University of Mumbai



No.UG/ 2.2 of 2021-22 Mumbai-400 032, 4 st June, 2021.

To, Co-Ordinator, Sub-Centre, Ratnagiri, University of Mumbai, P-61, MIDC, Mirjole Ratnagiri - 415 639

Sir.

I am to invite your attention to Ordinances, Regulations and Syllabus relating to the Diploma in Industrial Safety and Management and to inform you that the resolution passed by the Board of Deans at its meeting held on 20th July, 2021 vide item No. 40 have been accepted by the Academic Council at its meeting held on 23th February, 2021, vide item no. 4.146 and subsequently approved by the Management Council at its meeting held 9th April, 2021 vide item No. 15 and that in accordance therewith, in exercise of the powers conferred upon the Management Council under Section 74(4) of the Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017) the Ordinance 6629 & 6630 Regulations 9372 & 9373 and the syllabus of Diploma in Industrial Safety and Management has been introduced and the same have been brought into force with effect from the academic year 2020-21. (The said course might be introduced from the academic year 2021-2022 in the wake of prolonged Covid-19 pandemic situation in the country) accordingly. (The same is available on the University's website www.mu.ac.in).

MUMBAI - 400 032 4stJune, 2021 To ,

(Dr. B.N. Gaikwad) 1/c. REGISTRAR

A.C/4.146/23/02/2021 M.C/15/9/04/2021

No. UG/ 22-A of 2021

MUMBAI-400 032

1 st June, 2021

Copy forwarded with Compliments for information to:-

- 1) The Chairman, Board of Deans
- 2) The Director, Board of Examinations and Evaluation,
- 3) The Director, Board of Students Development,
- 4) The Co-ordinator, University Computerization Centre,

(Dr. B.N.Gaikwad) I/c. REGISTRAR

Copy to :-

- 1. The Deputy Registrar, Academic Authorities Meetings and Services (AAMS),
- 2. The Deputy Registrar, College Affiliations & Development Department (CAD),
- 3. The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),
- 4. The Deputy Registrar, Research Administration & Promotion Cell (RAPC),
- 5. The Deputy Registrar, Executive Authorities Section (EA),
- 6. The Deputy Registrar, PRO, Fort, (Publication Section),
- 7. The Deputy Registrar, (Special Cell),
- 8. The Deputy Registrar, Fort/ Vidyanagari Administration Department (FAD) (VAD), Record Section,
- 9. The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanagari,

They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above circular and that on separate Action Taken Report will be sent in this connection.

- 1. P.A to Hon'ble Vice-Chancellor,
- 2. P.A Pro-Vice-Chancellor,
- 3. P.A to Registrar,
- 4. All Deans of all Faculties,
- 5. P.A to Finance & Account Officers, (F.& A.O),
- 6. P.A to Director, Board of Examinations and Evaluation,
- 7. P.A to Director, Innovation, Incubation and Linkages,
- 8. P.A to Director, Board of Lifelong Learning and Extension (BLLE),
- 9. The Director, Dept. of Information and Communication Technology (DICT) (CCF & UCC), Vidyanagari,
- 10. The Director of Board of Student Development,
- 11. The Director, Department of Students Walfare (DSD),
- 12. All Deputy Registrar, Examination House,
- 13. The Deputy Registrars, Finance & Accounts Section,
- 14. The Assistant Registrar, Administrative sub-Campus Thane,
- 15. The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,
- 16. The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,
- 17. The Assistant Registrar, Constituent Colleges Unit,
- 18. BUCTU,
- 19. The Receptionist,
- 20. The Telephone Operator,
- 21. The Secretary MUASA

for information.

Necessity of starting these courses

All above courses are skill-based and add-on courses. These courses will develop a new skill in the students of already existing M.Sc. programmes (Chemistry, Environmental Science, Zoology (Oceanography) thereby making them still competent. The addition of these courses on the bio data of students, will increase the probability of their getting recruited in industries.

Whether UGC has recommended to start the said courses?

The University Grants Commission has from time to time, focused the importance of commencement of skill based courses

Whether all the courses have commenced from the academic year 2019-20?

