

# 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



## Diploma in Fire Instrumentation Design and Installation

Regulations and Syllabus

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

CHOICE BASED CREDIT SYSTEM

## **GENERAL INSTRUCTIONS AND REGULATIONS**

**Diploma in Fire Instrumentation Design and Installation** conducted by Alagappa University, Karaikudi, and TamilNadu through its Collaborative Institution. Applicable to all the candidates admitted from the academic year **2023** onwards.

### **1. Eligibility:**

Candidate for admission to **Diploma in Fire Instrumentation Design and Installation** shall be required to have passed in any bachelor degree 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 **SECONDCCLASS**.
- d. A candidate, whose secures 60% or more of the aggregate marks, shall be awarded **FIRSTCLASS**.
- 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 textbooks 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 practical's 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 successful complete the course within the stipulated period will be awarded the degree by the University.

## 9. Fees structure

Course fee shall be as prescribed by the University and 50% of the course fee should be deposited 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 <sup>th</sup> February of the academic year

## 10. Other Regulations:

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

**DIPLOMA-FIRE INSTRUMENTATION  
DESIGN AND INSTALLATION  
CREDITSTRUCTURE**

	Course Code	Title of the Paper	T/P	Cr.	Hrs./ Week	Max. Marks		
						Int.	Ext.	Total
<b>Sem I</b>	50211	EHS laws & Acts	T	4	5	25	75	100
	50212	Fire Protection Engineering	T	4	5	25	75	100
	50213	Basics of Fire Safety	T	5	10	25	75	100
	50214	Auto CAD Practical	P	5	10	25	75	100
		<b>Total</b>		<b>18</b>	<b>30</b>	<b>130</b>	<b>270</b>	<b>400</b>
<b>SemII</b>	50221	Study on Electricity as Source of Fire	T	4	5	25	75	100
	50222	Fire Safety Design, Installation and Maintenance	T	4	5	25	75	100
	50223	Fire & Explosion Engineering	T	5	10	25	75	100
	50224A 50224B	Internship/ Project	I/ PR	5	10	25	75	100
		<b>Total</b>		<b>18</b>	<b>30</b>	<b>130</b>	<b>270</b>	<b>400</b>

<b>PROGRAM OUTCOMES(POs)-Diploma in Fire Instrumentation Design and Installation</b>	
After the successful completion of Rail Safety program,students are expected to	
<b>PO 1</b>	Acquire fundamental knowledge and skills on the fire and Industrial safety
<b>PO 2</b>	Gain advanced level knowledge,techniques,skills and modern tools in the field of fire and Industrial Safety
<b>PO 3</b>	Understand the legal aspects and procedures of Safety Inspections and Safety Legislation
<b>PO 4</b>	Develop and Evaluate health and safety program for a variety of industries to promote the health and safety of workers
<b>PO 5</b>	Gain information on operation of fire service equipments and practical firefighting
<b>PO 6</b>	Acquire skills in the field of Energy Audit, Green Audit,OSHAstandards, NEBOSH, etc to improve employment opportunities
<b>PO 7</b>	Aware of the impact of the professional safety solutions in societal and environmental Contexts ,and demonstrate the knowledge of and need forsustainable development
<b>PO 8</b>	Function effectively as an individual and as a member or leader in diverse teams,and in multidisciplinary settings
<b>PO 9</b>	An ability to assess safety and legal issues and the consequen responsibilities relevant to the professional
<b>PO 10</b>	Recognize the need for ,and have the preparation and ability to engage inindependent and lifelong learning in the broadcast context of technological change

<b>Programme Specific Outcomes-Diploma in Fire Instrumentation Design and Installation</b>	
After the successful completion of the Rail Safety Programme, the students are expected to	
<b>PSO 1</b>	Students are able to design solution for complex major hazardous industries in terms of fixed fire fighting installation and fire prevention that meet the specified needs
<b>PSO 2</b>	Students in for the concepts impact of safety engineering solutions related to the fire prevention, industrial risk assessment and accidentprevention in environmental ,economicand societal context
<b>PSO 3</b>	Students gain relevant knowledge ,skills ,provisions and rules related to Pollution control in important legislations
<b>PSO 4</b>	Familiarize various fire fighting strategies incase of BLEVE ,LPG hazards and spillage
<b>PSO 5</b>	Students are familiar with Assess hazards and risk in process andmanufacturing industries and devise remedial measures and safety management systems

### **Program Education Objective-Diploma Fire Instrumentation and InstallationProgram**

1. Apply principles of transformational leadership to negotiate, mentor, motivate, and lead others toward a shared and ethical organizational visionor goal.
2. Apply knowledge of leadership,change,business models, organizational issues, and regulations to ensure organizational effectiveness, resulting in theimprovementof emergency services.
3. Utilize the methods and resources of research, science, and technology to effectively manage emergency services.
4. Utilizeappropriatecommunicationstrategiesandmethodstoaccomplishorganiza tionalgoals and objectives.
5. Utilize appropriate assessment and planning skills to improve organization and community risk management for emergency services.

