M.E. (Industrial Safety Engineering) 2024 Regulations, Curriculum & Syllabi



BANNARI AMMAN INSTITUTE OF TECHNOLOGY An Autonomous Institution Affiliated to Anna University - Chennai • Approved by AICTE • Accredited by NAAC with 'A+' Grade SATHYAMANGALAM - 638401 ERODE DISTRICT TAMILNADU INDIA Ph: 04295-226000/221289 Fax: 04295-226666 Email: stayahead@bitsathy.ac.in Web: www.bitsathy.ac.in

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M.E-INDUSTRIAL SAFETY ENGINEERING

Vision of the Department

Seek excellence in the field of Mechanical Engineering education through knowledge and skills to carter to the requirements of the society.

Mission of the Department

- I. To continuously improving the teaching and learning process to enable students to meet the global needs.
- II. To upgrade the knowledge and skills of students, members of faculty and supporting staff through regular training.
- III. To produce the best minds of engineers capable of meeting expectations of Industry, Society and Entrepreneurship development.

M.E. INDUSTRIAL SAFETY ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- I. Possess a mastery of health safety and environmental knowledge and safety management skills to reach higher levels in their profession.
- II. Competent safety engineer rendering professional expertise to the industrial and societal needs at national and global level subject to legal requirements.
- III. Effectively communicate information on health, safety, and environment, facilitating collaboration with experts across various disciplines to create and execute safe methodology in complex engineering activities.

PROGRAMME OUTCOMES (POs)

The Graduate will be able to

- 1. Apply knowledge of Engineering Specialization for Hazard identification risk assessment analysis of the cause of the incident and control of occupational health safety and environmental problems
- 2. Establish, implement, and maintain continuous improvement on industrial safety management to ensure a risk-free working environment.
- Recognize and evaluate occupational health safety, and legal issues at the workplace to determine appropriate hazard controls following the hierarchy of controls relevant to occupational health and safety practices.
- 4. Conduct investigation analyzes the root cause and can generate corrective and preventive measures to prevent recurrence of accidents in industries.
- 5. Create, select, and apply modern Safety and Fire Engineering and IT tools to complex engineering activities with an understanding of the limitations.
- 6. Effectively communicate the safety matters rules, and regulations to the employee's society for safe handling of equipment and maintain the safe working environment in industries.

POs	1	2	3	4	5	6
PEO I	Х	Х				Х
PEO II		Х	Х	Х	Х	Х
PEO III				Х	Х	Х

MAPPING OF PEOs WITH POs

	ME INDUSTRI Minim						2024			
	14111111			STER						
Course		1.		SILK		H	Maxi	mum M	arks	
Code	Course Title	L	Т	Р	C	Hours/ Week	CA	SEE	Total	Category
24RM11	Research Methodology and IPR	2	0	0	2	2	40	60	100	ES
24IS12	Mathematics for Engineering Application	3	0	0	3	3	40	60	100	BS
24IS13	Occupational Health and Hygiene	3	0	0	3	3	40	60	100	PC
24IS14	Regulations for Health, Safety and Environment	4	0	0	4	4	40	60	100	PC
24IS15	Safety Management	3	0	0	3	3	40	60	100	PC
24IS16	Plant Layout and Material Handling	3	0	0	3	3	40	60	100	PC
24IS17	Environmental Analysis Laboratory	0	0	4	2	4	60	40	100	PC
24IS18	Industrial Hygiene and Ergonomics Laboratory	0	0	4	2	4	60	40	100	PC
	Audit course I	2	0	0	-	2	100	0	100	EEC
	Total	20	0	8	22	28	-	-	-	-
		II	SEMI	ESTER	2	1	1	1	I	•
Course		-	_			Hours/	Maxi	mum M	larks	
Code	Course Title	L	T	Р	C	Week	СА	SEE	Total	Category
24IS21	Safety in Engineering Industry	3	0	0	3	3	40	60	100	PC
24IS22	Fire Engineering and Explosion Control	3	0	0	3	3	40	60	100	PC
24IS23	Electrical Safety	3	0	0	3	3	40	60	100	PC
24IS24	Risk Analysis	3	0	0	3	3	40	60	100	PC
	Program Elective I	3	0	0	3	3	40	60	100	PE
	Program Elective II	3	0	0	3	3	40	60	100	PE
24IS26	Industrial Fire and Electrical Safety Laboratory	0	0	4	2	4	60	40	100	PC
24IS27	Mini Project	0	0	4	2	4	100	0	100	PC
	Audit course II	2	0	0	-	2	100	0	100	EEC
	Total	20	0	8	22	28	-	-	-	-
		Ш	SEM	ESTEF	ł					
Course	С. Т'4	т	–	р	С	Hours/	Maxi	mum N	larks	Catal
Code	Course Title	L	Т	Р	C	Week	CA	SEE	Total	Category
	Program Elective III	3	0	0	3	3	40	60	100	PE
	Program Elective IV	3	0	0	3	3	40	60	100	PE
	Program Elective V	3	0	0	3	3	40	60	100	PE
24IS34	Dissertation Phase I	0	0	12	6	12	60	40	100	EEC
	Total	9	0	12	15	21	-	-	-	-

	IV SEMESTER											
Course Course Title L T P C Hours/ Maximum Marks										Catagory		
Code	Code Course Title			r		Week	СА	SEE	Total	Category		
24IS41	Dissertation Phase II	0	0	24	12	24	60	40	100	EEC		
Total 0 0 24 12 24												

ELECTIV	YES									
PROFESI	ONAL ELECTIVES									
Course						Hours/	Max	imum N	larks	Category
Code	Course Title	L	Т	Р	C	Week	CA	SEE	Total	Category
LIST OF	PROFESIONAL ELECTIVES									
24IS51	Artificial Intelligence and Industrial Safety	3	0	0	3	3	40	60	100	PE
24IS52	Nuclear Engineering and Safety	3	0	0	3	3	40	60	100	PE
24IS53	Industrial Noise and Vibration Control	3	0	0	3	3	40	60	100	PE
24IS54	Safety in Powder Handling	3	0	0	3	3	40	60	100	PE
24IS55	Safety in Chemical Industries	3	0	0	3	3	40	60	100	PE
24IS56	Environmental Pollution Control	3	0	0	3	3	40	60	100	PE
24IS57	Environmental Impact Assessment	3	0	0	3	3	40	60	100	PE
24IS58	Safety in Petrochemical Industries	3	0	0	3	3	40	60	100	PE
24IS59	Transport Safety	3	0	0	3	3	40	60	100	PE
24IS60	Safety in On-Shore and Off- Shore Drilling	3	0	0	3	3	40	60	100	PE
24IS61	Safety in Mines	3	0	0	3	3	40	60	100	PE
24IS62	Maintenance Engineering	3	0	0	3	3	40	60	100	PE
24IS63	Work Study and Ergonomics	3	0	0	3	3	40	60	100	PE
24IS64	Waste Water Management	3	0	0	3	3	40	60	100	PE
24IS65	Reliability Engineering	3	0	0	3	3	40	60	100	PE
24IS66	Management System Standards	3	0	0	3	3	40	60	100	PE
24IS67	Safety in Construction	3	0	0	3	3	40	60	100	PE
24IS68	Safety in Textile Industry	3	0	0	3	3	40	60	100	PE
LIST OF	AUDIT COURSES I & II	•	•	•	•					
24XE01	English for Research Paper Writing	2	0	0	-	2	100	0	100	EEC
24XE02	Cost Management of Engineering Projects	2	0	0	-	2	100	0	100	EEC
24XE03	Stress Management	2	0	0	-	2	100	0	100	EEC
24XE04	Disaster Management	2	0	0	-	2	100	0	100	EEC

