

VII Semester Syllabi – Fire Technology

B.Tech. FT Batch Sem-VII [July-Dec2019]						
Sr. No.	Course Code	Course Name	L	T	P	Credits
1		Program Elective VII – 1	3	0	0	3
2		Program Elective VII – 2	3	0	0	3
3		Open Elective – 3	3	0	0	3
4	FT3PC01	Project Work I	0	0	8	4
5	FT3PC03	Industrial Training	0	2	0	2
6	FT3CO21	Fire Fighting & Field Training V	0	0	2	1
		Total	9	2	10	16
		Total Contact Hours		21		

Program Elective VII – 1

FT3EL13 Safety in Constructions

FT3EL10 Safety in Mines

Open Elective – 3

1 OE00047 Advance Machining Processes

2 OE00048 Supply Chain Management

Program Elective VII – 2

FT3EL01 Fire Fighting Installation & Automation

FT3EL12 Safety in Chemical Industries



Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
FT3EL10	Safety in Mines	3	0	0	3

UNIT I

Minerals, Rocks Ores and Non-metallic Minerals: classification of rock coal classification, mine atmosphere neat and humidity, Composition of mine atmosphere: Mine gases; generation, properties and effects; sampling and analysis of mine air; methane content; types and characteristic selection and location.

UNIT II

Machineries & Tools: Mining tools & machinery, drilling machinery, including blast hole drills, ladders, excavators, dumpers, transportation equipment and conveyors and other related tools & equipment's used in mining.

UNIT III

Safety in Mines: Duty of care; occupational hazards of mining; causes and prevention; accidents and their classification; accident statistics; cause-wise analysis; basic causes of accident occurrence; in-depth study into various causes of accidents; measures for improving safety in mines; TRAP (take responsibility in accident prevention); cost of accident; contribution of human elements in mine safety; tripartite and bipartite committees; mine environment monitoring and control.

UNIT IV

Lighting in Mines: general principles of artificial lighting; lighting standards and their assessment. Sanitation and health in mines, Safety related issues in coal beneficiation and transport, Development and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

UNIT V

Health and Safety Laws: The Mines Act, 1952; Mines Rules, 1955; Coal Mine Regulation, 1957; Mines Rescue Rules, 1985; provisions of Indian Electricity Rules, 1956 applicable to mines; Mine Vocational Training Rules, 1966; other rules and legislation applicable to coal mines. Economic Impact of Mining; Economics of mining, effect on community before, during and after mining; corporate social responsibility (CSR).

Text Books:

1. Race against Time - Building a Culture of Mine Safety by Gregory M. Anderson & Stephen R. Rosen
2. Factories Act 1948
3. Hand Book of Dock Workers Act

Reference Books;

1. Mine Safety - Law Regulation Policy by Neil Gunningham
2. Understanding Human Error in Mine Safety by Geoff Simpson, Tim Horberry, and Jim Joy
3. Mine Health and Safety Management by Michael Karmis

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
FT3EL13	Safety in Constructions	3	0	0	3

UNIT I

Introduction: Safe Material Handling Operations, Safe Handling of materials, Major injuries, Lifting appliances, Safe operations of Cranes, Pilings, Rigs, Side Booms, General Safety Requirements for Lifting operations Accident Reporting, Investigation and Analysis Definitions, Lost Time Injury (LTI), Multiple LTI, Lost Time Injury Frequency Rate (LTIFR), Lost time Injury Severity Rate (LTISR), Reporting near misses, Reporting Accidents

UNIT II

Working at Heights: Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings, requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection, safety belts, safety-nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.

UNIT III

Safety in Construction Operations: Underground works: - Excavation, drilling & blasting, trenching, strutting, piling & safety in using and operation machinery and equipment relating to above components. Above ground works: Scaffolding, Centering, Frame work, Ladders, Concreting wall and floor openings, staircases and railings. Structural steel work including welding, cutting erection etc. Safety in use of related machinery equipment's.

UNIT IV

Safety in Demolition Operations: Planning & permit, Precautions prior to demolition; Protection of public; Precautions during demolition; Sequence of demolition operations from safety point. Safety measures with respect to building materials including cement, lime, timber, steel, glass, paints, varnishes, and petroleum products.

UNIT V

Health and Welfare: Personal protective equipment's; Health, Welfare measures; First aid facilities, Salient Features of safety and Health in The Building and other Construction Workers (Regulation of employment and conditions of service) Act 1996 and central rules 1998 (IS & NB codes).

Text Books:

1. K.N. Vaid, Construction Safety Management.
2. V.J. Davies and K. Tomasin, Construction Safety Handbook.
3. James B. Fullman, Construction Safety, Security & Loss Prevention

Reference Books:

1. Linger L, Modern Methods of Material Handling
2. R.T. Ratay, Handbook of Temporary Structures in Construction.
3. National Building Code of India

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
FT3EL01	Fire Fighting Installation & Automation	3	0	0	3

UNIT I

Grouping of Fixed Fire Fighting Installations: Provisions of First Aid Fire-Fighting Arrangements, External Hydrants, Ring- Mains, Rising Mains, Down Corner, Dry- rises, Wet- rises and specification of each types, their relevant code of practices.

UNIT II

Water Supply & Hydrants System: Grading, Requirement of water supply, Total requirement of water for different hazards pressure tanks water supply, designing of Fire Hydrant System for different occupancies; designing of H/VWSS/M/VWSS/Sprinklers System; Types of Sprinklers system and its specification New Standard for the installation of Sprinklers and Hazard classification, Multiple Drenchers, Rules for spacing Sprinklers and drencher's heads.

UNIT III

Fire Detection: Need and importance of automatic fire detection system, principle of detection, classification of detectors; Heat detectors – fixed temperature, rate of rise , thermistor rate of rise and rate compensated type detectors; Smoke detectors- optical and ionization type, photo electric light scattering and light obstruction type detectors; Flame detectors – infra red and ultra violet detectors; Flammable gas detection- laser detectors; Testing of fire detection devices as per relevant Indian standards specifications; Comparison of detectors; Performance characteristics of detectors; Lag time associated with fire detection.

UNIT IV

Mechanical Foam Installation: Determination of foam compound for fire-fighting in oil tanks, Methods of application, Top application Base injection, Sub-surface Injection, Foam inlets and Risk for which foam is used, Premix foams, Installation characteristics of foam, Different types of foam, Low expansion, Medium expansion and High expansion foam, their special application, advantage and disadvantage of various types and the storage of foam concentrates.

UNIT V

Installations Involving Carbon Di-oxide and Dry powder: Their special features, characteristics, designing, arrangements, operation, extinguishing action, risk, specification
Fire Alarm & Detection System: Designing, Calculations, Testing and Maintenance, Working principle of smoke detectors, heat detectors, Flame detectors & optical beam type detectors.

Text Books:

1. Standard Installation of sprinklers system by NFPA.
2. A study of Performance of Automatic sprinklers system by NFPA.
3. National Fire Code of sprinklers by NFPA.

Reference Books:

1. Care and Maintenance of sprinklers system by NFPA.
2. Fire and Fire by UNISEF Publication.
3. Relevant Indian Standard and Code of Practices

J. K. Land

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
FT3EL12	Safety in Chemical Industries	3	0	0	3

UNIT I

Toxic Release and Dispersion Models: Design basis, source model, dispersion model, Pasquill- Gifford model, effect of release momentum, Entry Points for Toxic Agents, Effects of Toxic Substance

UNIT II

Storages : storage tanks and vessel- layout segregation, separating distance, secondary containment- venting and relief, atmospheric vent, pressure, vacuum valves, flame arrestors, fire relief- fire prevention and protection LPG storage, pressure storage, layout, instrumentation, vaporizer, refrigerated storages LNG storages, hydrogen storage, toxic storage, chlorine storages, ammonia storages, other chemical storages- underground storages- loading and unloading facilities- drum and cylinder storage- ware house

UNIT III

Fire and Explosion: Work Place Hazard, Dangerous Substance Fire triangle, Effective Ignition Source, Static Electricity, Explosion: BLEVE, VCE, Detonation and Deflagration, Flammability Limits, LOC, Flash point, Flammability Diagram, Flammable and Combustible Liquids, storage hazard assessment of LPG and LNG Hazards during transportation

UNIT IV

Transportation and Case Studies: Pipeline transport, Safety in transportation of dangerous materials by road, rail, ships and pipelines. Safety in bulk storage of hazardous substances. Safety in shelf storage of hazardous substances
Review of Industry Accidents Major Oil Industry Accidents Major Chemical Industry Accidents: Flixborough Disaster, Seveso Disaster, The Mexico LPG Disaster, Phillips Disaster

UNIT V

Risk Assessment: Recognition of chemical hazards-dust, fumes, mist, vapor, fog, gases, types, concentration, Exposure vs. dose, TLV, Methodology for Hazard and Risk analysis: Hazards survey or inventories, hazards and operability studies (HAZOP), failure mode and effect analysis (FMEA), fault tree analysis (FTA), Event tree analysis (ETA, SOP)

Text Books:

1. Chemical Engineers handbook peoy JHJ & Chitten
2. Hazardous materials emergency planning guide-NSC India.
3. Loss prevention in the process Industries F.P. Lees.
4. Technical guidance for hazard analysis - NSC India.
5. Process equipment design - MV Joshi

Reference Books:

1. Chemical process safety, fundamental with application- Daniel A Crowl/ Joseph F Louver
2. Chemical exposure and toxic response- Edited by- Stephen K. Hall, Joana Chakraborty, Randall J. Ruch.
3. Chemical Risk analysis- Bernard Martel

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