### **Program Specific Objective- Diploma Fire Instrumentation and Installation Program**

1. Apply the knowledge and basic sciences, and Safety, Fire Engineering to the solution of complex engineering problems
2. Identify, formulate, study research literature, and analyze complex Safety and Fire Engineering problems reaching substantiated conclusions
3. Design solutions for complex engineering problems and design Safety and Fire components that meet the specified needs.
4. Use Fire engineering research -based knowledge related to interpretation of data and provides valid conclusions.
5. Create, select and apply modern Safety and Fire Engineering and IT tools to complex engineering activities with an understanding of the limitations

**DIP(Fire Instrumentation Design and Installation) I<sup>st</sup>-Semester**

<b>Core</b>	<b>Course Code:</b> 50211	<b>EHS Laws &amp; Acts</b>	<b>T</b>	<b>Credits:4</b>	<b>Hours:5</b>
<b>Pre-requisite</b>	<b>Basic Knowledge of EHS Laws &amp; Acts</b>		<b>Syllabus Revised</b>	<b>2023-2024</b>	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide exposure to the students about safety and health provisions related to hazardous processes as laid out in Factories Act 1948</li> <li>2. To Interpret General powers of the central government, prevention, control and abatement of environmental pollution.</li> <li>3. To familiarize students with powers of inspectorate of factories.</li> <li>4. To help students to learn about Environment Act 1986 and rules framed under the act.</li> <li>5. To provide wide exposure to the students about various legislations applicable to an industrial</li> </ol>				
<b>Unit -I</b>	<p><b>FACTORIES ACT-1948</b>                      Statutory Authorities – Inspecting Staff, Health, Safety, Provisions Relating To Hazardous Processes, Welfare, Working Hours ,Employment Of Young Persons–Special Provisions–Penalties And Procedures- Tamilnadu Factories Rules 1950 Under Safety And Health Chapters Of Factories Act 1948.Forms,Registers and notices–Tamilnadu Safety Officer Rules 2005-With Updated Amendments.</p>				
<b>Unit -II</b>	<p><b>ENVIRONMENT ACT-1986</b>                      General Powers Of The Central Government, Prevention, Control And Abatement Of Environmental pollution-Biomedical Waste (Management And Handling Rules, 1989- The noise pollution (Regulation And Control) Rules , 2000-The Batteries (Management And Handling Rules) 2001- No objection Certificate From Statutory Authorities Like Pollution Control Board. Air Act 1981 And water Act 1974: Central And State Boards For The Prevention And Control Of Air Pollution-Powers and Functions Of Boards – Prevention And Control Of Air Pollution And Water Pollution – Fund –Accounts And Audit ,Penalties And Procedures.</p>				
<b>Unit -III</b>	<p><b>MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES 1989 AND MAJOR ACCIDENT HAZARD CONTROL RULES AND AMENDMENT</b>                      Definitions – Duties Of Authorities – Responsibilities Of Occupier – Notification Of Major Accidents –Information To Be Furnished – Preparation Of Offsite And Onsite Plans – List Of Hazardous And Toxic chemicals–Safety reports–Safety Data sheets .Major Accident Hazard Control Rules Hazardous Wastes (Management, Handling And Transboundary movement) Rules 2016.</p>				
<b>Unit -IV</b>	<p><b>OTHER ACTS AND RULES</b>                      Indian Boiler (Amendments) Act 2007, Static And Mobile Pressure Vessel Rules (Smpv), Motor Vehicle Rules, The Mines And Minerals (Development &amp; Regulation) Amendment Act, 2015, Workman Compensation Act, Rules – Electricity Act And Rules – Hazardous Wastes (Management, Handling And Transboundary) Rules, 2008 - The building And Other Construction Workers Act 1996., Petroleum Rules, Gas Cylinder Rules 2016, Explosives Act 1884 -Pesticides Act– Ewaste (Management) Rules 2016.</p>				

<b>Unit -V</b>	<b>INTERNATIONAL ACTS AND STANDARD</b> Occupational Safety And Health Act Of Usa (The Williames - Steiger Act Of 1970) – Health And safety Work Act (Hasawa 1974, Uk) – Iso 14001 – Iso 45001 , European Safety And Health legislations, American Petroleum Institute (Api) Standards, Oil Industry Safety Directorate (Oisd ) Standards, National Fire Protection Association (Nfpa) Standards, Atomic Energy Regulatory board (Aerb), American national standards institute (Ansi)
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### References

1. The Factories Act 1948, Madras Book Agency, Chennai, 2000
2. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt. Ltd., New Delhi.
3. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India) Pvt. Ltd., New Delhi.
4. Air (Prevention and control of pollution) act 1981, Commercial Law Publishers (India) Pvt. Ltd., New Delhi.
5. The Indian boilers act 1923, Commercial Law Publishers (India) Pvt. Ltd., Allahabad.