Because of declaration of lockdown to prevent the spread of Covid-19 since March, 2020, this office was unable to place & subsequently obtain the sanction to the proposal of starting of these courses from the academic year 2019-20.

The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available?

The permanent faculty from this office and nearby aided colleges and experts from industries are available to complete the curriculum of these

· courses.

To give details regarding duration of the course and is it possible to compress the course?

Duration of each course is as below :-

Sr. No.	Course	Duration
1	Diploma in Industrial Safety & Management	1 Year
2	Certificate Course in Aquaculture	6 Months
3	Certificate Course in Aquaponics	6 Months

All courses are of shorter durations.

The intake capacity of each course and number of admissions given in the current academic year (2019-20)

Intake capacity of each course is as below:-

Sr. No.	Course	Intake Capacity
1	Diploma in Industrial Safety & Management	20 , 4
2	Certificate Course in Aquaculture	35
3	Certificate Course in Aquaponics	40

The admission to these courses is yet to be started.

Opportunities of employability / employment available after undertaking these courses.

The certificate courses have the potential of self-employment. The student having the graduation in science / engineering or diploma in engineering is eligible to take admission to the course of Diploma in Safety & Management. The addition of this Diploma course to the above qualification, will increase the employability of the student.

AC: 23/7/2020

<u>Item N</u>.: 4.146

UNIVERSITY OF MUMBAI



Program:

DIPLOMA IN INDUSTRIAL SAFETY AND MANAGEMENT (DISM)

Syllabus

(Diploma Course of one year w.e.f. academic Year 2020-21)

AC: 23/7/2020

<u>Item N</u>.: 4.146

UNIVERSITY OF MUMBAI



Syllabus for approval

S. No.	Heading	Particulars
1	O. 6629 Title of the course	Diploma in industrial safety and management (DISM)
2	O. 6630 Eligibility for admission	Any Science Graduate or Degree / Diploma in Engineering from recognized Statutory University / Board.
3	R – 9372 Passing Marks	40%
4	Ordinances / Regulations (if any)	
5	R – 9373 No. of Years / Semester	One year part time
6	Level	PG / UG / Diploma / Certificate (Strike out which is not applicable)
7	Pattern	Yearly / Semester (Strike out which is not applicable)
8	Status	New / Revised (Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year – 2020 -21

Date Signature

Name of BOS Chairperson / Dean -

University of Mumbai

Draft ordinance, Regulations and Syllabus related to the

DIPLOMA IN INDUSTRIAL SAFETY AND MANAGEMENT (DISM)

COURSE CONTENT AND CREDITS

DISM 101: INDUSTRIAL SAFETY, HYGIENE & OCCUPATIONAL HEALTH (04 Credits)

UNIT	TITLE	CREDITS
Ι	Introduction to Industrial Safety	01
II	Hazard identification, Risk assessment and control	01
III	Industrial Hygiene	01
IV	Occupational Health	01

DISM 102: CHEMICAL AND PROCESS SAFETY MANGEMENT (04 Credits)

UNIT	TITLE	CREDITS
Ι	Process Safety Management (PSM)	01
II	Unit operations and process hazards	01
III	Safety in plant operation and maintenance	01
IV	Safe Handling of chemicals	01

DISM 103: HAZARDS AT WORKPLACE (04 Credits)

UNIT	TITLE	CREDITS
I	Fire and explosion	01
II	Electrical Hazards	01
III	Physical Hazards	01
IV	Pressure System Hazards	01

DISM 104: SAFETY LEGISLATIONS & MANAGEMENT (04 Credits)

UNIT	TITLE	CREDITS
I	Industrial Safety Management	01
II	Safety Awareness & Training:	01
III	Industrial Safety Legislations	01
IV	Accident Prevention	01

DISM 101: INDUSTRIAL SAFETY, HYGIENE & OCCUPATIONAL HEALTH

UNIT I: INTRODUCTION TO INDUSTRIAL SAFETY: 20 Hrs.

