Principles of fire prevention and protection - Methods of fire extinguishment - Fire extinguishing agents: water, foam, dry chemical powder and CO₂ - Types and applications of fire extinguishers - Fire hydrant and sprinkler systems - Fire detection and alarm systems - Passive and active fire protection - Fire protection equipment and personal protective equipment - Basic fire safety installations	15	25
4	Chapter: 4 Fire Safety, Risk Management and Emergency - Fire hazards and risk assessment - Fire safety management - Fire safety inspection and prevention - Emergency preparedness and response - Evacuation procedures and escape routes - Emergency planning and assembly points - Fire drills and incident response - Occupational health and safety in fire emergencies - Basic fire safety legislation, codes and standards - Role and responsibilities of fire safety personnel	15	25

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	40%	30%	10%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Describe the fundamental principles of fire science, combustion, fire behaviour, and fire hazards.
CO2	Recognize common fire hazards, ignition sources, and factors contributing to the occurrence and spread of fire.



CO3	Employ basic principles of fire prevention, fire protection, fire detection, and fire suppression techniques.
CO4	Outline fire safety procedures, emergency response, evacuation practices, and relevant fire safety codes and regulations.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- A Handbook of Fire Technology by R.S. Gupta
- Manual of Fire Safety by N. Sesha Prakash
- Essentials of Firefighting and Fire Department Operations by IFSTA (International Fire Service Training Association)
- Handbook of Fire & Explosion Protection Engineering Principles for Oil, Gas, Chemical & Related Facilities by Dennis P. Nolan
- Industrial Fire Control Concepts: The Practical Guide to Facility Fire Protection by Jeffrey Moore
- Principles of Fire Safety Engineering by Akhil Kumar Das
- Fireground Strategies by Anthony Avillo

