SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode-638455

Regulation 2023 (Autonomous)

Curriculum and Syllabus

Choice Based Credit System (CBCS)

ME- INDUSTRIAL SAFETY ENGINEERING

SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode -638455

Regulation 2023 (PG)
Curriculum and Syllabus
ME - INDUSTRIAL SAFETY ENGINEERING

I. Program Educational Objective (PEO)

PEO1: Possess a mastery of Health safety and environment awareness and safety management skills, to reach higher levels in their profession.

PEO2: Proficient safety Engineer rendering professional expertise to the industrial and societal needs at national and global level subject to legal requirements.

PEO3: Well communicate the information on Health safety and environment facilitating collaboration with experts across various disciplines so as to create and execute safe methodology in complex engineering activities.

PEO4: Demonstrate professional and ethical attitude with awareness of current legal issues by rendering expertise to wide range of industries.

II. Program Outcomes (POs)

1. An ability to independently carry out research/investigation and development work to solve practical problems

2. An ability to write and present a substantial technical report/document

3. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

4. Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to safety, health and environmental engineering activities with an understanding of the limitations.

5. Demonstrate the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to occupational health and safety practices.

6. Recognise the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously

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SUMMARY OF CREDITS

S.No	Course Category	Credits per Semester				Total Credits	Credits in %
		I	II	III	IV		
1	FC	4	-	-	-	4	5.33
2	PC	12	14	3	-	29	38.67
3	PE	3	6	6	-	15	20
4	RMC	2	-	-	-	2	2.67
5	OE	-	-	3	-	3	4
6	EEE	1	1	8	12	22	29.33
7	Non Credit/Audit Course	√	√	-	-	-	-
Total Credits / Semester		22	21	20	12	75	100

CATEGORIZATION OF COURSES

i. Foundation Courses (FC)
ii. Program Core Courses (PC)
iii. Professional Electives (PE)
iv. Research Methodology And IPR Courses (RMC)
v. Open Electives (OE)
vi. Employability Enhancement Courses (EEC)
vii. Audit Courses (AC)

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Regulation 2023 (PG)
Curriculum and Syllabus
ME - INDUSTRIAL SAFETY ENGINEERING

SEMESTER I

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
THEORY											
1.	23IST11	Statistical Methods For Engineers	FC	4	0	0	4	4	40	60	100
2.	23IST12	Principles of Safety Management	PC	3	0	0	3	3	40	60	100
3.	23IST13	Environmental Safety	PC	3	0	0	3	3	40	60	100
4.	23IST14	Occupational Health and Industrial Hygiene	PC	3	0	0	3	3	40	60	100
5.	23IST15	Industrial Safety, Health and Environment Acts	PC	3	0	0	3	3	40	60	100
6.	23RMT11	Research Methodology and IPR	RMC	2	0	0	2	2	40	60	100
7.		Professional Elective – I*	PE	3	0	0	3	3	40	60	100
8.		Audit Course – I#	AC	2	0	0	2	0	100	-	100
PRACTICALS											
9.	23ISL11	Safety Audit	EEC	0	0	2	2	1	60	40	100
			Total	**23**	**0**	**2**	**25**	**22**			

*** Professional Elective – I shall be chosen from the list of Professional electives I offered by same Programme**

 # Audit Course is optional

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SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
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Regulation 2023 (PG)
Curriculum and Syllabus
ME - INDUSTRIAL SAFETY ENGINEERING

SEMESTER II

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
THEORY											
1.	23IST21	Fire Engineering and Explosion Control	PC	3	0	0	3	3	40	60	100
2.	23IST22	System Simulation and Hazard Analysis	PC	4	0	0	4	4	40	60	100
3.	23IST23	Electrical Safety	PC	3	0	0	3	3	40	60	100
4.	23IST24	Safety in Process Industries	PC	3	0	0	3	3	40	60	100
5.		Professional Elective – II*	PE	3	0	0	3	3	40	60	100
6.		Professional Elective- III*	PE	3	0	0	3	3	40	60	100
7.		Audit Course – II#	AC	2	0	0	2	0	100	-	100
PRACTICALS											
8.	23ISL21	Industrial Safety and Simulation Laboratory	PC	0	0	2	2	1	60	40	100
9.	23ISL22	Technical Seminar - I	EEC	0	0	2	2	1	60	40	100
			Total	**21**	**0**	**4**	**25**	**21**			

*** Professional Elective – II & III shall be chosen from the list of Professional electives II & III offered by same Programme**

 # Audit Course is optional

@ The students individually undergo training in reputed firms / research institute / laboratories for the specified duration (4 weeks) at summer vacation. After the completion of training, a detailed report should be submitted within ten days from the commencement of next semester.

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SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
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Regulation 2023 (PG)
Curriculum and Syllabus
ME - INDUSTRIAL SAFETY ENGINEERING
SEMESTER III

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
THEORY											
1.	23IST31	Reliability Engineering	PC	3	0	0	3	3	40	60	100
2.		Professional Elective – IV*	PE	3	0	0	3	3	40	60	100
3.		Professional Elective – V*	PE	3	0	0	3	3	40	60	100
4.		Open Elective **	OE	3	0	0	3	3	40	60	100
PRACTICALS											
5.	23ISL31	Project Work I	EEC	0	0	12	12	6	60	40	100
6.	23ISL32	Industrial Safety Assessment – Internship @	EEC	0	0	4	4	2	60	40	100
			Total	**12**	**0**	**16**	**28**	**20**			

*** Professional Elective – IV & V shall be chosen from the list of Professional electives IV & V offered by same Programme**

**** Open Elective shall be chosen from the list of Open Electives offered by other Programme**

@ The students undergone summer internship during II semester summer vacation and same will be evaluated in III semester

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Gobichettipalayam, Erode -638455

Regulation 2023 (PG)
Curriculum and Syllabus
ME - INDUSTRIAL SAFETY ENGINEERING

SEMESTER IV

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
PRACTICALS											
1.	23ISL41	Project Work II	EEC	0	0	24	24	12	60	40	100
			Total	**0**	**0**	**24**	**24**	**12**			