History and development of safety movement, Safety programs, Need for safety, Safety legislation: Acts and rules, Safety standards and codes, Safety policy: safety organization and responsibilities and authorities of different levels. Accident sequence theory, Nature of Accident, Process of accident, Causes of accidents, Accident prevention and control techniques, Plant safety inspections, Job safety Analysis and investigation of accidents, First aid, Financial costs-direct and indirect, social costs of accidents, Compilation procedure for financial costs, Cost data, quality and its limitations-Budgeting.

UNIT II: HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL: 20 Hrs.

Hierarchy of hazard control, Hazard Identification and Risk Assessment (HIRA), HAZard ANalysis (HAZAN), Hazard and operability (HAZOP) studies Maximum Credible Accident Analysis (MCAA)/Quantitative Risk Assessment (QRA) Hazard identification and risk control approaches and techniques: Reactive approach: Incident recall technique (after-the-event approach), Proactive approaches: Critical incident review technique (before-the-event approach), Deductive technique, Inductive technique

Hazard Risk Assessment, Cause/consequence finding techniques What-if, Fishbone, Why-Why, Root Cause Analysis (RCA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA), Cause-Consequence Analysis (CCA), Management Oversight and Review Technique (MORT), Failure Mode and Effects Analysis (FMEA), Job Safety Analysis (JSA). Hazard Analysis Critical Control Points (HACCP).

UNIT III: INDUSTRIAL HYGIENE: 20 Hrs.

Definition of Industrial Hygiene, Phases of industrial hygiene Industrial Hygiene: Control Methods, Substitution, Changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures.

Introduction to chemical hazards, dangerous properties of chemical, dust, gases, fumes, mist, vapours, smoke and aerosols, MSDS(Material Safety Data Sheets.

Route of entry to human system, recognition, evaluation and control of basic hazards, concepts of dose response relationship, bio-chemical action of toxic substances. Evaluation of toxicity and noise, Personal Sampler, High Volume Sampler, Midget impinger Tubes, Rotameter and its Calibration , concept of threshold, limit values TLV-TWA/PEL/OEL, STEL, IDLH, LC₅₀, LD₅₀ and air sampling strategies, personal exposure monitoring

UNIT IV: OCCUPATIONAL HEALTH: 20 Hrs.

Concept of health and occupational health, Spectrum of health, Occupational and work related diseases, Levels of prevention, History of occupational health, Characteristics of occupational diseases, Essentials of occupational health service, personal protective equipments (respiratory and non-respiratory),

<u>Various Occupational health hazards</u>: Adverse health effects of noise vibration, cold, heat stress, improper illumination, thermal radiation, ionizing and non-lionizing radiations. Permissible threshold exposure limits - short term and long term effects of exposures Preventive and control measures.

CISM 102: CHEMICAL AND PROCESS SAFETY MANGEMENT UNIT I: PROCESS SAFETY MANAGEMENT (PSM): 20 Hrs.

Purpose of PSM, its elements and Risk-Based Process Safety Management (RBPSM): (1) Process safety culture, (2) Compliance with standards, (3) Process safety competency, (4) Workforce involvement, (5) Stakeholder outreach, (6) Process knowledge management, (7) Hazard Identification and Risk Assessment (HIRA), (8) Operating procedures, (9) Safe work practices, (10) Asset integrity and reliability, (11) Contractor Management, (12) Training and Performance Assurance, (13)

Management Of Change (MOC), (14) Operational readiness, (15) Conduct of operations, (16) Emergency management, (17) Incident investigation, (18) Measurement and metrics, (19) Auditing, (20) Management review and continuous improvement.

Major Industrial Disasters (Case Studies) Bhopal disaster (1984), Chernobyl Disaster, Fukushima Daiichi Disaster etc.

UNIT II: UNIT OPERATIONS AND PROCESS HAZARDS: 20 Hrs.

Piping and Instrumentation Diagrams (P&ID), Various unit operations and their associated hazards, Control, precautions and prevention, specific safety measures for certain chemical industries like fertilizers, insecticides/pesticides, chlor-alkali, explosives, paints, petrochemicals, petroleum refineries, pharmaceuticals, etc., Sampling techniques for toxic and flammable chemicals, pharmaceuticals, etc., Precautions in the processes and operations involving explosives, flammables, toxic substances, dusts, gases, vapour cloud formations and combating to a Loss of containment, Prevention strategy.

