

ALAGAPPA UNIVERSITY

(Accredited with A+ Grade by NAAC (CGPA: 3.64) in the Third Cycle), Graded as
Category-I University and granted autonomy by MHRD-UGC)

DIRECTORATE OF COLLABORATIVE PROGRAMMES



Post Graduate Diploma in Fire & Industrial Safety

Regulations and Syllabus

[For those who join the Course in July 2023 and after]

CHOICE BASED CREDIT SYSTEM

GENERAL INSTRUCTIONS AND REGULATIONS

Post Graduate Diploma in Fire & Industrial Safety conducted by Alagappa University, Karaikudi, and Tamil Nadu through its Collaborative Institution . Applicable to all the candidates admitted from the academic year **2023** onwards.

1. Eligibility:

Candidate for admission to **Post Graduate Diploma in Fire & Industrial Safety** shall be required to have passed in any bachelor degree with 55% marks from recognized University/Institution.

Pattern: Semester

2. Admission:

Admission based on the marks in the qualifying examination.

3. Duration of the course:

The course for the Full-Time students shall extend over a period of only one Academic Year.

4. Standard of Passing and Award of Division:

- a. Students shall have a minimum of 50% of total marks of the University examinations in each subject. The overall passing minimum is 50% both in aggregate of Continuous Internal Assessment and external in each subject.
- b. The minimum marks for passing in each theory / Lab course shall be 50% of the marks prescribed for the paper / lab.
- c. A candidate who secures 50% or more marks but less than 60% of the aggregate marks, shall be awarded **SECOND CLASS**.
- d. A candidate, who secures 60% or more of the aggregate marks, shall be awarded **FIRST CLASS**.
- e. The Practical / Project shall be assessed by the two examiners, by an internal examiner and an external examiner.

5. Continuous internal Assessment:

- a. Continuous Internal Assessment for each paper shall be by means of Written Tests, Assignments, Class tests and Seminars
- b. **25 marks** allotted for the Continuous Internal assessment is distributed for Written Test, Assignment, Class test and Seminars.
- c. Two Internal Tests of 2 hours duration may be conducted during the semester for each course / subject and the best marks may be considered and one Model Examination will be conducted at the end of the semester prior to University examination. Students may be asked to submit at least five assignments in each subject. They should also participate in Seminars conducted for each subject and marks allocated accordingly.
- d. Conduct of the continuous internal assessment shall be the responsibility of the concerned faculty.
- e. The continuous internal assessment marks are to be submitted to the University at the end of every year.
- f. The valued answer papers/assignments should be given to the students after the valuation is over and they should be asked to check up and satisfy themselves about the marks they have scored.
- g. All mark lists and other records connected with the continuous Internal Assessments should be in the safe custody of the institution for at least one year after the assessment.

6. Attendance:

- Students must have earned 75% of attendance in each course for appearing for the examination.
- Students who have earned 74% to 70% of attendance to be applied for condonation in the prescribed form with the prescribed fee.
- Students who have earned 69% to 60% of attendance to be applied for condonation in the prescribed form with the prescribed fee along with the medical certificate.
- Students who have below 60% of attendance are not eligible to appear for the examination. They shall re-do the semester(s) after completion of the programme.

7. Examination:

The University examinations will be held at the end of the Academic Year for duration of three hours for each subject.

8. Miscellaneous

- a. Each student possess the prescribed text books for the subject and the workshop tools as required for theory and practical classes.
- b. Each student is issued with an identity card by the University to identify his / her admission to the course
- c. Students are provided library and internet facilities for development of their studies.
- d. Students are to maintain the record of practicals conducted in the respective laboratory in a separate Practical Record Book and the same will have to be presented for review by the University examiner.
- e. Students who successfully complete the course within the stipulated period will be awarded the degree by the University.