Syllabi: M.E.-Industrial Safety Engineering |Minimum Credits to be Earned:71|Regulations 2024

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24XE05	Value Education	2	0	0	-	2	100	0	100	EEC
24XE06	Pedagogy Studies	2	0	0	-	2	100	0	100	EEC
24XE07	Business Analytics	2	0	0	-	2	100	0	100	EEC

S.No	CATEGORY		CREDI SEMI	ITS PE ESTEF		TOTAL	CREDITS	Range of To	tal Credits
		Ι	II	III	IV	CREDIT	in %	Min	Max
1	BS	3	-	-	-	3	4.22	2%	10%
2	ES	2	-	-	-	2	2.81	2%	10%
3	HSS	-	-	-	-	-	-	-	-
4	РС	12	12	-	-	24	33.80	30%	40%
5	PE	-	6	9	-	15	21.12	20%	30%
6	EEC	5	4	6	12	27	38.02	30%	40%
	Total	22	22	15	12	71	100	-	-

SUMMARY OF CREDIT DISTRIBUTION

BS - Basic Sciences

ES - Engineering Sciences

HSS - Humanities and Social Sciences

PC - Professional Core

PE - Professional Elective

EEC - Employability Enhancement Course

CA - Continuous Assessment

ES - End Semester Examination

	1	RESE	ARCH	METH	IODOI	LOGY	AND I	PR		L		<u> </u>
		• •								2	0) []
	Pre-requ					T 1 0	•		ment Pattern		14	(0/
	Knowledge of researd Research ethics.	ch proce	SS.				Assess		sessment	Wei	ghtag 40	e(%
•	Research ethics.						End E				60	
Course	Objectives				5	•••••••	Ena E		lions		00	
• ′	To introduce the basi	cs of res	earch n	nethodo	ology.							
	To know the samplin					ethodol	ogy					
	To study the method	-				cincaci	°5J.					
	To learn the procedur	• •		-	ion of a	vnorim	onta					
	-				•	experim	ients.					
•	To educate on optimi	zation a	nd repo	ort writi	ng.							
rograr	nme Outcomes (POs	5)										
		<u> </u>	•	· 1·	<u></u>	1	1.1	<u>~ .</u> .	1 • 1		4 1	
PO1	Apply knowledge of the cause of an incide											yse
PO4	Conduct investigati											to
104	prevent recurrence					u gene			and preventiv	c me	150105	, 10
	1 4											
	Outcomes (COs)											
	lents will be able to											
CO1	Analyze the resear				n.							
CO2	Analyze research r					•. •	11		1 • 1 1	<u> </u>		
CO3	Apply the IPR in g			duals &	z nation	i, it is n	eedless	to emp	hasis the need	of inf	orma	ion
<u>CO1</u>	about Intellectual I				~~~~1	6 - art art		_				
CO4 CO5	Right to be promot Analyze IPR prote	ed amo	ng stud	ents in g	general	& engi	neering	5. Santh an e	accord work	andin	Tractor	ant
05	in R & D, which 1											
	growth and social				v allu u	euer pi	louuets,	, and m	tuin ornigs at	Jour, o	200110	me
	growth and social	Jenenus	•									
Articul	tion Matrix											
		CO.		[
		No.	PO1	PO2	PO3	PO4	PO5	PO6				
		1	3			3						
		2	3			3						
			3									
		2	3			3						
		2	3			3						
Unit I	Meaning	2 3 4 5	3 3 3 3	roblem		3 3 2					6 用	our
Jnit I	Meaning	2 3 4 5	3 3 3 3	roblem		3 3 2					<u>6 H</u>	our

Unit II	[Effective Literature	6 Hours
the exi	isting litera	re studies approaches-analysis-Plagiarism-Research ethics- Review of the literatur ture, reviewing the selected literature, developing a theoretical framework, D vork, Writing about the literature reviewed.	
Unit II	Ι	Effective Technical Writing	6 Hours
		l writing, how to write report, Paper Developing a Research Proposal, Format of tation and assessment by a review committee.	research
Unit IV	V	Nature Of Intellectual Property	6 Hours
		arch, innovation, patenting, development. International Scenario: International co rty. Procedure for grants of patents, Patenting under PCT.	Peration on
UNIT	V	Patent Rights	
UNIT Patent I Geogra	V Rights: Sco aphical Indi	Patent Rights ope of Patent Rights, Licensing and transfer of Technology, Patent information ar ications. New Developments in IPR: Administration of Patent system, IPR or rr Software-Traditional knowledge - Case studies.	of Biological
UNIT Patent Geogra system	V Rights: Sco aphical Indi is, Compute	Patent Rights ope of Patent Rights, Licensing and transfer of Technology, Patent information are ications. New Developments in IPR: Administration of Patent system, IPR of the system of the system.	nd databases-
UNIT Patent Geogra system	V Rights: Sco aphical Indi s, Compute	Patent Rights ppe of Patent Rights, Licensing and transfer of Technology, Patent information ar ications. New Developments in IPR: Administration of Patent system, IPR or or Software-Traditional knowledge - Case studies. Total Iville and Wayne Goddard, Research methodology: An introduction for science &	nd databases- of Biological 30 Hours
UNIT Patent Geogra system Refere	V Rights: Sco aphical Indi is, Compute ences Stuart Me students, 1	Patent Rights ppe of Patent Rights, Licensing and transfer of Technology, Patent information ar ications. New Developments in IPR: Administration of Patent system, IPR or or Software-Traditional knowledge - Case studies. Total Iville and Wayne Goddard, Research methodology: An introduction for science &	nd databases- of Biological 30 Hours
UNIT Patent Geogra system Refere 1.	V Rights: Sco aphical Indi is, Compute ences Stuart Me students,1 Wayne Go	Patent Rights ope of Patent Rights, Licensing and transfer of Technology, Patent information ar ications. New Developments in IPR: Administration of Patent system, IPR or software-Traditional knowledge - Case studies. Total Iville and Wayne Goddard, Research methodology: An introduction for science & 996.	nd databases- of Biological 30 Hours
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UNIT Patent Geogra system 1. 2. 3. 4.	V Rights: Sco aphical Indi is, Compute ences Stuart Me students, 1 Wayne Go Ranjit Ku Halbert, R Mayall, Ir Deborah I Secrets, 4 Bansal K	Patent Rights ppe of Patent Rights, Licensing and transfer of Technology, Patent information ar ications. New Developments in IPR: Administration of Patent system, IPR or r Software-Traditional knowledge - Case studies. Total Iville and Wayne Goddard, Research methodology: An introduction for science & 996. oddard and Stuart Melville, Research Methodology: An Introduction mar, 2nd Edition, Research Methodology: A Step-by-Step Guide for beginners Resisting Intellectual Property, Taylor & Francis Ltd, 2007.	nd databases- of Biological 30 Hours c engineering

