# 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

## MBA Environment and Industrial Safety

Regulations and Syllabus

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

CHOICE BASED CREDIT SYSTEM

## GENERAL INSTRUCTIONS AND REGULATIONS

**MBA Environment and Industrial safety** conducted by Alagappa University, Karaikudi, Tamil Nadu through its Collaborative Institution. Applicable to all the candidates admitted from the academic year **2023** onwards.

1. **Eligibility:**
   Candidate for admission to **MBA Environment and Industrial Safety** shall be required to have passed in any bachelor degree with 55% marks from recognized University/Institution.

2. **For the Degree:**
   The candidates shall have subsequently undergone the prescribed programme of study in a institute for not less than two academic years comprising 4 semesters, passed the examinations prescribed and fulfill such conditions as have been prescribed therefore.

3. **Admission:**
   Admission based on the marks in the qualifying examination.

4. **Duration of the course:**
   The course shall extend over a period of two years under semester pattern accounting to four semesters.

5. **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.

6. **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.

**7. 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.

**8. Examination:**

Candidate must complete course duration to appear for the university examination. Examination will be conducted with concurrence of Controller of Examinations as per the Alagappa University regulations. **University may send the representatives as the observer during examinations.** University Examination will be held at the end of the each semester for duration of 3 hours for each subject. Certificate will be issued as per the AU regulations. **Hall ticket will be issued to the 1st year candidates and upon submission of the list of enrolled students along with the prescribed course fee, subsequent 2nd year hall tickets will be issued.**

**9. Miscellaneous**

a. Each student posses 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 successful complete the course within the stipulated period will be awarded the degree by the University.

**10. 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 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 10th September of the academic year |

**11. Other Regulations:**

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

## Course Structure

| S. No | Study Components | Int. | Ext. | Marks | No. of Subjects | Total |
|---|---|---|---|---|---|---|
| 1. | Core course | 25 | 75 | 100 | 15 | 1500 |
| 2. | Elective Course | 25 | 75 | 100 | 3 | 300 |
| 3. | Non – Major Elective Course | 25 | 75 | 100 | 2 | 200 |
| 4. | Project | 25 | 75 | 100 | 1 | 200 |
| | **TOTAL** | - | - | - | 28 | 2200 |

## VISION

- To Produce competent safety professional of excellent technical and managerial skillsfor national and global development

## MISSION

- To provide best education in safety engineering & management , encouraging innovation and entrepreneurship though professional and moral ethics to improve the Environmental Health , safety & Quality of the people world wide.
- To provide knowledge based technological fire safety and hazard management measures to meet the infrastructural urban development needs of the society and the industry.
- To help in building national capabilities in fire safety engineering, security management, disaster management, hazard management industrial safety education and research to ensure a fire safe nation.
- To pursue research and development R&D in fire safety engineering, hazard management and disseminate its findings.

| **Program Outcome (POs)-On successful completion of the MBA Environmental and Industrial Safety** | |
|---|---|
| PO1 | Students acquire fundamental knowledge and skills on the Industrial Safety and Hygiene |
| PO2 | Gain advanced level knowledge, techniques, skills and moderntools in the field of Industrial Safety and Hygiene |
| PO3 | Recognize, assess and manage hazards and health risks prevailingat different occupational and environmental settings |
| PO4 | Understand the Hygiene risk factors prevailing in communities and inform appropriate policy actions to improve Hygiene of Workersat Factories and Industries. |
| PO5 | Enhance the research and analytical skills to design and conduct quality research in the area of occupational and environmental health |
| PO6 | Acquire in-depth knowledge on the various disciplines related tothe field of occupational and environmental health |
| PO7 | Critically think, analyze the data and interpret information on the basis of economic, political, social, ethical and cultural context |
| PO8 | Be efficient in occupational and environmental health practice withleadership qualities and relevant skills |

| | |
|---|---|
| PO9 | Demonstrate knowledge and understanding of the Industrial Safety and Hygiene and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary |
| P10 | Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological |

**Program Education Objective- MBA (E&IS)**

1. An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics toareas relevant to occupational safety and health.
2. An ability to formulate or design a system, process, procedure or program to meetdesired needs.
3. An ability to develop and conduct experiments or test hypotheses, analyze and interpretdata and use scientific judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.
5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societalcontexts.
6. An ability to function effectively on teams that establish goals, plan tasks, meetdeadlines, and analyze risk and uncertainty.

**Program Specific Objective-MBA (E&IS)**

1. Anticipate, recognize, evaluate and control hazardous conditions and practices affectingpeople, property and the environment;
2. Communicate and interact effectively with technical and non-technical audiences;
3. Integrate ethical, social, current, and global issues and responsibilities in their practice asa professional in the field;
4. Work individually or on a team to critically analyze, interpret, and provide leadership toaddress and manage problems in occupational safety and health; and
5. Recognize that the practice of occupational safety and health requires ongoing learning,and undertake appropriate activities to address this need.

| **Program Specific Outcome (PSOs)** | |
|---|---|
| After the successful completion of the **Environmental and Industrial Safety** program, the students are expected to | |
| PSO1 | Prevent harm to workers, property, the environment and the general public by identifying hazardous conditions and practices and implementing alternative practices and/or corrective measures. |
| PSO2 | Promote occupational health and safety within organizations by communicating to workers and management about risks and hazards and training workers how to prevent risks and hazards and how to protect themselves while performing various job-related tasks. |
| PSO3 | Advise management on how to increase worker productivitythrough raising morale and reducing absenteeism and equipmentdowntime while saving on insurance, workers' comp. benefits, and litigation expenses by presenting cost effective safety and health prevention measures. |

| | |
|---|---|
| PSO4 | Respond to an accident or incident by utilizing emergency response plans, investigating the event, assisting the worker(s) with immediate and long term rehabilitation with a focus on returning to work and by promoting corrective action to prevent a similar incident from happening again. |
| PSO5 | Maintain complete safety and health records as required by law andby company policy and preparing. |

## MBA Environment and Industrial Safety

| S.No | Course Code | Courses | Title of the paper | T/P | Credits | Hours/ Week | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| **I Semester** | | | | | | | **I** | **E** | **Total** |
| 1 | 30711 | Core 1 | Fire Prevention and Protection | T | 4 | 4 | 25 | 75 | 100 |
| 2 | 30712 | Core 2 | Organisational Behaviour | T | 4 | 4 | 25 | 75 | 100 |
| 3 | 30713 | Core 3 | Industrial Safety Management | T | 4 | 5 | 25 | 75 | 100 |
| 4 | 30714 | Core 4 | Safety Management in Constructional Sector | T | 4 | 5 | 25 | 75 | 100 |
| 5 | 30715 | Core 5 | Environmental Studies | T | 4 | 4 | 25 | 75 | 100 |
| 6 | 30716A<br>30716B | DSE-1 | I.Safety in Process Industries (or)<br>II.Work Study and Ergonomics | T | 4 | 5 | 25 | 75 | 100 |
| | | Library/ Yoga/counseling/Field Visit | | | | 3 | | | |
| | | | | | **24** | **30** | **150** | **450** | **600** |
| **II Semester** | | | | | | | | | |
| 7 | 30721 | Core 6 | Evolution of Modern Safety Concepts | T | 4 | 4 | 25 | 75 | 100 |
| 8 | 30722 | Core 7 | EHS Legislations | T | 4 | 4 | 25 | 75 | 100 |
| 9 | 30723 | Core 8 | Process Safety Management | T | 4 | 4 | 25 | 75 | 100 |
| 10 | 30724 | Core 9 | Occupational Health and Safety Management | T | 4 | 4 | 25 | 75 | 100 |
| 11 | 30725 | Core 10 | Hazard identification, Risk Assessment and Risk Control | T | 4 | 4 | 25 | 75 | 100 |
| 12 | 30726A<br>30726B<br>30726C | DSE- 2<br>I) Textile Safety<br>II) Safety in Mines<br>III) Transport Safety | | T | 4 | 5 | 25 | 75 | 100 |
| 13 | 30727 | Non-Major Elective – Personality development | | T | 2 | 3 | 25 | 75 | 100 |
| 14 | 30728 | Self-learning course(SLC) –MOOCs | | | Extra Credit | | | | |
| | | Library/ Yoga/ counseling/Field Visit | | | | 2 | | | |
| | | | | | **26** | **30** | **175** | **525** | **700** |
| **III Semester** | | | | | | | | | |
| 15 | 30731 | Core 11 | Safety Inspection and Audit | T | 4 | 4 | 25 | 75 | 100 |
| 16 | 30732 | Core 12 | Industrial Hygiene and Toxicology | T | 4 | 4 | 25 | 75 | 100 |
| 17 | 30733 | Core 13 | Safety Culture and Behaviour Based Safety | T | 4 | 4 | 25 | 75 | 100 |
| 18 | 30734 | Core 14 | Safety in Oil and Gas Industries | T | 4 | 4 | 25 | 75 | 100 |
| 19 | 30735 | Core 15 | Safety Aspects in Industrial Plant Layout Design | T | 4 | 4 | 25 | 75 | 100 |
| 20 | 30736A<br>30736B<br>30736C | DSE-3<br>I) Safety Management Systems<br>II) Safety in Fire Works<br>III) Disaster Management | | T | 4 | 5 | 25 | 75 | 100 |
| 21 | 30737 | Non-Major Elective – Food Hygiene and Sanitation | | T | 2 | 3 | 25 | 75 | 100 |
| 22 | 30738 | Self-learning course(SLC) –MOOCs ** | | | Extra Credit | | | | |
| | | Library/ Yoga/ Counselling/ Field Visit | | | | 2 | | | |
| | | | | | **26** | **30** | **175** | **525** | **700** |
| **IV Semester** | | | | | | | | | |
| 23 | 30741 | Core 16 | ***Dissertation Work or Internship Programme | D/I | 14 | 30 | 50 | 150 | 200 |
| **Total** | | | | | **14** | **30** | **50** | **150** | **200** |
| | | | | | **90+EC** | **120** | **550** | **1650** | **2200** |

*DSE–Student Choice and it maybe conducted by parallel sections.
**SLC-Voluntarybasis,
***Dissertation/internshipreport–Marks-Vivo-voce(50)+thesis (100) + internal (50) = 200.

**T-Theory 1cr = 1 hr /week or 15 hours.**

In each theory class, a new concept is taught and the student is learning something new throughout the class.

It also involves self-learning.

**P- Practical**

**1cr=2hrs/week or 30hours.**

Thepracticalisdependentontheoryandexperiments performed are based on concepts learned in theory class.

Repetition of an already learned concept. Observations are taken again and again.

**Experiential learning** including relevant experience and professional levels acquired1Credit=3hrs /weekor40-45 hours. **Minimum credit =9**

| MBA (E &IS) (2023Onwards) | | | I-Semester | | |
|---|---|---|---|---|---|
| **Core** | **Course code:30711** | **Fire Prevention & Protection** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge of Fire Prevention & Protection** | | **Syllabus Revised** | | **2023-2024** |

| | |
|---|---|
| **Course Objectives** | 1. To provide an in depth knowledge about the science of fire.<br>2. To understand the causes and effects of fire.<br>3. To know the various fire prevention systems and protective equipments.<br>4. To understand the science of explosion and its prevention techniques.<br>5. To understand the various fire prevention techniques to be followed in a building. |
| **UNIT-1** | **Fundamentals of Fire Safety:** 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 . |
| **UNIT-2** | **Selection ,Installation& Maintenance of Fire Extinguisher:** 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 |
| **UNIT-3** | **Selection ,Installation and Maintenance Of Fire Detection & Alarm System:** 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 |
| **UNIT-4** | **Installation & Maintenance Of Internal and External Fire Hydrants:** 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 |
| **UNIT-5** | **Fire Exit and Special Hazards:** 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. NFPA Fire protection Handbook – 21st edition – NFPA - 2023
2. Principles of fire safety engineering – 2nd edition – Das Akhil kumar – PHL learning Pvt.Ltd – 2020.
3. Fire Officer – principles and practice – Michael J.Ward – NFPA – 2020.