9. Fee structure

Course fee shall be as prescribed by the University and 50% of the course fee should be disbursed to University. Special fees and other fees shall be as prescribed by the Institution and the fees structure must be intimated to the University. Course fees should be only by Demand draft / NEFT and AU has right to revise the fees accordingly.

Pattern	Course Fee payment deadline
Semester	Fee must be paid before 10 th February of the academic year

10. Other Regulations:

Besides the above, the common regulation of the University shall also be applicable to this programme.

Post Graduate Diploma in Fire & Industrial Safety

	Course Code	Title of the Paper	T/P	Cr.	Hrs./ Week	Max.Marks		
						Int.	Ext.	Total
Sem I	90711	Fire Safety-Design, Installation and Maintenance	T	4	5	25	75	100
	90712	Industrial Safety Management	T	4	5	25	75	100
	90713	Fire Fighting and Rescue Operation Practical	P	5	10	25	75	100
	90714	Risk Assessment Practical	P	5	10	25	75	100
			Total		18	30	130	270
Sem II	90721	Construction Safety	T	4	5	25	75	100
	90722	HIRA & Safety Audit	T	4	5	25	75	100
	90723	Work at Height Practical	P	5	10	25	75	100
	90724	Confined Space Practical	P	5	10	25	75	100
		Total		18	30	130	270	400

PG DIP (F&IS) I -Semester

Core	Course code: 90711	Fire Safety Design , Installation and Maintenance	T	Credits:4	Hours:5
Course Objectives	<ol style="list-style-type: none"> 1. To provide an in depth knowledge about the science of fire. 2. To understand the causes and effects of fire. 3. To know the various fire prevention systems and protective equipments. 4. To understand the science of explosion and its prevention techniques. 5. To understand the various fire prevention techniques to be followed in a building. 				
UNIT -1	FIRE AND CLASSIFICATIONS OF BUILDING & HAZARDS Basics Of Fire –Fire Triangle, Tetrahedron And Pentagon-Flash Point-Ait-Fire Fighting Techniques- Fire Classification-Mode Of Heat Transfer- Types Of Fire Based On The Size &Manner-Stage Of Fire –Fire Load-Identify Ignition Sources-Classify The Level Of Fire Hazards-National Building Code –Nbc Classification Based On Occupancy.				
UNIT-2	FIRE PROTECTION AND CONTROL Fire Protection System- Types Of Fire Protection (Active & Passive)-Fire Extinguisher-Operating Methods- Types Of Fire Extinguisher-Installation Of Fire Extinguisher-Maintenance And Service Of Fire Extinguisher- Modular Fire Extinguisher-Sand And Water Bucket Technic Details-Fire Ball-Fire Blanket.				
UNIT-3	HYDRANT AND SPRINKLER SYSTEM Introduction-Fire Hydrant System-Installation Of Hydrant- Fire Water Storage Tank Specification-Hydrant Pipe Size-Hose Box-Hose Reel Drum-Hose Roll Training-Branches And Nozzle-Water Monitoring-Collecting Head/Suction Hose-Hydrant Fitting Methods-Sprinkler Heads –Installation Of Sprinkler System-Installation Of Wet/Dry, Foam, Pre-Action, Deluge Fire Sprinkler System-Fire Pump Room.				
UNIT-4	SUPPRESSION AND FLOODING SYSTEM Introduction-Co2 Flooding System-Co2 Suppression System-Installation of Clean Agent Suppression System-Foam Flooding System-Foam Suppression System-Basics Of Fire Brigade				
UNIT- 5	FIRE ALARM TECHNOLOGY Introduction-Fire Alarm Designing- Fire And Smoke Detectors-Flame Detectors-Communication Techniques-Basics Of Electrical And Electronic In Fire Alarm-Application Of Equipment-System Operation & Control-Installation Of Alarm Panel-Installation Of Mcp-Emergency Light Installation-Wiring Methods Of Fire Alarm System-Location Setting In Detectors-Program Of Alarm Panel-Maintenance, Services-Training.				
References					
<ol style="list-style-type: none"> 1. “Accident Prevention manual for industrial operations” N.S.C., Chicago, 1982. 2. “Davis Daniel et al, “Hand Book of fire technology” 3. “Fire Prevention and firefighting”, Loss prevention Association, India. 4. Derek, James, “Fire Prevention Hand Book”, Butter Worths and Company, London, 1986. 5. Dinko Tuhtar, “Fire and explosion protection 					
Related online content (MOOC, Swayam,NPTEL, Website etc.):					
https://archive.nptel.ac.in/courses/105/102/105102176/ https://onlinecourses.nptel.ac.in/noc20_ce09/preview					
Course outcomes				Knowledge level	
CO-1	To Recall about basic concepts of fire and explosion science.			K1	
CO-2	To Summaries the different source of ignition and their			K2	

