

**SU/BOS/Science/500**

**Date: 10/07/2023**

**To,**

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.
--	---

**Subject:** Regarding syllabi of as per NEP-2020 under the Faculty of Science and Technology.

**Sir/Madam,**

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of degree programme under the Faculty of Science and Technology.

1. B.Sc.-M.Sc. Part II Nanoscience and Technology	7. All Faculty Under Graduate Part II Environmental Studies
2. M.C.A. Part I (New NEP -2020)	8. P.G. Diploma in Data Science
3. B.C.A. Part II	9. P.G. Diploma in Environment Protection & Management
4. M.C.A. Part II	10. P.G. Diploma in Industrial Safety, Health & Environment
5. B.Sc. Part III Food Science	11. Diploma in Industrial Safety, Health & Environment
6. B.Sc. Part I Drug Chemistry	12. All Faculty UG & PG Value Added Course : <b>Intellectual Property Rights</b>

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website [www.unishivaji.ac.in](http://www.unishivaji.ac.in))

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,



**Dy Registrar  
Dr. S. M. Kubal**

**Copy to:**

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

**INDUSTRIAL SAFETY, HEALTH AND ENVIRONMENT  
(DISHE)  
2023-24**

Sr. No.	Code	Paper Title	Theory Hours	Practical Hours	Marks		Total
					External	Internal	
1.	CC1001	Occupational Health and safety Hazards	40	--	100	--	100
2.	CC1002	Safety at Workplace	40	--	100	--	100
3.	CC1003	Accident Prevention Techniques	40	--	100	--	100
4.	CC1004	Safety Management System	40	--	100	--	100
5.	CC1005	In-plant Training , Visits and Practical	--	2 Weeks	--	100	100
6.	CC1006	Project	--	One Year	50	50	100
Total marks							600

• **COURSE OUTCOMES:**

**CC1001: Occupational Health and Hazards**

Upon completion of the course, students will be able to:

**CO1:** Comprehend the basics of Occupational Health Hazards.

**CO2:** Introduce the Ergonomics and industrial safety.

**CO3:** Understand the Radiation and Industrial Hazards.

**CO4:** Realize the basics of electrical hazards and hazards in Construction Industry

**CO5:** Analyse the Fire and other related hazards.

**Syllabus**

**Unit - I Safety and Health Management: (10)**

- i. Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety.
- ii. Ergonomics - Introduction, Definition, Objectives, Advantages.  
Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders.
- iii. Importance of Industrial safety, role of safety department, Safety committee and Function

**Unit - II Radiation and Industrial Hazards : (10)**

- i. Types and effects of radiation on human body, Measurement and detection of Radiation intensity. Effects of radiation on human body, Measurement – disposal of radioactive waste, Control of radiation
- ii. Industrial noise -Sources, and its control, Effects of noise on the auditory system and health, Measurement of noise ,
- iii. Different air pollutants in industries, Effect of different gases and particulate matter, acid fumes ,smoke, fog on human health
- iv. Vibration - effects, measurement and control measures
- v. Industrial Hygiene.

**Unit -III Electrical Hazards and Hazards in Construction Industry: (10)**

- i. Safe limits of amperages, voltages, distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthing standards and earth fault protection, Protection against voltage fluctuations, Effects of shock on human body Hazards from Borrowed neutrals, Electrical equipment in hazardous atmosphere, Criteria in their selection, installation, maintenance and use, Control of hazards due to static electricity,
- ii. Introduction of Construction industry, Scaffolding and Working plat form, Welding and Cutting, Excavation Work, Concreting and Cementing work, Transportation of men and material, Handling and Storage of compressed gas.

**Unit - IV Fire and other Hazards:****(10)**

- i. General causes and classification of fire, Detection of fire, extinguishing methods, fire fighting installations with and without water.
- ii. Machine guards and its types, automation. High pressure hazards, safety, emptying, inspecting, repairing, hydraulic and nondestructive testing, hazards and control in mines.

**Reference Books :**

1. R.K.Jain and Sunil S.Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006)
2. Slote.L, Handbook of Occupational Safety and Health, John Willey and Sons, NewYork .

