

CERTIFICATE COURSE IN CONSTRUCTION SAFETY

(Duration: SIX MONTHS)



**STATE BOARD OF TECHNICAL EDUCATION AND
TRAINING**

**Sankethika Vidhaha Bhavan, Masab Tank,
Hyderabad – 500 028**

CERTIFICATE COURSE IN CONSTRUCTION SAFETY

COURSE TITLE : CERTIFICATE COURSE IN CONSTRUCTION SAFETY

COURSE CODE : CS

Periods per week : 5 days/s 30 Periods

Periods / Semester 650

TIME SCHEDULE

Subject Code	Major Subjects	Periods	Practical Periods	Weight age of Marks	
				Short Questions	Essay Type
CS-101	HSE Management	80	--	40	60
CS-102	Safety Engineering	120	--	40	60
CS-103	Construction Safety Management	150	--	40	60
CS-104	SHE Legislations	150	--	40	60
CS-105	Project Work		150	40	60
	TOTAL	500	150	200	300

HSE MANAGEMENT

Subject Title	: HSE MANAGEMENT
Subject Code	: CS-101
Periods/ weeks	80
Periods/ year	100

TIME SCHEDULE

S.No	Topic	No. of Periods	Short Questions	Long Questions
1	Introduction	20	1	1
2	Planning, Organizing and Directing for Safety	20	2	2
3	HSE Education & Training	20	1	1
4	Employee participation in Safety, Accident Prevention	20	2	2
5	BBS	20	1	1
6	MIS	20	1	1
Total		100	8	8

RATIONALE: To inculcate the Management Principles and Techniques for better practices of Safety, Health and Environment (SHE)

CHAPTER NO.	DETAILS
1	Introduction • Management Principles, Levels of Management- Lower, Middle and Top • Types of Management – Line and Staff; Line and Staff Functions for Safety, Health and Environment • Authority, Accountability and Responsibility of Management • Span of Management • Delegation and Decentralization of authority

	• Role of Management in Construction / Industrial Safety
2	Planning for Safety: • Planning: Definition, purpose, nature, scope and procedure. Range of planning, Variety of plans. • Strategic planning and tools of implementation • Management by Objectives and its role in Safety, Health and Environment • Management (Safety) Policy formulation and implementation • National policy on Safety, Health and Environment at Workplace Organizing for Safety: • Organizing: Definition, need, nature and principles • Organizing for safety, Health and Environment • Organizing structure, functions and responsibilities. • Safety Committee: Structure and Functions Directing for Safety: • Definition, process, principles and techniques. • Leadership: Leadership- Style, Role, functions and attributes of a good Leader. • Communication: Purpose, process, types and channels, Essential rules in Communication, Two ways communication, Barriers in Communication, Essentials of effective communication, Communication and group dynamics, Team building.
3	Safety, Health and Environment Management (SHE) Education & Training Elements of training cycle - Training need assessment - Techniques of Training, design and development of training programmes/modules - Training methods and strategies - Types of training - Evaluation and review of training programmes - Competence Building Technique (CBT) - Role of Multi-media, Communication, Applications of Computers
4	• Employee Participation in Safety: Purpose, areas of participation, methods; Role of trade union in Safety, Health and Environment protection; Toolbox talks, Safety Kaizen, One-point Lessons, etc.; Safety promotion and Safety Awards (National, State Level and unit Level) and Suggestion Schemes, Safety competitions, Safety

	incentives Publicity schemes, Audio Visual publicity, Other promotional methods. • Definitions of Incident, Accident, Injury, Dangerous occurrences, Unsafe Acts, Unsafe conditions Hazards, Error, Oversight, Mistakes etc.; • Accident prevention: Principles of Accident Prevention / program plan; Theories of Accident Causation; Need of Accident Prevention; Causes of Accident; Accident Prevention Models – Heinrich Theory, Frank Bird Model, Domino Model; Systems Model, Human Factor Model, Swiss Theory of Accident Causation • Accident costs – Direct and Indirect; • Role of supervisor in accident prevention; Role of Workmen in accident prevention; Role of Management in accident prevention; Role of Trade Union in accident prevention; Role of Factory Medical Officer in accident prevention; Role of Safety Officer in accident prevention • Accident / Incident / Near-miss/ Dangerous Occurrence reporting and Investigation: Accident/Incident Investigation reporting and investigation purpose and process - Accident Report forms - Accidents reportable under various statutes like Factories Act, 1948, the BOCW Act 1996, the ESI Act 1948 etc - Agencies investigating accident - Identifying the key factors and the immediate and basic causes - Accident investigation report, Corrective Action and Preventive Action (CAPA)
5	• Behavior Based Safety (BBS) - Human Behavior: Individual differences, Causes of behavior Changes. Behavior as function of self and situation, perception of danger and acceptance of risk, knowledge and responsibility vis-à-vis safety performance. • Theories of Motivation and their application to Safety, role of supervisors and safety departments in motivation. • Conflict & Frustration: Identification of situations leading to conflict and frustration and techniques of management. • Classification of Industrial Accidents and Special Cases according to IS-3786: Classification of accidents as per IS-3786, Assessment of