	prevention techniques.	
CO-3	To Practice the operation of various types of firefighting equipments.	K3
CO-4	To Interpret the causes and prevention of explosion.	K5
CO-5	To Explain the students to effectively employ explosion protection techniques and their significances to suit the industrial requirement	K6

PG DIPLOMA IN (F& IS) - FIRST SEMESTER

Course code: 90712		Industrial safety management	T	Credits: 4	Hours: 5
Course Objectives	1. To familiarize the basic information about industrial safety. 2. To provide technical knowledge about personal protective equipment's. 3. To educate on electrical safety. 4. To analyze the chemical hazards and safety precautions. 5. To learn about legal aspects of health and safety.				
UNIT I	BASICS OF INDUSTRIAL SAFETY Safety Policy- Implementation of Safety Management System -Hazard - Hazard Analysis- Hierarchy of Controlling Hazard- Risk - Risk Assessment - Unsafe Work - Unsafe Condition - Accident, Incident - Accident / Incident Investigation- Work Permit System - Standard Operating Procedures- Audit				
UNIT II	PERSONAL PROTECTIVE EQUIPMENT Head Protection- Eye Protection - Ear Protection - Hand Protection - Leg Protection - Skin Protection - Respiratory Protection - Fall Protection				
UNIT III	BASICS OF ELECTRICITY & HAZARDS OF ELECTRICITY Introduction-Current-Voltage-Power-Resistance-Capacitor-Inductor - Ohm's Law - Types of Electrical Faults-Overloads -Short Circuits-Hazard Analysis-Shock-Arc- Blast - Body Parts & Effects of Shock- Primary & Secondary Hazards - Shocks - Burns- Scalds Falls - Safety in the Use of Electricity-Lock Out Tag Out-Permit to Work System - Indian Electricity Rules - Statutory Requirements from Electrical Inspectorate-International Standards on Electrical Safety-CPR				
UNIT IV	EVALUATING HAZARDS & ASSESSING RISKS OF CHEMICALS Introduction- Types of Chemicals - Routes of Entry Sources of Information-Toxicity- Flammable, Reactive & Explosive Hazards Physical Hazards Nano materials Biohazards- Radioactive Hazards - Labeling of Chemicals - Safety Data Sheet-Globally Harmonized System - Exposure Limits WHMIS Symbols -CLP Hazard Pictogram Toxicological Properties: LC50 & LD50 Flammable Limits - Atmospheric Monitoring- Health Surveillance-Green Chemistry Acquisition of Chemicals - Inventory& Tracking of Chemicals - Transportation of Hazardous Chemicals - Emergency Information Panel -HAZCHEM Code - Chemical Exposure Risk Assessment-Hierarchy of Risk Controls.				
UNIT V	EHS LAWS & ACTS Factories Act, 1948 - Environment Act, 1986 -Manufacture. Storage & Import of Hazardous Chemical Rules, 1989 - Hazardous Wastes (Management And Handling) Rules, 1989 - The Building And Other Construction Workers Act 1996 - Health And Safety Work Act (HASAWA 1974, UK)-OSHAS 18000-ISO 14000- American National Standards Institute (ANSI).				
References					
1. Handbook of Occupational Safety and Health,S. Z. Mansdor,f29 March 2019 2. Changing the Workplace Safety CultureBy Ron C. McKinnon 2014					
Related online content (MOOC, Swayam, NPTEL, Website etc.)					
https://archive.nptel.ac.in/courses/110/105/110105094					
https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-mg59					
Course outcomes					Knowledge level
CO-1	To outline the fundamental concepts of integrated safety.				K2
CO-2	To identify the personal protective equipment's and its types.				K3
CO-3	To simplify the electrical hazards and safety measures.				K4
CO-4	To measure the chemical exposure and chemical safety				K5
CO-5	To explain the various EHS legislations.				K5