TOTAL CREDITS: 75

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SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode -638455

Regulation 2023 (PG)
Curriculum and Syllabus

LIST OF PROFESSIONAL ELECTIVES

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
SEMESTER I, ELECTIVE I											
1.	23ISE11	Plant Layout and Material Handling	PE	3	0	0	3	3	40	60	100
2.	23ISE12	Work Study and Ergonomics	PE	3	0	0	3	3	40	60	100
3.	23ISE13	Human Factors in Engineering	PE	3	0	0	3	3	40	60	100
4.	23ISE14	Maintainability Engineering	PE	3	0	0	3	3	40	60	100
5.	23ISE15	Optimization Techniques	PE	3	0	0	3	3	40	60	100
SEMESTER II, ELECTIVE II & III											
1.	23ISE21	Transport Safety	PE	3	0	0	3	3	40	60	100
2.	23ISE22	Fireworks Safety	PE	3	0	0	3	3	40	60	100
3.	23ISE23	Safety in Construction	PE	3	0	0	3	3	40	60	100
4.	23ISE24	Nuclear Engineering and Safety	PE	3	0	0	3	3	40	60	100
5.	23ISE25	Safety in Textile Industry	PE	3	0	0	3	3	40	60	100
6.	23ISE26	Safety in Mines	PE	3	0	0	3	3	40	60	100
7.	23ISE27	Dock Safety	PE	3	0	0	3	3	40	60	100
SEMESTER III, ELECTIVE IV & V											
1.	23ISE31	Safety in Engineering Industry	PE	3	0	0	3	3	40	60	100
2.	23ISE32	Quality Engineering in Production Systems	PE	3	0	0	3	3	40	60	100
3.	23ISE33	ISO 45001 and ISO 14000	PE	3	0	0	3	3	40	60	100
4.	23ISE34	Artificial Intelligence and Expert Systems	PE	3	0	0	3	3	40	60	100
5.	23ISE35	Design of Experiments	PE	3	0	0	3	3	40	60	100
6.	23ISE36	Data Analytics	PE	3	0	0	3	3	40	60	100

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SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode -638455

Regulation 2023 (PG)
Curriculum and Syllabus

LIST OF AUDIT COURSES

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
SEMESTER I & II											
1.	23ENA11	English for Research Paper Writing	AC	2	0	0	2	0	100	-	100
2.	23CMA12	Disaster Administration And Management	AC	2	0	0	2	0	100	-	100
3.	23MSA13	Constitution of India	AC	2	0	0	2	0	100	-	100
4.	23TAA14	நற்றமிழ் இலக்கியம்	AC	2	0	0	2	0	100	-	100

LIST OF OPEN ELECTIVES

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
OFFERED BY DEPARTMENT OF MANAGEMENT STUDIES											
1.	23MSO31	Sustainable Management	3	0	0	3	3	3	40	60	100
2.	23MSO32	Micro and Small Business Management	3	0	0	3	3	3	40	60	100
3.	23MSO33	Intellectual Property Rights	3	0	0	3	3	3	40	60	100
4.	23MSO34	Ethical Management	3	0	0	3	3	3	40	60	100

23/01/2024
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23IST11	STATISTICAL METHODS FOR ENGINEERS (for M.E – Industrial Safety Engineering)	L	T	P	C
		4	0	0	4

COURSE OBJECTIVES:

- This course is designed to provide the solid foundation on topics in various statistical methods which form the basis for many other areas in the mathematical sciences including statistics, modern optimization methods and risk modeling. It is framed to address the issues and the principles of estimation theory, testing of hypothesis, correlation and regression, design of experiments and multivariate analysis.

UNIT-I **ESTIMATION THEORY** **12**

Estimators : Unbiasedness, Consistency, Efficiency and sufficiency – Maximum likelihood estimation – Method of moments.

UNIT-II **TESTING OF HYPOTHESIS** **12**

Sampling distributions - Small and large samples -Tests based on Normal, t, Chi square, and F distributions for testing of means, variance and proportions – Analysis of r x c tables – Goodness of fit.

UNIT-III **DESIGN OF EXPERIMENTS** **12**

Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design – Latin square design - 2^2 Factorial design – 2^K - Factorial design.

UNIT-IV **CORRELATION AND REGRESSION** **12**

Multiple and partial correlation – Method of least squares – Plane of regression – Properties of residuals – Coefficient of multiple correlation – Coefficient of partial correlation – Multiple correlation with total and partial correlations – Regression and partial correlations in terms of lower order co - efficient.

UNIT-V **MULTIVARIATE ANALYSIS** **12**

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components: Population principal components – Principal components from standardized variables.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Consistency, efficiency and unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem

CO2 : Use statistical tests in testing hypotheses on data.

CO3 : List the guidelines for designing experiments and recognize the key historical figures in Design of Experiments

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CO4 : Concept of linear regression, correlation, and its applications

CO5 : Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.

REFERENCE BOOKS:

1. Gupta.S.C., and Kapoor, V.K., "Fundamentals of Mathematical Statistics", 12th Edition, Sultan Chand and Sons, 2020.
2. Jay L. Devore, "Probability and statistics for Engineering and the Sciences", 8th Edition, Cengage Learning, 2014.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", 9th Edition, Pearson Education, Asia, 2016.
4. Johnson, R.A. and Wichern, D. W. "Applied Multivariate Statistical Analysis", 6th Edition, Pearson Education, Asia, 2012.
5. Rice, J.A. "Mathematical Statistics and Data Analysis", 3rd Edition, Cengage Learning, 2015.

E-RESOURCES:

1. https://archive.nptel.ac.in/courses/111/105/111105077/
2. https://nptel.ac.in/courses/105105150

CO's – PO's MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	3	-	-	-
CO2	2	1	3	-	-	-
CO3	2	1	3	-	-	-
CO4	-	-	1	-	-	-
CO5	2	1	3	-	-	-
AVG	2	1	3	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23IST12	PRINCIPLES OF SAFETY MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students:

- To achieve an understanding of principles of safety management.
- To enable the students to learn about various functions and activities of safety department.
- To enable students to conduct safety audit and write audit reports effectively in auditing situations.
- To have knowledge about sources of information for safety promotion and training.
- To familiarize students with evaluation of safety performance.