**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 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 marksMapping Course Outcome Vs Programme Outcomes

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S(3) | M(2) | L(1) | M(2) | M(2) | L(1) | L(1) | L(1) | L(1) | M(2) |
| CO2 | M(2) | S(3) | M(2) | M(2) | S(3) | L(1) | M(2) | L(1) | L(1) | S(3) |
| CO3 | L(1) | L(1) | L(1) | M(2) | M(2) | L(1) | L(1) | L(1) | M(2) | S(3) |
| CO4 | M(2) | S(3) | M(2) | M(2) | S(3) | M(2) | M(2) | M(2) | M(2) | M(2) |
| CO5 | M(2) | M(2) | M(2) | M(2) | L(1) | M(2) | L(1) | M(2) | M(2) | S(3) |
| **W.AV** | **2** | **2.2** | **1.6** | **2** | **2.2** | **1.4** | **1.4** | **1.4** | **1.6** | **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 | M(2) | M(2) | L(1) | M(2) | M(2) |
| CO2 | M(2) | S(3) | M(2) | M(2) | M(2) |
| CO3 | M(2) | M(2) | L(1) | M(2) | M(2) |
| CO4 | M(2) | L(1) | M(2) | M(2) | M(2) |
| CO5 | L(1) | M(2) | L(1) | M(2) | S(3) |
| **W.AV** | **1.8** | **2** | **1.4** | **2** | **2.2** |

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

| MBA (E &IS)<br>(2023Onwards)<br>I-Semester | | | | | |
|---|---|---|---|---|---|
| **CORE** | **Course code:30712** | **Organisational Behaviour** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To familiarize the basic information about principles of management.<br>2. To educate on leadership and social and ethical responsibilities of management.<br>3. To learn about elements of good control system.<br>4.To provide knowledge about organizational behaviour and conflict.<br>5.To learn about work stress and international business. | | | | |
| **UNIT-1** | Management- meaning- characteristics-concepts –approaches -evolution- fayol's principles of management. -management theories-planning – importance -merits & demerits –principles –steps –planning & forecasting- decision making –methods – process-organisation –principles –formal & informal organisation | | | | |
| **UNIT-2** | Leadership-elements -characteristics -principles -theories-styles- motivation-importance –theories-delegation of authority- centralization & decentralization-span of management-line & staff-manpower planning- recruitment &selection-steps in selection procedure-management development -social &ethical responsibilities of management -criteria for social responsibilities- 10 commandments of corporate social responsibilities- ethics of managers | | | | |
| **UNIT-3** | Controlling-elements of control-essential of good control system- functions of controller- techniques of control-characteristics of effectivecontrol system-management information systems –international management -role of global managers. | | | | |
| **UNIT-4** | Organizational behaviour- nature –scope -elements -genesis and concept - theories on personality- factors influencing perception-process of learning-group behaviour-classification of groups-group development-functions of group-size of group-group structure-characteristics of effective groups communication-conflict-genesis of conflict-stages of conflict- conflict process-symptoms among conflicting persons-managing conflict. Hersey- blanchard's situational theory | | | | |
| **UNIT-5** | Work stress-sources of stress-coping strategies for stress-nature of organisational effectiveness-approaches to effectiveness-managerial implication. International organisational behaviour-growth of international business-trends in international business-cultural differences and similarities-culture stock-motivation across cultures-<br>Organization structures across cultures | | | | |

**References: -**


1. Organizational Behavior, Global Edition - Stephen Robbins , Timothy Judge – 2023.
2. Organizational Behavior and Management, 12th Edition - Robert Konopaske, John Ivancevich and MichaelMatteson – 2023.
3. Principles of Organizational Behavior: The Handbook of Evidence-Based Management 3rd Edition - E Locke -John Wiley & Sons Inc – 2023.
4. Organizational Behavior 13Th Edition - Griffin/ Phillips - Cengage India – 2020.


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

https://onlinecourses.swayam2.ac.in/cec20_ge19/preview

https://onlinecourses.nptel.ac.in/noc22_ce70/preview

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | To describe the basic concepts of management principles. | K1 |
| CO-2 | To illustrate about leadership and recruitment shipping. | K2 |
| CO-3 | To identify the elements of good control system. | K3 |
| CO-4 | To explain the importance of organizational behaviour and conflict. | K4 |
| CO-5 | Determine the concepts of work stress and organizational culture. | K5 |

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

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1(L) | - | 1(L) | - | - | 1(L) | - | 1(L) | - | 1(L) |
| CO2 | - | 1(L) | - | - | 1(L) | - | 1(L) | - | 1(L) | - |
| CO3 | 1(L) | 1(L) | - | 1(L) | - | 1(L) | - | 1(L) | - | 1(L) |
| CO4 | - | 1(L) | - | 1(L) | - | 1(L) | - | - | 1(L) | - |
| CO5 | 1(L) | - | 1(L) | - | 1(L) | - | 1(L) | - | - | 1(L) |
| W.AV | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

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

Mapping Course Outcome Vs Programme Specific outcomes

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 1(L) | - | 1(L) | - | - |
| CO2 | - | 1(L) | - | - | 1(L) |
| CO3 | 1(L) | - | - | 1(L) | - |
| CO4 | - | 1(L) | 1(L) | - | - |
| CO5 | 1(L) | - | 1(L) | - | - |
| W.AV | 1 | 1 | 1 | 1 | 1 |

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

| MBA (E &IS)<br>(2023Onwards)<br>I-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code:30713** | **Industrial Safety Management** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of Industrial Safety** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To understand the basic theory of fire chemistry, the development of fire and its characteristics, and about different types of fire.<br>2. To study about the product of combustion and their characteristics.<br>3. Identify the purpose for head protection, why it's important, and how hardhats protect an employee's head<br>4. Understand employer and employee responsibilities for safety<br>5. Describe the Hierarchy of Control and the role of personal protective equipment (PPE) | | | | |
| **UNIT-1** | **INTRODUCTION OF BASICS SAFETY:** Basics of fire – stage of fire- heat transfer methods- identify the ignition source -class of fire, fire fighting methods- flash point, auto ignition temperature-fire point-BLEVE. PPE- Introduction safety, hazards- risk-accident –incident- near miss , dangerous occurrence –basics of PPE- types of PPE. | | | | |
| **UNIT-2** | **HEAD AND EYE PROTECTION PPE AND FIRE EXTINGUISHER:** Introduction of head protection –hazards- safety helmet and types –parts and construction of safety helmet- care and maintenance- safety glass and goggles differentiate – potential eye hazards in industry- types of goggles. Classification of fire- fire extinguisher –types of fire extinguisher-water, co2, DCP, FOAM, halogenated agent- fire extinguisher operating methods and precaution steps. | | | | |
| **UNIT-3** | **HAND AND LEG PROTECTION PPE AND SPRINKLER SYSTEMS:** Introduction of hand protection-injuries –hazards-emergency measures-prevention of hand injuries-types of hand protection-selection- use and care of hand protection-leg protection important-hazards-protective measures-safety shoe-maintenance and care. water based sprinkler system- sprinkler heads-wet pipe system-water supply and distribution-piping and valves –water flow alarm – dry pipe system-sprinkler system inspection. | | | | |
| **UNIT-4** | **ALARM AND DETECTION SYSTEM AND SKIN PROTECTION:** NFPA 72 classification of fire alarm system-power supplies for alarm system-initiation device-basics consideration for installation-types of detectors- heat detector –smoke detector-radiant energy sensing detectors. Introduction of skin protections-causes – physical hazards –chemical substances-preventive measure – change cloths often-types of body suit -remove irritant- take shower-protective crams. | | | | |
| **UNIT-5** | **RESPIRATORY PROTECTION AND SPECIAL WORKPLACE HAZARDS:** Introduction-hazards-oxygen deficiency- harmful contaminants-smoke and fumes-spray and mists-gases and vapors-respirators- color code canister-air purifying respirator-self contained breathing apparatus –selection-use and fit. Flammable and combustible liquid –storage and transportation –loading and unloading-hot work. | | | | |

**References**


1. Purandare D.D& Abhay D.Purandare, "Hand book on Industrial Fire Safety" P & A publications, New Delhi, 2006.
2. Jain V K "Fire Safety in Building" New Age International 1996
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.)**<br>https://onlinecourses.nptel.ac.in/noc20_mg43/preview<br>https://archive.nptel.ac.in/courses/110/105/110105094/ | | |
|---|---|---|
| **Course outcomes** | | **Knowledge level** |
| CO-1 | To Formulate the water requirement and the pump capacity for firefighting and understand the basic fire ground operations. | K6 |
| CO-2 | To Classify different types of fire protection systems/ installations inoil and gas industry. | K2 |
| CO-3 | To identify the cost associated with PPE and describe the advantagesand disadvantages of PPE and engineering controls | K3 |
| CO-4 | To Describe the evaluation process of determining a successful PPEprogram | K1 |
| CO-5 | To Define the role of PPE in training and education | K1 |

On what level it correlated with COs & POs -based on that we have to give marksMapping 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)

| MBA (E &IS)<br>(2023Onwards)<br>I-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code: 30714** | **Safety Management in Constructional Sector** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of Construction safety** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To know causes of accidents related to construction activities and human factors associatedwith these accident<br>2.To understand the construction regulations and quality assurance in construction<br>3. To have the knowledge in hazards of construction and their prevention methods<br>4.To know the working principles of various construction machinery<br>5. To gain knowledge in health hazards and safety in demolition work | | | | |
| **UNIT-1** | **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 inconstruction - compensation– Education and training | | | | |
| **UNIT-2** | **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<br>- construction of high rise buildings. | | | | |
| **UNIT-3** | **WORKING AT HEIGHTS:** Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe useof 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 fragileroofs, work permit systems, height pass – accident case studies. | | | | |
| **UNIT-4** | **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 mobilecranes – manual handling. | | | | |
| **UNIT-5** | **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. The Construction Technology Handbook - Hugh Seaton – Wiley – 2021.
2. Construction Project Manager's Pocket Book - Duncan Cartlidge – Routledge publication – 2020.

3. Construction Safety: Industrial Safety and Environment - S.Suresh Raja - Kindle Edition – 2018.
4. Introduction to Health and Safety in Construction – Phil Hughes – NEBOSH – 2003.
5. (3146) Fall Protection in Construction – OSHA – 2015.

**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 |
| CO-5 | To Elaborate the safety procedure for working at heights during construction. | K6 |

On what level it correlated with COs & POs -based on that we have to give marksMapping 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)

| MBA (E &IS) (2023 Onwards) I-Semester | | | | |
|---|---|---|---|---|
| **Course code: 30715** | **ENVIRONMENTAL STUDIES** | **T/P** | **C** | **H/W** |
| | | **T** | **4** | **4** |

| | |
|---|---|
| **Objectives** | ➢ To understand the multi disciplinary nature of environmental studies such as forest, water, mineral and energy and land resources.<br>➢ To portray the ecosystem bio diversity and its conservation.<br>➢ To impart the knowledge of environmental pollution<br>➢ To know the importance of field work to study common plants,insects and birds and visitlocal areas to document environmental assets. |
| **Unit-I** | **The Multidisciplinary Nature of Environmental Studies:** Definition, Scope and importance-Need for public awareness |
| **Unit-II** | **Natural Resources:** Renewable and non-renewable resources<br>**A). Forest Resources:** Use and Over Exploitation, Deforestation, Case Studies, Timber Extraction, Mining, Dams and their Effect on Forests and Tribal People.<br>B). **Water Resources:** Use and Over Utilization of Surface and Ground Water, Floods, Drought, Conflicts over Water, Dams-Benefits and Problems.<br>C). **Mineral Resources:** Use and Exploitation, Experimental Effects of Extracting andUsing Mineral Resources, Case Studies.<br>D). **Food Resources:** World Food Problems, Changes Caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity, CaseStudies.<br>E). **Energy Resources:** Growing Energy Needs, Renewable and Non- Renewable Energy Sources, Use of Alternate Energy Resources, Case Studies.<br>F). **Land Resources:** Land as a Resource, Land Degradation, Main Induced Landsides, Soil-Erosionand Desertification.<br>➢ Role of Individual in Conservation of Natural Resources<br>➢ Equitable Use of Resources for Sustainable Lifestyle |
| **Unit-III** | **ECOSYSTEMS, BIO-DIVERSITYAND ITS CONSERVATION:**<br>**Ecosystems:** Concept of an Ecosystem, Structure and Function of an Ecosystem, EnergyFlowinThe Ecosystem, Food Chains, Food Webs and Ecological Pyramids.<br>**Biodiversity and Its Conservation:** Introduction- Definition: Genetic, Species and Ecosystem Diversity**,** Bio- Geographical Classification of India**,** Value of Biodiversity: Consumptive Use, Productive Use,Social, Ethical, Aesthetic and Option Values. Biodiversity at Global, National and Local Levels**,** India as a Mega- Diversity Nation**,** HotSpots of Biodiversity**,** Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man- Wildlife Conflicts**,** Endangered and Endemic Species of India**,** Conservation of Biodiversity: In-Situ And Ex-Situ Conservation of Biodiversity**.** |
| **Unit-IV** | **Environmental Pollution:** Causes, Effects And Control Measures of: **A).**Air Pollution, **B).**Water Pollution, **C).** Soil Pollution, **D).** Marine Pollution, **E).** Noise Pollution, **F).** ThermalPollution,**G).** NuclearHazards. |
| **Unit-V** | **FieldWork**<br>➢ VisittoaLocalAreatoDocumentEnvironmentalAssets– River/Forest/Grassland/Hill/Mountain<br>➢ VisittoaLocal PollutedSite-Urban/Rural/Industrial/Agricultural<br>➢ Studyof CommonPlants,Insects, Birds<br>➢ Studyof SimpleEcosystem-Pond,River,Hill Slopes,etc., |

**Reference and Textbooks**:-


1. Agarwal,K.C.(2001).*Environmental Biology*.Nidi PublicationLtd.
2. Bharucha, E. (2002). *The Biodiversity of India* (Vol. 1). Mapin Publishing Pvt Ltd, Ahamedabad, India.Brunner,C. R. (1993).*Hazardous waste incineration*.McgrawHillInc.
3. Clark, R. B., Frid, C., & Attrill, M. (2001). *Marine pollution* (Vol. 5). Oxford: Oxford university press.Cunningham, W. P., Cooper, T. H., Gorham, E., & Hepworth, M. T. (1998). *Environmental encyclopedia*.De,A.K.(1990). *EnvironmentalChemistry*.WileyEasternLtd.
4. Gleick,H.P.(1993).*WaterInCrisis,PacificInstituteForStudiesInDev,Envir onment& Security*.StockholmEnv.Institute, OxfordUniversityPress.
5. Goel, P. K., & Trivedi, R. K. (1998). *An introduction to air pollution*. Technoscience Publication, India.Hawkins,R.E.*EncyclopediaofIndianNaturalHistory.*BombayNatural HistorySociety,Bombay.