PG DIPLOMA IN (F& IS) - FIRST SEMESTER

Course code: 90713

**FIRE FIGHTING & RESCUE
OPERATION PRACTICAL**

P

Credits: 5

Hours: 10

OBJECTIVES

- 1.To Impart the Fire Fighting & Emergency response to the students
- 2.To Express the Evacuating procedure and emergency response procedures

EXPERIMENTS

1. Identification of classes of fire.
2. Learning the methods of fire fighting.
3. Identification of appropriate fire extinguishers.
4. Evacuating workforce by means of emergency siren/alarm.
5. Steps for emergency planning and preparedness.
6. Emergency response team and their response.
7. Headcount procedures.
8. Fire mock drill & rescue operation.
9. Different types of sirens and siren coding.
10. Debriefing and resuming operations.

REQUIREMENTS

1. All type of Fire extinguishers
2. Emergency Services
3. Suitable water and sand buckets
4. All other required safety equipments for fire demo
5. Provision of Windsock

OUTCOMES

The students will be able to

1. To Identify the Fire classifications and fire fighting methods.
2. To Practice Fire Rescue and evacuation methods with ERP procedures
3. To Operate fire mock drill with Headcount arrangements
4. To classify Siren codings and simplify resuming operations.

REFERENCE

1. Guide book on Fire safety – National Safety Council-2014
2. Guide book-Designing for Fire safety-National safety council-2015
3. Practical Guide on SHE-Volume 4-National safety council-2010

PG DIPLOMA IN (F& IS) - FIRST SEMESTER

Course code: 90714

**RISK ASSESSMENT
PRACTICAL**

P

Credits: 5

Hours: 10

OBJECTIVE:

- 1.To Identify Hazards and provide Evaluation methods with qualitative and quantitative analysis
- 2.To Assess Risk analysis and SIL with safety Instrumentation systems.

EXPERIMENT

Step 1: identify the hazards

Step 2: decide who may be harmed and how

Step 3: evaluate the risks and decide on control measures

Step 4: record your findings

Step 5: review the risk assessment

COURSE OUTCOMES:

The students will be able to:

- 1.To Identify hazards and Illustrate Risk and Risk Ranking
- 2.To evaluate Hazard & Relate Risk Analysis for an incident
- 3.To Formulate Qualitative and Quantitative Hazard Analysis for incidents
- 4.To Determine SIL and explain HAZOP and FMEA procedures

REFERENCES

- 1."Plant Hazard analysis and safety Instrumentation systems", Swapna Basu , Academic Press-Elsevier,ISBN:9780128037638