UNIT-I CONCEPTS AND TECHNIQUES **9**

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

UNIT-II SAFETY AUDIT **9**

Components of safety audit, types of audit, audit methodology, non-conformity reporting (NCR), audit checklist and report – review of inspection, remarks by government agencies, consultants, experts – perusal of accident and safety records, formats – implementation of audit indication - liaison with departments to ensure co-ordination – check list – identification of unsafe acts of workers and unsafe conditions in the shop floor.

UNIT-III ACCIDENT INVESTIGATION AND REPORTING **9**

Concept of an accident, reportable and non reportable accidents, reporting to statutory authorities – principles of accident prevention – accident investigation and analysis – records for accidents, departmental accident reports, documentation of accidents – unsafe act and condition – domino sequence – supervisory role – role of safety committee –cost of accident.

UNIT-IV SAFETY PERFORMANCE MONITORING **9**

ANSI (Z16.1) Recommended practices for compiling and measuring work injury experience – permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety "t" score, safety activity rate – problems.

UNIT-V SAFETY EDUCATION AND TRAINING **9**

Importance of training-identification of training needs-training methods – programmes, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: To understand the functions and activities of safety engineering department.

CO2: To carry out a safety audit and prepare a report for the audit.

CO3: To prepare an accident investigation report and To estimate the accident cost using supervisors report and data.

CO4: To evaluate the safety performance of an organization from accident records.

CO5: To identify various agencies, support institutions and government organizations involved in safety training and promotion

REFERENCE BOOKS:

1. "Accident Prevention Manual for Industrial Operations", N.S.C.Chicago, 13th Edition 2009.
2. Blake R.B., "Industrial Safety" Prentice Hall, Inc., New Jersey,. 3rd Edition 2000.
3. Lees, F.P., "Loss Prevention in Process Industries" Butterworth publications, London, 2nd edition, 1990.

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	2	-	-	-
CO2	-	-	3	-	-	-
CO3	-	-	-	-	-	-
CO4	-	-	-	2	-	-
CO5	-	-	-	-	-	-
Avg	**3**	**-**	**2.5**	**2**	**-**	**-**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23IST13	ENVIRONMENTAL SAFETY	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students:

- To provide in depth knowledge in Principles of Environmental safety and its applications in various fields.
- To Understanding the standards of professional conduct that are published by professional safety organizations and/or certification bodies.
- To give understanding of air and water pollution and their control.
- To expose the students to the basis in hazardous waste management.
- To design emission measurement devices.

UNIT-I AIR POLLUTION **9**

Classification and properties of air pollutants – Pollution sources – Effects of air pollutants on human beings, Animals, Plants and Materials - automobile pollution-hazards of air pollution-concept of clean coal combustion technology - ultra violet radiation, infrared radiation, radiation from sun-hazards due to depletion of ozone - deforestation-ozone holes-automobile exhausts-chemical factory stack emissions-CFC.

UNIT-II WATER POLLUTION **9**

Classification of water pollutants-health hazards-sampling and analysis of water-water treatment - different industrial effluents and their treatment and disposal -advanced wastewater treatment - effluent quality standards and laws- chemical industries, tannery, textile effluents-common treatment.

UNIT-III HAZARDOUS WASTE MANAGEMENT **9**

Hazardous waste management in India-waste identification, characterization and classification- technological options for collection, treatment and disposal of hazardous waste-selection charts for the treatment of different hazardous wastes-methods of collection and disposal of solid wastes-health hazards-toxic and radioactive wastes-incineration and verification - hazards due to bio-process- dilution-standards and restrictions – recycling and reuse.

UNIT-IV ENVIRONMENTAL MEASUREMENT AND CONTROL **9**

Sampling and analysis – dust monitor – gas analyzer, particle size analyzer – lux meter-pH meter – gas chromatograph – atomic absorption spectrometer.

Gravitational settling chambers-cyclone separators-scrubbers-electrostatic precipitator - bag filter – maintenance - control of gaseous emission by adsorption, absorption and combustion methods- Pollution Control Board-laws.

UNIT-V POLLUTION CONTROL IN PROCESS INDUSTRIES **9**

Pollution control in process industries - cement, paper, petroleum-petroleum products-textile- tanneries-thermal power plants – dying and pigment industries - eco-friendly energy.

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Illustrate and familiarize the basic concepts scope of environmental safety.

CO2: Understand the standards of professional conduct that are published by professional safety organizations and/or certification bodies.

CO3: Explain the ways in which environmental health problems have arisen due to air and water pollution.

CO4: Illustrate the role of hazardous waste management and use of critical thinking to identify and assess environmental health risks.

CO5: Discuss concepts of measurement of emissions and design emission measurement devices.

REFERENCE BOOKS:

1. Rao, CS, "Environmental pollution engineering:, Wiley Eastern Limited, New Delhi, 1st January 2018.
2. E. C Wolfe, Race to Save to Save Planet, Wadsworth Publishing Co., Belmont, CA 2006.
3. G. T Miller, Environmental Science: Working with the Earth, 11th Edition, Wadsworth Publishing Co., Belmont, CA, 2006

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	2	-	-	-
CO2	-	-	3	-	-	-
CO3	-	-	-	-	-	-
CO4	-	-	-	-	-	-
CO5	-	-	-	-	-	-
Avg	**3**	**-**	**2.5**	**-**	**-**	**-**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23IST14	OCCUPATIONAL HEALTH AND INDUSTRIAL HYGIENE	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students:

- To have knowledge about types of physical and chemical hazards.
- To have knowledge about types of biological agents.
- To understand the basic knowledge on anatomy of human organs and its basic functions.
- To enable the students to learn about various functions and activities of occupational health services.
- To enable students to compare the hazards with the permissible levels.

UNIT-I PHYSICAL HAZARDS **9**

Noise, compensation aspects, noise exposure regulation, properties of sound, occupational damage, risk factors, sound measuring instruments, octave band analyzer, noise networks, noise surveys, noise control program, industrial audiometry, hearing conservation programs- vibration, types, effects, instruments, surveying procedure, permissible exposure limit.