	MATHEMATICS FOR ENGI	NEERING APPL	ICATI	ON	L		<u> </u>
				(D ()	3	0 0	3
	Pre-requisite	Mode of Assess		nent Patt			<u>~(0/</u>
	Basic Statistics inference techniques. Hypothesis testing and analysis of variance to			essment	we	ightag 40	e(70
	engineering problems.	Semester End E				60	
	Objectives						
•	Exemplify the different approaches of Probabili in the face of uncertainty.	ity theory, which w	ill enabl	e them in	the decis	ion ma	king
	Summarize and apply the concepts of Statistics	s in solving safety e	ngineer	ing probl	ems.		
	Understand the concept of joint, marginal and c						
	Provide knowledge on root causes of the failure	-	•		a of hypo	thesis	
	•	•	-			unesis.	
•	Understand the design of experiments can help	in optimizing the i	nausuna	ii process	CS .		
Program	nme Outcomes (POs)						
PO1	Apply knowledge of engineering specialisation	on for hazard identi	fication	and risk a	issessmer	nt, anal	yse
	the cause of an incident, and control occupation						
PO4	Use research-based knowledge and research	0	0	1		alysis a	and
	interpretation of data, and synthesis of the inf	formation to provid	e valid (conclusio	ns.		
7							
	Outcomes (COs) lents will be able to						
	lents will be able to	phenomena in risk	analysi	s for the s	afety of i	ndustri	les.
The stud	Ints will be able to Construct probabilistic models for observed Apply the knowledge of probability distring international grounding standards.	butions for design	ing saf	ety criter	ia of nat	ional a	and
CO1 CO2 CO3	 Interval and the second seco	and conditional pr ve waste disposal in	iing saf obabilit 1 indust	ety criter y distribu ries.	ia of nat	ional a	and
CO1 CO2 CO3 CO4	Ients will be able to Construct probabilistic models for observed Apply the knowledge of probability distri international grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactiv Analyze the root causes of the failure events	and conditional pr ve waste disposal in susing the concepts	ing saf obabilit n indust s of testi	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3	 Ints will be able to Construct probabilistic models for observed Apply the knowledge of probability distriinternational grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactive Analyze the root causes of the failure events Illustrate how design of experiments can hele 	and conditional pr ve waste disposal in susing the concepts	ing saf obabilit n indust s of testi	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3 CO4	Ients will be able to Construct probabilistic models for observed Apply the knowledge of probability distri international grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactiv Analyze the root causes of the failure events	and conditional pr ve waste disposal in susing the concepts	ing saf obabilit n indust s of testi	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3 CO4 CO5	 Ints will be able to Construct probabilistic models for observed Apply the knowledge of probability distriinternational grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactive Analyze the root causes of the failure events Illustrate how design of experiments can hele 	and conditional pr ve waste disposal in susing the concepts	ing saf obabilit n indust s of testi	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3 CO4 CO5	Ints will be able to Construct probabilistic models for observed Apply the knowledge of probability distriinternational grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactive Analyze the root causes of the failure events Illustrate how design of experiments can hele open-loop control systems.	and conditional pr ve waste disposal in susing the concepts	ing saf obabilit n indust s of testi	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3 CO4 CO5	Interventional state Construct probabilistic models for observed Apply the knowledge of probability distrinternational grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactive Analyze the root causes of the failure events Illustrate how design of experiments can hele open-loop control systems. Ation Matrix	and conditional pr ve waste disposal in s using the concepts p in optimizing the	ing saf obabilit n indust s of testi industr	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3 CO4 CO5	Interventional standards Construct probabilistic models for observed Apply the knowledge of probability distriinternational grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactive Analyze the root causes of the failure events Illustrate how design of experiments can hele open-loop control systems. Ation Matrix CO. PO1 PO2 PO	and conditional pr ve waste disposal in s using the concepts p in optimizing the O3 PO4 PO5	ing saf obabilit n indust s of testi industr	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3 CO4 CO5	Ients will be able to Construct probabilistic models for observed Apply the knowledge of probability distriinternational grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactive Analyze the root causes of the failure events Illustrate how design of experiments can hele open-loop control systems. Ation Matrix CO. PO1 PO2 PO 1 3 1 3	and conditional prove waste disposal in susing the concepts prove the concepts prove the provement of the pr	ing saf obabilit n indust s of testi industr	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo
CO1 CO2 CO3 CO4 CO5	Interventional standards Construct probabilistic models for observed Apply the knowledge of probability distriinternational grounding standards. Demonstrate the concept of joint, marginal random variables for assessing the radioactive Analyze the root causes of the failure events Illustrate how design of experiments can hele open-loop control systems. Ation Matrix CO. PO1 PO2 PO1 1 3 1 3 1 2 3 1 3 1	and conditional prove waste disposal in susing the concepts prove the concepts prove the provement of the pr	ing saf obabilit n indust s of testi industr	ety criter y distribu ries. ng of hyp	ia of nat tion invo oothesis.	ional a lving t	wo