## **CC1002: Safety at Workplace**

Upon completion of the course, students will be able to:

**CO1:** Sensitise about Safe use of machines and tools

**CO2:** Introduce the plant design and Housekeeping.

**CO3:** Consider the importance of Industrial Lighting.

**CO4:** Analyse the fire and other related hazards.

**CO5:** Understand the effects of Vibration and Noise

### **Syllabus**

#### **Unit I - Safe use of machines and tools: (10)**

- i. Safety in the use of :
  - 1) Grinding 2) CNC's 3) Shearing 4) Bending 5) Milling 6) Boring 7) ShapingSafe use of hand tools: Safe use of various types of hand tools used for metal cutting, torsion tools, shock tools, non sparking tools, portable power tools
- ii. Ergonomics of machine guarding, Principles of machine guarding of different types of machinery including special precautions for paper, rubber and printing machinery, wood working. Built-in-safety devices, maintenance and repairs of guards, Ergonomics of machine guarding
- iii. Working in different areas: Working in confined spaces, Working Underground, working at heights - use of stairways, clamps, working platforms, ladders of different types, Boatswain's chair and safety harness working on roofs, Lifting machinery lifts and hoists,
- iv. Operation, inspection and maintenance of industrial trucks, loose gears conveyors, Safe working load for mechanical material handling equipments.

#### **Unit II - Plant design and Housekeeping : (10)**

- i. Plant layout, design and safe distance, Need for planning and follow-up. Safety and good housekeeping. Ventilation and heat stress, Significance of ventilation, Natural ventilation, Mechanical ventilation Air conditioning
- ii. National Building code part VIII and Building service, Thermal comfort, Indices of heat stress, Physiology of heat regulation,
- iii. Safety and good housekeeping, Typical accidents due to poor housekeeping Disposal of scrap and other trade wastes ,Spillage prevention ,Use of colour as an aid of housekeeping, Cleaning methods, Inspection and Checklists, Advantages of good housekeeping

**Unit III - Industrial Lighting: (10)**

Purpose of lighting, Phenomenon of lighting and safety, Lighting and the work. Uses of good illumination, recommended optimum standards of illumination, Design of lighting installation, Standards for lighting and colour.

**Unit IV - Vibration and Noise : (10)**

Activities related to vibrations, its impact on human health, abatement  
Sources, effects of noise on man, Measurement and evaluation of noise,  
Practical aspects of control of noise isolation. Noise absorption techniques.  
Vibration reduces techniques. Silencers, damping etc

**Reference Books :**

1. Frank P Lees - Loss of prevention in Process Industries , Vol. 1 and 2, Butterworth- Heinemann Ltd., London (1991).
2. Industrial Safety -National Safety Council Of India.
3. Industrial Accident Prevention, Heinrich et al., McGraw Hill, 1980. Techniques for safety management - A systems approach, Petersen D, ASSE 1998

## **CC1003: Accident Prevention Techniques**

Upon completion of the course, students will be able to:

**CO1:** Aware about the principles of accidents prevention.

**CO2:** Introduce the plant design and Housekeeping.

**CO3:** Consider the importance of Industrial Lighting.

**CO4:** Understand the use of Personal Protective Equipments.

**CO5:** Realise the need of Plant layout for safety

### **Syllabus**

#### **Unit - I Principles of accidents prevention: (10)**

Definition: Incident, accident, injury, dangerous occurrences, unsafe acts, unsafe conditions, hazards, error, oversight, mistakes, etc.

Accident Prevention : Theories / Models of accident occurrences, Principles of accident prevention, Accident and Financial implications, Hazard identification and analysis, fault tree analysis, Event tree analysis, failure modes and effects analysis, Hazop studies, Job safety analysis - examples ,Plant safety inspection - objectives and types check procedure inspection report.

#### **Unit - II Theories and principles of accident causation: (10)**

- i. The effect of accident, unsafe act, unsafe condition, unpredictable performance, Human factors contributing to accidents - causes for unsafe acts,
- ii. Safety and psychology -Theories of motivation and their application to safety. Consequences of accident, accident prevention programmers, Role of safety,

#### **Unit - III First aid: (10)**

- i. Body structure and Functions, Position of causality, the unconscious casualty, fracture and dislocation, Injuries in muscles and joints, Bleeding, Burns, Scalds and accidents caused by electricity, Respiratory problems, Rescue and Transport of Casualty. Cardiac massage, poisoning, wounds.
- ii. Personal Protective Equipments: Need, selection, supply, use, care and maintenance, Personal protective devices for head, ear, face, eye, foot, knee and body protection, Respiratory personal protective devices.