Ionizing radiation, types, effects, monitoring instruments, control programs, OSHA standard- non- ionizing radiations, effects, types, radar hazards, microwaves and radio-waves, lasers, TLV- cold environments, hypothermia, wind chill index, control measures-hot environments, thermal comfort, heat stress indices, acclimatization, estimation and control

UNIT-II CHEMICAL HAZARDS **9**

Recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. dose, TLV - Methods of Evaluation, process or operation description, Field Survey, Sampling methodology, Industrial Hygiene calculations, Comparison with OSHAS Standard.

Air Sampling instruments, Types, Measurement Procedures, Instruments Procedures, Gas and Vapour monitors, dust sample collection devices, personal sampling

Methods of Control - Engineering Control, Design maintenance considerations, design specifications - General Control Methods - training and education

UNIT-III BIOLOGICAL AND ERGONOMICAL HAZARDS **9**

Classification of Biohazardous agents – examples, bacterial agents, rickettsial and chlamydial agents, viral agents, fungal, parasitic agents, infectious diseases – Covid SARS - Biohazard control program, employee health program-laboratory safety program-animal care and handling-biological safety cabinets - building design.

Work Related Musculoskeletal Disorders –carpal tunnel syndrome CTS- Tendon pain-disorders of the neck- back injuries.

UNIT-IV OCCUPATIONAL HEALTH AND TOXICOLOGY **9**

Concept and spectrum of health - functional units and activities of occupational health services, pre- employment and post-employment medical examinations - occupational related diseases, levels of prevention of diseases, notifiable occupational diseases such as

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silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax, lead-nickel, chromium and manganese toxicity, gas poisoning (such as CO, ammonia, coal and dust etc) their effects and prevention – cardio pulmonary resuscitation, audiometric tests, eye tests, vital function tests.

Industrial toxicology, local, systemic and chronic effects, temporary and cumulative effects, carcinogens entry into human systems.

UNIT-V OCCUPATIONAL PHYSIOLOGY **9**

Man as a system component – allocation of functions – efficiency – occupational work capacity – aerobic and anaerobic work – evaluation of physiological requirements of jobs – parameters of measurements – categorization of job heaviness – work organization – stress – strain – fatigue – rest pauses – shift work – personal hygiene.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Identify various types of physical and chemical hazards in a process.

CO2: Identify various types of biological agents in a process.

CO3: To understand the various physiological functions of our body and the test methods for periodical monitoring of health.

CO4: To understand the functions and activities of Occupational health services.

CO5: To identify notifiable occupational diseases arising out of Occupation and suggest methods for the prevention of such diseases.

REFERENCE BOOKS:

1. DanutaKoradecka, Handbook of Occupational Health and Safety, CRC, 2010.
2. Benjamin O.Alli, Fundamental Principles of Occupational Health and Safety ILO 2008.
3. Interim guidance "COVID-19: Occupational health and safety for health workers", WHO & ILO,2021.

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	2	-	-	-
CO2	-	-	3	-	-	-
CO3	-	-	-	-	-	-
CO4	-	-	-	-	-	-
CO5	-	-	-	-	-	-
Avg	**3**	**-**	**2.5**	**-**	**-**	**-**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23IST15	INDUSTRIAL SAFETY, HEALTH AND ENVIRONMENT ACTS	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students:

- To provide exposure to the students about safety and health provisions related to hazardous processes as laid out in Factories act 1948.
- To familiarize students with powers of inspectorate of factories.
- To help students to learn about Environment act 1986 and rules framed under the act.
- To provide wide exposure to the students about various legislations applicable to an industrial unit.

UNIT-I FACTORIES ACT – 1948 **9**

Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young persons – special provisions – penalties and procedures-Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948. Forms, Registers and notices – Tamilnadu Safety Officer Rules 2005- with updated Amendments.

UNIT-II ENVIRONMENT ACT – 1986 **9**

General powers of the central government, prevention, control and abatement of environmental pollution-Biomedical waste (Management and handling Rules, 1989-The noise pollution (Regulation and control) Rules, 2000-The Batteries (Management and Handling Rules) 2001- No Objection certificate from statutory authorities like pollution control board.

Air Act 1981 and Water Act 1974: Central and state boards for the prevention and control of air pollution-powers and functions of boards – prevention and control of air pollution and water pollution – fund – accounts and audit, penalties and procedures.

UNIT-III MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES 1989 AND MAJOR ACCIDENT HAZARD CONTROL RULES AND AMENDMENT **9**

Definitions – duties of authorities – responsibilities of occupier – notification of major accidents – information to be furnished – preparation of offsite and onsite plans – list of hazardous and toxic chemicals – safety reports – safety data sheets. Major Accident Hazard Control Rules. Hazardous Wastes (management, handling and Transboundary Movement) Rules 2016.

UNIT-IV OTHER ACTS AND RULES **9**

Indian Boiler (Amendments) Act 2007, static and mobile pressure vessel rules (SMPV), motor vehicle rules, The Mines and Minerals (Development & Regulation) Amendment Act, 2015, workman compensation act, rules – electricity act and rules – hazardous wastes (management, handling and transboundary) rules, 2008 - the building and other construction workers act 1996., Petroleum rules, Gas cylinder rules 2016, Explosives Act 1884 - Pesticides Act – E waste (management) rules 2016.

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UNIT-V INTERNATIONAL ACTS AND STANDARDS **9**

Occupational Safety and Health act of USA (The Williames - Steiger Act of 1970) – Health and safety work act (HASAWA 1974, UK) – ISO 14001 – ISO 45001 , European Safety and Health Legislations, American Petroleum Institute (API) Standards, Oil Industry Safety Directorate (OISD) Standards, National Fire Protection Association (NFPA) Standards, Atomic Energy Regulatory Board (AERB), American National Standards Institute(ANSI).

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: To list out important legislations related to health, Safety and Environment.

CO2: To list out requirements mentioned in factories act for the prevention of accidents.

CO3: To understand the health and welfare provisions given in factories act.

CO4: To understand the statutory requirements for an Industry on registration, license and its renewal.