UNIT III: SAFETY IN PLANT OPERATION AND MAINTENANCE: 20 Hrs.

Safe procedures for plant start-up and shut-down, Pipeline colour coding for identification of contents, Safety precautions for working on pipelines, Safety in preventive and emergency maintenance work, Pressure relief systems and breather valves, Flare system, Mechanism of Mechanical Failure that lead to a Loss of containment. Prevention strategy.

UNIT IV: SAFE HANDLING OF CHEMICALS: 20 Hrs.

Safety in receiving, storage and handling of chemicals Nitrogen blanketing of flammable liquid storage tanks, Hazardous material classification, Use of Material Safety Data Sheets (MSDS) and understanding the terminology used in MSDS,

Chemical compatibility considerations Transportation of hazardous materials, HAZMAT placards, Safety Precautions for transporting hazardous/ toxic/flammable/explosive/ radioactive substances by all modes, U.N. classification of dangerous goods Transfer of chemicals by pipelines within and outside the installation (aboveground, underground and submarine), Pigging operation of pipelines including intelligent pigging, Cathodic protection of underground pipelines

DISM 103: HAZARDS AT WORKPLACE

UNIT I: FIRE AND EXPLOSION: 20 Hrs.

Industrial fires, Dispersion modeling, Chemistry of fire, Fire Triangle, Flammability characteristics of liquids and gases, Classification of fires, Deflagration and detonation, Vapour Cloud Explosion (VCE), Runaway reaction and control methods, Boiling-Liquid Expanding Vapour Explosion (BLEVE), Common causes of industrial fires, Dust explosion, factors of pentagon, causes of dust explosions and controls Fire and Explosion prevention methods.

Fire protection: Fire PPEs, Design of building, plant, exits, etc. for fire safety, Fireresistance of building materials, Fire-doors and firewalls, Determination of fire load, Dow Fire and Explosion Index, Salient features of fire, explosion and toxicity index **Fire detection and alarm system:** Various types of fire detection and alarm system, Special safety measures for control of fire and explosion in handling / processing of flammable gases, liquids, vapours, mists, solids, dusts and flying.

UNIT II: ELECTRICAL HAZARDS: 20 Hrs.

Hazards of electrical energy, Safe limits of amperages, voltages. Safe distance from lines. Capacity and protection of conductor, Joints and connections, Means of cutting off power. Overload and short circuit protection. No load protection, Earth fault protection, Earth insulation and continuity tests, Earthling Standards. Protection against voltage fluctuation, Hazards arising out of 'borrowed' neutrals, Types of

protection for electrical equipment in hazardous atmosphere, Hazardous area classification, Criteria for selection, installation, maintenance and use of equipment in hazardous area.

Fire-fighting systems: Different types of portable fire extinguishers, their installation, periodic inspection and operation, Replacement of Halon with safer substitutes, Fire hydrant system, Fire monitors, sprinkler system and deluge system, Carbon-dioxide flooding system, Foam Pourer system

UNIT III: PHYSICAL HAZARDS: 20 Hrs.

Physical and Chemical hazards (toxic compounds, sterilizers, expired drugs, heavy metals, volatile, plastics etc.), Purpose of lighting, Advantages of good illumination, Lighting and safety, Lighting and the work, Sources and types of artificial lighting. Principles of good illumination. Recommended minimum standards of illumination. Design of lighting installation, Lighting and colour, Purpose of ventilation Classification of Ventilation as General Ventilation (Natural and Mechanical modes), Local Exhaust Ventilation, Special methods for Thermal Stress control such as Air conditioning, Radiant Heat Control, Engineering Control of noise, Vibration damping, Noise isolation, Noise absorption. Silencers.

UNIT IV: PRESSURE SYSTEM HAZARDS: 20 Hrs.