	Drohability	0 Hours
Unit I	Probability	9 Hours
theorem (p	Probability - Addition and multiplication theorems on probability - Conditional probability or conditional probability - Conditinal probability - Conditional probability - Co	distributions:
Unit II	Correlation And Curve Fitting	9 Hours
	n properties and problems - Rank correlation - Multiple and Partial Correlations Prince	ciple of least
Unit III	Parametric Methods	9 Hours
<u> </u>		, 110415
	s testing: One sample and two sample tests for mean and proportion of large samples (d two sample tests for means of small samples (t-test) - F-test.	z-test) - One
Unit IV	Non-Parametric Methods	9 Hours
	e test for independence of attributes and goodness of fit - Sign test for paired data -	
Smirnov te	e test for independence of attributes and goodness of fit - Sign test for paired data - est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation.	
Smirnov te	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation.	e sample run
Smirnov te test - Rank UNIT V	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation. Design Of Experiments	e sample run 9 Hours
Smirnov te test - Rank UNIT V Basic princ	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation.	e sample run 9 Hours
Smirnov te test - Rank UNIT V Basic princ	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation. Design Of Experiments ciples of experimental designs - Analysis of variance: one-way, Two-way classifications - Factorial Design.	e sample run 9 Hours Latin square
Smirnov te test - Rank UNIT V Basic princ	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation. Design Of Experiments ciples of experimental designs - Analysis of variance: one-way, Two-way classifications - Factorial Design. Total	e sample run 9 Hours Latin square
Smirnov te test - Rank UNIT V Basic princ design - 2 Reference 1. Jo	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation. Design Of Experiments ciples of experimental designs - Analysis of variance: one-way, Two-way classifications - Factorial Design. Total	e sample run 9 Hours Latin square 45 Hours
Smirnov te test - Rank UNIT V Basic princ design - 2 Reference 1. Joi Ed 2. W	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation. Design Of Experiments ciples of experimental designs - Analysis of variance: one-way, Two-way classifications - Factorial Design. Total s hnson R.A., Miller & Freunds: Probability and Statistics for Engineers , Pearson Education	e sample run 9 Hours Latin square 45 Hours ducation, 8th
Smirnov te test - Rank UNIT V Basic princ design - 2 Reference 1. Jol Ed 2. W , P 3. Lij	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation. Design Of Experiments ciples of experimental designs - Analysis of variance: one-way, Two-way classifications - Factorial Design. Total s hnson R.A., Miller & Freunds: Probability and Statistics for Engineers , Pearson Eclition, 2013. alpole R.E , Myers R.H, Myers R.S.L and Ye K, Probability and Statistics for Engineers a	e sample run 9 Hours Latin square 45 Hours ducation, 8th
Smirnov te test - Rank UNIT V Basic princ design - 2 Reference 1. Joi Ed 2. W , P 3. Lij Hi	est for goodness of fit - Rank sum test: Mann–Whitney U test, Kruskal Wallis test - On correlation. Design Of Experiments ciples of experimental designs - Analysis of variance: one-way, Two-way classifications - Factorial Design. Total s hnson R.A., Miller & Freunds: Probability and Statistics for Engineers , Pearson Ed lition, 2013. alpole R.E , Myers R.H, Myers R.S.L and Ye K, Probability and Statistics for Engineers a 'earsons Education, Delhi , 2002. pschutz S and Schiller J, Schaums outline Series: Introduction to Probability and Statist	e sample run 9 Hours Latin square 45 Hours ducation, 8th and Scientists ics, McGraw

24IS13	0	OCCUP	ATIO	NAL H	EALT	H AND	HYG	ENE		L	T P	0
										3	0 0	3
	Pre-requ								ent Pattern			
	Threshold limit values		-	posure.		lode of				Wei	ghtage	(%
•	Workplace exposure a	assessm	ent.					rnal Asse			40	
~					S	emester	End E	xaminatio	ons		60	
	Objectives											
•	To provide knowledge	e on phy	ysical h	azards	of an in	dustria	l unit.					
•	To provide knowledge	e on che	emical l	nazards	of an in	ndustria	al unit.					
•	To expose the biologi	cal and	ergono	mic haz	zards pr	esent ir	1 an ind	ustrial un	it.			
•	To impart knowledge	on occi	upation	al healt	h and to	oxicolos	gv.					
	To introduce the topic		-									
•	To introduce the topic		upation	ai piiys	lology.							
Prograi	mme Outcomes (POs)										
_	-					•						4 -
PO2	Establish, implement ensure a risk-free wo				inuous	improv	ement	on indust	rial safety n	nanag	ement	10
PO3	Recognize and eval	0			lth safe	tv and	legal i	ssues at t	he workplac	e to d	letermi	ne
100	appropriate hazard o											
	safety practices.			0		5			1			
PO4	Use research-based									s, ana	ılysis ar	nd
	interpretation of data	a, and s	ynthesis	s of the	inform	ation to	o prović	le valid co	onclusions.			
CO1	lents will be able to Identify the physical								nit.			
CO2 CO3	State the chemical Indicate the biologi		-		_				nit			
CO4	Find out the toxic e								III. .			
C04	Use the elements of											
		1		1 2	87							
Articul	ation Matrix					-						
		CO .	PO1	PO2	PO3	PO4	PO5	PO6				
		No.	101	102	105	104	105	100				
		1		3	3	2		├ ───┤				
					5							
		2		3	2	3						
		3		3	3	3						
		4		3	2	2						
		5		2	2	2						

Noise, compensation aspects, noise exposure regulation occupational damage, risk factors, sound measuring instruments, octave band analyser, 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, TLV- cold environments, hypothermia, wind chill index, control measures- hot environments, thermal comfort, heat stress indices, acclimatization, estimation and control.

Unit II Chemical Hazards	10 Hours
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Recognition of chemical hazards- 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 IIIBiological And Ergonomic Hazards9 How	Unit III
---	----------

Classification of Biohazardous agents - bacterial agents, rickettsia and chlamydial agents, viral agents, fungal, parasitic agents, infectious diseases - 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 Hours
--	---------	------------------------------------	---------

Concept and spectrum of health - functional units and activities of occupational health services, preemployment and post-employment medical examinations - occupational related diseases, levels of prevention of diseases, notifiable occupational diseases. Gas poisoning their effects and prevention - cardiopulmonary resuscitation, audiometric tests, eye tests, vital function tests - Industrial toxicology, local, systemic and chronic effects, temporary and cumulative effects, carcinogens entry into human systems.

- L			
	UNIT V	Occupational Physiology	9 Hours

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.

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- 2. Danuta Koradecka, Handbook of Occupational Health and Safety, CRC, 2010.
- 3. Lawrence Slote, Handbook of occupational safety and health, Wiley, 2001.
- 4. John W. Cherrie, Reducing occupational exposure to chemical carcinogens, Oxford journal of occupational medicine (2009).
- 5. Barbara A.Plog, Patricia J.Quinlan, MPH, CIH and Jennifer Villareal Fundamentals of Industrial Hygiene, 6th edition 2012, National Safety Council, 2012.
- 6. Encyclopaedia of , Vol.I and II, International Labour Office, Geneva, 2011.

Total

45 Hours

24IS14	REGULAT	IONS I	FOR H	EALTI	H, SAF	ETY A	ND EN	VIRO	NMENT	L	T P	
	Pre-requ	isita						1 55055	ment Pattern	4	00	
•	Interpret the safety an		n nrovis	sion	N	Iode of	Assess		ment i attern	Wei	ghtag	-(%
	Compensations towar		1						sessment		40	(/)
	e empensarions te war						End E				60	
Course	Objectives									1		
• ′	To introduce the statu	tory pro	ovisions	s of The	e Factor	y Act a	nd Rule	es.				
• ′	To familiarize Tamil	Nadu F	actories	Rules.								
• '	To introduce Environ	ment A	ct.									
	To highlight the impo			s in Air	·Act							
	To study the provision											
				·								
rogran	nme Outcomes (POs)										
PO2	Establish, implemen ensure a risk-free we				inuous	improv	ement	on indı	ustrial safety n	nanag	ement	to
PO3	Recognize and eval appropriate hazard of safety practices.											
PO4	Use research-based	know	ledge :	and res	search	method	ls inclu	iding a	design of exp	erime	ents a	nd
101	interpretation of dat									•••••••		
	Outcomes (COs)											
The stud	lents will be able to											
CO1	Find the relevant re	eference	es in Th	e Facto	ry Act,	related	to the i	ndustry	y involved.			
CO2	Implement the prov											
CO3	Implement the prov											
<u>CO4</u>	Predict the provisio											1
CO5	Classify the provis act (HASAWA 197			ational S	Safety a	and Hea	alth act	of USA	A and Health a	nd sat	ety wo	ork
rticula	ation Matrix	, ,										
		CO .]			
		No.	PO1	PO2	PO3	PO4	PO5	PO6				
		1		3	2	2						
		2		3	3	3						
		3		3	3	2						
		4		3	2	2						
		5		2	2	3						
J nit I	Occupatio	nal Saf	ety, He	ealth Ai	nd Woi	rking C	Conditio	ons Co	de		12 H	our
	•											
statutory	y authorities - inspecti	ng staff	, health	, safety,	provisi	ions rela	ating to	hazard	ous processes, v		e - spe	ecia
tatutory rovisio	•	ng staff cedures	, health - Tamil	, safety, Nadu F	provisi actorie	ions rela s Rules	ating to under S	hazard Safety a	ous processes, v		e - spe	eci