CO5: To prepare onsite and offsite emergency plan.

REFERENCE BOOKS:

1. The Factories Act 1948, Madras Book Agency, Chennai, 2000
2. Srinivasan S , "The Tamil Nadu Safety Officers Rules 2005" Madras BookAgency,Chennai, 28th Edition, 2017
3. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt.Ltd., New Delhi.

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	2	-	-	-
CO2	-	-	3	-	-	-
CO3	-	-	-	-	-	-
CO4	-	-	-	-	-	-
CO5	-	-	-	-	-	-
Avg	**3**	**-**	**2.5**	**-**	**-**	**-**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23RMT11	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

UNIT-I RESEARCH DESIGN **6**

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT-II DATA COLLECTION AND SOURCES **6**

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT-III DATA ANALYSIS AND REPORTING **6**

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT-IV INTELLECTUAL PROPERTY RIGHTS **6**

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, Copyrights, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT-V PATENTS **6**

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL : 30 PERIODS

REFERENCE BOOKS:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.
3. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.

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23ISL11	SAFETY AUDIT	L	T	P	C
		0	0	2	1

Course Objectives:

The main learning objective of this course is to prepare the students:

- To Inculcate the Industrial Safety Environment to the students
- To Explore the Human Capital Management and Hazardous System

DESCRIPTION OF THE COURSE

- The students are expected to make a presentation on the state of Safety Audit from the observation from the Industry Safety Department.
- A faculty guide is to be allotted and the Student will visit the industry to aware about the Importance of the Safety.
- Students are encouraged to prepare the Safety System Guidelines from your observation period of Inspection from the Industry Safety Department and contribute the same to the Environment Contribution.
- The Students are advised to go through the below mentioned following heads of safety Measures to be audit and inspect at the time of visit. Depending on the requirements of the organizations, the audit can focus attention on the following aspects of a safety system and make sure that your level of expertise in the safety system.

Every safety audit as per 'The Code of Practice' on Occupational Safety & Health 'Indian Standard – 14489:2018, ISO 45001:2018,EMS- ISO 14001:2015, NBC:2016 and other national and international standard applicable to each particular industry.

- Safety Management systems.
- Fire and Explosion prevention, protection and emergency management.
- Work injury prevention.
- Health hazards control.
- Evaluating emergency plan.
- First aid practices
- Management of health and safety
- Accidents and accident reporting
- Asbestos
- Contractors
- Display screen equipment
- Electrical safety
- Emergency lighting
- Environmental protection
- Fire prevention and emergencies
- Hazardous substances
- Housekeeping and cleanliness
- Information and communication
- Kitchens, catering and food safety
- Lifts and lifting equipment
- Manual handling operations
- Noise
- Occupational health
- Personal protective equipment

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- Plant rooms, machinery and equipment
- Risk assessment requirements
- Safety Policy
- Safety signs and notices
- Training
- Use of vehicles / vehicle safety
- Water services
- Welfare provision
- Working time
- Work at heights
- Workplace environment
- Accident prevention
- Identifying and correcting Regulatory Deficiencies
- Improvement of Employee Morale
- Identification and Elimination of Safety Hazards

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: To Minimize the Labor turnover by existence of Safety Measures of an Employee

CO2: To Promote the Fatigue Study it will lead to good production

CO3: To Implement the Human Resource Management Practices

CO4: To impart the Health Consciousness to the Working Community

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	3	-	-	-	-
CO2	-	2	2	-	-	-
CO3	-	-	-	3	-	-
CO4	-	-	-	-	-	-
CO5	-	-	-	-	-	-
Avg	-	**2.5**	**2**	**3**	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

27/01/2024
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23IST21	FIRE ENGINEERING AND EXPLOSION CONTROL	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students:

- To provide an in depth knowledge about the science of fire.
- To understand the causes and effects of fire.
- To know the various fire prevention systems and protective equipments.
- To understand the science of explosion and its prevention techniques.
- To understand the various fire prevention techniques to be followed in a building.

UNIT-I PHYSICS AND CHEMISTRY OF FIRE **9**

Fire properties of solid, liquid and gases - fire spread - toxicity of products of combustion - theory of combustion and explosion – vapour clouds – flash fire – jet fires – pool fires – unconfined vapour cloud explosion, shock waves - auto-ignition – boiling liquid expanding vapour explosion – case studies – Flixborough, Mexico disaster, Pasedena Texas, Piper Alpha, Peterborough and Bombay Victoria dock ship explosions.

UNIT-II FIRE PREVENTION AND PROTECTION **9**

Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers – fire stoppers – hydrant pipes – hoses – monitors – fire watchers – lay out of stand pipes – fire station-fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations – fire drills – notice-first aid for burns.

UNIT-III INDUSTRIAL FIRE PROTECTION SYSTEMS **9**

Sprinkler-hydrants-stand pipes – special fire suppression systems like deluge and emulsifier, selection criteria of the above installations, reliability, maintenance, evaluation and standards – alarm and detection systems. Other suppression systems – CO2 system, foam system, dry chemical powder (DCP) system, halon system – need for halon replacement – smoke venting. Portable extinguishers – flammable liquids – tank farms – indices of inflammability-fire fighting systems.

UNIT-IV BUILDING FIRE SAFETY **9**

Objectives of fire safe building design, Fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design - exists – width calculations - fire certificates – fire safety requirements for high rise buildings – snookers.

UNIT-V EXPLOSION PROTECTING SYSTEMS **9**

Principles of explosion-detonation and blast waves-explosion parameters – Explosion Protection, Containment, Flame Arrestors, isolation, suppression, venting, explosion relief of large enclosure- explosion venting-inert gases, plant for generation of inert gas-rupture disc in process vessels and lines explosion, suppression system based on carbon dioxide (CO2) and halons-hazards in LPG, ammonia (NH3), sulphur dioxide (SO3), chlorine (CL2) etc.

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: To make familiar about basic concepts of fire and explosion science.

CO2: To know the different source of ignition and their prevention techniques.

CO3: To understand the operation of various types of firefighting equipments.

CO4: To understand the causes and prevention of explosion.