**Unit IV - Plant layout for safety:****(10)**

- i. Design and location ,distance between hazardous units, colour coding ,Lighting, ventilation, Flow charts, pilot plant applications and machine guarding and it's types, Housekeeping.
- ii. Accidents related with maintenance of machines, maintenance of machines- advantages.
- iii. Work permits systems - Significance of documentation.

**Reference Books :**

1. Frank P Lees – Loss of prevention in Process Industries , Vol. 1 and 2, Butterworth- Heinemann Ltd., London (1991).
2. R. K. Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006)



## **CC1004: Safety Management System and Law**

Upon completion of the course, students will be able to:

**CO1:** Recognise the principles of Legislative measures in industrial safety

**CO2:** Determine effectiveness of PSM.

**CO3:** Know the structure, function and responsibilities of safety officer.

**CO4:** Familiarise with the essential rules in communication with employees with conducting training,

**CO5:** Understand the role of trade union in safety.

### **Syllabus**

#### **Unit - I Legislative measures in industrial safety : (10)**

Factories Act, 1948, Workman's Compensation Act, 1943,  
Employees State Insurance Act, 1948.

Mines Act , Air (Prevention and control) Pollution Act, 1981,  
Water (Prevention and Control) Pollution Act, 1974,Boiler Vessels Act.  
Child Labour and Women Employee Act.

The factories rules, History, Provisions under the factories Act and rules made there under with amendments, Functions of safety management.

ILO Convention and Recommendations in the furtherance of safety, health and welfare.

#### **Unit – II Occupational Safety, Health and Environment Management: (10)**

Bureau of Indian standards on safety and health 14489 - 1998 and 15001 - 2000  
OSHA, Process Safety Management (PSM) as per OSHA, PSM principles,  
ISO 45001:2018, EPA Standards,  
Performance measurements to determine effectiveness of PSM

#### **Unit – III Safety Management : (10)**

Organising for safety, Health and Environment.

Organisation : Structure, Function and responsibilities

Safety Committee : Structure and function

The competent person in relation to safety legislation - duties and responsibilities.

Competence Building Technique (CBT),

Concept for training, application of computer, multimedia, communication.

Relevance of WTO regarding safety, Health and environment.

Employee participation in safety - Role of Trade union in safety, health and environment. Safety promotion and safety awards, safety, competitions, audio visual publication.

**Unit IV Directing safety:****(10)**

Definition, process, principles and techniques.

Leadership - role, function and attribution of a leader.

Essential rules in communication with employees with conducting training, team building and group dynamics.

Financial cost to individual worker and family, organisation and society.

Procedures for compilation, utility and limitations of cost data, budgeting for safety, role of trade unions in safety.

**Reference Books:**

1. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai
  2. Grimaldi and Simonds , Safety Management, AITBS Publishers , New Delhi (2001)
  3. Industrial Safety –National Safety Council of India
- 

**CC1005 : In-plant Training and Industrial Visits**

- i. In-plant training of 2 weeks is compulsory and a Report to be submitted to the Department with due Certification of the industry where training is sought.
- ii. Minimum 5 Industrial Visits are compulsory.

**CC1006: Project**

One year compulsory Project on Industrial Safety to be completed before Theory examination and a Report to be submitted to the Department.

## Format of question paper with marking scheme

### **Diploma in Industrial Safety, Health and Environment (Revised) Examination, ENVIRONMENTAL SCIENCE (Paper- ) (New)**

**Paper name:**

**Sub. Code:**

**Day and Date:**

**Total Marks: 100**

**Time:**

**Instructions: 1. Question No. 1 is compulsory.**

**2. Solve any four questions from Question No. 2 to 7.**

**3. All questions carry equal marks.**

Q. 1. (20)

Q. 2. (20)

Q. 3. (20)

Q. 4. (20)

Q. 5. Write Short Notes (Any Two) (20)

a)

b)

c)

Q. 6. Write Short Notes (Any Two) (20)

a)

b)

c)

Q. 7. Write Short Notes (Any Four) (20)

a)

b)

c)

d)

e)

- Standard of Passing : 40 M