	Environment Protection Act - 1986	12 Hours
Biomedical w 2000-The Bat	ers of the central government, prevention, control and abatement of environmenta aste(Management and handling Rules), 1989-The noise pollution(Regulation and con teries (Management and Handling Rules) 2001- No Objection certificate from statutor control board. Air Act 1981 and Water Act 1974.	ntrol) Rules,
Unit III	Manufacture, Storage And Import Of Hazardous Chemical Rules 1989	12 Hours
	uties of authorities - responsibilities of occupier - notification of major accidents - inf preparation of offsite and onsite plans - list of hazardous and toxic chemicals - safe eets.	
Unit IV	Other Acts And Rules	12 Hours
Minerals (Der rules - Hazard other construct Tamil Nadu li	Act 2007, Static and mobile pressure vessel rules (SMPV), Motor vehicle rules, The velopment and Regulation) Act, 2010, Employees compensation code, rules - Electricous wastes (management and handling) rules, 1989, with amendments in 2000 - The lectrin workers act 1996, Petroleum rules, Gas cylinder rules-Explosives Act 1983-Pest fts act 1997, Boiler operating Engineers - rules -2011, Dock Workers (Safety, Health, a	icity act and building and ticides Act –
Act 1986.		ind wellare)
Act 1986.	International Acts And Standards	
UNIT V Occupational	International Acts And Standards Safety and Health act of USA - Health and safety work act (HASAWA 1974, UK), OSB 50 14000 - benefits and elements.	12 Hours
UNIT V Occupational	Safety and Health act of USA - Health and safety work act (HASAWA 1974, UK), OS	12 Hours

- 2. Srinivasan S, The Factories Act 1948 with Tamil Nadu Factories Rules 1950 Madras Book Agency, Chennai, 28th Edition, 2017.
- 3. The Factories Act 1948 with Tamilnadu factories rules 1950, Madras Book Agency,21st ed., Chennai, 2000.
- 4. The Environment Act(Protection) 1986 with allied rules, Law Publishers (India) Pvt Ltd., Allahabad,2014
- 5. Water(Prevention and control of pollution) act 1974, Law publishers (India) Pvt. Ltd., Allahabad, 2016
- 6. Air (Prevention and control of pollution) act 1981, Law Publishers (India) Pvt. Ltd., Allahabad, 2021

			SAFETY M	ANAGE	CMENT			L	T P	(
		•••					4 D 44	3	0 0	:
• 7	Pre-requ Theoretical concepts		icas of industr	rial Mo	de of Asses		nt Pattern	Wai	togo	(0/
	afety.	and pract	ices of industr		ntinuous Int		sment	weiş	ghtage 40	//0
	Principles of manager	nent to s	afety		nester End l				60	
	Objectives			201					00	
	Fo introduce the eval	uation of	safety concer	ots						
	Fo impart hazardous		• •							
	1		1							
	Fo understand the pro			-						
	Γo study the methods		-		•					
•]	Гo impart knowledge	on safety	y education an	ld trainin	ıg.					
Program	nme Outcomes (POs)								
PO2	Establish, implement ensure a risk-free w			nuous in	nprovement	on industr	ial safety m	anag	ement	to
PO3	Recognize and eval appropriate hazard safety practices.	uate occi	upational heal							
PO6	Effectively communisate handling of equ								ciety f	or
	Derive the concepts Implement the techn	iques res	olving the safe	ety probl	lems related	to industrie	es.	eofa	aaidan	ts.
	Execute the accident	investig		ut the roo	ot cause to p	brevent the	e occurrenc	010	celuen	
CO3					-					
CO3 CO4	Execute the accident Determine the accident Demonstrate organiz	ent indice	es to indicate t	he safety	y performan	ce of an ind	ustry.			
CO3 CO4 CO5	Determine the accide	ent indice	es to indicate t	he safety	y performan	ce of an ind	ustry.			
CO3 CO4 CO5	Determine the accide Demonstrate organiz	ent indice	es to indicate t	he safety y training	y performan	ce of an ind	ustry.			
CO3 CO4 CO5	Determine the accide Demonstrate organiz	ent indice ting and l	es to indicate t handling safet	he safety y training	y performan g classes to	ce of an ind different le	ustry.			
CO3 CO4 CO5	Determine the accide Demonstrate organiz	ent indice ting and l	es to indicate t handling safet PO1 PO2	he safety y training PO3	y performan g classes to	ce of an ind different le	ustry.			
CO3 CO4 CO5	Determine the accide Demonstrate organiz	CO. No.	es to indicate t handling safet PO1 PO2 3	he safety y training PO3	y performan g classes to	ce of an ind different le PO6 3	ustry.			
CO3 CO4 CO5	Determine the accide Demonstrate organiz	CO. No.	PO1 PO2 3 3	PO3 2	y performan g classes to	re of an ind different le PO6 3 3	ustry.			
CO3 CO4 CO5	Determine the accide Demonstrate organiz	CO. No. 1 2 3	PO1 PO2 3 3 3 3	PO3 2 2	y performan g classes to	re of an ind different let PO6 3 3 3 3	ustry.			
CO3 CO4 CO5	Determine the accide Demonstrate organiz	continuition continuition continuition no. 1 2 3 4 5	es to indicate t handling safet PO1 PO2 3 3 3 3 3	PO3 2 2 2	y performan g classes to	re of an ind different let PO6 3 3 3 2	ustry.			

Analysis (JSA).