CO5: To equip the students to effectively employ explosion protection techniques and their significances to suit the industrial requirement.

REFERENCE BOOKS:

1. "Accident Prevention manual for industrial operations" N.S.C., Chicago, 1982.
2. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.
3. Gupta, R.S., "Hand Book of Fire Technology" Orient Longman, Bombay 1977.

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	3	-	-		-
CO2	-	-	3	-	-	-
CO3	-	-	-	2	-	-
CO4	-	-	-	-	3	-
CO5	-	-	-	-	-	2
Avg	-	**3**	**3**	**2**	**3**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

27/6/2024
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23IST22	SYSTEM SIMULATION AND HAZARD ANALYSIS	L	T	P	C
		4	0	0	4

Course Objectives:

The main learning objective of this course is to prepare the students:

- To provide knowledge on risk, hazard and their assessment techniques in Industry
- To understand the principles of operation of various equipment for safety application
- To know the consequences of fire, explosion and toxic release
- To know the various software available for risk quantification
- To conduct a risk assessment technique in Industries.

UNIT-I HAZARD, RISK ISSUES AND HAZARD ASSESSMENT 12

Introduction, hazard, hazard monitoring-risk issue, group or societal risk, individual risk, voluntary and involuntary risk, social benefits Vs technological risk, approaches for establishing risk acceptance levels, Risk estimation. Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, preliminary hazard analysis(PHA), human error analysis, hazard operability studies(HAZOP),safety warning systems.

UNIT-II COMPUTER AIDED INSTRUMENTS 12

Applications of Advanced Equipments and Instruments, Thermo Calorimetry, Differential Scanning Calorimeter(DSC), Thermo Gravimetric Analyser(TGA), Accelerated Rate Calorimeter(ARC), Reactive Calorimeter(RC), Reaction System Screening Tool(RSST) - Principles of operations, Controlling parameters, Applications, advantages.

Explosive Testing, Deflagration Test, Detonation Test, Ignition Test, Minimum ignition energy Test, Sensitiveness Test, Impact Sensitiveness Test(BAM) and Friction Sensitiveness Test (BAM), Shock Sensitiveness Test, Card Gap Test.

UNIT-III RISK ANALYSIS QUANTIFICATION AND SOFTWARES 12

Introduction to Discrete and Continuous Systems Simulation- Fault Tree Analysis and Event Tree Analysis, Logic symbols, methodology, minimal cut set ranking - fire explosion and toxicity index(FETI), various indices - Hazard analysis(HAZAN)- Failure Mode and Effect Analysis(FMEA)- Basic concepts of Reliability- Software on Risk analysis, CISCON, FETI, HAMGARS modules on Heat radiation, Pool fire, Jet, Explosion. Reliability softwares on FMEA for mechanical and electrical systems.

UNIT-IV CONSEQUENCES ANALYSIS 12

Logics of consequences analysis- Estimation- Hazard identification based on the properties of chemicals- Chemical inventory analysis- identification of hazardous processes- Estimation of source term, Gas or vapour release, liquid release, two phase release- Heat radiation effects, BLEVE, Pool fires and Jet fire- Gas/vapour dispersion- Explosion, UVCE and Flash fire, Explosion effects and confined explosion- Toxic effects- Plotting the damage distances on plot plant/layout.

UNIT-V CREDIBILITY OF RISK ASSESSMENT TECHNIQUES 12

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

22/01/2024
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nuclear installation- Rijnmond report, risk analysis of size potentially Hazardous Industrial objects- Rasmussen masses report, Reactor safety study of Nuclear power plant Thiscoursewouldmakefamiliarizingofbasicconceptsinriskandhazard

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Make familiarizing of basic concepts in risk and hazard

CO2: Understand the various instruments to bring safety in Industries

CO3: Find solution for risk assessment studies through the use of software

CO4: Make use of a risk assessment technique to quantify the risk

CO5: Equip the students effectively to employ hazard analysis techniques in Industry and helpful to prevent the accidents in Industry

REFERENCE BOOKS:

1. Brown, D.B. System analysis and Design for safety, Prentice Hall, 1976.
2. Guidelines for Hazard Evaluation Procedures, Centre for Chemical Process safety, AICHE 1992
3. ILO- Major Hazard control- A practical Manual, ILO, Geneva, 1988

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	3	-	-		2
CO2	-	-	-	-	-	3
CO3	-	-	-	2	-	-
CO4	-	-	-	-	3	-
CO5	-	-	2	-	-	-
Avg	**-**	**3**	**2**	**2**	**3**	**2.5**

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman 22/01/2024
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23IST23	ELECTRICAL SAFETY	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students:

- To provide knowledge on basics of electrical fire and statutory requirements for electrical safety
- To understand the causes of accidents due to electrical hazards
- To know the various protection systems in Industries from electrical hazards
- To know the importance of earthing
- To distinguish the various hazardous zones and applicable fire proof electrical devices

UNIT-I CONCEPTS AND STATUTORY REQUIREMENTS 9

Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation(CPR).

UNIT-II ELECTRICAL HAZARDS 9

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications-excess energy- current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc- ignition energy-national electrical safety code ANSI.

Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

UNIT-III PROTECTION SYSTEMS 9

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no load protection-earth fault protection.

FRLS insulation-insulation and continuity test-system grounding-equipment grounding-earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

UNIT-IV SELECTION, INSTALLATION, OPERATION AND MAINTENANCE 9

Role of environment in selection-safety aspects in application - protection and interlock-self diagnostic features and fail safe concepts-lock out and work permit system-discharge rod and earthing devices- safety in the use of portable tools-cabling and cable joints-preventive maintenance.

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UNIT-V HAZARDOUS ZONES **9**

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe equipment-their selection for different zones-temperature classification-grouping of gases-use of barriers and isolators-equipment certifying agencies.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: This course would make familiar of basic concepts in electrical circuit and hazards involvec in it.

CO2: Course would be helpful to understand the electrical hazards in Industries.

CO3: Students would be able to understand the operation of various protection systems from electrical hazards

CO4: Recognize different hazardous zones in Industries

REFERENCE BOOKS:

1. "Accident prevention manual for industrial operations", N.S.C., Chicago, 1982.
2. Power Engineers – Handbook of TNEB, Chennai, 1989.
3. Indian Electricity Act and Rules, Government of India.