	special cases: Inguinal hernia, back injury, Aggravation of pre-existing condition, Aggravation of a minor injury, cardio-vascular diseases, Miscellaneous, Other disabilities
6	• Management Information System: Sources of information on Safety, Health and Environment protection, Compilation and collation of Information; Analysis & use of modern methods of programming, Storing and retrieval of MIS for Safety, Health and Environment; Computer utilization in Safety, Health and Environment (SHE) and SHE Software development. • Safety Performance Indicators: Frequency Rate, Weighted Frequency Rate, Severity Rate (SR), Incidence Rate, Frequency- Severity Index (FSI), Safe T-score, Cost Factor, Cost severity rate, activity rate, Fatal Accident Frequency Rate (FAFR), Time charges in the Employee's Compensation Act, 1923; • Leading and Lagging Indicators • Occupational Health and Safety Audits: Occupational Health and Safety Audit IS-14489: 2018; Different types of audits; Internal, External audits Integrated Management System (IMS) – IS 18001:2007 / OSHAS 18001:2007 / ISO 45001

SAFETY ENGINEERING

Subject Title	: SAFETY ENGINEERING
Subject Code	: CS-102
Periods/ weeks	: 5 hours / 30 periods
Periods/ year	120

TIME SCHEDULE

S.No	Topic	No. of Periods	Short Questions	Long Questions
1	Safety in use of Hand tools and Portable Power Tools	20	1	1
2	Electrical safety & Lightning protection	20	1	1
3	Material Handling	20	2	2
4	Plant Designing & housekeeping; Permit to work	20	1	2
5	First Aid and PPE	20	1	1
6	Fire & Explosion	20	2	1
Total		120	8	8

RATIONALE: Acquire the Knowledge, Skill and Mechanism of functioning of Machine, Tools and Safe Use of the same

SYLLABUS

1	Safety in the use of Hand tools & Power tools: Main causes of accidents, prevention and control of accidents in the use of hand and power tools - Centralized and personal tool issues system - Purchase, Storage and supply of tools. - Inspection, maintenance and repair of tools. - Portable power tools and their selection, inspection, maintenance, repair and safe use - Non-sparking tools; Electrical Tools – Abrasive Tools – Pneumatic Tools – Electrical safety
2	Electrical Hazards at workplace - Hazards of electrical energy - Safe limits of amperages, Voltages - Safe distance from lines - Capacity and

	protection of conductor. Joints and connections. Means of cutting off power - Overload and short circuit protection - No load protection - Earth fault protection - Earth insulation and continuity tests Earthing Standards. - Protection against surge and voltage fluctuation. - Types of Protection for electrical equipment in hazardous atmosphere - Electrical area classification. Criteria in their selection, installation, maintenance and use. Lightning Protection - Definition, lightening splash, lightening strokes, lightening protection systems. Characterization of health effects of lightening stroke (electrical effects, side flashers, thermal effects, mechanical effects). Functions of lightning arrestors
3	Material Handling Manual: - Kinetics of manual handling - Maximum loads that could be carried - Lifting and carrying of objects of different shapes, size and weight - Safe use of accessories for manual handling. - Storage of materials: - Stacking and unstacking, Floor loading conditions, Layout condition for safety in storage - Ergonomics of manual handling and storage. Mechanical: Lifting machinery, Lifts and hoists -Safety aspects in design and construction, testing, use and care, signaling, inspection and maintenance ; Safety in design and construction, operation, inspection and maintenance of industrial trucks ; Safety in design and construction, operation, inspection and maintenance of lifting tackles and loose gears - testing, inspection and maintenance of lifting tackles ; Conveyors-Safety features, safe working load for all mechanical material handling equipment. The competent persons in relation to safety legislation – duties and responsibilities.
4	Plant design and Housekeeping: Plant layout, design and safe distance. - Need for planning and follow-up Safety and good housekeeping. Typical accidents due to poor housekeeping - Benefits of good housekeeping - Disposal of scrap and other trade wastes - Prevention of spillage - Marking of aisles space and other locations - Use of color as an aid for good housekeeping.