**Outcomes**

On successful completion of the subject ,the students acquired knowledge about:

- Renewable and non-renewable resources.
- Species and Ecosystem Diversity**,** Bio-Geographical Classification of India**,** Value ofBiodiversity:
- Causes, Effects and Control Measures of environmental pollution
- Field work knowledge of studying eco system pond,river,hill and common plants,insects and birds
- Documentation of environmental assets

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

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) |
| CO2 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) |
| CO3 | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) |
| CO4 | 2(M) | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) |
| CO5 | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| W.AV | 1.8 | 1.2 | 1.4 | 1.6 | 1.2 | 1.6 | 1.4 | 1.4 | 1.4 | 1.4 |

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

Mapping Course Outcome Vs Programme Specific outcomes

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| CO2 | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) |
| CO3 | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) |
| CO4 | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) |
| CO5 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| W.AV | 1.6 | 1.4 | 1.4 | 1.4 | 1.2 |

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

| MBA (E &IS)<br>(2023Onwards)<br>I-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code:30716 (A)** | **Safety in Process industries** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of safety in process industries** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To provide knowledge on design features for a process industry and safety in the operation of various equipment in industry.<br>2. To understand the various hazards and prevention in commissioning stage of industry.<br>3. To recognise and identify the safe operation of equipment in process industry.<br>4. To plan and train for emergency planning in a process industry.<br>5. To get fundamental knowledge on safe storage of chemicals. | | | | |
| **UNIT-1** | **Safety in process design and pressure system design:** design process, conceptual design and detail design, assessment, inherently safer design chemical reactor, types, batch reactors, reaction hazard evaluation, assessment, reactor safety, operating conditions, unit operations and equipments, utilities. Pressure system, pressure vessel design, standards and codes- pipe works and valves heat exchangers- process machinery- over pressure protection, pressure relief devices and design, fire relief, vacuum and thermal relief, special situations, disposal-flare and vent systems- failures in pressure system. | | | | |
| **UNIT-2** | **Plant commissioning and inspection:** commissioning phases and organization, pre-commissioning documents, process commissioning, commissioning problems, post commissioning documentation plant inspection, pressure vessel, pressure piping system, nondestructive testing, pressure testing, leak testing and monitoring- plant monitoring, performance monitoring, condition, vibration, corrosion, acoustic emission-pipe line inspection. | | | | |
| **UNIT-3** | **Plant operations:** operating discipline, operating procedure and inspection, format, emergency procedures hand over and permit system- start up and shut down operation, refinery units- operation of fired heaters, driers, storage-operating activities and hazards-trip systems- exposure of personnel-colour coding of pipes and cylinders – corrosion prevention for underground pipes. | | | | |
| **UNIT-4** | **Plant maintenance, modification and emergency planning:** management of maintenance, hazards- preparation for maintenance, isolation, purging, cleaning, confined spaces, permit system- maintenance equipment- hot works- tank cleaning, repair and demolition- online repairsmaintenance of protective devices modification of plant, problems- controls of modifications. Emergency planning, disaster planning, onsite emergency- offsite emergency, apell. | | | | |
| **UNIT-5** | **Storages:** general consideration, petroleum product storages, storage tanks and vessel- storages layout- segregation, separating distance, secondary containment-venting and relief, atmospheric vent, pressure, vacuum valves, flame arrestors, fire relief- fire prevention and protection- lpg storages, pressure storages, layout, instrumentation, vapourizer, refrigerated storages- lng storages, hydrogen storages, toxic storages, chlorine storages, ammonia storages, other chemical storages- underground storages- loading and unloading facilities- drum and cylinder storage- ware house, storage hazard assessment of lpg and lng. | | | | |

**References**


1. Guidelines for Revalidating a Process Hazard Analysis, 2nd Edition – CPS – Wiley – 2022.
2. Human Factors Handbook for Process Plant Operations: Improving Process Safety

and System Performance –CPS – Wiley – 2022.

3. Hazards and Safety in Process Industries: Case Studies - Mihir Kumar Purkait – CRC Press – 2021.

**Related online content (MOOC, Swayam,NPTEL, Website etc.):**
https://archive.nptel.ac.in/courses/103/107/103107156/
https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ch19/

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | To Recall the safe design of equipment which are the essential to chemical industry and leads to design of entire process industries. | K1 |
| CO-2 | To Examine the problems and find innovative solutions while industries facing problems in commissioning and maintenance stages. | K4 |
| CO-3 | To Explain the chemical plant operations. | K5 |
| CO-4 | To Evaluate the emergency planning for chemical industry problems. | K5 |
| CO-5 | To Assess safe storage systems. | 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 | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) |
| CO2 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) |
| CO3 | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) |
| CO4 | 2(M) | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) |
| CO5 | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| W.AV | 1.8 | 1.2 | 1.4 | 1.6 | 1.2 | 1.6 | 1.4 | 1.4 | 1.4 | 1.4 |

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

Mapping Course Outcome Vs Programme Specific outcomes

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| CO2 | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) |
| CO3 | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) |
| CO4 | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) |
| CO5 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| W.AV | 1.6 | 1.4 | 1.4 | 1.4 | 1.2 |

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

| MBA (E &I (2023Onwards)<br>I-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code: 30716(B)** | **Work Study & Ergonomics** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge Work Study & Ergonomics** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To study the applications of ergonomic principles and physiology of workers<br>2. To know the concepts of personal protective equipment and its usages<br>3. To create the knowledge in process and equipment design in safety aspects<br>4. To Prioritise Concept modules in Equipment design<br>5. To Justify Job and personal risk factors | | | | |
| **UNIT-1** | **Work study:** Study of operations – work content – work procedure – breakdown – human factors – safety and method study – methods and movements at the workplace – substitution with latest devices – robotic concepts – applications in hazardous workplaces – productivity, quality and safety (pqs). | | | | |
| **UNIT-2** | **Ergonomics:** Definition – applications of ergonomic principles in the shop floor – work benches – seating arrangements – layout of electrical panels- switch gears – principles of motion economy – location of controls – display locations – machine foundations – work platforms, fatigue, physical and mental strain – incidents of accident – physiology of workers. | | | | |
| **UNIT-3** | **Personal protection:** Concepts of personal protective equipment – types – selection of ppe – invisible protective barriers – procurement, storage, inspection and testing – quality – standards – ergonomic considerations in personal protective equipment design. | | | | |
| **UNIT-4** | **Process and equipment design:** Process design – equipment – instrument – selection – concept modules – various machine tools - in- built safety – machine layout-machine guarding-safety devices and methods – selection, inspection, maintenance and safe usage – statutory provisions, operator training and supervision – hazards and prevention. | | | | |
| **UNIT-5** | **Man machine systems:** Job and personal risk factors – standards-selection and training-body size and posture-body dimension (static/dynamic) – adjustment range – penalties – guide lines for safe design and postures evaluation and methods of reducing posture strain.man-machine interface-controls -types of control-identification and selection-types of displays- compatibility and stereotypes of important operations-fatigue and vigilance-measurement characteristics and strategies for enhanced performance | | | | |

**References**


1. Head, Eye, and Face Personal Protective Equipment New Trends, Practice and Applications -Katarzyna Majchrzycka - CRC Press – 2023.
2. Personal Protective Equipment – OSHA – 2023.
3. Handbook of Human Factors and Ergonomics Gavriel Salvendy, Waldemar Karwowski – Wiley –2021.
4. Ergonomics for Improved Productivity Proceedings of HWWE 2017 Volume 2 - Mohammad Muzammil, Abid Ali Khan, Faisal Hasan – Springer – 2021.


**Related online content (MOOC, Swayam,NPTEL, Website etc.):**
https://www.youtube.com/watch?v=KNFZXNWYVno

| Course outcomes | | Knowledge level |
|---|---|---|
| CO-1 | To describe work procedure and applications in hazardous | K 1 |
| CO-2 | To Illustrate the human factors in design of Personal protective equipment | K2 |
| CO-3 | To Explain the risk factors, guide lines for safe design of man machine systems considering human factors | K5 |
| CO-4 | To Justify the Guideline for safe design | K5 |
| CO-5 | To elaborate the Strategies for enhanced performance in Man Machine systems | K6 |

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

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) |
| CO2 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) |
| CO3 | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) |
| CO4 | 2(M) | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) |
| CO5 | 2(M) | 1(L) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| W.AV | 1.8 | 1.2 | 1.4 | 1.6 | 1.2 | 1.6 | 1.4 | 1.4 | 1.4 | 1.4 |

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

Mapping Course Outcome Vs Programme Specific outcomes

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| CO2 | 1(L) | 2(M) | 1(L) | 2(M) | 1(L) |
| CO3 | 2(M) | 2(M) | 1(L) | 1(L) | 1(L) |
| CO4 | 1(L) | 1(L) | 1(L) | 2(M) | 2(M) |
| CO5 | 2(M) | 1(L) | 2(M) | 1(L) | 1(L) |
| W.AV | 1.6 | 1.4 | 1.4 | 1.4 | 1.2 |

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

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **CORE** | **Course code: 30721** | **Evolution of Modern Safety Concepts** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic knowledge of Evolution of Modern Safety Concepts** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. Tofamiliarize the basic information about safety concepts.<br>2.To provide technical knowledge in safety audit.<br>3.To educate on accident investigation and reporting.<br>4.To analyze the calculation of work injury rates.<br>5.To learn about safety education and training. | | | | |

**UNIT-1CONCEPTS AND TECHNIQUES**

History of Safety movement –general concepts of management – planning for safety for optimization of productivity -productivity, quality and safety-line and staff functions for safety-budgeting for safety-safety policy. Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety.

**UNIT-2MANAGEMENT TECHNIQUES**

Management Theories-Maslow's Hierarchy of Needs .-Physiological Needs-Safety Needs -Love and Belonging -Esteem-Self-Actualization-McGregor's Theory X and Theory Y -Theory X -Theory Y-Herzberg Motivational Theory -The Deming Cycle-Management by Objectives -Contingency Theory-Systems Theory -Chaos Theory-Management Styles-Directive Democrat-Directive Autocrat-Permissive Democrat-Permissive Autocrat.

**UNIT-3RISK MANAGEMENT**

Definitions- Hazard Identification- Hazard Assessment-Risk Analysis -Risk Assessment concepts-Identifying Risks-Hazard Analysis and Risk Control-Quantitative Risk Analysis Procedures-Reliability of Critical Systems and Devices-Risk Assessment-HIRA-FTA-ETA-FMEA.

**UNIT-4 ACCIDENT CAUSATION & INVESTIGATION TECHNIQUES**

Domino Theory-Heinrich's Axioms of Industrial Safety- Human Factors Theory- Accident/Incident Theory- Epidemiological Theory- Systems Theory- Energy Release Theory- Behavior Theory-Combination Theory- Modern Causation Model-Seven Avenues-Near miss relationship-Accident Investigation Procedures- Purpose of the Investigation- Investigation Procedures- Fact Finding-Interviews- Problem-Solving Techniques (Accident Investigation Techniques)- The Scientific Method- Gross Hazard Analysis- Job Safety Analysis- Multilinker Events Sequencing Method-Report of Investigation.