Unit II	Safety Performance Monitoring	9 Hours
indices,	ent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, sa activity rate – problems, safety survey, safety inspection, safety sampling, Safety Audit, Beh	afety t score,
Unit III	I Accident Investigation And Reporting	9 Hours
prevent	t of an accident, reportable and non-reportable accidents, unsafe act and condition - principle ion - Heinrich theory, Supervisory role- Role of safety committee - Accident causation mod t. Overall accident investigation process -Planning document, Planning matrix, Inves ns of investigator, four types of evidence, Records of accidents, accident reports -Class exerc	lels - Cost of tigators Kit,
Unit IV	Safety Education and Training	9 Hours
competi consulti	ance of training-identification of training needs -Training methods - programme, seminars, itions - method of promoting safe practice- motivation - communication - role of government ing agencies in safety training creating awareness, awards, celebrations, safety posters, safe bledge, safety incentive scheme, safety campaign - Home safety training - 5S concepts.	nt and private
competi consulti safety p UNIT V Definiti	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safeledge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. W Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcement	at and private Yety displays 9 Hours nt learning -
competi consulti safety p UNIT V Definiti Importa	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safeldge, safety incentive scheme, safety campaign - Home safety training - 5S concepts.	at and private Yety displays, 9 Hours nt learning -
competi consulti safety p UNIT M Definiti Importa (IoT) ar	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safebledge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. W Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcementance of data in AI for industrial safety - Predictive modelling for hazard identification - Interned its role in safety monitoring. Total	nt and private fety displays, 9 Hours nt learning - net of Things
competi consulti safety p UNIT V Definiti Importa (IoT) ar Referen	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safededge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. W Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcementation - Internation of the instant safety monitoring.	at and private Yety displays 9 Hours nt learning -
competi consulti safety p UNIT V Definiti Importa (IoT) ar Referer 1.	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safebledge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. W Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcementance of data in AI for industrial safety - Predictive modelling for hazard identification - Interned its role in safety monitoring. Total nces Chales D. Reese (2017) Occupational Health and Safety management.	nt and private Sety displays 9 Hours nt learning net of Things 45 Hours
competi consulti safety p UNIT V Definiti Importa (IoT) ar Referen 1. 2.	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safededge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. W Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcementation - Internation of the instant safety monitoring.	at and private Tety displays 9 Hours at learning tof Things 45 Hours blications.
competitions after the safety provide the safety provident safety provide the safety provide the safety provide the safety provides the safety pro	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safe bledge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. W Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcement ance of data in AI for industrial safety - Predictive modelling for hazard identification - Interned its role in safety monitoring. Total nces Chales D. Reese (2017) Occupational Health and Safety management. Frank Lees (2012) Lees Loss Prevention in Process Industries. Butterworth-Heinemann pu Philip Hagan, Accident Prevention Manual for Business and Industry, N.S.C.Chicago, T	at and private Sety displays 9 Hours 1 learning 45 Hours blications.
competi consulti safety p UNIT V Definiti Importa (IoT) ar 1. 2. 3. 4.	itions - method of promoting safe practice- motivation - communication - role of governmer- ing agencies in safety training creating awareness, awards, celebrations, safety posters, safeledge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. V Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcemer- nance of data in AI for industrial safety - Predictive modelling for hazard identification - Inter- ind its role in safety monitoring. Chales D. Reese (2017) Occupational Health and Safety management. Frank Lees (2012) Lees Loss Prevention in Process Industries. Butterworth-Heinemann pu Philip Hagan, Accident Prevention Manual for Business and Industry, N.S.C.Chicago, 1 2009 V. Subramanian, The Factories Act 1948 with Tamilnadu factories rules 1950, M	at and private Sety displays 9 Hours at learning net of Things 45 Hours blications. 13th Edition
competi consulti safety p UNIT V Definiti Importa (IoT) ar 1. 2. 3. 4. 5.	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safeledge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. V Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcementer ance of data in AI for industrial safety - Predictive modelling for hazard identification - Interned its role in safety monitoring. Total Total nces Total Chales D. Reese (2017) Occupational Health and Safety management. Frank Lees (2012) Lees Loss Prevention in Process Industries. Butterworth-Heinemann pu Philip Hagan, Accident Prevention Manual for Business and Industry, N.S.C.Chicago, 12009 V. Subramanian, The Factories Act 1948 with Tamilnadu factories rules 1950, M	at and private Sety displays 9 Hours at learning net of Things 45 Hours blications. 13th Edition fadras Bool
competi consulti safety p UNIT V Definiti Importa (IoT) ar 1. 2. 3. 4. 5.	itions - method of promoting safe practice- motivation - communication - role of governmenting agencies in safety training creating awareness, awards, celebrations, safety posters, safeldge, safety incentive scheme, safety campaign - Home safety training - 5S concepts. V Artificial Intelligence in Safety ion and scope of AI in industrial safety - Supervised, unsupervised, and reinforcemented its role in safety monitoring. Total Inces Total Chales D. Reese (2017) Occupational Health and Safety management. Frank Lees (2012) Lees Loss Prevention in Process Industries. Butterworth-Heinemann puphilip Hagan, Accident Prevention Manual for Business and Industry, N.S.C.Chicago, 12009 V. Subramanian, The Factories Act 1948 with Tamilnadu factories rules 1950, M Agency, Chennai, 2000. C.Ray Asfahl, Industrial Safety and Health management, Pearson Prentice Hall, 2003.	at and private Sety displays 9 Hours at learning net of Things 45 Hours blications. 13th Edition fadras Book

24IS16	PL	ANT L	AYOU	T AND) MAT	ERIAL	L HAN	DLING			ΓΡ	(
	D	•••						• •	-	3 (0 0	
•	Pre-request Selection of Plant Log				N	lada of	Assess	Assessment		Voigh	tage	0/
	Manual Material Han		minmer	nt				rnal Assessm			40	/(
- 1			laibiinei					xaminations			60	
Course	Objectives											
• 7	To provide knowledg	e in Sel	ection c	of plant	locatio	ns.						
	To enhance knowledg			-			dustrie	s incorporatin	g the safety	aspe	ects.	
	To develop knowledg	-						-		F -		
	To impart knowledge		-		-		-					
					-		ining 1	dekies.				
•	To educate on Manua	I Mater	iai Han	ding ed	Juipmei	nı.						
Program	nme Outcomes (POs	5)										
PO1	Apply knowledge of	fengine	ering sr	pecialis	ation fo	r hazar	d identi	fication and r	isk assessm	ent a	analy	e
101	the cause of an incid	0	01							-	litury	·
PO2	Establish, implement	nt, and	maintai	in cont							nent	0
	ensure a risk-free w											
PO3	Recognise and eval											
	appropriate hazard safety practices.	controls	, Iollow	ing the	e hierar	chy of o	controls	s relevant to c	occupationa	I hea	ith ar	d
PO4	Conduct investigati	on ana	vse the	root c	ause an	d gene	rate con	rective and r	reventive n	neasu	ires	0
104	prevent recurrence					u gene		freetive and p		nease	<i></i> 05,	Ő
Common	Outcomes (COs)											_
The stud	Outcomes (COs) lents will be able to											
		•.	11	1		•			•.			
<u>CO1</u>	Select plant location										-	
CO2 CO3	Develop layout for Create and maintai										y.	
CO4	Select suitable Mar									cty.		
CO5	Explain Manual M				-							
	•											
Articula	ation Matrix		1		1	1	1					
		CO .	PO1	PO2	PO3	PO4	PO5	PO6				
		No.	101	10-	100	101	100	100				
		1	3	3	3	2						
		2	2	3	3	2						
		3	2	3	3	3						
					2	3						
		4	3	3								
		4	3	3		3						
			3	3	2	3						
Unit I	Plant Loc	5				3					9 Ho	Ir
	·	5 ation	2	2	2		oflar		visity 1			
election	Plant Locations, to and disposal, furthe	5 ation erritoria	2 Il paran	2 neters, o	2 conside	rations				ion fo	or wa	s1

Unit II	Plant Layout	9 Hours

Safe layout, equipment layout, safety system, fire hydrant locations, fire service rooms, facilities for safe effluent disposal and treatment tanks, site considerations, Safe layout for process industries, engineering industry, construction sites, pharmaceuticals, pesticides, fertilizers, refineries, food processing, nuclear power stations, thermal power stations, metal powders manufacturing, fireworks and match works.