Related online content (MOOC, Swayam, NPTEL, Website etc.)

[https://onlinecourses.nptel.ac.in/noc23\\_lw03/preview](https://onlinecourses.nptel.ac.in/noc23_lw03/preview)

<https://archive.nptel.ac.in/noc/courses/noc21/SEM1/noc21-ce16/>

<b>Course outcomes</b>		<b>Knowledge level</b>
CO-1	To list out important legislations related to health, Safety and Environment.	K1
CO-2	To list out requirements mentioned in factories act for the prevention of accidents.	K1
CO-3	To Interpret the health and welfare provisions given in factories act.	K4
CO-4	To Justify the statutory requirements for an Industry on registration, license and its renewal	K5
CO-5	To Develop site and off-site emergency plan	K6



On what level it correlated with COs & POs - based on that we have to give marks  
 Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3(S)	2(M)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)	2(M)	3(S)
CO2	3(S)	3(S)	2(M)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)	3(S)
CO3	3(S)	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)
CO4	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)
CO5	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)
W.AV	2.8	2.4	2.6	2.4	2.6	2.8	2.2	2.6	2.4	2.6

S-Strong(3),M-Medium(2),L-Low(1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3(S)	2(M)	3(S)	3(S)	2(M)
CO2	2(M)	3(S)	2(M)	3(S)	2(M)
CO3	3(S)	2(M)	3(S)	3(S)	3(S)
CO4	2(M)	3(S)	2(M)	3(S)	2(M)
CO5	3(S)	2(M)	3(S)	2(M)	3(S)
W.AV	2.6	2.4	2.6	2.8	2.4

S-Strong(3),M-Medium(2),L-Low(1)

**DIP (Fire Instrumentation Design and Installation)**  
**I-Semester**

<b>Core</b>	<b>Course Code: 50212</b>	<b>Fire Protection Engineering</b>	<b>T</b>	<b>Credits:4</b>	<b>Hours:5</b>
<b>Pre-requisite</b>	<b>Basic Knowledge of Fire Protection Engineering</b>		<b>Syllabus Revised</b>	<b>2023-2024</b>	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide an in depth knowledge about the science of fire.</li> <li>2. To understand the causes and effects of fire.</li> <li>3. To know the various fire prevention systems and protective equipments.</li> <li>4. To understand the science of explosion and its prevention techniques.</li> <li>5. To understand the various fire prevention techniques to be followed in a building.</li> </ol>				
<b>Unit -I</b>	<b>INTRODUCTION TO INDUSTRIAL FIRE PROTECTION</b> Fire prevention vs fire protection –importance of fire safety –major fire accident in history- reason for fire-heat transfer-sources of heat-theory of combustion & explosion-flash point-autoignition temperature-flash fire-jet fire-pool fire-unconfined vapor clouds explosions				
<b>Unit -II</b>	<b>ALARM &amp; DETECTION SYSTEM</b> NFPA 72 classification for fire alarm system- power supply for alarm system-basic consideration for installation-selection of initiating devices- detection system-heat detector - smoke detector- Radiant energy sensing fire detectors- sprinkler water flow alarm initiating devices- audible and visible criteria of notification devices-reporting system public fire alarm system remote supervising station fire alarm system				
<b>Unit -III</b>	<b>FIRE EXTINGUISHMENT</b> Classifications of Fire- extinguishing agents -water -carbon dioxide- halogenated agent- chemical powders- home extinguishing agent combustible metal extinguishing agent- portable fire extinguishes- fire extinguisher distribution and mounting- maintenance instruction and testing of fire extinguisher- water based sprinkler system- Wet pipe system- water supply and distribution - dry pipe system-sprinkler heads- fire department connections- singular system inspection- fire hydrant- stand Pipe and hose system.				
<b>Unit -IV</b>	<b>FIRE EXIT AND FIRE WATER REQUIREMENTS</b> Introduction-exit requirements-types of exit-occupant load- capacity of exits-arrangements of exits-travel distance-number of exit-fire escape & staircase—ramp-sources of water supply- requirements –static water tank-inspection and maintenance- fire load-classification of hazardous area-emergency assembly area.				
<b>Unit -V</b>	<b>HAZARDOUS PROCESS</b> Difference between flammable and combustible liquid- upper and lower explosive limits- Handling and storage of flammable and combustible liquids-electricity as an ignition source- hazardous location & national electric code-hot work-hazards and precaution steps-permit to work system				