	Housekeeping contest. Cleaning methods - “5s” system - Safety checklist for buying new machinery for the plant - Role of standards and codes of practice for plant and equipment Permit to work systems: Types of Work permit – Hot Work, Cold Work, working at height, Electric Isolation, Confined Space entry, Excavation, Working on Fragile roof; Contents of work permits, Process for execution and closure of work permit; Lock Out and Tag Out (LOTO) System
5	Personal Protective Equipment: 2.1.1 : Need for personal protective equipment, selection, applicable standards Supply, use, care & maintenance respiratory and non-respiratory personal Protective Equipment. 2.1.2 : Non-respiratory personal protective devices: Head protection, Ear protection, Face and Eye protection, Hand protection, Hand protection, Foot protection, Body protection. 2.1.3 : Respiratory personal protective devices: Classification of hazards, Classification of respiratory Personal protective devices, Selection of respiratory personal protective devices. 2.1.4 : Instructions and training in the use, maintenance and care of self-containing breathing apparatus. Training in the use of breathing apparatus (Open Circuits and Close Unit) - Testing procedure and standards Define First Aid, Purpose, Principles of First aid, First Aider-Role & Responsibilities and Qualities Fundamentals of First Aid for thermal burns, Chemical burns, Fractures, Fainting, Shock, Insects and animal bites, Suffocation, Toxic Ingestion, Bleeding wounds and bandaging, Artificial respiratory, Cardiopulmonary Resuscitation (CPR), Techniques, Victim transportation, Rescue Techniques, first aid box and its contents.
6	Fire & Explosion: Industrial Fires. Dispersion Modelling

	• Chemistry of Fire – Classification of Fires • Common causes of industrial fires • Deflagration and Detonation • Fire Protection: Design of building, Plant, exits, etc. for fire safety. Fire resistance of building materials, Fire doors and firewalls, Determination of fire load. Dow Fire and Explosion Index, Salient features of fire explosion and toxicity index. • Fire Detection and Alarm System: - Various types of fire detection and alarm system., special safety measures for control of fire and explosion in handling / processing of flammable gases, liquids, vapors, mists, solids, dusts and flying. • Fire-fighting system: Different types of portable fire extinguishers, their installation, periodic inspection and operation. Replacement of Halon with safer substitutes. Fire hydrant system. Fire monitors, sprinkler systems and deluge system. Carbon-dioxide flooding system. Foam pourer system.
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CONSTRUCTIONS SAFETY MANAGEMENT

Subject Title	: CONSTRUCTION SAFETY MANAGEMENT
Subject Code	: CS-103
Periods/ weeks	: 5 hours / 30 periods
Periods/ year	150

TIME SCHEDULE

S.No	Topic	No. of Periods	Short Questions	Long Questions
1	Hazards in Construction Sector and their Preventive measures	15	1	1
2	Hazards control Measures & Working at Heights	20	1	1
3	Types of Construction Activity	40	2	2
4	General Safety Measures for Excavation, Piling etc.	25	1	1
5	Safety in Demolition Operation	25	1	1
6	Other Safety activities – Safety precautions	25	2	2
Total		150	8	8

RATIONALE: This subject deals with the scope of safety in construction operation as well as in the demolition operations. It also deals with importance of safety with regards to storage, stocking and handling of materials of construction

Chapter no.	Details
1	Hazards in Construction Sector and their Preventive measures Basic Philosophy - Peculiarities and Parameters governing the Safety In construction such as site planning and design layout, Safe Access, Good Housekeeping

	• Safety in use of Construction Machinery and transport equipment's, Signs and Indication • Liaison for Safety with local authorities • Structural Soundness • Accidents and Hazards – their causes and effects • Good Safety practices / Initiatives in Construction Safety Construction Safety Management – Introduction - Organizational Structure for Health and Safety Management - MANAGEMENT OF HEALTH AND SAFETY IN DIFFERENT STAGES OF THE PROJECT (Pre-Construction Stage, Construction Stage, Commissioning and Handing over stage) – Health and Safety Management Requirements
2	• Common Hazards – Air borne contaminants – Impregnation of Timber – Lead Poisoning – Toxic Fumes – Noise – Vibrations – Power Supply – Lighting – Maintenance – Housekeeping – Material – Movement – Drowning – Openings – Weight – Occupational Health and Hygiene – Risks to Health at work • Recommendations for Preventive measures against hazards at workplaces for – Falling material hazards prevention – Fall Prevention- Disposal of Debris – Timber structures – Fire Protection • Emergencies in Construction Sites and Construction Activities- recognition-assessment and mitigation planning-mock drills Working at Height: • Scaffolds and Ladders - Design Features, Installation, use related safety, Inspection and certification of Scaffolds-Use of Nets-laying-anchoring-inspection-limitations- fall protection systems –fall arresting systems-use of special protective equipment to facilitate safe working at height
3	Types of Construction Activity Working below ground level: • Excavation – Introduction, Hazards, Responsibilities of Foreman and Supervisors - Shoring and Timbering – Loose Side Material –