Unit III Working Conditions

9 Hours

45 Hours

15

Principles of good ventilation, purpose, physiological and comfort level types, local and exhaust ventilation, hood and duct design, air conditioning, ventilation standards, application. Purpose of lighting, types, advantages of good illumination, glare and its effect, lighting requirements for various work, standards- Housekeeping, principles of 5S.

Unit IV Manual Material Handling And Lifting Tackles 9 Hou
--

Material handling, Principle and methods of manual handling. Preventing common injuries, lifting by hand, team lifting and carrying - accessories for manual handling, hand tools, jacks, hand trucks, dollies and wheel barrows - storage of specific materials - problems with hazardous materials, liquids, solids - storage and handling of cryogenic liquids - shipping and receiving, stock picking, dock boards, machine and tools, steel strapping and sacking, glass and nails, pitch and glue, boxes and cartons and car loading - personal protection ergonomic considerations. Fibre rope, types, strength and working load inspection, rope in use, rope in storage - wire rope, construction, design factors, deterioration causes, sheaves and drums, lubrication, overloading, rope fitting, inspection and replacement - slings, types, method of attachment, rated capacities, alloy chain slings, hooks and attachment, inspection.

UNIT V	Mechanical Material Handling	9 Hours
Hoisting appa	aratus, types - cranes, types, design and construction, guards and l	imit devices, signals, operating
rules mainter	nance safety rules inspection and inspection checklist - conveyors t	precautions types applications

rules, maintenance safety rules, inspection and inspection checklist - conveyors, precautions, types, applications. Powered industrial trucks, requirements, operating principles, operators selection and training and performance test, inspection and maintenance, electric trucks, gasoline operated trucks, LPG trucks - power elevators, types of drives, hoist way and machine room emergency procedure, requirements for the handicapped, types-Escalator, safety devices and brakes, moving walks - man lifts, construction, brakes, inspection.

	Total
References	

- 1. Encyclopedia of occupational safety and health, ILO Publication, 2009.
- 2. Accident prevention manual for industrial operations N.S.C., Chicago, 2012.
- 3. M.P. Alexandrov. Material handling equipment Mir Publishers, Moscow, 1981
- 4. Apple M. James Plant layout and material handling, 3rd edition, John Wiley and sons.1978
- 5. Spivakosky, Conveyors and related Equipment, Vol.I and II Peace Pub. Moscow, 1985.
- 6. Industrial ventilation (A manual for recommended practice), American conference of Governmental Industrial Hygiene, USA, 1984.

	EN	VIRO	MEN'	TAL A	NALY	SIS LA	BORA	TORY		L	TF) (
		• • .							(T) ()	0	04	
	Pre-requ		· c		1 1	T 1 P	•		nent Pattern	XX7 •	14	(0)
	Various methods of wastewater.	analys	15 01	water a		lode of			essment	wei	ghtag 100	e(%
	wastewater.							xaminat			100	
Course	Objectives				5	cillester		Xammat	10113			
	To provide basic kno	wledge	on the s	various	method	ls of an	alveie o	fwater	and wastewate	r		
	-						•					
	To emphasize the stu				arryou	t airre	ent expe	eriments	related to sale	ety.		
	To introduce determi											
•	To highlight the impo	ortant in	estimat	tion of H	30D, C	COD.						
•	To provide knowledg	e in mea	asureme	ent of du	ust and	fumes.						
Program	nme Outcomes (POs	5)										
DO1		fanaina			tion fo		d : dant:	fication	and male access	~~~~~~	امسما	
PO1	Apply knowledge of the cause of an incide											yse
PO3	Recognise and eval			1					1			ine
	appropriate hazard											
	safety practices.			-		-			-			
PO4	Conduct investigati					d gener	rate con	rective	and preventive	e mea	sures	to
	prevent recurrence	of accide	ents in i	industri	es.							
CO1 CO2 CO3	Demonstrate the vAnalyse a given wDetermine the pro	ater sam	ple to f	ind out	the pro	perties.	•		е.			
CO4	Compute the estim								unit.			
	Apply the measure	ומנוטוו טו										
CO5	rippiy the measure			nd fume	s availa		the wor	King ch	/ironment.			
CO5 Articula	tion Matrix			nd fume	s availa		the wor	king en	/ironment.			
	117			PO2	s availa		PO5	PO6	/ironment.			
	117	cment of	dust ar	1		able in t	1		/ironment.			
	117	CO. No.	dust ar	1	PO3	PO4	1		/ironment.			
	117	CO. No.	PO1 3	1	PO3	PO4 3	1		/ironment.			
	11 2	CO. No.	PO1 3 3	1	PO3 3 2	PO4 3 2	1		/ironment.			
	11 2	CO. No. 1 2 3 4	PO1 3 2 2	1	PO3 3 2 2 2 2	PO4 3 2 3 2 2	1		/ironment.			
	11 2	CO. No. 1 2 3 3	PO1 3 2	1	PO3 3 2 2 2	PO4 3 2 3	1		/ironment.			
	11 2	CO. No. 1 2 3 4 5	PO1 3 2 2	1	PO3 3 2 2 2 2	PO4 3 2 3 2 2	1		/ironment.		5 H	
Articula Unit I	ntion Matrix	CO. No. 1 2 3 4 5	PO1 3 2 2	1	PO3 3 2 2 2 2	PO4 3 2 3 2 2	1				5 H	DUI

Unit II	Experiment 2	5 Hours
Determination o	f pH for a given sample.	
Unit III	Experiment 3	5 Hours
Estimation of Al	kalinity in Wastewater.	
Unit IV	Experiment 4	5 Hours
Determination o		
UNIT V	Experiment 5	5 Hours
	f Total solids, Suspended solids and Dissolved solids.	5 110013
Determination of	Total solids, Suspended solids and Dissolved solids.	
UNIT VI	Experiment 6	5 Hours
Estimation of Su	lphates in the given sample	
UNIT VII	Experiment 7	5 Hours
Determination of	f Iron	
UNIT VIII	Experiment 8	5 Hours
Estimation of Di	ssolved oxygen	
UNIT IX	Experiment 9	5 Hours
Determination o	f bio chemical oxygen demand in the given sample (titration method)	
		.
UNIT X	Experiment 10	5 Hours
Indian standards	of drinking water- A Study	
UNIT XI	Experiment 11	5 Hours
Exhaust Gas ana	lysis using ORSAT Apparatus	
UNIT XII	Experiment 12	5 Hours
Analysis of flue	gas using portable Flue Gas Analyser	
	Total	60 Hours