PG DIP(F& IS)II -Semester				
Course code: 90721	CONSTRUCTION SAFETY	T	Credits: 4	Hours: 5
Course Objectives	1. To know causes of accidents related to construction activities and human factors associated with these accident 2. To understand the construction regulations and quality assurance in construction 3. To have the knowledge in hazards of construction and their prevention methods 4. To know the working principles of various construction machinery 5. To gain knowledge in health hazards and safety in demolition work			
UNIT I	ACCIDENTS CAUSES AND MANAGEMENT SYSTEMS Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident –construction regulations, contractual clauses – Pre contract activates, preconstruction meeting -design aids for safe construction – permits to work – quality assurance in construction - compensation– Education and training			
UNIT II	HAZARDS OF CONSTRUCTION AND PREVENTION Excavations, basement and wide excavation, trenches, shafts – scaffolding , types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work, dismantling –tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water - road works – power plant constructions – construction of high rise buildings.			
UNIT III	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 IV	CONSTRUCTION MACHINERY Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder’s hoist, winches, chain pulley blocks – use of conveyors – concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes – manual handling.			
UNIT V	SAFETY IN DEMOLITION WORK Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition- Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods –interesting experiences at the construction site against the fire accidents			
References				
1. Handbook of OSHA Construction safety and health charles D. Reese and James V. Edison 2. Hudson, R.,”Construction hazard and Safety Hand book, Butter Worth’s, 1985. 3. JnatheaD.Sime, “Safety in the Build Environment”, London, 1988. 4. V.J.Davies and K.Thomasin “Construction Safety Hand Book” Thomas Telford Ltd., London, 1990				
Related online content (MOOC, Swayam,NPTEL, Website etc.)				
https://onlinecourses.nptel.ac.in/noc21_ce16/preview https://archive.nptel.ac.in/courses/105/102/105102206/				
Course outcomes				Knowledge level

CO-1	To Recall the problems impeding safety in construction industries.	K1
CO-2	To Summarise the types and causes of accidents, and designing aids for safe construction.	K2
CO-3	To Categorise the hazards during construction of power plant, road works and high rise buildings.	K4
CO-4	To Interpret construction regulations and Indian standards for construction and demolition work.	K5

PG DIP (F&IS) II -Semester					
Course code: 90722		HIRA and Safety Audit	T	Credits: 4	Hours: 5
Course Objectives	1.To Describe fundamentals of Hazard and risk with Human error analysis 2.To Express Risk analysis with Root cause analysis methods and Cost benefit analysis 3. To achieve understanding of safety inspection and audit 4. To enable students to conduct safety audit and write audit report effectively in auditing situation 5. To Evaluate HAZOP studies with its methodologies				
UNIT I	FUNDAMENTALS OF HAZARD, RISK&RISK RANKING Introduction-hazard & risk –risk register –risk characterization& risk ranking-hazard characterization-horseplay-hazardous event- unsafe act-unsafe condition-preliminary hazard analysis-ALARP-Concept of AIARP- and Its Application in Risk Assessment.				
UNIT II	HIRA HAZARD IDENTIFICATION & RISK ASSESSMENT (HIRA)- Objectives of HIRA study-principles of risk assessment-Steps involved in Hazard identification and risk assessment- Identification of the Hazard- Risk Analysis- Evaluation Of Hazard And Risk –Risk Matrix-Risk Control Method-Preventive Measure- Control Measure-Reporting-Implementation &Monitoring-Review Of HIRA-Quantitative risk assessment-Qualitative risk assessment.				
UNIT III	SAFETY INSPECTION Importance of workplace inspection-purpose of inspection-planning of workplace inspection-hazards in workplace- types of inspection-information required in workplace inspection report-inspection team-duration of inspection-frequency of inspection follow up &monitoring-Safety tours- Safety sampling-Checklist-Safety Culture.				
UNIT IV	SAFETY AUDITING Safety Audit-Types of safety audit-audit objectives-methodology to conduct safety audit-Pre audit activities-background information to be gathered-data to be gathered-on site activities-understanding management system-assessing strength &weakness-collecting audit evidence-interviewing-observation-evaluating audit evidence-reporting audit findings-post audit evidence- Safety Report and Risk Assessment Report for emergency planning. ISO 14040(ECO LABELLING) - EIA Methodology.				
UNIT V	SAFETY MANAGEMENT TECHNIQUES Hazard and Operability Studies (HAZOP) – HAZOP METHODOLOGY-Hazard analysis (HAZAN)-Fault Tree Analysis (FTA)-Event Tree Analysis (ETA)-Failure Mode &Effect Analysis (FMEA)- FMEA Methodology-Types Of FMEA-When To Use FMEA-FMEA Procedure-Steps-Risk Priority Number-Control Measure OF FMEA.				
References					
1.ENVH 577 Readings (On Canvas site) 2. Harr, J., A Civil Action. Vintage Press, 1996 (on reserve at HS Library) 3. “Guidelines on Occupational Health and Safety Management Systems (OSH-MS)” International Labour Organization, 2001 4. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980 5. John Ridley, “Safety at Work”, Butterworth and Co., London, 1983					
Related online content (MOOC, Swayam,NPTEL, Website etc.)					
www.atsdr.cdc.gov/HAC/HAGM/ https://archive.nptel.ac.in/courses/110/105/110105160/					
Course outcomes				Knowledge level	
CO-1	To Recall Fundamentals of Hazard and Risk with concept of ALARP			K1	
CO-2	To Illustrate Risk analysis methods with Risk Identification			K2	
CO-3	To recall basic safety audit and prepare a report for safety audit			K1	
CO-4	To Illustrate safety inspection and prepare a report for safety inspection			K2	
CO-5	To Interpret Safety Management tools with HAZOP			K4	