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	3	-	-		2
CO2	-	-	2	-	-	-
CO3	-	-	-	2	-	3
CO4	-	-	-	-	3	-
CO5	-	-	-	-	-	-
Avg	-	**3**	**2**	**2**	**3**	**2.5**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23IST24	SAFETY IN PROCESS INDUSTRIES	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students:

- To provide knowledge on design features for a process industry and safety in the operation of various equipment in industry.
- To understand the various hazards and prevention in commissioning stage of industry.
- To recognise and identify the safe operation of equipment in process industry.
- To plan and trained for emergency planning in a process industry.
- To get fundamental knowledge on safe storage of chemicals.

UNIT-I SAFETY IN PROCESS DESIGN AND PRESSURE SYSTEM DESIGN 9

Design process, conceptual design and detail design, assessment, inherently safer design-chemical reactor , types, batch reactors, reaction hazard evaluation, assessment, reactor safety, operating conditions, unit operations and equipments, utilities.

Pressure system, pressure vessel design, standards and codes- pipe works and valves- heat exchangers- process machinery- over pressure protection, pressure relief devices and design, fire relief, vacuum and thermal relief, special situations, disposal- flare and vent systems- failures in pressure system.

UNIT-II PLANT COMMISSIONING AND INSPECTION 9

Commissioning phases and organization, pre-commissioning documents, process commissioning, commissioning problems, post commissioning documentation

Plant inspection, pressure vessel, pressure piping system, non destructive testing, pressure testing, leak testing and monitoring- plant monitoring, performance monitoring, condition, vibration, corrosion, acoustic emission-pipe line inspection.

UNIT-III PLANT OPERATIONS 9

Operating discipline, operating procedure and inspection, format, emergency procedures-hand over and permit system- start up and shut down operation, refinery units- operation of fired heaters, driers, storage- operating activities and hazards- trip systems- exposure of personnel

UNIT-IV PLANT MAINTENANCE, MODIFICATION AND EMERGENCY PLANNING 9

Management of maintenance, hazards- preparation for maintenance, isolation, purging, cleaning, confined spaces, permit system- maintenance equipment- hot works- tank cleaning, repair and demolition- online repairs- maintenance of protective devices-modification of plant, problems- controls of modifications.

Emergency planning, disaster planning, onsite emergency- offsite emergency, APELL

UNIT-V STORAGES 9

General consideration, petroleum product storages, storage tanks and vessel- storages layout- segregation, separating distance, secondary containment- venting and relief, atmospheric vent, pressure, vacuum valves, flame arrestors, fire relief- fire prevention and protection- LPG storages, pressure storages, layout, instrumentation, vapourizer,

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refrigerated storages- LNG storages, hydrogen storages, toxic storages, chlorine storages, ammonia storages, other chemical storages- underground storages- loading and unloading facilities- drum and cylinder storage- ware house, storage hazard assessment of LPG and LNG

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: This course would make familiar of safe design of equipment which are the essential to chemical industry and leads to design of entire process industries.

CO2: Course would be helpful to understand the design of pressure systems.

CO3: Students would understand the problems and find innovative solutions while industries facing Problems in commissioning and maintenance stages.

CO4: Students can prepare the emergency planning for chemical industry problems

CO5: Students would be able to create safe storage systems.

REFERENCE BOOKS:

1. "Accident Prevention Manual for Industrial Operations" NSC, Chicago, 1982.
2. "Quantitative Risk Assessment in Chemical Process Industries" American Institute of Chemical Industries, Centre for Chemical Process safety.
3. Carbide of Calcium Rules, Government of India.

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	-	-	3	-
CO2	-	-	2	-	-	-
CO3	-	-	-	2	-	-
CO4	-	3	-	-	1	-
CO5	-	-	-	-	-	2
Avg	-	**3**	**2**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

22/01/2024
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23ISL21 INDUSTRIAL SAFETY AND SIMULATION LABORATORY

L	T	P	C
0	0	2	1

Course Objectives:

The main learning objective of this course is to prepare the students:

- To provide opportunity to operate the equipment to acquire practical knowledge.
- To know the various PPEs and software.
- To carry out experiments to find out the environmental parameters.
- To assess the impact of sensitivity of chemicals on explosivity.
- To run the software to assess the consequence effects of major accidents.

FIRST AID CONCEPTS

Study of Emergency Kits ,First – aid, road safety signs and signals -Safety Software Demo

NOISE LEVEL MEASUREMENT AND ANALYSIS

Measurement of sound pressure level in dB for Impact, continuous and intermittent sources at various networks, peak and average values.

FRICTION TEST

Explosive materials like barium nitrate, gun powder, white powder, amorces composition etc.

IMPACT TEST

Explosive materials like gun powder, white powder, amerce composition etc.

Burst strength test of packaging materials like paper bags, corrugated cartoons, wood etc. Auto ignition temperature test.

EXHAUST GAS MEASUREMENT AND ANALYSIS

Measurement of Sox, Nox, Cox, hydrocarbons.

ENVIRONMENTAL PARAMETER MEASUREMENT

Dry Bulb Temperature, Wet Bulb Temperature, Determination of relative humidity, wind flow and effective corrective effective.

Particle size Measurement Air sampling analysis

TRAINING IN USAGE AND SKILL DEVELOPMENT

Personal protective equipment:

Respiratory and non-respiratory-demonstration-self contained breathing apparatus. Safety helmet, belt, hand gloves, goggles, safety shoe, gum boots, ankle shoes, face shield, nose mask, ear plug, ear muff, anti static and conducting plastics/rubber materials, apron and leg guard.

Fire extinguishers and its operations

Water Co2 Foam

Carbon dioxide (Co2)

Dry chemical powder and

29/01/2024
Chairman
BoS / Mech

Currently amendment fire safety systems

Static charge testing on plastic, rubber, ferrous and non-ferrous materials.

Illumination testing - by lux meter and photo meter.

Electrical safety

Insulation resistance for motors and cables Estimation of earth resistance

Earth continuity test

Sensitivity test for MCB, ELCB, RCCB, MCCB

Software Usage

Dispersion modeling of various highly dangerous chemicals using ALOHA software

SOFTWARE USAGE - Accident Analysis ,Safety Audit Packages, Consequence Analysis (CISCON), Fire, Explosion and Toxicity Index (FETI), Reliability Analysis for Mechanical system and Electrical System, Failure Mode Analysis

Experiments on simulation to be added
Discrete and continuous
Equipments Required

1.	Noise level meter	:	1 No
2.	Friction tester	:	1 No
3.	Impact tester	:	1 No
4.	Exhaust gas analyzer:		1 No
5.	High volume sampler :		1 No
6.	PPE Set	:	1 No
7.	Fire extinguisher set :		1 No
8.	Static charge tester	:	1 No
9.	First aid kid	:	1 No
10.	Lock out/Tag out	:	1 No
11.	Software: ALOHA, CAMEO		
12.	Extend SIM		
13.	System	:	12 No

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to	
CO1:	This course would make students to know and run the various equipments to bring out the safety environment in the industry.
CO2:	Course would be helpful for the students to measure the particulate matter and assess the impact of air pollution.
CO3:	Students would be trained to conduct experiments to find out various environmental parameters.
CO4:	Students would be able to use personal protective equipment in-dependently.
CO5:	Students can recognise the various problems with the use of software and hence to predict the real situations on major accidents.

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CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	-	-	-	-
CO2	-	-	3	-	-	-
CO3	-	-	-	3	-	-
CO4	-	-	-	-	3	-
CO5	-	-	-	-	-	2
Avg	**-**	**2**	**3**	**3**	**3**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ISL22	TECHNICAL SEMINAR-I	L	T	P	C
		0	0	2	1

Course Objectives:

- To enrich the communication skills of the student through presentation of topics in recent advances in Industrial safety engineering/technology

COURSE OUTCOMES:

Students will develop skills to read, write, comprehend and present research papers.
Students shall give presentations on recent areas of research in industrial safety engineering in two cycles. Depth of understanding, coverage, quality of presentation material (PPT/OHP) and communication skill of the student will be taken as measures for evaluation.

TOTAL : 30 PERIODS

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	3	-	2	-
CO2	-	-	-	-	-	3
CO3	-	-	-	-	-	-
CO4	-	-	-	-	-	-
CO5	-	-	-	-	-	-
Avg	**3**	**-**	**3**	**-**	**2**	**3**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ENA11	ENGLISH FOR RESEARCH PAPER WRITING (Common to all M.E branches)	L T P C 2 0 0 0

COURSE OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very irst-time submission

UNIT-I **INTRODUCTION TO RESEARCH PAPER WRITING** 6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II **PRESENTATION SKILLS** 6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT-III **TITLE WRITING SKILLS** 6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT-IV **RESULT WRITING SKILLS** 6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT-V **VERIFICATION SKILLS** 6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the irst-time submission

TOTAL : 30 PERIODS

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COURSE OUTCOMES:

At the end of the Course the students will able to

CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title
CO4	Understand the skills needed when writing the Conclusion
CO5	Ensure the good quality of paper at very first-time submission

REFERENCE BOOKS:

1. Adrian Wallwork, "English for Writing Research Papers", Springer New York Dordrecht Heidelberg London, 2011
2. Day R, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006.
3. Goldbort R, "Writing for Science", Yale University Press (available on Google Books), 2006.
4. Highman N, "Handbook of Writing for the Mathematical Sciences", SIAM, Highman's book, 1998.

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23TAA14

நற்றமிழ் இலக்கியம்

L T P C
2 0 0 0

(அனைத்து M.E பாடப்பிரிவுகளுக்கும் பொதுவானது)

அலகு - I சங்க இலக்கியம் 6

1. தமிழின் துவக்க நூல் தொல்கொப்பியம்

– எழுத்து, சொல், பொருள்

2. அகநானூறு (82)

- இயற்கை இன்னிசை அரங்கம்

3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி

4. புறநானூறு (95,195)

- போரை நிறுத்திய ஔவையார்

அலகு - II அறநெறித் தமிழ் 6

1. அறநெறி வகுத்த திருவள்ளுவர்

- அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புரவறிதல், ஈகை, புகழ்

2. பிற அறநூல்கள் - இலக்கிய மருந்து

– ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை

(தூய்மையை வலியுறுத்தும் நூல்)

அலகு - III இரட்டைக் காப்பியங்கள் 6

1. கண்ணகியின் புரட்சி

- சிலப்பதிகார வழக்குரை காதை

2. சமூக சேவை, இலக்கியம் மணிமேகலை

- சிறைக் கோட்டம் அறக்கூட்டமாகிய காதை

அலகு - IV அருள்நெறித் தமிழ் 6

1. சிறுபாணாற்றுப்படை

- பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்

2. நற்றிணை

- அன்னைக்குரிய புன்னை சிறப்பு

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3. திருமந்திரம் (617, 618)

- இயமம் நியமம் விதிகள்

4. தர்மச்சாலையை நிறுவிய வள்ளலார்

5. புறநானூறு

- சிறுவனே வள்ளலானான்

6. அகநானூறு (4) - வண்டு

நற்றிணை (11) - நண்டு

கலித்தொகை (11) - யானை, புறா

ஐந்திணை 50 (27) - மான்

ஆகியவை பற்றிய செய்திகள்

அலகு - V **நவீன தமிழ் இலக்கியம்** 6

1. உரைநடைத் தமிழ்,

- தமிழின் முதல் புதினம்,
- தமிழின் முதல் சிறுகதை,
- கட்டுரை இலக்கியம்,
- பயண இலக்கியம்,
- நாடகம்.

2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,

3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,

4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,

5. அறிவியல் தமிழ்,

6. இணையத்தில் தமிழ்,

7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

மொத்தம்: 30 பாடவேளைகள்

தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University) - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia) -https://ta.wikipedia.org
3. தீம்புர ஆதீன வெளியீடு
4. வாழ்வியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

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5. தமிழ்கலைக் களஞ்சியம் - தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

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