Principle of pressure system, Pressure, Hazards of steam, Mechanism of Steam explosion, Properties of Liquid Petroleum Gas, Liquefaction of gases for bulk storage under pressure, Pressure system, meaning of relevant fluids, key components and safety features of pressure system, Failure of pressure system, Hazards of overpressure and over temperature in pressure system Corrosion causes and protection Corrosion and erosion, location, causes inspection and prevention, Cathodic protection of underground tanks/pipelines, Sacrificial anode, Protective cladding and lining.

DISM 104: SAFETY LEGISLATIONS & MANAGEMENT

UNIT I: INDUSTRIAL SAFETY MANAGEMENT: 20 Hrs.

Management Principles, Levels of Management-Lower, Middle and Top, Types of Management –Line and Staff, Authority, Accountability and Responsibility of Management. Span of Management, Delegation and decentralization of authority.

Role of Management in Industrial Safety: Planning for Safety- Definition, Purpose, Nature, Scope and Procedure. Range of planning, Types of plans, Management By Objectives (MBO), Policy formulation and implementation

Organizing for Safety: Definition, need, nature and principles, Health and Environment, Organization structure, functions and responsibilities,

Directing Safety: Definition, process, principles and techniques, Leadership—Styles, Role, functions and attributes of a good leader.

UNIT II: SAFETY AWARENESS & TRAINING: 20 Hrs.

Element of training cycle, Training Need Assessment (TNA), Techniques of training, design and development of training programs/module, Training methods and strategies, Types of training, Evaluation and review of training programs, Competence Building Technique (CBT),

Employee Participation Purpose, nature, scope and methods, Safety committee and union participation Trade Unions: History of trade unions in India, Role of trade unions in safety and health, Collective bargaining and safety.

Safety Promotion and Safety Awards and Suggestion Schemes

Human behavior and safety: Human behavior - Individual differences, behavior as function of self and situation, perception of danger and acceptance of risk, knowledge, and responsibility vis-a-vis safety performance, theories of motivation and their application to safety, role of supervisors and safety departments in motivation

UNIT III: INDUSTRIAL SAFETY LEGISLATIONS: 20 Hrs.

Legislative measures in industry: Factories Act, 1948, the factories rules, History, Provisions under the factories Act and rules made there under with amendments, Electricity act 2003, Functions of safety management. Workman's Compensation Act, 1943, Employees State Insurance Act, 1948, Air Pollution (Prevention and control) Act, 1981, Water Pollution (Prevention and Control) Act, 1974, Boiler Vessels Act, Child Labour and Women Employee Act., EPA 1986.

UNIT IV: PLANT LAYOUT DESIGN AND HOUSEKEEPING: 20 Hrs.

Plant layout, design and safe distance, Need for planning and follow-up, Inspections and check-lists, Safety Check list for buying new machinery for the plant, Role of preventive maintenance in safety and health, Importance of standards and codes of practice for plant and equipment, Case study on building Plant layout.

Safety and good house-keeping, Typical accidents due to poor house-keeping, Disposal of scrap and other trade wastes, Prevention of spillage, Marking of aisles space and other locations. Use of colour as an aid for good housekeeping, Cleaning methods, Benefits of good housekeeping, '5S' system.

DISM 105: PRACTICAL COURSE

Suggested list of lab experiments. Any other experiment based on syllabus which will help to the students to understand any topic can be performed

Sr.	Name of Experiment
No.	
1	Measurement of Static Charge/Electricity with the help of Static Charge Meter.
2	Continuity test for Electrical Circuits
3	Measurement of earth resistance
4	Measurement of soil resistivity
5	Study of electrical earthling
6	Measurement of illumination level at working place with the help of digital Lux meter
7	Noise Level Measurement. (a) Measurement of Sound pressure level in dBA and dB linear. b) Frequency analysis of noise.
8	Demonstration of Personal Protective Equipment (PPE)
9	Sampling and Estimation of Gases in Work Environment by Colorimetric Method Oxides of Nitrogen, Ammonia & Chlorine
10	Sampling and Estimation of Dust by Gravimetric Method.
11	Detection of Carbon Monoxide, NOx Hydrogen Sulphide, Ammonia, Aromatic Hydrocarbons, SO2 by Gas Detectors and other direct reading instruments.
12	Toxicity :Determination LDL, UDL
14	Sampling and analysis of SO2 using Colorimetric method.