	Minimum Berm – Edge of Excavation to be kept clear – Plant and Machinery – Means of Access and Escape – Provision of Fences, Guards etc. – Use of Safety Rope – Lone workers – Harmful Gases and Fumes – Drilling and Blasting Operations- Insects, Leeches, Vermin's, snakes – Poisonous plants – Overhangs and Slopes – under cutting – Shelter- Temporary supports for foundations – Walkways and Bridges – Dangerous areas – Common Hazards in Excavation – Safety Precautions • Blasting and Related Drilling Operations – Statutory Requirements – Transportation of Explosives (Vehicles – Safety Precautions – Weights of containers) – Storage of Explosives – Handling and Use of Explosives – Drilling and Loading – Electrical short firing circuit - Blasting with Safety fuse - Underground work – Before and after blasting – Explosive disposal and Account • Piling and Other Deep Foundations – Piling Rig – Operation of Equipment – Floating pile drivers – Sheet Piling – Other measures while working with Caisson Foundation - Additional Measures for caisson foundation – Protection to neighboring structures and underground services • Tunneling Work – Safety program (Safety Personnel, Reporting of accidents) 0 Medical and other facilities (First aid arrangements, Protective wear, Sanitation and Drinking water, Miscellaneous, Telephone System, Warning signals) – Electrical installations and Lighting – Underground Excavation (Drilling Equipment, Drilling Operations, Underground transportation and storage, Loading and Blasting, Inspection and Blasting, Misfires, , Shaft Excavation, Water Handling, Machinery and Mechanical Equipment) – Ventilation – Scaling and Mucking
4	GENERAL SAFETY MEASURES At Ground Level: • Storage of Materials – General Considerations for Stacking and Storage – Stacking and Storage of Materials - Cement, Lime, Bricks, Aggregate, Fly ash, Steel, Doors, Ventilators and Windows, Roofing

	sheets, Boards, Plastic and Rubber sheets, Glass sheets, Asbestos cement, pipes and fittings, Polyethylene pipes, Un plasticized PVC Pipes, Bitumen, Road Tar and Asphalt, Oil Paints, Sanitary Appliances, Electrical materials, Piles etc. Underwater portions: • Construction, Operation and Maintenance of River Valley Projects – General Precautions – Amenities, Protective Clothing and Equipment – Plant and Machinery – Handling, Transportation and Storage of Explosives - Electrical aspects – Construction – Fire Safety Aspects – Open Excavation – Canals and Cross Drainage works – Storage, Handling, Detection and safety measures for gases, chemicals and flammable liquids – Underground Excavation
5	Safety in Demolition Operation- • Demolition - Demolition of Buildings – Planning – Precautions before starting demolition work – protection of the public – sequence of demolition operations – Removal of materials – Stairs, Passageways and Ladders – Demolition of Walls – Demolition of Floors – Demolition of Steel Structures – Catch Platforms – Mechanical Demolition- Recommendations for demolition of certain special types and Elements of Structures (Roof Trusses, Heavy Floor Beams , Jack Arches, Brick Arches, In-situ Reinforced concrete, Cantilevers (Not part of framed structures), Precast reinforced concrete) Special precautions for works of • Road Making - Hot mix plant – Sprayers – Spreader and Paver – Heating bitumen – Road Maintenance – Traffic management during construction repair /management • Structural steel erection – Advance Planning; Erection Equipment; Structural steel works; Scaffolding; Form work; Machinery; Surroundings – Other precautions – Safe Practices – Guidelines of safety requirements to be followed at sites of construction work • Safety during additional construction and alternation to existing buildings – Excavation and Trenching – Scaffolds and Ladders – Working platform, gangways and Stairways – Electrical installations