**UNIT-5 RELIABILITY –DESIGN & LIFE TESTING**

Reliability: improvements – techniques- use of Pareto analysis – design– redundancy unit and standby redundancy – Optimization in reliability – Product design – Product analysis – Product development – Product life cycles. Life testing – Objective – failure data analysis, Mean failure rate, mean time to failure, mean time between failure, hazard rate – Weibull model, system reliability, series, parallel and mixed configuration – Maintainability 114 and availability – simple problems. Acceptance sampling based on reliability test – O.C Curves.

**References**


1. HeinrichH.W."IndustrialAccidentPrevention"McGraw-HillCompany,NewYork,1980.
2. KrishnanN.V."SafetyManagementinIndustry"JaicoPublishingHouse,Bombay,1997.
3. Lees, F.P., "Loss Prevention in Process Industries" Butterworth publications,London,2ndedition,1990.
4. JohnRidley, "SafetyatWork",ButterworthandCo.,London,1983.

5. Dan Petersen, "Techniques of Safety Management", McGraw-HillCompany,Tokyo,1981.
6. RelevantIndiaActsandRules,GovernmentofIndia.
7. RelevantIndianStandardsandSpecifications,BIS,NewDelhi.
8. BlakeR.B.,"IndustrialSafety"PrenticeHall,Inc.,NewJersey,1973.
9. "Safetyand Good HouseKeeping",N.P.C.,NewDelhi,1985.
10. "AccidentPreventionManualforIndustrialOperations",N.S.C.Chicago,1982.

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

**https://archive.nptel.ac.in/courses/110/105/110105094**

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | Understand the fundamental concepts of safety. | K2 |
| CO-2 | Identify the safety audit methodology. | K3 |
| CO-3 | Generate the accident reporting and investigation procedure. | K4 |
| CO-4 | Measure the incident and accident rates. | K5 |
| CO-5 | Discuss safety training and methods of safety training . | K5 |

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **CORE** | **Course code: 30722** | **EHS Legislations** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic knowledge of EHS Laws & Acts** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1.Tofamiliarize the basic information about factories act 1948.<br>2.To educate on environment act 1986.<br>3.To learn about manufacture ,storage and import of hazardous chemicals rules 1989.<br>4.To provide knowledge about important EHS legislations.<br>5.To learn about international health and safety laws. | | | | |

**Unit I-Factories Act, 1948**

Statutory Authorities - Inspecting Staff, Health, Safety, Provisions Relating to Hazardous Processes, Welfare, Working Hours, Employment of Young Persons - Special Provisions - Penalties and Procedures-Tamil Nadu Factories Rules 1950 Under Safety and Health Chapters of Factories Act 1948.

**Unit II-Environment Act, 1986**

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.

**Unit III-Manufacture. Storage & Import of Hazardous Chemical Rules, 1989**

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.

**Unit IV-Other Acts & Rules**

Indian Boiler Act 1923, Static And Mobile Pressure Vessel Rules (SMPV), Motor Vehicle Rules, Mines Act 1952, Workman Compensation Act, Rules - Electricity Act And Rules - Hazardous Wastes (Management And Handling) Rules, 1989, With Amendments In 2000- The Building And Other Construction Workers Act 1996, Petroleum Rules, Gas Cylinder Rules-Explosives Act 1983-Pesticides Act.

**Unit V-International Acts & Standards**

Occupational Safety and Health Act of USA (The William Steiger Act of 1970) - Health And Safety Work Act (HASAWA 1974, UK)-OSHAS 18000-ISO 14000- American National Standards Institute (ANSI).

**References**.


1. The Factories act, 1948.
2. The Environment act, 1986.
3. Manufacture, storage and import of hazardous chemical rules, 1989.
4. The Indian boiler act 1923, International acts and health and safety standards.


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

https://onlinecourses.swayam2.ac.in/cec20_ge19/preview

https://www.classcentral.com/course/swayam-health-safety-management-14339

| Course outcomes | | Knowledge level |
|---|---|---|
| CO-1 | To express the basic concepts of factories act 1948. | K2 |
| CO-2 | To explain the knowledge about environment act 1986. | K4 |
| CO-3 | To discuss manufacture, storage, import of hazardous chemicals rules 1989. | K4 |
| CO-4 | To Explain theimportant industrial safety laws. | K4 |
| CO-5 | To Determine the various international health and safety laws and standards. | K5 |

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **CORE** | **Course code: 30723** | **Process Safety Management** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge Process Safety management** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. Tofamiliarize the basic information about process safety.<br>2.To provide technical knowledge in process hazard analysis.<br>3.To educate on process safety elements.<br>4.To analyze the incident investigation methods.<br>5.To learn about emergency planning and response. | | | | |

**UnitI – ProcessSafetyInformation**

Hazards of Regulated Substance – Block Flow Diagram – Process Chemistry – MaximumIntendedInventory–Upper&LowerLimits–ConsequencesofDeviation – Materials of Construction – Piping & Instrumentation Diagrams –Electrical Classification – Relief System Design – Ventilation System Design –Design Codes &Standards–Materials &EnergyBalances– SafetySystems

**UnitII–Process HazardAnalysis,Operating Procedures &Training**

Introduction –Deciding the Methods of PHA – Limitations of PHA's – PrioritizingPHA's – Methods for Conducting the PHA: What If, Checklist, HAZOP, FMEA,FTA – PHA Team – PHA Findings – Review & Revalidation – Description ofOperatingProcedure– ElementsofOperatingProcedure–AvailabilityofOperatingProcedure–InitialTraining– IntermittentTraining–OntheJobTraining– RefresherTraining– TrainingDocumentation

**Unit III – Mechanical Integrity, Management of Change, Prestart up Review&Compliance Audits**

MechanicalIntegrity–Training–EquipmentDeficiencies&QualityAssurance–ManagementofChange– PrestartUpReview–ComplianceAudits

**UnitIV–IncidentInvestigation,EmployeeParticipation&TradeSecrets**

IncidentInvestigation–InvestigationMethodologies –InvestigationQuestionnaire-EmployeeParticipation–TradeSecrets

**UnitV–Hot WorkPermit,Contractors&Emergency Response**

HotWorkPermit–ContractorSelection–PrincipleEmployerResponsibilities–Contractor Employer Responsibilities – Emergency Planning & Response

**References**


1. "ProcessSafetyManagementManual" US Departmentof Labor, OSHA3132,Reprintedon2000
2. "DOEHandbook–ProcessSafetyManagementforHighlyHazardousChemicals",US Departmentof Energy
3. "RiskManagementPlan(RMP)&ProcessSafetyManagement(PSM)Manual", Newington Energy, General Electric Contractual Services, TritonEnvironmental Inc.
4. "ChemicalProcessSafety:LearningfromMistakes",RoyE.Sanders,Butterworth-Heinemann,Elsevier.


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

https://archive.nptel.ac.in/courses/103/107/103107156

https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ch19

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | To define the fundamental concepts of process safety management. | K1 |
| CO-2 | To Identify the process hazard analysis methods. | K3 |
| CO-3 | To Generate the importance of process safety elements | K4 |

| | | |
|---|---|---|
| CO-4 | To explain the knowledge about incident investigation. | K5 |
| CO-5 | To Discuss about handling of emergencies. | K6 |

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code: 30724** | **Occupational Health & Safety Management** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge of Occupational Health & Safety Management (OHSM )** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To teach the significance of occupational health and hygiene.<br>2. To learn the fundamental principles of first aid.<br>3. To Gain an historical, economic, and organizational perspective of occupational health and first aid.<br>4. To identify the components needed to provide a safe and healthful work environment<br>5. To acquired knowledge and skills needed to identify workplace problems and advance safe work | | | | |

**UNIT I OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES 9**

Concept and spectrum of health- functional units and activities of occupational health servicesoccupationaland work related disease- Levels of prevention of diseases - notifiable occupationaldiseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis andanthrax - Lead-Nickel, chromium and manganese toxicity- gas poisoning (such as CO,ammonia, coal and dust ), their effects and prevention - Industrial toxicology - local and systemic and chronic effects, temporary and cumulative effects - threshold limit values,calculation of TLVs - carcinogens, mutagens, teratogens. Instruments for Radiation detectionand measurement. Early recognition of radiation hazard. Personal monitoring devices, Medicalsupport. Hazards associated with the following radiations and preventive measures- Laser, infra-red,ultra violet and ELF.

**UNIT II PHYSICAL HAZARD MEASUREMENT, EVALUATION AND CONTROL 9**

Recognition, evaluation and control of physical hazards. Vibration - description and measurementof vibration. Vibration control methods. Effects of whole body vibration on human body and controlmeasures. Noise- noise measurement, evaluation, noise control methods -hearing loss - causes -Biological effects of noise exposure.Thermal stress - heat disorders and health effects such as heatexhaustion, hear cramp etc. WBGT index, acclimatization. Ventilation systems - purpose ofventilation-general principles ventilation requirements. Physiological and comfort level. Naturalventilation - Dilution ventilation - Mechanical ventilation - Local exhaust ventilation – Ventilationmeasuring instruments. Fundamentals of hood and duct designs. Standards on ventilation. Purposeof lighting. Advantages of good illumination. Lighting and the work. Sources and kinds of artificiallighting principles of good illumination. Design of lighting installation. Maintenance. Lighting andcolour. Standards on lighting and illuminations.

**UNIT III PRINCIPLES OF FIRST AID 9**

First Aid principles-Role of the first aider-sequence of action on arrival at scene. Vital signs-breathing-pulse. Introduction to the body-basic anatomical terms-body cavities-head- cranium - thorax- abdomen and pelvis. Biomechanics - Structure and functions of musculoskeletal systems,tendons, ligaments, facia, bone, muscles, joints and basic mechanisms.Fainting-recognitionmanagement-aftercare. Diabetes - hypoglycaemia – hyper glycaemia- management. Seizures(epileptic fits, convulsions) features- management, stroke. Head injuries-fractures of the basevaultand sides of skull.

**UNIT IV FIRST-AID PRACTICE IN INDUSTRY 9**

The circulatory system-heat attack-chest compression- CPR. Shock -causes - signs and symptoms - management of shock. Eye-eye injuries-foreign body in eye-eye trauma-corrosive chemical in

eyearc
eye. Wounds-bleeding-classification-types of wounds-case of wounds- bleeding from special sites. Fractures- classification of fractures-principles of immobilisation- sprains and dislocation. Broad and narrow fold bandages-hand bandages-slings. The skin. Burns-rule of nines-pure thermal burns. Electric burns. Chemical burns. Radiation burns. Cold burns. Poisoning. Physical fitness. Lifting -casualty handling. Use of stretchers.

**UNIT V OCCUPATIONAL AND PSYCHOLOGICAL HAZARDS**

Elements of Industrial Psychology-Mental Health in Industries- OrganisationalBehaviour, Motivational Theory , Job SatisfactionValue system, Habits, Drug Abuse-Alcoholism in Industry, Communications, Organising Health education and Training Programme for employees, Psychological Hazards - Workplace Stress- General Adaptation SyndromeEustress –Distress-Diseases/Disorders related to Work stress- Psychosomatic disorders. Managing Work-stress in industry- Individual responsibilities - Employers Responsibilities. Psychological Counseling of employees- Employees Assistance Programme, Behaviour based Safety,.

**REFERENCE: -**

1. Jeanne Mager Stellman (ed). Encyclopedia of occupational health and safety. (four volumes). (fourth edition). International Labour Office, Geneva.
2. The industrial environment - its evaluation and control. DHHS (NIOSH) publication number 74-117, 1973.
3. Clayton, C.D. and Clayton, F. (1981). Patty´s industrial hygiene and toxicology. Wiley Inderscience, New York.
4. Sue Reed, Dino Pisaniello, Geza Benke, Kerrie Burton, “Principles of Occupational Health and Hygiene” – An Introduction,Taylor and Francis group,2nd Edition,2013

**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 | Understand the concept and spectrum of health – functional units and activities of occupational health service. | K1 |
| CO-2 | Identify physical chemical and biological hazards in the work environment and its control measures. | K2 |
| CO-3 | Demonstrate the principles of first aid. | K4 |
| CO-4 | Understand anatomy and functions of different human systems. | K5 |
| CO-5 | Identify the decisions required to maintain protection of the environment, home and workplace as well as personal health and safety. | K6 |

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code: 30725** | **Hazard Identification , Risk Assessment and Risk Control** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge of Hazard Identification , Risk Assessment and Risk Control** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1.To Describe fundamentals of Hazard and risk with Human error analysis<br>2.To Express Risk analysis with Root cause analysis methods and Cost benefit analysis<br>3.To Evaluate HAZOP studies with its methodologies<br>4.To Prioritise Hazard Identification & Risk Assessment with Qualitative and Quantitative site assessment<br>5.To Develop credibility of risk assessment techniques through Past accident analysis | | | | |

**UNIT I FUNDAMENTALS OF HAZARD, RISK**

Introduction- hazard & Risk-Risk register-Checklist-hazard characterization-horseplay-hazardous event- unsafe act-unsafe condition preliminary hazard analysis-ALARP- Concept of ALARP and its application in Risk Assessment -Safety Warning System-Human error analysis.