Demonstration and Hands on training (compulsory)

1	Demonstration, Calibration of Sampling Equipment
2	Demonstration of Fire fighting equipments
3	Demonstration of First aid

REFERENCE BOOKS

- Industrial Accident Prevention, H.W. Heinrich, Dan Petersen, and Nestor Roos, McGraw-Hill Book Company, New York / New Delhi
- Techniques of Safety Management (ISBN: 978-18-8-558139-6), Dan Petersen, McGraw-Hill Book Co. Ltd., New York, N.Y. USA,
- 3 Industrial Safety and Environment, A.K.Gupta, Laxmi Publications, New Delhi
- 4 Industrial Safety: Concepts and Practices, K.T. Kulkarni, Pune Vidyarthi Griha Prakashan, 1786, Sadashiv Peth, Pune
- Hazardous Chemical Data Book ISBN:081-551072-1), G. Weiss, Noyes Data Corporation, Park Ridge, New Jersey, N.Y. (USA)
- Risk Based Process Safety, By Center for Chemical Process Safety (CCPS), American Institute of Chemical Engineers (AIChE) (ISBN: 978-0-470-16569-0), John Wiley & Sons Inc., Somerset, NJ (USA)
- Handbook of Environmental Risk Assessment and Management, Peter Calow, Blackwell Science, Ltd. USA (1998).
- 8 Environment Management in India, R K Sapru, Ashish Publishing House, New Delhi
- 9 Accident Prevention Manual for Industrial Operations (ISBN: 978-08-7-912024-5), National Safety Council, 1121, Spring Lake Drive, Itasca, Illinois 60143 USA
- 10 Chemical Process Quantitative Risk Analysis, (*ISBN*-13: 978-08-1-690720-5), Center for Chemical Process Safety, American Institute of Chemical Engineers, New York
- 11 Environmental Health & Safety Management, Nicholas & Madelyn , Jaico Publishing House, Mumbai
- 12 Industrial Accident Prevention, H.W. Heinrich, Dan Petersen, and Nestor Roos, McGraw-Hill Book Company, New York / New Delhi
- 13 The Factories Act, 1948 & Factory Rules
- 14 Environment (Protection) Act, 1986 and Rules
- 15 Indian Boilers Act, 1923 with allied Regulations, 1961
- Industrial Safety, Health and Environment Management Systems, R.K.Jain and Sunil S.Rao, Khanna publishers, New Delhi (2006)
- Model Code of Safety Regulation for Industrial Establishments, International Labour Office (ILO), Geneva (Switzerland)
- The Merck Index An Encyclopedia of Chemicals (ISBN: 978-1-84973-670-1) Merck & Company, Rahway, New Jersey, N.Y. (USA)
- Supervisors' Safety Manual (ISBN: 978-08-7-912288-1)
 National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)

- Method for computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Accidents' IS:3786 1983 Indian Standards Institution, New Delhi
- Threshold Limit Values for Chemical Substances in Work Environment Adopted by ACGIH Published every year) American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (USA)
- NIOSH Pocket Guide to Chemical Hazards By National Institute of Occupational Safety & Health (ISBN: 978-15-9-042586-2) U.S. Department of Health and Human Services, Washington, D.C. (USA
- Employees Compensation Act, 1923 and Rules, Bare Act
- Indian Electricity Act, 2003 and Rules CEA guidelines, Indian Explosives Act, 1984 and Rules
- 25 The Maharashtra Fire Prevention and life Safety Measures Act 2006 and Rules
- Handbook of Occupational Safety and Health, Slote.L, John Willey and Sons, NewYork
- Industrial Safety and pollution control handbook: National Safety Council and Associate publishers Pvt. Ltd, Hyderabad(1993).
- Publications from Inter National standard organizations like ISO, OSHA, IOSH, NEBOSH etc.
- 29 Radiation protection, Inter National Labor Office
- The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai