UNIVERSITY OF THE PUNJAB

NOTIFICATION

It is hereby notified that the Syndicate at its meeting held on 27-07-2023 has approved the recommendations of the Academic Council made at its meeting dated 24-05-2023 regarding approval of the Revised Syllabi and Courses of Reading for one year Postgraduate Diploma in Occupational Health & Safety Program (Self-Supporting Evening Classes) under Semester System at the College of Earth and Environmental Sciences w.e.f. the Academic Session, 2022 and onward.

The Revised Syllabi and Courses of Reading one year Postgraduate Diploma in Occupational Health & Safety Program (Self-Supporting Evening Classes) is attached herewith as Annexure 'A'.

Sd/-
REGISTRAR

Admin. Block,
Quaid-i-Azam Campus,
Lahore.

No. D/ 7660 /Acad. **Dated: 11-10- /2023.**

Copy of the above is forwarded to the following for information and further necessary action: -

1. Dean, Faculty of Geo Sciences.
2. Principal, College of Earth and Environmental Sciences.
3. Controller of Examinations
4. Director, IT for placement at the website
5. Admin Officer (Statutes)
6. Secretary to the Vice-Chancellor.
7. PS to the Registrar.
8. Assistant Syllabus.

Assistant Registrar (Academic)
for Registrar

COLLEGE OF EARTH & ENVIRONMENTAL SCIENCES
UNIVERSITY OF THE PUNJAB, LAHORE

Revised Courses & Syllabi for

Postgraduate Diploma (PGD) in Occupational Health & Safety

1 Year Diploma

(Self-Supporting Evening Classes)

Duration: 1 Year

Session: July / August

Seats:	**Total**	**Merit**	**Reserve**
	50	50	00

Eligibility:
Bachelor degree (BA / B.Sc. / B.Com / BS) or equivalent with any combination from the recognized Institutions of Pakistan

Admission Criteria: As per Punjab University Admission Committee's rules.

Introduction and Objectives of the Program

The PGD in Occupational Safety and Health is designed in The College of Earth & Environmental Sciences, University of the Punjab to prepare students to become competent and demonstrate knowledge in the occupational safety and health program concentrations: environmental health and safety, industrial hygiene and safety management. The PGD in the College provides a comprehensive, broad-based educational background to prepare practical-oriented and academically sound graduates for entry-level and advanced positions in the safety, health and environmental profession. This diploma program is designed to provide the technical and professional knowledge required by individuals pursuing careers in safety management, occupational health, industrial hygiene, loss/risk control management, ergonomics, emergency planning and response, and environmental health and safety. Our mission and purpose include:

- having a core value of teaching excellence to provide quality education that prepares the very best graduates possible to serve in the challenging roles as safety, health and environmental professionals;
- placing a high premium on academic outreach, collaborative relationships with business and industry, government agencies and other universities at home and abroad;
- emphasizing student-centered learning and educational experiences that include internships, co-ops, study abroad programs, service learning, research and creative projects, and professional organizations that enhance and strengthen their academic preparation;
- preparing graduates to function in a culturally diverse, technologically orientated society and an increasingly interdependent world;
- conducting research to contribute to the scientific safety, health and environmental community.

The objectives of the occupational safety and health masters program at The College of Earth & Environmental Sciences, University of the Punjab are to prepare graduates who:

- apply a broad educational background in mathematics, science, technology and management as occupational safety and health professionals in state, regional, national or international levels in industry, government or academia;
- are critical thinkers and anticipate, identify and evaluate hazardous conditions and practices, and implement effective hazard control strategies in such areas as accident prevention, safety management, occupational health, industrial hygiene, loss/risk control management, ergonomics, emergency planning and response, and environmental health and safety;
- are effective communicators and ethical leaders within the occupational safety and health profession; and
- pursue life-long learning to effectively practice within a rapidly evolving, continually changing and increasingly diverse global environment.

COLLEGE OF EARTH & ENVIRONMENTAL SCIENCES
UNIVERSITY OF THE PUNJAB, LAHORE

REVISED COURSES & SYLLABI FOR

Postgraduate Diploma in Occupational Health & Safety

1 Year Diploma

(Self-Supporting Evening)

Total Credit hrs: 24 **Duration: 01 Year**

Sr. No.	Course Code	Title of Course	Credit hrs
SEMESTER–I			
1.	OHS-501	Introduction to Occupational Health & Safety	03+1
2.	OHS-502	Principles of Industrial Hygiene (Theory)	02+1
3.	OHS-503	Fundamentals of Ergonomics and Noise Control	03
4.	OHS-504	Environmental & Occupational Toxicology	03
5.	OHS-505	Hazardous And Industrial Solid Waste Management	02
SEMESTER–II			
1.	OHS-506	Fire Safety and Emergency Preparedness (Theory) (Core-Course)	03+1
2.	OHS-507	Field Studies (Core-Course)	01
02 courses of 07 credit hrs from the following will be offered in 2nd Semester			
3.	OHS-508	Occupational Health & Safety Auditing & Project Management (Elective)	03
4.	OHS-509	Biostatistics and Epidemiology (Elective)	03
5.	OHS-510	Biosafety and Biosecurity (Elective)	03
6.	OHS-511	Regulatory standards for Occupational Health & Safety (Elective)	03
7.	OHS-512	Environment, Health and Safety for Textile Manufacturing (Elective Course)	02
8.	OHS-513	Environment and Health Risk Assessment	03
9.	OHS-514	Health Safety and Environmental Entrepreneurship	02

NOTE: Core-Courses and Elective Courses (12 credit hrs) will be taught in each semester

FIRST SEMESTER

OHS - 501 INTRODUCTION TO OCCUPATIONAL HEALTH & SAFETY

(03 Credit hours)

PRE-REQUISITE: Bachelor degree (BA / B.Sc. / B.Com / BS) or equivalent

COURSE LEARNING OUTCOMES

After successful completion of this course, students will be able to:

1. learn basic understanding of potential workplace safety and health hazards and determine how to mitigate the hazards through engineering controls, administrative controls, and personal protective equipment.
2. identify and demonstrate a working knowledge of the occupational health and safety regulations.
3. conduct basic safety inspections using strategies that has been developed though hazard identification, job hazard analysis and risk assessment.
4. review the principles for developing and implementing a successful occupational health and safety program and evaluation of a work site.
5. identify the major historical events that influenced accident prevention activities in the pre/post industrial revolution.
6. identify the moral and economic consequences associated with the major classifications and causes of accidents and the cost of worker's compensation based on the risk classes of industries.

SYLLABUS OUTLINE

This course is a foundation of Occupational Health & Safety covering all basic areas of this discipline, such as occupational safety, industrial hygiene, ergonomics, etc.

Theory

Module-1 Introduction

- Introduction of occupational health & safety
- History of health and safety
- Evolution of health and safety standards,
- Industrial hygiene
- Role of national/international agencies

Module-2 Elements of Occupational Health and Safety

- Elements of ILO-OSH 2001, elements of OHSAS 18001,
- Elements of ISO 45001,
- Features and contents of OHS policy,

Module-3 Health & safety culture

- Concept and significance of Health & safety culture
- Factors influencing safety related behavior and improving such behaviors

Module-4 Planning and Implementation

- Principles and practice of risk assessment,
- Hierarchy of controls,
- Electrical safety,
- Confined spaces,
- Permit to work system,
- Impact of temporary works,
- Physical and psychological health hazards and risk control,
- Emergency preparedness,
- Personal protective equipment.

Module-5 Inspection and Audit system

- Inspection system,
- Safety audits
- Reporting systems
- Management review

Module-6 Special hazards

- Hazardous substances and health effects,
- Toxicology and importance of material safety data sheet,
- Lock out/tag out,
- Work at height,
- Fire safety
- Ergonomics/musculoskeletal disorders and risk control
- Occupational noise control

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Hughes, P., & Ferrett, E. (2020). *Introduction to Health and Safety at Work: For the NEBOSH National General Certificate in Occupational Health and Safety*. Routledge.
2. Friend, Mark A., and James P. Kohn. (2018). *Fundamentals of Occupational Safety And Health*. Rowman and Littlefield.
3. David L. Geotech, (2015). *The Basics of Occupational Safety, 2nd Edition*, Pearson Education, Inc.
4. Kelloway, E. Kevin, Karina Nielsen, and Jennifer K. Dimoff, eds. (2017). *Leading to Occupational Health and Safety: How Leadership Behaviours Impact Organizational Safety and Well-Being*. John Wiley and Sons.
5. Brauer, Roger L. (2016). *Safety and health for engineers*. John Wiley and Sons.
6. N. Sesha Prakash, (2017). *Manual of Fire Safety*. CBS Publishers and Distributors.

OHS - 501 INTRODUCTION TO OCCUPATIONAL HEALTH & SAFETY (LAB) (01 Credit hours)

COURSE LEARNING OUTCOMES

The expected outcomes of this course are:

1. familiarization of students with work place safety laws and regulations related to occupational health safety compliance requirements;
2. understanding of causes of occupational hazards and their evaluation;
3. understanding of basic OHS equipment used for assessment for compliance;
4. hands on experience in the calibration and utilization of such equipment;
5. hands on experience on equipment used for assessment of hazards in occupational health and safety;
6. understanding on how to use such equipment for assessment of hazards and interpretation of results;
7. familiarization with the methods and techniques used to control of hazards.

SYLLABUS OUTLINE

Module-1

- Personal protective equipment

Module 2

- Noise level monitoring
- Illumination level monitoring
- Relative humidity and workplace temperature monitoring

Module 3

- Hazard identification and risk assessment techniques
- Development of emergency response plan

Module 4

- Fire safety
- Development of emergency response plan
- First aid and Cardio Pulmonary Resuscitation (CPR)
- Biological monitoring (workplace air and drinking water)

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

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- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
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RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Hughes, P. and Ferrett, E., (2020). *Introduction to Health and Safety at Work: For the NEBOSH National General Certificate in Occupational Health and Safety*. Routledge.
2. Leva, Maria Chiara, Tom Kontogiannis, Marko Gerbec, and Olga Aneziris. (2019) *Total Safety and the Productivity Challenge*. Routledge.
3. Brauer, Roger L. (2016*). Safety and health for engineers*. John Wiley and Sons.
4. N. Sesha Prakash, (2017). *Manual of Fire Safety*. CBS Publishers and Distributors.
5. Gul, Muhammet. *Fine-Kinney-Based Fuzzy Multi-Criteria Occupational Risk Assessment: Approaches, Case Studies and Python Applications. Vol. 398*. Springer Nature, 2020.

OHS-502 PRINCIPALS OF INDUSTRIAL HYGIENE (02 Credit Hrs)

PRE-REQUISITE: Bachelor degree (BA / B.Sc. / B.Com / BS) or equivalent

COURSE LEARNING OUTCOMES

1. Describe the nature of the health effects associated with exposure to industrial agents;
2. Be familiar with the standard methods for measuring and evaluating worker exposure to chemical and physical agents and identify strengths and weaknesses to typical approaches;
3. Apply and interpret health and safety standards and regulations for the work place environment;
4. Apply feasible approaches to controlling worker exposure to health and safety hazards to a specific industrial setting.
5. Describe how the social and economic context of work affects workers' and employers' ability to control threats to health and safety.

SYLLABUS OUTLINE

The course provides introduction to the principles and practices of occupational hygiene for students. Occupational hygiene role in *Anticipation, Recognition, Evaluation, and Control* of work place hazards to health and safety. All these functions require a sound understanding of industrial toxicology, methods of exposure measurement, behavior of chemical and physical agents in the body, the application of guidelines and standards, and technical and administrative approaches for controlling risks from such exposures.

Theory

Module-1 Introduction

- Introduction to occupational hygiene, Recognition, evaluation, and control of industrial hazards due to chemical and physical agents.
- Brief History of Occupational Hygiene

Module-2 Description of related standards

- Occupational hygiene standards
- Industrial hygiene and monitoring techniques,
- Indoor air quality,
- Occupational health standards,
- Regulatory requirements,

Module-3 Exposure and hygiene issues

- Effects of contaminants on human health,
- Sampling and control of hazards,
- Current issues,
- Exposure, dose and risk,
- Guidelines and regulations,
- Deriving a standard,

Module-4 Monitoring and control

- Measurement of gases and vapors,
- Measurement of particulate matter,
- Direct reading instruments and measuring exposures,

- Exposure assessment, exposure data and statistics,
- Exposure models and control banding,
- Biological monitoring,
- Interpreting monitoring data, lead battery mfg., controls and management,
- Hierarchy and ventilation,
- PPE, work organization and management, control strategies,
- Thermal stress.

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

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3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Yamamoto, D. P. (2020). *Industrial Hygiene: A Foundational Role in Total Exposure Health. In Total Exposure Health*. CRC Press.
2. Scott, Ronald M (2018). *Basic concepts of industrial hygiene*. Routledge.
3. Johnson, Thomas, (2017). *Introduction to Health Physics*. Mcgraw Hill Publisher.
4. Nagy, John, (2017). *Development and control of dust explosions*. Routledge.
5. Boss, Martha J., and Dennis W. Day, eds. (2016). *Biological risk engineering handbook: infection control and decontamination*. CRC Press.

OHS-502: PRINCIPLES OF INDUSTRIAL HYGIENE (LAB) (01 Credit Hrs)

PRE-REQUISITE: Bachelor degree (BA / B.Sc. / B.Com / BS) or equivalent

COURSE LEARNING OUTCOMES

At the end of this course, students should be able to accomplish the following:

- Identify literature sources of standard methods for measurement of occupational exposures to chemical contaminants.
- Identify the advantages and the limitations inherent in a variety of techniques and instruments used for industrial hygiene measurements, and what specific factors in the sampling situation might prevent accurate application of that approach.
- Describe a framework for selection of appropriate methods for measurements of specific workplace contaminants.

SYLLABUS OUTLINE

Module-1

- Laws and Regulations; Standards; Associations,
- Exposure Evaluation,
- Air Sampling; Air-Sampling Instruments;

Module 2

- General Methods of Control;
- Local Exhaust Ventilation of Industrial Occupancies; General Ventilation of Industrial Occupancies.
- Respiratory Control Techniques Relative humidity and workplace temperature monitoring

Module 3

- Calculate time-weighted averages. Convert between various units of exposure (for example, mg/m3 to ppm)

Module 4

- Aerosol analysis using gravimetric and real-time methods
- Detector tubes and direct reading instruments. Atomic absorption and X-ray fluorescence spectroscopies for analysis of metals in airborne particles and surface samples.

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
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RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Yamamoto, D. P. (2020). *Industrial Hygiene: A Foundational Role in Total Exposure Health. In Total Exposure Health.* CRC Press.
2. Scott, Ronald M (2018). *Basic concepts of industrial hygiene.* Routledge.
3. Johnson, Thomas, (2017). *Introduction to Health Physics*. Mcgraw Hill Publisher.

OHS - 503 **FUNDAMENTALS OF ERGONOMICS AND NOISE CONTROL (03 Credit Hrs)**

PRE-REQUISITE: Bachelor degree (BA / B.Sc. / B.Com / BS) or equivalent

COURSE LEARNING OUTCOMES

At the end of this course, the student will be able to:

1. Identify and be familiar with the physical, individual and organizational factors which can contribute to musculoskeletal disorders.
2. Identify and be familiar with common musculoskeletal disorders which can result from occupational activities.
3. Identify and be familiar with the structure and anatomy of the upper extremities and low back.
4. Use various assessment tools to identify and evaluate various upper extremity hazards in the workplace.
5. Use various assessment tools to identify and evaluate lifting and manual material handling activities:
6. Identify ergonomic hazards and implement solutions in office and manufacturing environments.
7. Use various economic techniques to identify, propose and justify implementing ergonomic solutions in the workplace.
8. Be able to set-up, establish and maintain a workplace ergonomics program, identify the occupational noise hazards and why noise pollution should be controlled. The students are expected to be familiar with the principal methods for the control of these pollutants in terms of theory and practice.

SYLLABUS OUTLINE

Theory

Module-1 Introduction to Ergonomics

- Anthropometry Overview,
- Research Application of Anthropometry,
- Anatomy of the back,
- Introduction to Statics,

Module-2 Ergonomic issues and control

- Material Handling/Back Protection,
- ergonomics and productivity, ergonomic standards,
- lean manufacturing and ergonomics,
- ergonomics and the fishing industry,
- hand tool design,
- construction ergonomics,
- office ergonomics,
- manufacturing ergonomics,
- manual material handling, patient handling, whole body vibration, hand-arm vibration,
- agricultural ergonomics,
- Upper extremity anatomy, Upper Extremity, Musculoskeletal Disorders,
- Objective and Subjective Measurements Methods,
- Obesity in the Workplace,
- Manufacturing Ergonomics and Hand Tool Use and Design,
- Justifying costs of ergonomic solutions.

Module-3 Introduction to Noise

- Occupational noise and noise pollution
- Noise Measurement and its Assessment,
- Causes of Occupational Noise,
- Effects of Occupational Noise,
- Exposures to Workers in Different Areas,

- Limits for Occupational Noise Exposure,
- Health Effects of Occupational Noise Exposure,

Module-4 Control Measures

- Control of Noise at Source,
- Control of Noise Exposure with Hearing Protectors,
- Monitoring the Health Effects of Noise (Audiometry), and Notification of Serious Harm,
- Training and Education
- Duties of Employees and the Self-Employed Regarding Occupational Noise,
- Duties of Designers,
- Manufacturers and Suppliers of Plant and Hearing Protectors

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
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2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Burke, Michael, (2020). *Applied ergonomics handbook*. CRC Press.
2. Le Prell, Colleen G. (2020). *"Effect of noise exposure on human auditory function: Hidden versus not-so-hidden hearing loss." In Advances in Audiology and Hearing Science*. Apple Academic Press.
3. Bies, David A., Colin Hansen, and Carl Howard, (2017). *Engineering noise control*. CRC press.
4. Konz, Stephan (2017). *Work design: occupational ergonomics*. CRC Press.
5. Nieuwenhuijsen, M. J, (2015). *Exposure Assessment in Environmental Epidemiology*. Oxford University Press, USA.

OHS – 504 ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY (03 Credit Hrs)

PRE-REQUISITE: Bachelor degree (BA / B.Sc. / B.Com / BS) or equivalent

COURSE LEARNING OUTCOMES

After completion of this course, students will be able to

1. assess the basic toxic responses and dose-response relationships and deduce the types of interactions between toxicants and various routes of exposure.
2. describe the value of various approaches for classifying toxicants in terms of their use for assessing occupational and environmental health
3. describe how toxicants affect organisms at the molecular to ecosystem level
4. explain the toxicity, availability, uptake by various exposure routes of anthropogenic chemicals

SYLLABUS OUTLINE

Occupational and Environmental toxicology included different topics Effects of environmental toxicants on the health of living organisms and the environment, Toxicants released into the general environment and their adverse effects on health. Human survival depends on the availability of clean air, water, and food and on the welfare of plants and animals, Adverse effects of anthropogenic chemicals on human being at workplace and ecological processes in ecosystem to biosphere level.

Module 1 Introduction to Environmental Toxicology

- Environmental Toxicology as an interdisciplinary science
- History and background
- General principles from toxicology
- Physicochemical Properties of Toxicants
- Toxicological Effects from molecular to ecosystem level

Module 2 Routes of Exposure and Modes of Action

- routes and types of exposure
- Inhalation, Ingestion and Dermal uptake
- Interaction of Pollutants
- Environmental and Biological Factors Affecting Toxicity

Module 3 Toxicity of Major Types of Pollutants

- Toxicity of gaseous pollutants
- Toxicity of Heavy Metals
- Toxicity of Petroleum Hydrocarbons
- Toxicity of Halogenated Compounds
- Toxicity of Pesticides

Module 4 Chemicals and Human Toxicology

- Endocrine Disruptors
- Mutagenic Pollutants
- Teratogenic toxicant
- Carcinogens Chemicals
- Ionizing Radiations

Module 5 Occupational Toxicology

- Industrial Chemicals
- Industrial Workplace Environment
- Occupational human Diseases
- Preventive Medicine
- Respiratory Toxicity
- Recent Chemicals of Concern

Module 6 Human Health Risk Assessment

- Risk Assessment, Management, and Communication
- Exposure and Toxicity assessment
- Risk calculation Risk Management
- Management of Contaminated sies
- Regulatory Issues in Risk Assessment

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Gupta, P. K. (2020) *"Principles of toxicology." In Problem Solving Questions in Toxicology:* Springer, Cham.
2. Neagu, Daniel, and Andrea-Nicole Richarz, eds. (2020). *Big Data in Predictive Toxicology*. Royal Society of Chemistry.
3. Otsuki, Takemi, Claudia Petrarca, and Mario Di Gioacchino, eds. (2017). *Allergy and immunotoxicology in occupational health.* Springer Singapore.
4. Gupta, Ramesh C., ed. (2015). *Handbook of toxicology of chemical warfare agents*. Academic Press.
5. Landis, W. G., Sofield, R. M., & Yu, M. H. (2017). *Introduction to environmental toxicology: molecular substructures to ecological landscapes*. CRC Press.
6. D'Mello, J. F. (Ed.). (2019). *A Handbook of Environmental Toxicology: Human Disorders and Ecotoxicology*. CABI.
7. Kesari, K. K. (Ed.). (2017). *Perspectives in environmental toxicology*. Springer International Publishing.
8. Philp, R. B. (2016). *Ecosystems and human health: Toxicology and environmental hazards*. CRC Press.

OHS-505 HAZARDOUS AND INDUSTRIAL SOLID WASTE MANAGEMENT (ELECTIVE)
(02 Credit Hrs)

PRE-REQUISITE: Per eligibility requirements for admission or Instructor Approval

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the student will have ability to:

1. Describe hazardous waste management issues;
2. Learn approaches to minimize hazardous waste production and safe methods to transport it to disposal facilities;
3. Understand national and international waste management regulations and guidelines;
4. Prepare waste management programs and train facilities employees and manage it properly in compliance with all applicable regulatory requirements.

SYLLABUS OUTLINE

The course delineates study of the complexities associated with waste generation, environmental effects and management, relevant regulations; integrated waste management strategies; disposal and diversion methods and site selection and operational health risks.

Theory

Module-1 Introduction to Hazardous wastes

- hazardous waste sources, characteristics and classification
- hazardous waste management priorities
- hierarchy of potential implementation strategies
- US-EPA hazardous waste lists

Module-2 Industrial waste management

- industrial waste generation and management
- characteristics of solid waste streams from industries
- management of an industrial site classified as a very small quantity generator
- management of environmental hazards at industrial sites

Module-3 Waste management and treatment strategies

- current waste reduction, reuse, and recycling strategies
- treatment and disposal of solid wastes from industry
- health and safety issues in handling, transportation and waste disposal

Module-4 Hazardous Waste Practices

- best practices of hazardous waste management in world (developed/developing)
- hazardous waste management regulations in Pakistan
- hazardous waste generator status and regulatory requirements
- waste audits (strategies, administrative processes)

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
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3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Saxena, G., Kishor, R., & Bharagava, R. N. (2020). *Bioremediation of industrial waste for environmental safety*. Springer Singapore.
2. Celenza, G. J. (2019). *Industrial waste treatment process engineering: biological processes*. CRC Press.
3. Blackman Jr, W. C. (2016). *Basic Hazardous Waste Management*. CRC Press.
4. LaGrega, M. D., Buckingham, P. L., & Evans, J. C. (2010). *Hazardous waste management*. Waveland Press.
5. Wang, L. K., Hung, Y. T., Lo, H. H., & Yapijakis, C. (Eds.). (2004). *Handbook of industrial and hazardous wastes treatment*. CRC Press.

SECOND SEMESTER

OHS 506 FIRE SAFETY & EMERGENCY PREPAREDNESS (THEORY) (ELECTIVE)

(03 Credit Hrs)

PRE-REQUISITE: Occupational Health, Safety, Industrial Hygiene, Noise Control

COURSE LEARNING OUTCOMES

This subject will give the students understanding;

1. About preventive measures that will eliminate or minimize causes of fire or fire hazards in the workplace,
2. And proper emergency and evacuation procedures in the event of a fire.
3. The effective emergency preparation can reduce injuries, prevent or minimize environmental impacts, protect employees and neighbors, reduce asset losses, and minimize downtime.

SYLLABUS OUTLINE

Module-1 Fire Safety

- History of fire incidents,
- Introduction to fire and fire triangle,
- Possible causes of fire,
- Prevent to possible causes of fire,
- Importance of fire safety at work, classes of fire,

Module-2 Role of National And International Governments

- Local standards and legislation
- NFPA Standards
- OSHA Standards

Module-3 Fire Prevention

- Types of fire extinguishers,
- Selection of fire extinguisher,
- RACE (Rescue, Alarm, Contain and Extinguish)
- PASS (Pull, Aim, Squeeze and Sweep) acronyms, emergency response plan and its components; fire detectors, alert system, assembly point, evacuation plan, accounting emergency warden, and training and participation in fire drills.

Module 4 Emergency Preparedness and Response

- To overview potential emergency situations (such as fires, explosions, spills or releases of hazardous materials, and natural disasters),
- key organizational responsibilities in emergency conditions, arrangements with local emergency support,
- emergency response procedures,
- emergency evacuation plan, emergency evacuation map (evacuation routes, exits and assembly points,
- locations and types of emergency response equipment, training / testing of personnel, including the on-site emergency response team.

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Das, A. K. (2020). *Principles of Fire Safety Engineering: Understanding Fire and Fire Protection*. PHI Learning Pvt. Ltd..
2. Buchanan, Andrew H., and Anthony Kwabena Abu. (2017). *Structural design for fire safety*. John Wiley & Sons.
3. N. Sesha Prakash, 2017. *Manual of Fire Safety*. CBS Publishers & Distributors.
4. Hurley, Morgan J.,(2015). *SFPE handbook of fire protection engineering*. Springer.
5. Smith, K. (2013). *Environmental hazards: assessing risk and reducing disaster*. Routledge.

OHS 506 FIRE SAFETY & EMERGENCY PREPAREDNESS (PRACTICAL) (ELECTIVE)

(01 Credit Hr)

PRE-REQUISITE: Occupational Health, Safety, Industrial Hygiene, Noise Control

COURSE LEARNING OUTCOMES

This subject will give the students understanding;

1. About preventive measures that will eliminate or minimize causes of fire or fire hazards in the workplace,
2. Proper emergency and evacuation procedures in the event of a fire.
3. The effective emergency preparation can reduce injuries, prevent or minimize environmental impacts, protect employees and neighbors, reduce asset losses, and minimize downtime.

SYLLABUS OUTLINE

Module 1 Fire Safety

- Fire and its types
- Understanding of Fire diamond
- Fire prévention

Module 2 Emergency Preparedness and Response

- Types of Fire extinguishing methods
- Emergency procedure and evacuation
- Drills and training methods of fire emergencies
- Fire-fighting Equipment-installation and use

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Das, A. K. (2020). *Principles of Fire Safety Engineering: Understanding Fire and Fire Protection*. PHI Learning Pvt. Ltd..
2. Buchanan, Andrew H., and Anthony Kwabena Abu. (2017). *Structural design for fire safety*. John Wiley & Sons.
3. N. Sesha Prakash, 2017. *Manual of Fire Safety*. CBS Publishers & Distributors.
4. Hurley, Morgan J.,(2015). *SFPE handbook of fire protection engineering*. Springer.

OHS – 507 FIELD STUDIES (01 Credit hr)

PRE-REQUISITE: Occupational Health, Safety, Industrial Hygiene, Noise Control

COURSE LEARNING OUTCOMES

Learn to generate, review, interpret, and apply statistical and epidemiological data from published research; be proficient at preparing technical summaries and reports using the most current technology for managing and presenting data and incorporating appropriate data and observations from the peer-reviewed environmental and occupational hygiene literature; understand basic theories, concepts, models and methods from a range of core and related disciplines and apply them to the design of research and practice, etc.

SYLLABUS OUTLINE

To visit following industries to conduct hazard identification and risk assessment in industries, evaluation of occupational health and hygiene conditions in industries, evaluation of occupational health and safety management system (if exist), occupational health and safety auditing (checking compliance with existing legal and other requirements).

Module-1 Assessment of Occupational hazards and its controls in various industries such as Petrochemical Industry, Mining Industry, Textile industry etc.

Module-2 Study of national and internal rules and regulations and Report writing

BOOK RECOMMENDED

As suggested by the instructor

OHS–508 OCCUPATIONAL HEALTH & SAFETY AUDITING AND PROJECT MANAGEMENT (ELECTIVE) (03 Credit Hrs)

PRE-REQUISITE: Occupational Health, Safety, Industrial Hygiene, Noise Control

COURSE LEARNING OUTCOMES

After successful completion of this course, students will be able to:

1. Know the various standards and types of auditing and environmental audits.
2. Know how to conduct an audit according to ISO 45001 as well as to local management systems.
3. Understand the project definition and project management tools.
4. Understand the identification of stakeholders, the role of sponsors and the role of project manager.
5. Know how to apply project life cycle to a project.

SYLLABUS OUTLINE

Theory

Module-1 Fundamentals of Auditing

- Introduction to ISO 19011 for auditing,
- Principals of Environmental Auditing,
- Local and international environmental auditing systems,

Module-2 Introduction to Occupational health and safety Auditing

- History of Occupational health and safety Auditing
- Types of Occupational health and safety audits,
- Audit preparation and planning,
- Methods of Gathering Audit Evidence,
- Practical Audit Exercise,
- Audit communication and reporting system.

Module-3 Practical Examples of OHS Auditing

- Case Study-I
- Case Study-II

Module-3 Introduction to Project Management

- Project Philosophy,
- Project methodologies,
- Project perspectives
- Stakeholders Analysis and Participation
- Project goal and scope management,
- Project life cycle

Module-4 Project Life Cycle

- Project initiation
- Project planning,
- Project execution and control
- Project closure management
- Communication and conflict management
- Reasons for project success or failure
- Planning commission proformas
- Project planning and approval processes
- Resource mobilization

Module-6 Case Studies

- Case study of industrial project
- MS Project.

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

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1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
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3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Lee, Thomas Alexander, ed. (2020). *The evolution of audit thought and practice. Vol. 18.* Routledge.
2. Scott Gunderson CSP, A. R. M. (2020*). "Safety, Health & Environmental Auditing: A Practical Guide."* Professional Safety 65, no. 5.
3. Kjellen, Urban, and Eirik Albrechtsen. (2017). *Prevention of Accidents and Unwanted Occurrences: Theory, Methods, and Tools in Safety Management*. CRC Press.
4. Turner, Rodney. (2016). *Gower handbook of project management.* Routledge Publishers.

OHS-509 BIOSTATISTICS AND EPIDEMIOLOGY (ELECTIVE) (03 Credit Hrs)

PRE-REQUISITE: Occupational Health, Safety, Industrial Hygiene, Noise Control

COURSE LEARNING OUTCOMES

After successful completion of this course, students will be able to:

1. Learn to generate, review, interpret, and apply statistical and epidemiological data from published research;
2. Be proficient at preparing technical summaries and reports using the most current technology for managing and presenting data and incorporating appropriate data and observations from the peer-reviewed environmental and occupational hygiene literature;
3. Understand basic theories, concepts, models and methods from a range of core and related disciplines and apply them to the design of research and practice, etc.

SYLLABUS OUTLINE

Course is designed to enable students to analyze, present, and interpret scientific data. Students will learn to apply common statistical concepts and methods, e.g., distribution, probability, hypothesis testing, statistical significance, sampling, and an introduction to univariate, bivariate and multivariate analyses. The course is taught through lectures and computer exercises using Excel and SPSS.

Theory

Module-1 An introduction to applied Biostatistics

- Definitions of Biostatistics
- Frequency distributions;
- Sampling; testing means; testing proportions,
- Basic sample size estimations; one-way analysis of variance, correlation and simple linear regression; non-parametric analyses

Module-2 Introduction to the statistical computing program SAS

- Review of statistical methodology from epidemiological viewpoint, including cohort and case-control designs, relative odds (odds ratio) and relative risks.
- Introduction to computer simulation, and resampling methodology, including cross-validation and bootstrapping. Introduction to computer packages SAS, Splus/R and LaTeX, Multivariate methods of Biostatistics.

Module-3 Introduction to Epidemiology

- History, concepts and terminology of epidemiology.
- Basic types of epidemiological investigation, including strategies for infectious and chronic disease.
- Outline of important epidemiological variables,

Module-4 Introduction to Health Economics

- Demand for healthcare,
- Demand for health insurance,
- Market failure in the health sector,
- Cost-minimization analysis,
- Cost-effectiveness analysis, cost-utility analysis, and cost-benefit analysis.

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

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3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Elmore, Joann G., Dorothea Wild, David L. Katz, and Heidi D. Nelson. (2020). *Jekel's Epidemiology, Biostatistics and Preventive Medicine E-Book*. Elsevier Health Sciences.
2. Ahlbom, Anders. (2017*). Biostatistics for epidemiologists*. CRC Press.
3. Bhopal, Raj S. (2016). *Concepts of epidemiology: integrating the ideas, theories, principles, and methods of epidemiology*. Oxford University Press.
4. Wassertheil-Smoller, Sylvia, and Jordan Smoller. (2015). *Biostatistics and epidemiology: a primer for health and biomedical professionals*. Springer.

OHS 510 BIOSAFETY AND BIOSECURITY (ELECTIVE) (03 Credit Hrs)

PRE-REQUISITE: Occupational Health, Safety, Industrial Hygiene, Noise Control

COURSE LEARNING OUTCOMES

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

1. Have a grasp on the concept of biosafety and biosecurity, biohazards, their nature and fate in the environment
2. Have a concept of biosafety levels, risk groups and the containment levels
3. Able to conduct biosafety risk assessment and management for a given workplace
4. Have knowledge of biosafety protocols, containment measures and emergency response procedures
5. Understand the guidelines and decontamination operations for accidental spills and management of biohazardous waste

SYLLABUS OUTLINE

This course is designed to provide an overview of biosafety, biosecurity and bio contaminants, biosafety risk assessment, levels of biosafety, components of biosecurity, decontamination and guidelines for the handling of regulated material in different workplaces

Theory

Module 1 Introduction to Biosafety

- Concept of biosafety and Biosecurity
- History of biosafety
- Biological threats and challenges

Module 2 Biocontaminants and Biosafety levels

- Types of bio contaminants
- Virulence and transmission of biohazardous material
- Biosafety Levels
- Containment of biohazards

Module 3 Biosafety Risk Assessment

- The 6 P's of Risk Assessment
- Biosafety Risk Management
- Risk communication

Module 4 Components of Biosafety and Biosecurity Program

- Biosafety equipment (Safety Cabinets etc.)
- Personal protective equipment
- Biosecurity, emergency and incident response to biohazard spills and releases,

Module 5 Disinfection and Decontamination

- Biological waste spill cleanup
- Waste disposal
- Disinfection/selection of disinfection
- Sterilization

Module 6 Guidelines and Regulations

- Shipping and transportation of regulated biological materials,
- OSHA bloodborne pathogen standards
- NIH recombinant DNA guidelines

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
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3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Wooley, Dawn P., and Karen B. Byers, eds. (2020). *Biological safety: principles and practices.* John Wiley & Sons.
2. Bayot, M. L., & Limaiem, F. (2020). *"Biosafety guidelines*.". Stat Pearls Publishing.
3. Andrew, W. (2017). *Public health in practice*. Macmillan International Higher Education.
4. Ives, Jane H. (2017). *The export of hazard: Transnational corporations and environmental control issues*. Routledge.
5. Fleming, D. O., & Hunt, D. L. (2014). *Biological Safety: Principles and Practices*. ASM Press.

OHS 511 REGULATORY STANDARDS FOR OCCUPATIONAL HEALTH AND SAFETY (ELECTIVE) (03 Credit Hrs)

PRE-REQUISITE: Occupational Health, Safety, Industrial Hygiene, Noise Control

COURSE LEARNING OUTCOMES

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

1. Understand the principles of OH&S management systems.
2. Understand benefits of implementing OH&S management systems.
3. Explain and define the purpose, intent, and requirement of each element of the OHSAS 18001:2007.
4. Develop a documented OH & S management system framework.
5. Conduct risk assessments and OH&S management system audits in any organization in accordance to requirements of OHSAS 18001: 2007.
6. Implement & maintain OHSAS 18001:2007 in any organization.

SYLLABUS OUTLINE

This course specifies requirements for an occupational health and safety management system, to enable a person to improve the Occupational Health & Safety (OH&S) performance risks at any organization, regardless of its activity or sector by identification and control of its OH&S risks. It helps the learners to know the procedures to develop, implement, maintain and continually improve an occupational health and safety management system within an organization to meet the increasingly stringent legislations and economic policies that demands good OH&S practices.

Theory

Module-1 Introduction

- Introduction to basic concepts and terminologies associated with occupational health and safety,
- Brief overview of BS (british standards),
- History and introduction to BS OHSAS 18001:2015 and ISO 45001, PDCA cycle (Deming's cycle)

Module-2 Guidelines and regulations

- Review and interpretation of BS OHSAS 18001: 2015 and ISO 45001 general requirements;
- Occupational health & safety policy,
- Planning (hazard identification,
- Risk assessment and controls,
- Legal and other requirements,
- Objectives and programs),
- Implementation and operation (resources, roles, responsibility,
- Accountability and authority;
- Competence training and awareness;
- Communication, participation and consultation;
- Documentation; control of documents;
- Operational controls, & emergency preparedness and response),
- Checking (performance measurement and monitoring, evaluation of compliance, incident investigation, non-conformity, corrective and preventive actions; control of records, and internal audit),
- Management review

Module-3 Economic Role

- The economic impacts of implementing the standard

Module-4 Certification process

- Correspondence between to OHSAS 18001:2007, and other regulatory standards,
- The ISO 45001 and OHSAS 18001: 2015 certification process and auditing.

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Manuele, F. A. (2020). *Advanced Safety Management: Focusing on Z10. 0, 45001, and Serious Injury Prevention.* John Wiley & Sons.
2. Servais, Jean-Michel. (2020). *International labour law*. Kluwer Law International BV.
3. Friend, Mark A., and James P. Kohn. (2018). *Fundamentals of occupational safety and health*. Rowman & Littlefield.
4. Brauer, Roger L. (2016). *Safety and health for engineers*. John Wiley & Sons.
5. Naeem Sadiq, (2012). *OHSAS 18001 Step by Step: A Practical Guide.* IT Governance Publishing.

OHS-512 ENVIRONMENT, HEALTH AND SAFETY FOR TEXTILE MANUFACTURING (ELECTIVE) (02 Credit Hrs)

PRE-REQUISITE: As per completion of 1st semester courses

COURSE LEARNING OUTCOMES

1. The student will understand various environmental aspects of textile industry
2. They will learn types of injuries at production sites, avoidance and minimization, and preparation for emergencies
3. Student will also get knowledgeable about potential fire issues and using preventive techniques
4. They will learn to develop safe work practices and reduce injuries and illnesses

SYLLABUS OUTLINE

The course is aimed to familiarize students about various environment health and safety issues and how to mitigate them in various sectors of textile industry

Theory

Module-1 Introduction to Textile Industry

- Importance and history of Textile Industry
- Various Textile Manufacturing Processes
- Role of EHS in Textile Industry

Module-2 Environmental Impact and Management

Environmental issues during the operational phase of textile manufacturing primarily include the following:

- Hazardous materials management
- Wastewater
- Emissions to air
- Energy consumption
- Solid and liquid waste

Module-3 Health and Safety Impacts and Management

Occupational health and safety hazards during the operational phase of textile manufacturing projects primarily include the following: ·

- Chemical hazards
- Physical hazards
- Heat
- Noise
- Ionizing and non-ionizing radiation

Module-4 Performance Indicators and Monitoring

- Emissions and Effluent Guidelines
- General EHS Guidelines
- Accident and Fatality Rates
- Resource Use
- Environmental Monitoring
- Occupational Health and Safety Monitoring

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Nadda, V., Arnott, I., & Sealy, W. (Eds.). (2020). *Legal, Safety, and Environmental Challenges for Event Management: Emerging Research and Opportunities: Emerging Research and Opportunities*. IGI Global.
2. Bunsell, A. R. (Ed.). (2018). *Handbook of properties of textile and technical fibres*. Woodhead Publishing.
3. Raheel, M. (Ed.). (2017). *Modern textile characterization methods*. Routledge.
4. Prentice, R., & De Neve, G. (Eds.). (2017). *Unmaking the global sweatshop: health and safety of the world's garment workers*. University of Pennsylvania Press.
5. Muthu, S. S. (Ed.). (2017). *Sustainability in the Textile Industry*. Springer.

OHS-513 ENVIRONMENT AND HEALTH RISK ASSESSMENT (THEORY)

Credit hours (03 Hrs)

PRE-REQUISITE: BS / M. Sc Environmental Sciences

Course Learning Outcomes

Students will learn to:

- Define risk in the context of environment and health.
- Identify factors that alter people's perception of risk.
- Apply various approaches for environmental and ecological health risk assessment
- Examine concepts such as exposure and consequence assessment and analysis models
- Apply risk assessment concepts to specific health and environmental risks
- Understand risk management approaches

Course outline

This course will provide the understanding about assessment of human and ecological health risks from environmental stresses and various risk management approaches.

Module 1: Fundamentals of environmental Risk assessment and management

- Definition and major types of environmental risk
- Introduction to environmental risk assessment
- Introduction to environmental risk management

Modules 2. Types and application of Environmental health risk

- Risk assessment as an early warning
- Risk assessment via inhalation and ingestion
- Risk assessment via external contact and/or deposition
- Risk assessment environmental micropollutants/chemicals
- Risk assessment for GMOs
- Risk assessment for microbes and pathogens

Module 3: Approaches and models of Environmental health risks assessment

- Human health risk assessment
- Ecological health risk assessment
- Toxicology assessment studies
- Dose response based studies
- Exposure assessment studies
- Epidemiology and environmental risk assessment

Module 4: Aquatic habitats and environmental risk assessment

- Water bodies and concentrations of pollutants
- Pathways of environmental pollutants in aquatic bodies
- Risk assessment for aquatic flora and fauna
- Risk evaluation through food chain and food web

Modules 5: Terrestrial matrices and environmental risk assessment

- Risk through air, dust, soil and sediments
- Pathways of environmental pollutants in terrestrial habitats
- Exposure of human and wildlife to contaminants in terrestrial environment

Module 6: Risk management strategies

- Pollution control strategies
- Bioremediation of environmental pollutants
- Waste disposal strategies
- Laws and legislations

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Dalezios, N. R. (2017). *Environmental hazards: methodologies for risk assessment and management.* IWA Publishing, London.
2. Greenberg, R. M. (2017). *Explaining Risk Analysis: Protecting health and the environment.* Routledge, New York.
3. Muralikrishna, I. V. and Manickam, V. (2017). *Environmental Management Science and Engineering for Industry.* BS Publications, Oxford.
4. Pritchard, P. (2014). *Environmental Risk Management.* Earthscan, USA.
5. Mohapatra, R. (2002). *Occupational Health Hazards and Remedies.* Jaypee Brothers Medical Publishers Pvt. Ltd., India.

Assorted Research Papers

OHS-514 HEALTH SAFETY AND ENVIRONMENTAL ENTREPRENEURSHIP (2 Credit Hours)

PRE-REQUISITE: As per completion of 1st semester courses

COURSE LEARNING OUTCOMES

1. The student will understand the relationship of environment and health and safety in job market.
2. They will learn types of injuries at production sites, avoidance and minimization, and preparation for emergencies in industries.
3. Student will also get knowledgeable about how to develop business ideas related to health and safety.
4. They will learn to develop safe business practices.

SYLLABUS OUTLINE

The course is aimed to familiarize students about various environment health and safety entrepreneurship and how to develop ideas of business startup.

Theory

Module-1 Introduction

- Relationship between health and safety and environmental business
- Various public and private organizations
- The status quo related to health and safety and environment.

Module-2 The reality of the safety job market

- Why is the safety job market getting saturated?
- Defying the status quo
- Safety entrepreneurship is definitely the new cool
- Why is health and safety a better niche?

Module-3 Health and safety business ideas

- Health and safety training
- Career related training courses
- In-house health and safety training courses
- Health and safety consultancy
- General health and safety merchandise
- Physical products
- Digital products

Module-4 How can you take advantage?

- Career related training courses
- In-house health and safety training courses
- Health and safety consultancy.
- Physical products
- Digital products

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Mazzarol, T., & Reboud, S. (2020). Work Book: Entrepreneurship and Innovation in Large Firms. In *Workbook for Entrepreneurship and Innovation* (pp. 31-44). Springer.
2. Baporikar, N. (Ed.). (2020). *Handbook of research on entrepreneurship development and opportunities in circular economy*. IGI Global.
3. Gurtu, A. (Ed.). (2020). *Recent Advancements in Sustainable Entrepreneurship and Corporate Social Responsibility*. IGI Global.
4. Bedell, F. (2016). *The Role of Government in the Realms of Consumerism and Entrepreneurship: A Case for the Health, Safety, and Financial Risks and Rewards for the American Taxpayer*. Xlibris Corporation.
5. Baum, J. R., Frese, M., & Baron, R. A. (Eds.). (2014). *The psychology of entrepreneurship*. Psychology Press.