**UNIT II RISK ANALYSIS METHODS**

Risk analysis-What Is Risk Identification-*What Is Risk Analysis-benefits of risk analysis-risk analysis process*-Root Cause Analysis.Job safety analysis-Risk-Benefit and Cost-Benefit Analysis.

**UNIT III SAFETY MANAGEMENT TOOLS**

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.

**UNIT IV 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-Reviewing-Types of Risk Assessment-Quantitative and Qualitative Risk Assessment-Specific Site Assessment.

**UNIT V CREDIBILITY OF RISK ASSESSMENT TECHNIQUES**

Past accident analysis as information sources for Hazard analysis and consequences analysis of chemical accident, Mexico disaster, Flixborough,Bhopal, Seveso, Pasadena,Feyzin disaster (1966), Port Hudson disaster-convey report.

**References**

1. ENVH 577 Readings (On Canvas site)
2. Harr, J., A Civil Action. Vintage Press, 1996 (on reserve at HS Library)
3.Devra Davis, When Smoke Ran Like Water: Tales of Environmental Deception and the Battle Against Pollution.
4.Phil Brown (editor), Health and the Environment (HTE)

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

www.atsdr.cdc.gov/HAC/HAGM/

www.epa.gov/superfund/programs/risk/ragsa/index.htm

| 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 Interpret Safety Management tools with HAZOP | K4 |
| CO-4 | To Justify HIRA with Risk Matrix and Risk Control Methods | K5 |
| CO-5 | To Elaborate credibility of Risk Assessment Techniques | K6 |

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code: 30726A** | **Textile Safety** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of safety in textile industries** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. Toprovidethestudentaboutthebasicknowledgeaboutthetextileindustriesanditsproductsbyusingvariousmachineries.<br>2. Toenforcetheknowledgeontextileprocessingandvariousprocessesinmakingtheyarnfromcottonorsyntheticfibres.<br>3. Tounderstandthevarious hazards of processingtextilefibresbyusingvariousactivities. | | | | |

**UNITI INTRODUCTION**

Introduction to process flow charts of i) short staple spinning, ii) long staple spinning, iii) viscose rayonandsyntheticfibre,manufacturer,iv)spunandfilamentyarntofabricmanufacture,v)jutespinningandjutefabricmanufacture-accidenthazard,guardingofmachineryandsafetyprecautionsinopening, carding, combing, drawing, flyer frames and ring frames, doubles, rotor spinning, winding,warping,softening/spinning specifictojute.

**UNITII TEXTILEHAZARDS I**

Accident hazards i)sizing processes- cooking vessels, transports of size, hazards due to steam ii)Loom shed–shuttleloomsandshuttlessloomsiii)knittingmachinesiv) non-wovens.

**UNITIII TEXTILEHAZARDS II**

Scouring,bleaching,dyeing,punting,mechanicalfinishingoperationsandeffluentsintextileprocesses.

**UNITIV HEALTHAND WELFARE**

Health hazards in textile industry related to dust, fly and noise generated-control measures-relevantoccupational diseases, personal protective equipment-health and welfare measures specific to textileindustry,Specialprecautionsforspecifichazardous workenvironments.

**UNITV SAFETYSTATUS**

Relevant provision of factories act and rules and other statues applicable to textile industry – effluenttreatmentandwastedisposalin textileindustry.

**References**


1. 100Textilefires –analysis,findingsandrecommendationsLPA
2. GrooverandHenryDS,"Handbookoftextiletestingandqualitycontrol"
3. "Qualitytolerancesforwaterfortextileindustry",BIS
4. Shenai,V.A."Atechnologyoftextileprocessing",Vol.I,TextileFibres
5. Little,A.H.,"Watersuppliesandthetreatmentanddisposalofeffluent"


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

https://archive.nptel.ac.in/courses/116/102/116102029/

https://archive.nptel.ac.in/content/storage2/courses/103103027/pdf/mod9.pdf

| Course outcomes | | Knowledge level |
|---|---|---|
| CO-1 | To describe about the textile industries and its operations. | K1 |
| CO-2 | To Explain the various concepts underlying in the processes involved in processing offibrestoyarn. | K2 |
| CO-3 | To Classify various hazards in the textile industry and will be able toapplythe controlmeasures tomitigatetheriskemanatingfromthehazard. | K4 |
| CO-4 | To Interpret the various health and welfare activities as pertheFactoriesactandcould implementstatutoryrequirements. | K5 |
| CO-5 | To Determine various methods meant formitigatingtheriskandabletoguidehissubordinatesinexecutingthework safely. | K5 |

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code: 30726B** | **Safety in mines** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of safety in mines** | | **Syllabus Revised** | | **2023-2024** |

**Course Objectives**

1. Toprovideindepthknowledgeon Safetyofmines of varioustypes.
2. Tostudy,knowandunderstandaboutthetypesofminesandvariousrisk involvedin theminingoperations.
3. To get exposed to various types of accidents happened in mines and how to manage duringaccidents.
4. To analyze the nature of mining activities and developing a safety system to reduce the risk andalsotoimplementtheEmergencypreparednessintheworkingenvironment ofmines andtoplanforthedisastermanagement.

**UNITI OPEN CAST MINES**

Causes and prevention of accident from: Heavy machinery, belt and bucket conveyors, drilling, handtools-pneumatic systems, pumping, water, dust, electrical systems, fire prevention.Garage safety –accidentreportingsystem-workingcondition-safetransportation–handlingofexplosives.

**UNITII UNDERGROUND MINES**

Fallofroofandsides-effectofgases-fireandexplosions-waterflooding-warningsensors-gasdetectors-occupationalhazards-workingconditions-windingandtransportation.

**UNITIII TUNNELLING**

Hazards from: ground collapse,inundationandcollapseoftunnel face,falls fromplatforms anddanger from falling bodies. Atmospheric pollution (gases and dusts) – trapping – transport-noise-electrical hazards-noise and vibration from: pneumatic tools and other machines – ventilation andlighting –personalprotective equipment.

**UNITIV RISK ASSESSMENT**

Basicconceptsofrisk-reliabilityandhazardpotential-elementsofriskassessment–statisticalmethods – controlcharts-appraisal of advanced techniques-fault tree analysis-failure mode and effectanalysis–quantitativestructure-activityrelationshipanalysis-fuzzymodelforrisk assessment.

**UNITV ACCIDENT ANALYSIS AND MANAGEMENT**

Accidents classification and analysis-fatal, serious, minor and reportable accidents – safety audits-recent development of safety engineering approaches for mines-frequency rates-accident occurrence-investigation-measures for improving safety in mines-cost of accident-emergency preparedness –disastermanagement

**References**


1. DGMSCirculars-MinistryofLabour,GovernmentofIndiapress,ORLovelyPrakashan-DHANBAD,2002.
2. Kejiriwal,B.K. SafetyinMines,GyanPrakashan,Dhanbad, 2001.
3. "MineHealthandSafetyManagement",MichaelKarmised.,SME,Littleton,Co.2001.


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

https://onlinecourses.nptel.ac.in/noc23_mg98/preview

https://onlinecourses.nptel.ac.in/noc22_mg55/preview

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | To Describe basicsof safetyaspects intheminingindustries. | K1 |
| CO-2 | To classify the various types of mining activities like open casemines,undergroundminesandtunnel ling. | K4 |
| CO-3 | To Simplify the various risks involved in the mining activities and come toknowaboutthevarioussafetyactivities tobetaken | K4 |

| | | |
|---|---|---|
| | toensurethesafetyoftheworkers. | |
| CO-4 | To Explain the techniques like risk assessment Disaster management andemergencypreparednesswiththe properknowledgeon accidentprevention. | K5 |
| CO-5 | To effectively Elaborate their knowledge on accident prevention inmines. | K6 |

| MBA (E &IS) II-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code: 30726C** | **Transport Safety** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge Transport safety** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. Toprovidethestudentsaboutthevariousactivities/stepstobefollowedinsafehandlingthehazardousgoodstransportationfromonelocation to another location.<br>2. ToeducatethereasonsfortheroadaccidentandtherolesandresponsibilitiesofasafeDriverandthetraining needs of the driver.<br>3. Toinculcatethecultureofsafedrivingandfuelconservationalongwithknowingofbasictrafficsymbolsfollowed through out the highways | | | | |

**UNITI TRANSPORTATION OFHAZARDOUS GOODS**

Transport emergency card (TREM) – driver training-parking of tankers on the highways-speed of thevehicle – warning symbols – design of the tanker lorries -static electricity-responsibilities of driver – inspectionandmaintenanceofvehicles-checklist-loadinganddecantingprocedures–communication.

**UNITII ROAD TRANSPORT**

Introduction–factorsforimprovingsafetyonroads–causesofaccidentsduetodriversandpedestrians-design, selection, operation and maintenance of motor trucks-preventive maintenance-checklists-motorvehiclesact –motorvehicle insurance andsurveys.

**UNITIII DRIVERAND SAFETY**

Driversafetyprogramme–selectionofdrivers–drivertraining-tacho-graph-drivingtest-driver'sresponsibility-accident reporting and investigation procedures-fleet accident frequency-safe drivingincentives-slogans in drivercabin-motor vehicletransport workers act- driverrelaxation and restpauses –speed andfuelconservation–emergencyplanningand Hazmatcodes

**UNITIV ROAD SAFETY**

Roadalignmentandgradient-reconnaissance-rulinggradient-maximumriseperk.m.-factorsinfluencing alignment like tractive resistance, tractive force, direct alignment, vertical curves-breakingcharacteristics of vehicle-skidding-restriction of speeds-significance of speeds- Pavement conditions –Sightdistance–Safetyatintersections–Trafficcontrollinesandguideposts-guardrailsandbarriers – streetlightingandilluminationoverloading-concentrationofdriver.

Plantrailway:Clearance-track-warningmethods-loadingandunloading-movingcars-safetypractices.

**UNITV SHOPFLOORANDREPAIRSHOPSAFETY** 9

Transportprecautions-safetyon manual, mechanicalhandlingequipmentoperations-safe driving-movement of cranes-conveyors etc., servicing and maintenance equipment-grease rack operation-wash rack operation-battery charging-gasoline handling-other safe practices-off the road motorizedequipment.

**References**


1. "AccidentPreventionManualforIndustrialOperations",NSC, Chicago,1982.
2. Babkov,V.F.,"RoadConditionsandTrafficSafety"MIRPublications,Moscow,1986.
3. K.W.Ogden,"SaferRoads –AguidetoRoadSafetyEngineering"
4. Kadiyali,"TrafficEngineeringandTransportPlanning"KhannaPublishers,NewDelhi,1983.
5. MotorVehiclesAct,1988,GovernmentofIndia.


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

https://nptel.ac.in/courses/105105215

https://onlinecourses.nptel.ac.in/noc22_ce41/preview

| **Course outcomes** | | **Knowledge** |
|---|---|---|
| CO-1 | To Describe the Transportation of Hazardous goods with legal procedures | K1 |
| CO-2 | To Explain the road transport safety with preventive maintenance checklists and motor vehicle insurance and surveys | K2 |
| CO-3 | To Examine the Driver safety programme with emergency planning and HAZMAT codes | K4 |
| CO-4 | To Interpret Road safety with Clearance and pavement conditions | K5 |
| CO-5 | To Justify the usage of Transport precautions with safety on manual | K5 |

| MBA (E&IS) II -Semester | | | | | |
|---|---|---|---|---|---|
| **NME** | **Course code: 30727** | **Personality development** | **T** | **Credits: 2** | **Hours:3** |
| **Pre-requisite** | **Basic knowledge of Personality development** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1.To familiarize with Introduction to Skills in Personality development<br>2. To Illustrate Emotional intelligence and competency to reach Personal Goals<br>3.To Evaluate the Management skills with Leadership styles and motivational outbringing<br>4. To Interpret Job interview and interview skills<br>5.To Discuss about Job attires and Training certifications. | | | | |

**UNIT-1**

Listening- Observation - Communication- Stages of listening process- Barriers of listening observation- Positive outlook- Communication Barriers of communication- Communication Skill

**UNIT-2**

Empathy Emotional Intelligence- Emotional Competencies- Measurement of the Emotional Competencies - Personal Goal Setting Basic methods to improve creativity 10 blocks that affects creativity

**UNIT-3**

Management Skills- Leadership Motivation The Top 10 Leadership Qualities- Types of leadership styles- Seven Rules of Motivation-Time Management- Importance of time- What are our time wasters

**UNIT-4**

Interview Skills- 10 Rules of Interviewing - 5 Steps to Effective Preparation-"Illegal Questions- 7 Steps to Success at the Interview- 3 Steps to Effective Follow-up- Thank-You Letters - Cabin Crew - Job Interview - Goal Orientation- Success Tips- Creativity.