	and system – Stacking of materials – protective barriers – safety equipment for workers • Erection of Concrete Framed Structures – Handling of Plants (Mixers, Cranes, Trucks) – Form work – Ramps and Gangways – Prestressed concrete – Erection of Prefabricated members – Heated Concrete – Structural Connections – General. • Safety in grouting, guniting, shotcreating
6	• Other Safety activities - Safety code for Working in Compressed Air – Equipment – Duties of Lock attendants and Rules with regard to compression or decompression – Egress from Working Chamber – Temperature in Working Chamber – Employment of persons without previous experience – Identification badges – Medical supervision and Certification – Medical Lock – Drinks – Safety against fire Hazard – Detection of Gas – Hours of work – General • Site Transport – Human Factor – Vehicles and Drivers – Loading – Hazard Control – Machine Faults – Other dangers • Floor and Wall opening – Floor opening – Wall Opening – Cat-walks – Stairways • Construction Machinery – General Precautions – Earth Moving Machinery – Lifting and Hoisting Machinery – Transporting Machinery – Concrete Mixers and Batching Plants – Hydraulic Machines – Hazards and Control Measures / Safety Precautions • Safety and Health requirements in Electric and Gas welding and Cutting Operations – Installation and Operation of Gas Welding and Cutting Equipment – Installation and Operation of Arc-welding and Cutting Equipment – Installation and Operation of Resistance welding - equipment - Fire Prevention and Protection – Protection of Personnel – Ventilation and Health Protection

SHE LEGISLATIONS

Subject Title : SHE LEGISLATIONS
Subject Code : CS-104
Periods/ weeks : 5 hours / 30 periods
Periods/ year 150

TIME SCHEDULE

S.No	Topic	No. of Periods	Short Questions	Long Questions
1	Construction Laws	20	1	2
2	NBC & Indian Standards	20	1	1
3	Safety, Health and Environment (SHE) related Important Legislation	30	1	2
4	Social Security- Legislations	25	2	1
5	Environmental Related laws - 1	30	1	1
6	Environmental Related laws - 2	25	2	1
Total		150	8	8

RATIONALE: : To acquaint the student with National and International Acts, Rules, Conventions pertaining to Safety, Health and Environment

SYLLABUS

1	- Construction safety related Acts and Rules (Central Act, Central Rules and State Rules) - Building & Other Construction Workers (RE & CS) Act, 1996 and Central Rules, 1998: - Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Welfare provisions, Penalties. - Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Welfare provisions, Penalties
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	• The Occupational Safety, Health and Working Conditions Code, 2020 & Rules framed there under • Telangana Building and Other Construction Workers Welfare Board
2	• National Building Code 2016 (as amended) - Provisions on construction safety • Special Publication of Indian Standards on Construction Safety and • General safety related Indian Standards
3	Sections Pertaining to HSE: • The Explosives Act and Explosive rules • The Petroleum Act and Petroleum Rules • Gas Cylinder Rules 2016 • The Electricity Act 2003 & Rules framed there under • Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations 2010
4	• The Public Liability Insurance Act 1986 amended 1991 (as amended) • Contract Labor (R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Women Employment related- Migratory Workers-Workmen compensation • The Employees State Insurance Act, 1948 & Rules framed there under • The inter-state migrant workmen (Regulation of Employment and Conditions of Service) Act, 1979 & Rules framed there under • The Minimum Wages Act, 1948 • Child Labour (Prohibition and Regulation) Act, 1986
5	• Environment (Protection) Act, 1986 & Rules Framed there under • The Water (Prevention and Control of Pollution) Act and rules • The Air (Prevention and Control of Pollution) Act and rules

	• Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 • Central Motor Vehicles Rules, 1989 • The Motor Vehicle Act and rules
6	• E-Waste (Management) Rules, 2016 • Noise Pollution (Regulation and Control) Rules, 2000 • Battery Waste Management Rules, 2020 • Bio-medical waste (Management and Handling) Rules, 1998 • Construction and Demolition Waste Management Rules, 2016 • Plastic waste Management & Handling Rules 2011 (as amended)

Subject Title: PROJECT WORK

Subject Code: CS-105

Periods/ year:150

The main aim of the preparation of project on construction safety is to judge the knowledge gained by the students during their tenure of the construction safety programme. The transfer or learning that has taken place as well as their exposure to industrial environment and its safety, so that many faceted developments of the students can be achieved under various skills of domains such as Personal, Social, Professional and lifelong learning. The students will be benefited lot by this exercise of preparation of project on their safety experience which will certainly add values in their attitudes such as value for health, work commitment, hardworking, honesty, problem solving, punctuality, loyalty and independent study.

The student should also make a brief presentation about the project and the salient observations and findings.

The Project report should essentially consist of the following

1. Title of the Project work
2. Contents
3. Acknowledgement
4. Preface, Objective and Methodology
5. Introduction
6. Safety, Health and Environmental Activities in the Company
7. Recommendations
8. References / Bibliography
9. Any Key learning in construction safety after project

Implementation Strategy

The project report is to be assessed by external and internal examiners equally for

a) Project assessment – 70 marks

b) Oral based on Project Work – 30 Marks

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
- Font Size – 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)