**References:**

1. "Accident Prevention manual for industrial operations" N.S.C., Chicago, 1982.
2. "Davis Danielet al, "Hand Book of fire technology"
3. "Fire Prevention and firefighting", Loss prevention Association, India.
4. Derek, James, "Fire Prevention Hand Book", Butterworths 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](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 Summarise the different source of ignition and their prevention techniques.	K2
CO-3	To Practise the operation of various types of fire extinguishers.	K3
CO-4	To Interpret the emergency evacuation methods	K4
CO-5	To Explain the students to effectively understand storage and transport of Hazardous substances	K5

On what level it correlated with COs & POs -based on that we have to give Mapping Course Outcome Vs Programme Specific outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3(S)	2(M)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)	2(M)	3(S)
CO2	3(S)	3(S)	2(M)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)	3(S)
CO3	3(S)	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)
CO4	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)
CO5	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)
W.AV	2.8	2.4	2.6	2.4	2.6	2.8	2.2	2.6	2.4	2.6

S-Strong(3), M-Medium(2), L-Low(1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3(S)	2(M)	3(S)	3(S)	2(M)
CO2	2(M)	3(S)	2(M)	3(S)	2(M)
CO3	3(S)	2(M)	3(S)	3(S)	3(S)
CO4	2(M)	3(S)	2(M)	3(S)	2(M)
CO5	3(S)	2(M)	3(S)	2(M)	3(S)
W.AV	2.6	2.4	2.6	2.8	2.4

S-Strong(3), M-Medium(2), L-Low(1)

**DIP (Fire Instrumentation Design and Installation)  
I-Semester**

<b>Core</b>	<b>Course code: 50213</b>	<b>Basics of Fire Safety</b>	<b>T</b>	<b>Credits:5</b>	<b>Hours:10</b>
<b>Pre-requisite</b>	<b>Basic Knowledge of Basics of Fire Safety</b>		<b>Syllabus Revised</b>	<b>2023-2024</b>	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide an in depth knowledge about the science of fire.</li> <li>2. To understand the causes and effects of fire.</li> <li>3. To know the various fire prevention systems and protective equipments.</li> <li>4. To understand the science of explosion and its prevention techniques.</li> <li>5. To understand the various fire prevention techniques to be followed in a building.</li> </ol>				
<b>Unit - I</b>	<b>FUNDAMENTALS OF FIRE SAFETY</b> Introduction-Physical And Chemicals Properties Of Fire- Mode Of Heat Transfer-Flash Point-N Fire Point-Ait(Auto Ignition Temperature- Flammable And Combustible-Fire Triangle-Fire Tetrahedron-Explosion Pentagon-Bleve-Classification Of Fire- Causes Of Fire-Extinguishing Methods-Fire Extinguisher- Fire Load Calculation-Hazardous Area Classification- Fire Safety In Public Place, High Rise Building, Educational Institution, Shopping Malls,Chemical Labs, Warehouse And Garages .				
<b>Unit - II</b>	<b>SELECTION ,INSTALLATION&amp; MAINTENANCE OF FIRE EXTINGUISHER</b> Terminology-Classification Of Hazards-Number &Size Of Fire Extinguisher-Fire Extinguisher Size And Placement-Selection Of Location-Initial Inspection-Installation-Selection Of Fire Extinguisher-Suitability Of Fire Extinguisher-Inspection And Maintenance-Testing Of Fire Extinguisher-Maintenance Record-Rejected Extinguisher-Refilling-Spares-Maintenance- Checklist				
<b>Unit - III</b>	<b>SELECTION ,INSTALLATION AND MAINTENANCE OF FIRE DETECTION &amp; ALARM SYSTEM</b> Terminology-General Requirements-Detection Zone-Automatics Fire Detectors-Heat Detector-Smoke Detectors-Optical Smoke Detectors- Air Sampling Detectors- Uv Flame Detectors-Ir Flame Detectors- Sitting Of Manual Call Points-Inspection &Maintenance-Test-System Disconnecting During Testing-Spares, Checklist				
<b>Unit - IV</b>	<b>INSTALLATION &amp; MAINTENANCE OF INTERNAL AND EXTERNAL FIRE HYDRANTS</b> Terminology-Hydrant Installation-Underground Static Water Tank-Terrace Tanks-Fire Pumps & Pump House-Risers-Fire Service Inlet- Typical Fire Fighting Installations/Requirements-Size Of Mains-Hose Reels-Water Supplies & Pumping Arrangements-Testing-Maintenance- Check List				
<b>Unit - V</b>	<b>FIRE EXIT AND SPECIAL HAZARDS</b> Introduction-Exit Requirements-Types Of Exits-Occupant Load- Capacity Of Exit-Arrangements Of Exits-Travel Distance-Number Of Exits-Fire Escape & Staircase – Flammable And Combustible Liquids- Upper And Lower Explosive Limits-Handling And Storage Of Flammable & Combustible Liquids-Hot Work Activities- Hazards And Precaution Steps.				

**References**

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

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<a href="https://onlinecourses.nptel.ac.in/noc20_ce09/preview">https://onlinecourses.nptel.ac.in/noc20_ce09/preview</a>		
Course outcomes	Knowledge level	
CO-1	To Recall about basic concepts of fire and explosion science.	K1
CO-2	To Practice the operation of various types of fire extinguishers	K3
CO-3	To Summarise the different source of ignition and their prevention techniques	K3
CO-4	To Explain the students to effectively employ explosion protection techniques and their significances to suit the industrial requirement	K2
CO-5	To Interpret the emergency evacuation methods	K5

On what level it correlated with COs & POs -based on that we have to give marks Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3(S)	2(M)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)	2(M)	3(S)
CO2	3(S)	3(S)	2(M)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)	3(S)
CO3	3(S)	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)
CO4	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)
CO5	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)
W.AV	2.8	2.4	2.6	2.4	2.6	2.8	2.2	2.6	2.4	2.6

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3(S)	2(M)	3(S)	3(S)	2(M)
CO2	2(M)	3(S)	2(M)	3(S)	2(M)
CO3	3(S)	2(M)	3(S)	3(S)	3(S)
CO4	2(M)	3(S)	2(M)	3(S)	2(M)
CO5	3(S)	2(M)	3(S)	2(M)	3(S)
W.AV	2.6	2.4	2.6	2.8	2.4

S –Strong (3), M-Medium (2), L- Low (1)

<b>Course Code: 50214</b>	<b>Auto CAD Practical</b>	<b>P</b>	<b>Credits:5</b>	<b>Hours:10</b>
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**OBJECTIVE:**

1. To Learn about Auto CAD for designing Evacuation plans.
2. To Learn about Auto CAD for designing Sprinkler plans.

**EXPERIMENTS:**

1. Introduction to AutoCAD
2. Different Software's for CAD
3. Practice Exercises on AutoCAD Software
4. Drawing Plan of a building in AutoCAD
  - a. Plan of a Single Storied building in Auto CAD i. Plan of a Multi Storied building in AutoCAD
5. Drawing Section and Elevation of a building in AutoCAD
  - a. Section and Elevation of a Single Storied building in AutoCAD i. Section and Elevation of a Multi Storied building in AutoCAD
6. Detailing of building components like Doors, Windows, Roof Trusses
7. Exercises on development of working drawings of buildings in AutoCAD
8. Exercise on drawing of fire safety plan
9. Exercise on development of emergency evacuation map

**COURSE OUTCOME**

1. To describe Introduction of AutoCAD
2. To Explain about Drawing Plan in Auto CAD
3. To Formulate Section and Elevation of a Building
4. To Create a Drawing of Fire Safety plan

<b>DIP (Rail Safety) II<sup>nd</sup>-Semester</b>					
<b>CORE</b>	<b>Course code: 50221</b>	<b>Study on Electricity as Source of Fire</b>	<b>T</b>	<b>Credits:4</b>	<b>Hours:5</b>
<b>Pre-requisite</b>			<b>Syllabus Revised</b>	<b>2023-2024</b>	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>To familiarize the basic information about electricity and hazards.</li> <li>To educate on electrical hazard analysis.</li> <li>To learn about protection from electrical hazards.</li> <li>To provide technical knowledge in chemical exposure and safety.</li> <li>To analyse the handling and storage of hazardous chemicals.</li> </ol>				
<b>UNIT I</b>	<b>BASICSOFELECTRICITY&amp;HAZARDSOFELECTRICITY</b> 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 OfShock- Heart, Pulmonarysystem-Indianelectricityrules- Statutoryrequirementsfromelectricalinspectorate- Internationalstandardsonelectricalsafety-Cpr.				
<b>UNIT II</b>	<b>ELECTRICAL HAZARD ANALYSIS</b> Primary & Secondary Hazards - Shocks - Burns-Scalds Falls - SafetyIn The Use Of Electricity Energy Leakage -Clearances & Insulation -Classes Of Insulation - Voltage Classifications - Excess Energy - Current Surges - Overcurrent & Short Circuit Current- Heating Effects Of Current - Electromagnetic Forces - Corona Effect - Statischelectricity Sources - Electrical Causes Of Fire & Explosion Ionization - Spark & Arc - National Electrical Safety Code- Lightninghazards- Lightningarrestor -Earthing				
<b>UNIT III</b>	<b>MINIMIZING ELECTRICAL HAZARDS</b> Fuses -Circuit Breakers & Overload Relays - Protection Against OverVoltage & Under Voltage-Safe Limits Ofamperage -Safe Distance From Lines -Short Circuit Protection- No Load Protection - Earth Fault Protection -Earthing Standards- Grounding - Equipment Grounding - Miniature Circuit Breaker - Earth Leakage Circuit Breaker -Groundfault Circuitinterrupter -Electricalguarding- Personalprotective Equipment's.				
<b>UNIT IV</b>	<b>EVALUATING HAZARDS &amp; ASSESSING RISKS OF CHEMICALS</b> Introduction- Types Of Chemicals - Routes Of Entry Sources Of Information-Toxicity- Flammable, Reactive &Explosivehazardsphysicalhazardsnanomaterialsbiohazards- Radioactivehazards-Labelingofchemicals-Safety Data Sheet- Globally Harmonized System - Exposure Limits Whmis Symbols -ClpHazard Pictogramtoxicologicalproperties:Lc50&Ld50flammablelimits- Atmosphericmonitoring-Healthsurveillance.				
<b>UNIT V</b>	<b>CLASSIFICATION &amp; MANAGEMENT OF HAZARDOUS CHEMICALS</b> Classification Of Hazardous Chemicals Green Chemistry Acquisition Of Chemicals - Inventory & Tracking Ofchemicals - Transportation Of Hazardous Chemicals - Emergency InformationPanel Hazchem Code - Personalprotective Equipment For Chemicals - Chemical Exposure Risk Assessment-Hierarchy Of Risk Controls- Generalguidelinesforsafestorage&Handling- Chemicalstoragetanksdesignconsiderations.				

<b>References</b>	
1. Electrical Safety Handbook, Hardcover – by John Cadick(Author), Mary Capelli-Schellpfeffer(Author), Dennis Neitzel (Author)	
2. Practical Guide to Electrical Safety, Author(s): RK Jain	
<b>Related online content(MOOC, Swayam, NPTEL, Website etc.)</b>	
<a href="https://onlinecourses.swayam2.ac.in/nou20_cs08/preview">https://onlinecourses.swayam2.ac.in/nou20_cs08/preview</a>	
<a href="https://alison.com/course/chemical-safety-process-safety-managment">https://alison.com/course/chemical-safety-process-safety-managment</a>	
<b>Course Outcomes</b>	<b>Knowledge level</b>
CO-1	To define the fundamental concepts of electricity and risks.
CO-2	To express the knowledge about analysis of electrical hazards.
CO-3	To identify the concepts about electrical protection devices.
CO-4	To simplify the hazards and risks of chemicals.
CO-5	To evaluate the safe storage and transportation of chemicals.
	K1
	K2
	K3
	K4
	K5

On what level it correlated with COs & POs -based on that we have to give Mapping Course Outcome Vs Programme Specific outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3(S)	2(M)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)	2(M)	3(S)
CO2	3(S)	3(S)	2(M)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)	3(S)
CO3	3(S)	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)
CO4	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)
CO5	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)
W.AV	2.8	2.4	2.6	2.4	2.6	2.8	2.2	2.6	2.4	2.6

S–Strong(3),M-Medium(2),L-Low(1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3(S)	2(M)	3(S)	3(S)	2(M)
CO2	2(M)	3(S)	2(M)	3(S)	2(M)
CO3	3(S)	2(M)	3(S)	3(S)	3(S)
CO4	2(M)	3(S)	2(M)	3(S)	2(M)
CO5	3(S)	2(M)	3(S)	2(M)	3(S)
W.AV	2.6	2.4	2.6	2.8	2.4

S–Strong(3),M-Medium(2),L-Low(1)



<b>DIP (Fire Instrumentation Design and Installation)II-Semester</b>					
<b>Core</b>	<b>Course Code: 50222</b>	<b>Fire Safety Design, Installation and Maintenance</b>	<b>T</b>	<b>Credits:4</b>	<b>Hours:5</b>
<b>Pre-requisite</b>	<b>Basic Knowledge of Fire Safety Design, Installation and Maintenance</b>		<b>Syllabus Revised</b>	<b>2023-2024</b>	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide an indepth knowledge about the science of fire.</li> <li>2. To understand the causes and effects of fire.</li> <li>3. To know the various fire prevention systems and protective equipments.</li> <li>4. To understand the science of explosion and its prevention techniques.</li> <li>5. To understand the various fire prevention techniques to be followed inabuilding.</li> </ol>				
<b>UNIT I</b>	<b>FIRE AND CLASSIFICATIONS OF BUILDING &amp; HAZARDS</b> 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-Classifythelevel Of Firehazards-Nationalbuilding Code –Nbc Classification Based On Occupancy.				
<b>UNIT II</b>	<b>FIRE PROTECTION AND CONTROL</b> Fireprotectionsystem-Typesoffireprotection(Active&Passive)- Fireextinguisher-Operatingmethods-Typesoffireextinguisher- Installation Of Fire Extinguisher- Maintenance And Service Of FireExtinguisher- Modular Fireextinguisher-Sandand Waterbuckettechnic Details-Fire Ball-Fire Blanket.				
<b>UNIT III</b>	<b>HYDRANT AND SPRINKLER SYSTEM</b> Introduction-Fire Hydrant System-Installation Of Hydrant- Fire Water Storage Tank Specification-Hydrant Pipe Size-Hosebox-Hose Reel Drum-Hose Roll Training- Branches And Nozzle-Water Monitoring-Collecting Head/Suction Hose-Hydrantfitting Methods-Sprinkler Heads –Installation Of Sprinkler System-Installation Of Wet/Dry, Foam, Pre-Action ,Deluge Firesprinklersystem-Fire Pump Room.				
<b>UNIT IV</b>	<b>SUPPRESSION AND FLOODING SYSTEM</b> Introduction-Co2floodingsystem-Co2suppressionsystem- Installationofcleanagentsuppressionsystem- Foamfloodingsystem-Foam Suppression System-Basics OffireBrigade				
<b>UNIT V</b>	<b>FIRE ALARM TECHNOLOGY</b> Introduction-Fire Alarm Designing- Fire And Smoke Detectors- Flame Detectors- Communication Techniques-Basics Ofelectrical And Electronic In Fire Alarm- Application Of Equipment-System Operation & Control-Installation Of Alarmpanel- Installation OfMcp-Emergency Light Installation-Wiring Methods Of Fire Alarm System-Location Setting Indetectors-Programof Alarmpanel- Maintenance, Services-Training .				
<b>References</b>					
<ol style="list-style-type: none"> <li>1. “AccidentPreventionmanualforindustrialoperations”N.S.C.,Chicago,1982.</li> <li>2. “DavisDanielet al,“Hand Bookof firetechnology”</li> <li>3. “FirePreventionandfirefighting”,LosspreventionAssociation,India.</li> <li>4. Derek,James,“FirePreventionHandBook”,ButterWorthsandCompany,London,1986.</li> <li>5. DinkoTuhtar,“Fireandexplosionprotection</li> </ol>					
<b>Related online content (MOOC,Swayam,NPTEL,Websiteetc.)</b>					
<a href="https://archive.nptel.ac.in/courses/105/102/105102176/">https://archive.nptel.ac.in/courses/105/102/105102176/</a> <a href="https://onlinecourses.nptel.ac.in/noc20 ce09/preview">https://onlinecourses.nptel.ac.in/noc20 ce09/preview</a>					

Course outcomes		Knowledge level
CO-1	To Recall about basic concepts of fire and explosion science.	K1
CO-2	To Summarise the different source of ignition and their prevention techniques.	K2
CO-3	To Practise 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 significance to suit the industrial requirement	K6

On what level it correlated with COs & POs -based on that we have to give Mapping Course Outcome Vs Programme Specific outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3(S)	2(M)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)	2(M)	3(S)
CO2	3(S)	3(S)	2(M)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)	3(S)
CO3	3(S)	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)
CO4	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)
CO5	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)
W.AV	2.8	2.4	2.6	2.4	2.6	2.8	2.2	2.6	2.4	2.6

S-Strong(3),M-Medium(2),L-Low(1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3(S)	2(M)	3(S)	3(S)	2(M)
CO2	2(M)	3(S)	2(M)	3(S)	2(M)
CO3	3(S)	2(M)	3(S)	3(S)	3(S)
CO4	2(M)	3(S)	2(M)	3(S)	2(M)
CO5	3(S)	2(M)	3(S)	2(M)	3(S)
W.AV	2.6	2.4	2.6	2.8	2.4

S-Strong(3),M-Medium(2),L-Low(1)

<b>DIP(Fire Instrumentation Design and Installation)Ist-Semester</b>					
<b>Elective</b>	<b>Course code: 50223</b>	<b>Fire &amp;Explosion Engineerig</b>	<b>T</b>	<b>Credits:5</b>	<b>Hours:10</b>
<b>Pre-requisite</b>	<b>Basic Knowledge of Fire&amp; Explosion Protection Engineering</b>		<b>Syllabus Revised</b>	<b>2023-2024</b>	
<b>Course Objectives</b>	1. Tostudythepropertiesofpyrotechnicchemicals 2. Toknowaboutthehazards in themanufactureof variousfireworks 3. Tounderstandthehazards infireworksindustries relatedprocesses 4. Tostudytheeffectsofstaticelectricity 5. Tolearnpyrotechnicmaterialhandling,transportationandusersafe ty				
<b>UNIT I</b>	<b>PROPERTIES OF FIREWORKS CHEMICALS</b> Fire Properties–Potassium Nitrate (Kn03), Potassium Chlorate(Kcl03),Barium Nitrate(Bano3),Calcium Nitrate(Cano3),Sulphur(S),Phosphorous(P),Antimony(Sb),Pyroa Luminum (A1) Powder- Reactions-Metal Powders, Borax,Ammonia (Nh3) – Strontium Nitrate,Sodium Nitrate,PotassiumPerchloride.Fire And Explosion, Impact And Friction Sensitivity.				
<b>UNIT II</b>	<b>STATIC CHARGE AND DUST</b> Concept-Prevention-Earthing-Copperplates-Dressmaterials-taticchargemeterlightning,Causes- Effects-Hazards InFireworksFactories-Lightning Arrestor :Concept- Installation-Earth Pit-Maintenance-Resistance- Legalrequirements-Casestudies.Dust:Size-Desirable,Non- Respirable-Biologicalbarriers-Hazards-Personal Protective Equipment- Pollution Prevention.				
<b>UNIT III</b>	<b>PROCESS SAFETY</b> Safe-Quantity, Mixing-Filling-Fuse Cutting – Fuse Fixing –Finishing – Drying At Various Stages-Packing-Storage- Handtools-Materials,Layout:Building-Distances- Factoriesact–Explosiveactandrules –Firepreventionandcontrol– Riskrelatedfireworksindustries.				
<b>UNIT IV</b>	<b>MATERIAL HANDLING AND TRANSPORTATION</b> Manual Handling – Wheel Barrows-Trucks-Bullock Carts- Cycles-Automobiles-Fuse Handling – Papercaps Handling- Nitric Acid Handling In Snake Eggs Manufacture-Handling The Mix In This Factory-Material Movement-Godown-Waste Pit.Packing-Magazine-Design Of Vehicles For Explosive Transports Loading Into Automobiles –Transport Restrictions – Case Studies-Over Head Powerlines - Driverhabits-Intermediateparking-Fire Extinguishers-LooseChemicals Handling And Transport.				
<b>UNIT V</b>	<b>WASTE CONTROL AND USER SAFETY</b> Conceptsofwastes–Wastesinfireworks-Disposal-Spillages-Storageofresidues.Consumeranxiety-Hazards In Display-Methods In Other Countries-Fires,Burns And Scalds-SalesOutlets-Restrictions-Role Of Fire Service.				
<b>References</b>					
1. “Seminaronexplosives”,Dept.ofofexplosives. 2. J.A.Purkiss,“Fireworks-FireSafetyEngineering” 3. Billofonce,“FireworksSafetymanual” 4. “Goeff,“DustExplosionprevention,Part1” 5. A.Chelladurai,“Fireworksrelatedaccidents”					

**Related online content (MOOC, Swayam, NPTEL, Website etc.)**

<https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Seasonal-fire-causes/Fireworks>  
[https://onlinecourses.nptel.ac.in/noc22\\_me37/preview](https://onlinecourses.nptel.ac.in/noc22_me37/preview)

Course outcomes		Knowledge level
CO-1	To Describe about the chemical reactions of Fireworks chemicals	K1
CO-2	To Explain the safe manufacture of Fireworks items	K2
CO-3	To Simplify the process safety in fire works industries	K4
CO-4	To Justify the safety measures applicable again static electricity	K5
CO-5	To Elaborate safe practices for handling of fireworks in factories, transport and at user end	K6

On what level it correlated with COs & POs -based on that we have to give  
 Marks Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3(S)	2(M)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)	2(M)	3(S)
CO2	3(S)	3(S)	2(M)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)	3(S)
CO3	3(S)	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)
CO4	2(M)	3(S)	2(M)	3(S)	3(S)	2(M)	2(M)	3(S)	2(M)	3(S)
CO5	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	3(S)	2(M)	3(S)	2(M)
W.AV	2.8	2.4	2.6	2.4	2.6	2.8	2.2	2.6	2.4	2.6

S–Strong(3),M-Medium(2),L-Low(1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3(S)	2(M)	3(S)	3(S)	2(M)
CO2	2(M)	3(S)	2(M)	3(S)	2(M)
CO3	3(S)	2(M)	3(S)	3(S)	3(S)
CO4	2(M)	3(S)	2(M)	3(S)	2(M)
CO5	3(S)	2(M)	3(S)	2(M)	3(S)
W.AV	2.6	2.4	2.6	2.8	2.4

S–Strong(3),M-Medium(2),L-Low