**UNIT-5**

Landing the Job- Attires and professionalism Grooming and Personal Appearance - Soft Skills- Grooming Group Discussion- Interview Training & Mock Interviews Resumes and applications - Training and Certification. Presentation and Seminars-Project

**References**

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16th Edition: Prentice Hall
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).

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

https://onlinecourses.swayam2.ac.in/cec19_mg36/preview

https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20-hs43/

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | To List and Relate Skills in Personality development | K1 |
| CO-2 | To Express Emotional Competencies and emotional intelligence | K2 |
| CO-3 | To Interpret Management skills on Motivation and Leadership styles | K3 |
| CO-4 | To Explain the Rules of Interviewing | K5 |
| CO-5 | To Formulate Professionalism in Interviews | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code: 30731** | **Safety Inspection and Audit** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge of Safety Inspection and audit** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1.To achieve understanding of safety inspection and audit<br>2.To enable students to conduct safety audit and write audit report effectively in auditing situation<br>3.The course could provide basic knowledge of OHSMS and EMS<br>4.To educate about the various steps to be taken for certification of ISO 14001(EMS)<br>5.To impart knowledge on environmental impact assessment, life cycle assessment of product and principles of eco labeling | | | | |

Unit I-SAFETY INSPECTION

Importance of Workplace Inspection Planning of Workplace Inspection Purpose of Workplace Inspection Hazards in Workplace Information's Required in Workplace Inspection Report Inspection Team Duration of Inspection - Frequency of Inspection - Follow up & Monitoring - Summary

Unit II-SAFETY AUDIT

Introduction Types of Audits Audit Objectives Methodology to Conduct Safety Audit- Pre Audit Activities - Background Information to be Gathered Data to be Gathered - On Site Activities - Understanding Management Systems Assessing Strengths & Weaknesses - Collecting Audit Evidence - Interviewing - Observation Evaluating Audit Evidence Reporting Audit Findings - Post Audit Activities.

Unit-III-OH & S MANAGEMENT SYSTEM STANDARD

Introduction to ISO 45001 – Development of various OHSMS standards – aim of OH & S management system–success factors– plan do check act cycle- contents and scope of ISO 45001- terms and definitions –leadership and worker participation –leadership and commitment - OH & S policy- organizational roles and responsibilities and authorities – consultation and participation of workers

UNIT- IV ISO 14001

EMS, ISO 14001, specifications, objectives, Environmental Policy, Guidelines and Principles (ISO 14004), clauses 4.1 to 4.5. Documentation requirements, 3 levels of documentation for a ISO 14000 based EMS, steps in ISO 14001

UNIT V- ENVIRONMENT IMPACT ASSESSMENT

ISO 14040(LCA), General principles of LCA, Stages of LCA, Report and Review. ISO 14020 (Eco labeling) – History, 14021, 14024, Type I labels, Type II labels, ISO 14024, principles, rules for eco labeling before company attempts for it. Advantages. EIA in EMS, Types of EIA, EIA methodology EIS, Scope, Benefits.

**References**

1. ISO 45001: 2018 –Occupational Health and safety management systems Requirements with guidance for use
2. ISO14001:2004, Environmental Management Systems Requirements with Guidance for Use" ,ISO, 2004.

| | | |
|---|---|---|
| 3. “Guidelines on Occupational Health and Safety Management Systems (OSH-MS)” International Labour Organization, 2001<br>4. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980<br>5. John Ridley, “Safety at Work”, Butterworth and Co., London, 1983 | | |
| **Related online content (MOOC, Swayam,NPTEL, Website etc.)** | | |
| https://archive.nptel.ac.in/courses/110/105/110105160/ | | |
| https://onlinecourses.nptel.ac.in/noc23_mg48/preview | | |
| **Course outcomes** | | **Knowledge level** |
| CO-1 | To recall basic safety audit and prepare a report for safety audit | K1 |
| CO-2 | To Illustrate safety inspection and prepare a report for safety inspection | K2 |
| CO-3 | To interpret various standards for maintaining OHSMS | K4 |
| CO-4 | To Justify ISO 14001standards on Safety audit and inspection | K5 |
| CO-5 | To Discuss EIA and ecosystem development | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code: 30732** | **Industrial Hygiene & Toxicology** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic knowledge of Industrial Hygiene & Toxicology** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1.To familiarize with Introduction to Industrial Safety and Hygiene<br>2. To appraise monitoring of safety, health and environment with standards and control methods<br>3.To Prioritize Occupational Health and Environmental Safety education with evaluation and training programmes.<br>4. To Interpret Occupational Safety, Health and environmental management with its functions and needs<br>5.To Solve industrial Hazards with necessary Control methods and Precautional measures. | | | | |

**Unit- I – Introduction to Industrial Hygiene, Human Physiology & Industrial Diseases**

Introduction to IH – The Study of Human Systems – Basic Unit of Life: Cells – Structure of the Body: Skeleton – The Moving Force: Muscles – The Control System: Nervous System – Fuel Processing: The Digestive System – Distribution System: Circulatory System – Fuel Supply System: Respiratory System – Filtering System: Renal System – Defense System: Skin & Sense Organs.

**Unit-II – Recognition, Evaluation & Control of Hazards**

Noise – Vibration, Ionizing &Non-Ionizing Radiation – Thermal – Mechanical – Pressure – Illumination – Traumatic – Phycological – Legionella & Humidifier Fever – Bloodborne Diseases: Hepatitis B & C, HIV – Zoonoses: Anthrax, Leptospirosis, Salmonellosis- Substitution – Isolation of Source – Ventilation: Local Exhaust Ventilation, Dilution Ventilation of Industrial Workplaces, General Ventilation of Non-Industrial Workplaces – Administrative Controls – Personal Protective Equipment – Determining the Control Measure to Use.

**Unit-III–Fundamentals of Toxicology**

Introduction – Physical Form – Dose – Routes pf Entry/Absorption – Classification of Toxic Materials in Air: Irritants, Asphyxiants, Anesthetics, Hepatotoxic Agents, Nephrotoxic Agents, Blood Damaging Agents, Lung Damaging Agents – Metabolism – Excretion – Response to Toxins – Stages of Toxicological Evaluation – Exposure Limits – ACGIH Threshold Limit Values – HAZCHEM.

**Unit-IV – Industrial Ergonomics**

Introduction – Man/Machine System – Workplace Risk Assessment – Factors Affecting Performance of Physical Tasks – Manual Handling – Repetitive Tasks – Display Screen Equipment –Carpal Tunnel Syndrome – Bible Bumps – White Finger – Trigger Finger – Tendinitis – Tennis Elbow – MSD – WRULD – Minimum Requirements for Workstations – Design of the Job – Design of the Workplace – Administrative Controls

**Unit-V – Air Sampling, Biological Monitoring & Health Surveillance**

Introduction – Sampling Particulates – Sampling Gases & Vapors – Sampling & Analytical Methods – Indoor Air Quality – HVAC – Microorganism & AAQ

Urine – Blood – Skin – Breath – Vision – X Rays – Neurological Tests – Audiometry – Lung Function Tests: Lung Volume, Airways Resistance – Biological Exposure Indices (BEI).

**References**

1. Jeanne MagerStellman, Encyclopedia of Occupational Health and Safety (ILO) Ms. Irma Jourdan publication
2. Frank P Lees - Loss of prevention in Process Industries, Vol. 1 and 2,
3. ButterworthHeinemann Ltd., London (1991). 2. Industrial Safety - National Safety Council of India
4. Frank P Lees – Loss of prevention in Process Industries , Vol. 1 and 2, Butterworth- Heinemann Ltd.,

| | | |
|---|---|---|
| London<br>5. R. K. Jain and Sunil S. Rao, Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006). | | |
| **Related online content (MOOC, Swayam,NPTEL, Website etc.)** | | |
| https://onlinecourses.nptel.ac.in/noc20_mg43/preview | | |
| https://archive.nptel.ac.in/courses/110/105/110105094/ | | |
| **Course outcomes** | | **Knowledge level** |
| CO-1 | To Describe the basics of Industrial Hygiene | K1 |
| CO-2 | To Outline the monitoring of Safety, Health and Environment | K2 |
| CO-3 | To Priorities the occupational health and environmental safety education | K5 |
| CO-4 | To Justify occupational safety,health and environmental manageement | K5 |
| CO-5 | To Elaborate Industrial Hazards | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **CORE** | **Course code: 30733** | **Safety Culture & Behaviour based Safety** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge of Behaviour based safety and Industrial ergonomics.** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. Tolearn the basic information about human behaviour<br>2. To provide knowledge of group behaviour.<br>3. To educate the concepts of behaviour based safety.<br>4. To familiarize the information about workplace ergonomics.<br>5. To learn about ergonomical system design of workers.. | | | | |

**UNIT-I-INDIVIDUAL BEHAVIOUR**

Personality types - Factors influencing personality - Theories - Learning - Types of learners-The learning process-Learning theories-Organizational behavior modification-Misbehavior-Types-Management Intervention Emotions Emotional Labor-Emotional Intelligence Theories- Attitudes Characteristics Components Formation- Measurement Values. Perceptions Importance Factors influencing perception Interpersonal perception Impression Management- Motivation - Importance-Types -Effects on work behavior.

**UNIT-II-GROUP BEHAVIOUR**

Organization structure dynamics Emergence of informal leaders and working norms - Group decision making- Formation Groups in organizations Influence Group techniques-Team building - Interpersonal relations-Communication - Control.

**UNIT-III-BEHAVIOUR BASED OBSERVATION AND FEEDBACK**

Introduction to BBS(Behavior based safety)-Why behavior based safety-ABC model of behavior change-ABC behavior model-ABC behavior model consequences-ABC behavior model feedback -Safety coaching through observation and feedback-Integrating behavioral safety principles in to other management systems-Critical impact of social comparison feedback-Seven lessons from behavior based safety for increasing PPE use-Addressing ergonomic hazards through behavior based observation and feedback-Safety culture.

**UNIT-IV-ERGONOMICS**

Definition-applications of ergonomic principles in the shop floor-work benches-seatingarrangements - layout of electrical panels- switch gears - principles of motion economy-location of controls-display locations-machine foundations- work platforms, fatigue,physical and mental strain - incidents of accident-physiology of workers.

**UNIT V WORK DESIGN FOR STANDING AND SEATED WORKS**

Design For Everyone, Anthropometry And Personal Space, Effectiveness And Cost Effectiveness Fundamental Aspects Of Standing And Sitting, An Ergonomics Approach To Work Station Design, Design For Standing Workers, Design For Seated Workers, Work Surface Design -Guidelines For Design Of Static Work, Effectiveness And Cost.

**References**

1. **Behaviour-Based Safety in Organizations: Life Before the Accident** Paperback – 30 April 2017by H.L. Kaila (Author)

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

https://archive.nptel.ac.in/courses/110/105/110105160

https://alison.com/course/behaviour-based-safety-revised

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | To name the fundamental concepts of human behavoiur. | K1 |
| CO-2 | To Identify the information about workplace groups. | K3 |
| CO-3 | To examine the behaviour based safety and model. | K4 |
| CO-4 | To explain the ergonomic principles in workplace. | K5 |
| CO-5 | To construct the ergonomical system design of workplace and work | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code: 30734** | **Safety in Oil & Gas Industries** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge of Safety in Oil & Gas Industries** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1.To give basic information aboutoil and gas work process<br>2. To Analyze Root cause and reliability analysis in Oil and Gas industries<br>3.To Regulate Safety norms and procedures in Offshore<br>4.To Interpret Accident factors in Oil and gas Industry with Common hazards and Precaution measures<br>5.To Evaluate Accident Data Analysis based on previous accident records | | | | |

**UNIT-1 INTRODUCTION TO OIL AND GAS SAFETY**

Introduction –upstream –down stream- mid stream- safety management principle –product hazard classification – product organization task-common cause of work injuries –differentiate of onshore and offshore –accident caution theory- human error occurrence reasons and consequences-bath tub hazard curve.

**UNIT -2 SAFETY ANALYSIS METHODS AND RELIABILITY ANALYSIS IN OIL AND GAS INDUSTRY.**

Introduction –root cause analysis-HAZOP(hazards and operability analysis)-interface safety analysis-job safety analysis-preliminary hazards analysis-failure mode of effective analysis-fault tree analysis-markov methods-daily observation report –safety checklist- safety training program- tool box talk –safety induction training- on job training-refreshment training.