PG DIP (F&IS) II -Semester

Course code: 90723

WORK AT HEIGHT PRACTICAL

P

Credits: 5

Hours: 10

OBJECTIVES:

- 1.To Provide Safety in Work at Height to students
- 2.To Impart PTW for Work height with illustrations to students.

EXPERIMENTS:

- 1.100% tied off procedure.
- 2.3 point anchorage while ascending and descending.
- 3.Wearing the full body harness with double lanyard.
- 4.Using method of vertical / horizontal lifeline.
- 5.Training on the use of fall arrestor – rope grab and retractable.
- 6.Using the safety net for man falling and material handling.
- 7.Inspection of all fall protection equipments.
- 8.Learning of technical data's about fall protectors.

REQUIREMENTS:

- 1.Fall protection harness with double lanyard.
- 2.Rope grab.
- 3.Vertical / horizontal lifeline.
- 4.Fall arrestor – retractable.
- 5.Safety net and Debris net.
- 6.Mobile ladders.
- 7.All other training and safety required equipments.

OUTCOMES

The students will be able to

- 1.To Illustrate tie off procedure and anchorage ascending and descending methods
- 2.To Interpret the full body harness and method of vertical / horizontal lifeline
- 3.To Priorities use of fall arrestor and safety net
- 4.To Justify technical data's on Fall arrestors and Fall protection equipments

PG DIP (F&IS) II -Semester

Course code: 90724

**CONFINED SPACE
PRACTICAL**

P

Credits: 5

Hours: 10

EXPERIMENTS:

- 1.Practise on gas detecting / testing and other inspection of toxic gases.
- 2.Practise on entry into confined space and rescue operation.
- 3.Practise on work permit system for confined space entry.
- 4.Purging/cleaning/removing of toxic gases or any other flammable gases.
- 5.Direct supervision of confined space attendant / hole watcher.

REQUIREMENTS:

- 1.Portable Gas tester.
- 2.Proper safety sign boards.
- 3.Suitable fire extinguisher.
- 4.First aid box.
- 5.Emergency escape breathing apparatus.
- 6.Required PPE.

OUTCOMES:

The students will be able to

- 1.To Operate gas detecting and testing for inspection of toxic gases
- 2.To Assess Entry and rescue operation in confined space
- 3.To Evaluate work permit system for confined space entry
- 4.To Priorities Cleaning and removing of toxic and flammable gases
- 5.To describe about direct supervision of confined space to Hole watcher and Confined space attendant.

REFERENCES

- 1.Health Safety and Environment-Training Manual-Oil & Gas Sector-SPIC
- 2.Tata Mc Graw Hill-Industrial Safety Management-I.M Deshmukh-2016