**UNIT-3 OFFSHORE SAFETY**

Introduction –Who regulates the offshore safety-consequences of not fallowing safety -offshore industrial risk picture-offshore worker situation awareness concept-studies and result –offshore industry accident reporting procedure –important of regular inspection of machinery –offshore industry accident case studies (Mumbai north platform, piper alpha accident-glomar java sea drillship accident- baker drilling barge accident-seacrest drillship accident).

**UNIT-4 OIL AND GAS INDUSTRY ACCIDENT FACTORS**

Introduction- human factors that effects in general-organization factor-group factor-individual factor-oil field fatalities analysis-common hazards in oil and gas industry-explosion and fire hazards-recommendation reduce fatal oil and gas industry accident- work permit system

**UNIT -5 MAIN CAUSES OF ACCIDENT IN OIL AND GAS INDUSTRY AND ACCIDENT DATA ANALYSIS**

Introduction –confined space –hazards- requirements of ventilation and gas test –precaution steps .lifting –hazards – control measure of lifting activities-hazardous materials –dehydration –poor lighting-work at height –storage and handling of flammable liquids-offshore oil and gas industry accident data base and accident data collection sources.

**References**


1. B.S. Dhillonm, safety and reliability in the oil and gas industry apractical approach, CRC press, Taylor and francis group 2016.
2. Alireza bahadori, personnel protection and safety equipment for oil and gas industries, gulf professional publishing of Elsevier group 2015
3. Abdul khalique, Basic offshore safety, routledge 2016
4. Alireza bahadori, personnel protection and safety equipment for oil and gas industries, gulf professional publishing of Elsevier group 2015

5. Abdul khalique, Basic offshore safety, routledge 2016

| Related online content (MOOC, Swayam,NPTEL, Website etc.) | | |
|---|---|---|
| https://archive.nptel.ac.in/courses/114/106/114106017/ | | |
| https://onlinecourses.nptel.ac.in/noc19_oe02/preview | | |
| **Course outcomes** | | **Knowledge level** |
| CO-1 | To Recall the functions of upstream, midstream and downstream segments | K1 |
| CO-2 | To Explain Work related to oil and gasindustry covering flammability limits,explosive hazards, and other hazardsrelated to health, safety and environment | K2 |
| CO-3 | To describe offshore oil and gas industry who are responsible for ensuring safety, health and security for workers as part of their daily routines. | K1 |
| CO-4 | To Elaborate about the recommendation to reduce fatal oil and gas industry accidents | K6 |
| CO-5 | To Discuss about work permit system like hot work, confined spaced job work entry etc. | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **Core** | **Course code: 30735** | **Safety Aspects in Industrial Plant Layout Design** | **T** | **Credits:4** | **Hours:4** |
| **Pre-requisite** | **Basic Knowledge of Safety Aspects in Industrial Plant Layout Design** | | **Syllabus Revised** | | **2023-2024** |

**UNIT-1-PLANT LAYOUT DESIGN**

Introduction- The blue print stage- Plant layout, design and safe distance- Safe layout, equipment layout, safety system- Fire hydrant locations, fire service rooms- facilities for safe effluent disposal and treatment tanks, site considerations, approach roads, plant railway lines, security towers- safe layout for process industries, engineering industry, construction sites, pharmaceuticals, pesticides, fertilizers, food processing, nuclear power stations, thermal power stations and metal powders manufacturing- importance of standards and codes of practice for plant and layout.

**UNIT-2- PLANT LOCATION** Plant location, selection of plant locations, territorial parameters- Consideration of land, water, electricity, location for waste treatment and disposal, further expansions- Safe location of chemical storages, LPG, LNG, CNG, acetylene, ammonia, chlorine, explosives and propellants- Plant inspection, NDT testing, significance and limitations, radiography ultrasonic's magnetic particle methods, eddy current methods, die penetration test.

**UNIT-3- INDUSTRIAL OPERATIONS AND DESIGN**Computerized layout and analytical methods- ALDEP, CORELAP, CRAFT- Warehouse operations, function and storage operations- Manufacturing operation- JIT, TQM, AM, CIM, SCM, facility systems- Quantitative models, layout model – workstations, unit loads & containers, conveyors, vehicles, lifting devices, workstation material handling- Facility design, facility design procedure and planning strategies, production activity and materials flow analysis, space requirements and personnel services design considerations.

**UNIT-4- WORKING CONDITIONS**

Principles of good ventilation, local and exhaust ventilation, hood and duct design, air conditioning, ventilation standards- Purpose of lighting, types of lighting, advantages of good illumination, glare and its effect, lighting requirements for various work- housekeeping principles, principles of 5s, typical accidents due to poor housekeeping, cleaning methods, employee assignment- inspection and checklists, benefits of good housekeeping- role of preventive maintenance in safety and health

**UNIT-5-MANUAL AND MECHANICAL MATERIAL HANDLING**

Preventing common injuries, lifting by hand, team lifting and carrying, handling specific shape machines and other heavy objects,- Design, installation, operation and maintenance of conveying equipment, hoisting travelling and slewing mechanisms- General safety consideration in material handling, ropes, chains, hoops, clamps, arresting gears, prime movers- design factors, deterioration causes, sheaves ad drums, lubrication, overloading, rope fitting, inspection and replacement- Slings, method of attachment, rated capacities, alloy chain slings, hooks and attachment, inspection, ergonomic considerations.

**References Books:**


1. Plant layout and material handling, by- James M. Apple, John Willey & sons.
2. Plant layout and material handling, by- Fred E. Meyers, Prentice Hall.
3. Facility layout and location; an analytical Approach, by Richard L, Francis, Pearson India.
4. Plant layout and material handling, by-B.K. Aggarwal, Jain Brothers.
5. Plant layout and material handling, by- S.C. Sharma, Jain brothers.
6. Materials handling handbook, by- peters, McGraw hill education.
7. Purchasing and material management, by- Gopalakrishnan, McGraw hill education.

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code: 30736A** | **Safety Management Systems** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of Safety management systems** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To provide knowledge about Safety Management and accident prevention with Financial direct and indirect costs and management Information systems.<br>2. To impart knowledge on planning and organizing for safety in an industry<br>3. To acquire knowledge on Training methods and out of plant training programmes<br>4. To Understand the employee participation in safety with techniques of safety promotion | | | | |

UNIT - I SAFETY MANAGEMENT AND ACCIDENT PREVENTION

History of Safety Management in India and abroad- Need for safety, legal, Economic and Social Considerations, OSHAS / IS- 18001 - Role of management in Industrial safety- Management principles & practices- Theories of Accident Occurrences -Principles and Modals of Accident Prevention, Near miss incident - Financial costs direct and indirect, Social Costs of accidents – Compilation procedures for financial costs - Budgeting for Safety- Economic Evaluation and methods in safety promotion - Management Information System (MIS) - Sources,

Protection, Collection and compilation of SHE information - Use of Modern Methods of Programming, Storing and Retrieval of MIS for SHE, Use of IT Tools in managing SHE systems.

UNIT – II- PLANNING AND ORGANISING FOR SAFETY

Safety Policy- Formulation and Cascading down the organization - Variety / Forms of plans -Strategic Planning and Process of Implementation - Management by Objectives and its Role in safety - Effective Planning for Safety - Haddon's Principle- Safety Department- Organization Structure - Functions and Responsibilities - Authority Power and Qualifications / Attributes of Safety Officer Department - Effective System of Communication for SHE - Barriers and Break downs in communication - Communication with Management Employees & Trade

Union Communication and Group Dynamics - Modes of Communication - Manageable Communication.

UNIT - III SAFETY, HEALTH AND ENVIRONMENT EDUCATION AND TRAINING

Assessment of Needs- Tool box talk design & development of training programme - Training methods and strategies- Modern Methods of Safety Training - E- Learning - In-plant training programmes- Out-of-plant training programmes, Seminars, Programmes for new workers- Training of Manager, Supervisors & Workers Evaluation and review of Training Programmes -Induction Training - Training for Contractors and visitors - Integrating safety into Operating Procedures - Job Instructions Vs Safety Instructions.

UNIT - IV EMPLOYEE PARTICIPATION IN SAFETY

Purpose, Nature, Scope and methods - Importance of Employee / Participation – history of trade Unions in India, Role of Trade Unions in Safety, Health and Environment integrating SHE in Collective Bargaining - Safety Suggestion Schemes - Safety Competitions - Safety Incentive Schemes - Promotional Methods - Performance - Appraisal - Modern Methods and Techniques of Safety Promotion.

UNIT - V BEHAVIOURAL SAFETY

Organizational behavior - Human Factors Contributing to Accidents - Psychological aspects Of Safety, Safety Culture System - Individual differences -Behavior as function of sell situation -Perception of danger and acceptance of risks - Knowledge and responsibility Vis-a-Vis Safety performance - Theories of motivation and their application of safety - Role of management, Supervisors and Safety department in motivation - Ethical issues.

**References**

1. Ray Asfahl. C “Industrial Safety and Health Management” Pearson Prentice Hall,2003.
2. John V. Grimaldi and Rollin H. Simonds, “Safety Management”, All India Travelers Book seller, New Delhi, 2001
3. Krishnan, N.V. (1997). Safety management in Industry. Jaico Publishing House, NewDelhi.
4. John V. Grimaldi and Rollin H.Simonds. (1989) Safety management. All India TravellerBook Seller, Delhi.
5. Ronald P. Blake. (1973). Industrial safety. Prentice Hall, New Delhi.

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

https://nptel.ac.in/courses/110105160

https://www.digimat.in/nptel/courses/video/110105160/L01.html

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | To recall basic concepts of accident occurrences and accident prevention based on OSHAS / IS- 18001 | K1 |
| CO-2 | To Explain about Safety policy with Effective system of communication | K2 |
| CO-3 | To Interpret Modern methods of Safety Training | K4 |
| CO-4 | To Evaluate Safety Incentive Schemes with Promotional Methods | K5 |
| CO-5 | To Elaborate Organizational beahviour with Psychological aspects of Safety | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code: 30736B** | **Safety in Fire Works** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of Fireworks safety** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | • Tostudythepropertiesof pyrotechnicchemicals<br>• Toknowaboutthe hazardsinthemanufactureof variousfireworks<br>• Tounderstandthehazards infireworksindustries relatedprocesses<br>• Tostudytheeffectsofstaticelectricity<br>• Tolearnpyrotechnicmaterialhandling,transportationandusersafety | | | | |

**UNITI PROPERTIES OFFIREWORKS CHEMICALS**

Fire properties – potassium nitrate (KN03), potassium chlorate (KCl03), barium nitrate (BaNO3),calcium nitrate (CaNO3), Sulphur (S), Phosphorous (P), antimony (Sb), Pyro Aluminum (A1) powder-Reactions-metal powders, Borax, ammonia (NH3) – Strontium Nitrate, Sodium Nitrate, Potassium per chloride. Fire and explosion, impact and friction sensitivity.

**UNITII STATIC CHARGEAND DUST**

Concept-prevention-earthing-copperplates-dressmaterials-staticchargemeterlightning,Causes-effects-hazardsinfireworksfactories-lightningarrestor:concept-installation-earthpit-maintenance-resistance-legalrequirements-casestudies.Dust:size-desirable,non-respirable-biologicalbarriers-hazards-personalprotectiveequipment-pollutionprevention.

**UNITIII PROCESS SAFETY**

Safe-quantity, mixing-filling-fuse cutting – fuse fixing – finishing – drying at various stages-packing-storage-hand tools-materials, layout: building-distances- factories act – explosive act and rules – fire prevention and control –risk related fire works industries.

**UNITIV MATERIAL HANDLINGANDTRANSPORTATION:**

Manual handling – wheel barrows-trucks-bullock carts-cycles-automobiles-fuse handling – paper caps handling-nitric acid handling in snake eggs manufacture-handling the mix in this factory-materialmovement-godown-wastepit.Packing-magazine-designofvehiclesforexplosivetransportsloadingintoautomobiles-transportrestrictions-case studies-overhead power lines-driver habits-intermediate parking-fire extinguishers-loose chemical shandling and transport.

**UNITV WASTE CONTROLANDUSER SAFETY**

Concepts of wastes – Wastes in fireworks-Disposal-Spillages-storage of residues. Consumer anxiety-hazards in display-methods in other countries-fires, burns and scalds-sales outlets-restrictions-role offireservice.

**References**


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

| **Course outcomes** | | **Knowledge level** |
|---|---|---|
| CO-1 | ToDescribe about thechemicalreactionsof Fireworks chemicals | K1 |
| CO-2 | ToExplain the safemanufacture ofFireworks items | K2 |
| CO-3 | ToSimplify the processsafetyinfireworksindustries | K4 |
| CO-4 | ToJustify the safetymeasuresapplicableagainststaticelectricity | K5 |
| CO-5 | ToElaboratesafepracticesforhandlingoffireworks infactories,transportandatuserend | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **Elective** | **Course code: 30736C** | **Disaster Management** | **T** | **Credits:4** | **Hours:5** |
| **Pre-requisite** | **Basic Knowledge of Disaster management and APELL** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To provide basic conceptual understanding of disasters<br>2.To understand approaches of Disaster Management<br>3. To build skills to respond to disaster<br>4.To evaluate the training and awareness program<br>5. To gain knowledge in health hazards and safety in demolition work | | | | |

**UNIT: I DEFINITION AND TYPES OF DISASTER**

Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-Made Disasters, Earthquakes, Floods Drought, Landside, Land Subsidence, Cyclones, Volcanoes, Tsunami, Avalanches, Global Climate Extremes. Man-Made Disasters: Terrorism, Gas and Radiations Leaks, Toxic Waste Disposal, Oil Spills, Forest Fires.

**UNIT – II - DISASTER MANAGEMENT**

Definitions, History and Relevance. Resilience Building. Disaster Cycle: Risk Management-Risk Identification, Risk Reduction (Planning, Prevention, Mitigation, Preparedness), Risk Transfer; Crisis Management- Response (Search Ad Rescue), Relief, Recovery and Reconstruction. Multi-Disciplinary Character ff DM.

**UNIT: III MITIGATION AND MANAGEMENT TECHNIQUES OF DISASTER**

Basic Principles of Disasters Management, Disaster Management Cycle, Disaster Management Policy, National And State Bodies for Disaster Management, Early Warming Systems, Building Design and Construction in Highly Seismic Zones, Retrofitting of Buildings.

**UNIT IV TRAINING, AWARENESS PROGRAM AND PROJECT ON DISASTER MANAGEMENT**

Training and Drills for Disaster Preparedness, Awareness Generation Program, Usages of GIS and Remote Sensing Techniques in Disaster Management, Mini Project on Disaster Risk Assessment and Preparedness for Disasters with Reference to Disasters in India and Tamilnadu.

**UNIT – V - DISASTER ADMINISTRATION & MITIGATION AND MANAGEMENT TECHNIQUES OF DISASTER**

United Nations and its Disaster Management Mechanism - UNDP, UNDRR, WHO. Disaster Administration in India: APELL - Disaster Management Authority at National, State and District Levels; Allied Governmental Bodies, Institutions and Mechanisms/ Resources for Disaster Management; State And National Disaster Mitigation Funds. Gaps In Disaster Policy And Administration. Basic Principles of Disasters Management, Disaster Management Cycle, Disaster Management Policy, National and State Bodies for Disaster Management, Early Warming Systems, Building Design and Construction in Highly Seismic Zones, Retrofitting of Buildings.

**REFERENCE: -**

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of

Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

**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 describe the various types of disasters | K1 |
| CO-2 | To explain about disaster management system. | K2 |
| CO-3 | To examine the management cycle. | K4 |
| CO-4 | To determine the training program | K5 |
| CO-5 | To create the APELL | K6 |

| MBA (E &IS) III-Semester | | | | | |
|---|---|---|---|---|---|
| **NME** | **Course code: 30737** | **Food Hygiene and Sanitation (HACCP)** | **T** | **Credits:2** | **Hours:3** |
| **Pre-requisite** | **Basic Knowledge of Food hygiene and its safety** | | **Syllabus Revised** | | **2023-2024** |
| **Course Objectives** | 1. To learn about food quality<br>2. To learn about physical, chemical and biological contamination in food and sanitation.<br>3. To learn the quality, challenges in food industry.<br>4. To learn basics about food quality auditing.<br>5. To learn the chemical, technological and toxicological aspects of food additives and food contaminants and the legal and socio-economic aspects of biotechnology | | | | |

**UNIT I FOOD QUALITY**

Objective and Importance of Quality Control, Classification of Quality Attributes and its Role in Food Quality, Quality Assessment of Food Materials (Fruits, Cereals, Milk And Meat), Types of Quality Characteristics of Food, Methods used for Determination of the Quality in Food Industry, Factors in Fluencing The Quality of Food, Sample and Sampling Methods of Quality Evaluation.

**UNIT II FOOD SANITATION**

Factors Contributing to Physical, Chemical and Biological Contamination in Food Chain, Prevention and Control of Food Borne Hazards, Definition and Regulation of Food Sanitation, Sources of Contamination, Personal Hygiene-Food Handlers, Cleaning Compounds, Sanitation Methods and Pest Control, Sanitation and Safety in Food Services.

**UNIT III FOOD SAFETY**

Principles of Food Safety and Quality, Quality Assurance, Total Quality Management (TQM). Good Agricultural Practices (Gap), Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Veterinary Practice (GVP), Risk Analysis, Riskassessment, Risk Management. Applications of HACCP in Food Safety, Current Challenges to Food Safety.

**UNIT IV FOOD LAWS AND REGULATIONS**

Basic Concepts of Food Standards, Role of National Regulatory Agencies: Food Safety and Standards Act: Salient Provision And Prospects, Fssai, Pfa, Certification- Agmark, Isi (Bis). Role of International Regulatory Agencies: USDA, FDA, BRC, WHO, FAO, Codex Alimentarius Commission, WTO Agreements: Sps And Tbt Agreements, ISO and its Standards for Food Quality and Safety (ISO 9000, ISO 17025, ISO 22000, And ISO14000).

**UNIT V FOOD SAFETY AUDITING**

Food Surveillance: International And National Practices, Procedure And Protocols, Food Alerts, Traceability And Food Product Recall. Export And Import Of Food In India: Introduction, Import And Export Policies, Fda Import Policy, Export-Import Policy, Export Control Systems. Import Intelligence And Alert Systems, Packaging And Labelling, Specifications And Certifications.

**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 Understand the food quality in food industry | K1 |
| CO-2 | To Identify the food additives and food contaminants and their | K2 |

| | | |
|---|---|---|
| | chemical and toxicologicalproperties. | |
| CO-3 | To Recognize the effects of pests on food and the various methods for controlling them | K4 |
| CO-4 | To Attain knowledge about the national and international regulations for biosafety. | K5 |
| CO-5 | To Demonstrate an ability to recognize the environmental, social and ethical implications ofbiotech applications. | K6 |

## PG Programme

### 19.1 Passing minimum

- A candidate shall be declared to have passed each course if he/she secures not less than 40% marks in the End Semester Examinations and 40% marks in the Internal Assessment and not less than 50% in the aggregate, taking Continuous Assessment and End Semester Examinations marks together.
- The candidates not obtain 40% in the Internal Assessment are permitted to improve their Internal Assessment marks in the subsequent semesters (2 chances will be given) by writing the CIA tests and by submitting assignments.
- Candidates, who have secured the pass marks in the End-Semester Examination and in the CIA but failed to secure the aggregate minimum pass mark (E.S.E + C I.A), are permitted to improve their Internal Assessment mark in the following semester and/or in University examinations.
- A candidate shall be declared to have passed the Project/Dissertation/Internship if he/she gets not less than 40% in the End Semester Examinations and 40% marks in the Internal Assessment and not less than 50% in the aggregate in each of the Project/Dissertation/Internship Report and Viva-Voce.
- A candidate who gets less than 50% in the Project/Dissertation/Internship Report must resubmit the thesis. Such candidates need to take again the Viva-Voce on the resubmitted Project report.

### 19.2 Grading

The following table gives the marks, Grade points, Letter Grades, and classifications meant to indicate the overall academic performance of the candidate.

Conversion of Marks to Grade Points and Letter Grade (Performance in Paper/ Course)

| RANGE OF MARKS | GRADE POINTS | LETTER GRADE | DESCRIPTION |
|---|---|---|---|
| 90 - 100 | **9.0 – 10.0** | **O** | **Outstanding** |
| 80 - 89 | **8.0 – 8.9** | **D+** | **Excellent** |
| 75 - 79 | **7.5 – 7.9** | **D** | **Distinction** |
| 70 - 74 | **7.0 – 7.4** | **A+** | **Very Good** |
| 60 - 69 | **6.0 – 6.9** | **A** | **Good** |
| 50 - 59 | **5.0 – 5.9** | **B** | **Average** |
| 00 - 49 | **0.0** | **U** | **Re-appear** |
| ABSENT | **0.0** | **AAA** | **ABSENT** |

a) Successful candidates passing the examinations and earning a GPA between 9.0 and 10.0 and marks from 90 – 100 shall be declared to have Outstanding (O).

b) Successful candidates passing the examinations and earning a GPA between 8.0 and 8.9 and marks from 80 - 89 shall be declared to have Excellent (D+).

c) Successful candidates passing the examinations and earning a GPA between 7.5 – 7.9 and marks from 75 - 79 shall be declared to have Distinction (D).

d) Successful candidates passing the examinations and earning a GPA between 7.0 – 7.4 and marks from 70 - 74 shall be declared to have Very Good (A+).

e) Successful candidates passing the examinations and earning a GPA between 6.0 – 6.9 and marks from 60 - 69 shall be declared to have Good (A).

f) Successful candidates passing the examinations and earning a GPA between 5.0 – 5.9 and marks from 50 - 59 shall be declared to have an Average (B).

g) Candidates earning a GPA between 0.0 and marks from 00 - 49 shall be declared to have Re-appear (U).

h) Absence from an examination shall not be taken as an attempt.

From the second semester onwards the total performance in a semester and continuous performance starting from the first semester are indicated respectively as Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). These two are calculated by the following formulate

GRADE POINT AVERAGE (GPA) = $\Sigma_i C_i \; G_i / \Sigma_i C_i$

GPA = Sum of the multiplication of Grade Points by the credits of the courses
Sum of the credits of the courses in a Semester

**19.3 Classification of the final result**

| CGPA | Grade | Classification of Final Result |
|---|---|---|
| 9.5 – 10.0<br>9.0 and above but below 9.5 | **O+**<br>**O** | First Class – Exemplary* |
| 8.5 and above but below 9.0<br>8.0 and above but below 8.5<br>7.5 and above but below 8.0 | **D++**<br>**D+**<br>**D** | First Class with Distinction* |
| 7.0 and above but below 7.5<br>6.5 and above but below 7.0<br>6.0 and above but below 6.5 | **A++**<br>**A+**<br>**A** | First Class |
| 5.5 and above but below 6.0<br>5.0 and above but below 5.5 | **B+**<br>**B** | Second Class |
| 0.0 and above but below 5.0 | **U** | Re-appear |

The final result of the candidate shall be based only on the CGPA earned by the candidate.

a) Successful candidates passing the examinations and earning a CGPA between 9.5 and 10.0 shall be given Letter Grade (O+), and those who earned a CGPA between 9.0 and 9.4 shall be given Letter Grade (O) and declared to have First Class –Exemplary*.

b) Successful candidates passing the examinations and earning a CGPA between 7.5 and 7.9 shall be given Letter Grade (D), those who earned a CGPA between 8.0 and 8.4 shall be given Letter Grade (D+), those who earned a CGPA between 8.5 and 8.9 shall be given Letter Grade (D++) and declared to have First Class with Distinction*.

c) Successful candidates passing the examinations and earning a CGPA between 6.0 and 6.4 shall be given Letter Grade (A), those who earned a CGPA between 6.5 and 6.9 shall be given Letter Grade (A+), those who earned a CGPA between 7.0 and 7.4 shall be given Letter Grade (A++) and declared to have First Class.

d) Successful candidates passing the examinations and earning a CGPA between 5.0 and 5.4 shall be given a Letter Grade (B), and those who earned a CGPA between 5.5 and 5.9 shall be given a Letter Grade (B+) and declared to have passed in Second Class.

i) Candidates who earned a CGPA between 0.0 and 4.9 shall be given Letter Grade (U) and declared to have Re-appear.

e) Absence from an examination shall not be taken as an attempt.

CUMULATIVE GRADE POINT AVERAGE (CGPA) = $\Sigma_n \Sigma_i C_{ni} G_{ni} / \Sigma_n \Sigma_i C_{ni}$

CGPA = Sum of the multiplication of Grade Points by the credits of the entire Programme

Sum of the credits of the courses for the entire Programme

Sum of Grade Points X credits of the entire Programme

Where '**Ci**' is the Credit earned for Course i in any semester; '**Gi**' is the Grade Point obtained by the student for Course i and 'n' refers to the semester in which such courses were credited.

**CGPA** (Cumulative Grade Point Average) = Average Grade Point of all the Courses passed starting from the first semester to the current semester.

Note: * The candidates who have passed in the first appearance and within the prescribed Semesters of the PG Programme are alone eligible for this classification.