Pre-requisite Assessment Pattern • Carry out ergonomic assessment using RULA and REBA. Mode of Assessment Weightaget Continuous Internal Assessment 100 • Apply fire mock drill in industries. Semestre End Examinations 100 • To provide basic knowledge on the various methods of exhaust gas, particulate matter measurement. • To emphasize the students to know how to carryout heat stress index, relative humidity measurement • To emphasize the students to know how to carryout heat stress index, relative humidity measurement • To apply fire mock drill in industries. Programme Outcomes (POs) Portamet of the cause of an incident, and control occupational health safety and environmental problems. PO1 Apply knowledge of engineering specialisation for hazard identification and risk assessment, analyst the cause of an incident, and control occupational health safety and environmental problems. PO4 Conduct investigation, analyse the root cause and generate corrective and preventive measures, the revent recurrence of accidents in industries. Course Outcomes (COs) The students will be able to CO1 Analyse to various characteristics of exposure measurement to dust furnes and gaseous pollutant CO2 CO3 Analyse luminance level, emissivity measurement CO4 Analyse to various characteristics of exposure measurement to dust furnes and gaseous pollutant CO2 CO3 Analyse lo		INDUSTR	IAL HY	YGIEN	E AND	ERG	ONOM	ICS L	ABORAT	ORY	L		(
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Unit I Experiment 1 5 Hor Personal Exposure measurement to Dust And Fumes using Personal Air Sampler			No. 1 2	3	PO2	PO3	3	PO5	PO6				
Unit I Experiment 1 5 Hot Personal Exposure measurement to Dust And Fumes using Personal Air Sampler 5			No. 1 2 3	3 3 2	PO2	PO3	3 2 3	PO5	PO6				
Personal Exposure measurement to Dust And Fumes using Personal Air Sampler			No. 1 2 3	3 3 2	PO2	PO3	3 2 3	PO5	PO6				
			No. 1 2 3 4	3 3 2 2	PO2	PO3	3 2 3 2	P05	PO6				
Unit II Experiment 2 5 Hor	Unit I	Experime	No. 1 2 3 4 5	3 3 2 2	PO2	PO3	3 2 3 2	PO5	PO6			5 Ho	urs
			No. 1 2 3 4 5	3 3 2 2 3			3 2 3 2 2					5 Ho	urs
	Personal	Exposure measurem	No. 1 2 3 4 5 nt 1 ent to D	3 3 2 2 3			3 2 3 2 2						

Unit III	Experiment 3	5 Hours
Measurement	of heat stress index using WBGT instrument.	
	ž	
Unit IV	Experiment 4	5 Hours
Measurement	of moisture and temperature using Relative Humidity Meter.	
UNIT V	Experiment 5	5 Hours
Measurement	and monitoring of Temperature using Infrared Thermometer and Thermal imaging c	amera.
UNIT VI	Experiment 6	5 Hours
Emissivity Me	easurement	
UNIT VII	Experiment 7	5 Hours
Measurement	of Luminance of Light Using Lux Meter.	
UNIT VIII	Experiment 8	5 Hours
Sound Pressur	e Level Measurement.	
UNIT IX	Experiment 9	5 Hours
Assessment of	Ergonomic impact using RULA.	
UNIT X	Experiment 10	5 Hours
Assessment of	Ergonomic impact using REBA.	
UNIT XI	Experiment 11	5 Hours
Air Condition	ing Test.	
UNIT XII	Experiment 12	5 Hours
Vibration Mea	isurement.	
	Total	60 Hours

24IS21	SAFETY IN ENG	NEERI	NG IN	DUST	RY			L		T P	C
								3		0 0	3
	Pre-requisite				Assess	ment I	Patter	'n		•	
•	Principles of machine guarding.			Assess				We	ig	htage	e(%
•	Safe methods in finishing, inspection, testi	ng. C	ontinuo	ous Inte	rnal As	sessme	nt			40	
		S	emester	r End E	xamina	tions				60	
Course	Objectives										
•	To provide knowledge on safe operation of	metal a	nd woo	odworki	ng mac	hinerie	s.				
	To introduce the principles of machine gua				U						
	To learn the safety methods in welding and	U	tina								
		-	-	1 a							
	To provide knowledge safety in cold and h		-								
•	To study safe methods in finishing, inspect	ion and	testing.								
D											
Program	nme Outcomes (POs)										
PO1	Apply knowledge of engineering specialis	sation fo	r hazar	d identi	ficatior	and ri	sk ass	essmer	nt.	analy	vse
101	the cause of an incident, and control occu										
PO2	Establish, implement, and maintain cont										to
	ensure a risk-free working environment.		-				-		-		
PO3	Recognise and evaluate occupational heat										
	appropriate hazard controls, following th	e hieraro	chy of o	controls	s releva	nt to o	ccupat	tional l	hea	alth a	nd
							-				
DO 4	safety practices.		1					•			
PO4	Conduct investigation, analyse the root of		d gene	rate con	rective			ive me		ures,	to
	Conduct investigation, analyse the root of prevent recurrence of accidents in industr	ies.				and pr	revent		eas		
PO4 PO6	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter	ies. ers, rule	s and r	egulatio	ons to tl	and pr	revent	s and s	eas		
	Conduct investigation, analyse the root of prevent recurrence of accidents in industr	ies. ers, rule	s and r	egulatio	ons to tl	and pr	revent	s and s	eas		
	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter	ies. ers, rule	s and r	egulatio	ons to tl	and pr	revent	s and s	eas		
	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter	ies. ers, rule	s and r	egulatio	ons to tl	and pr	revent	s and s	eas		
PO6	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining	ies. ers, rule	s and r	egulatio	ons to tl	and pr	revent	s and s	eas		
PO6 Course	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaini	ies. ers, rule	s and r	egulatio	ons to tl	and pr	revent	s and s	eas		
PO6 Course	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintain Outcomes (COs) lents will be able to	ies. ers, rule ng a saf	s and ro e work	egulatic ing env	ons to tl ironmer	and pr	revent	s and s	eas		
PO6 Course The stud CO1	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w	ies. ers, rule ng a saf	s and ro e works	egulatio ing env	ons to tl ironmer y.	and pr	revent	s and s	eas		
PO6 Course The stud CO1 CO2	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu	ies. ers, rule ng a saf ood wor arding fo	s and ro è work: king m or relev	egulatio ing env achiner achiner	y.	and prine emp	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga	ies. ers, rule ng a saf ood wor arding fo s cutting	s and ro e works king m or relev g to pre	egulation ing environment achiner vant mar	y. chines. e hazaro	and provide the second	event loyee: dustrie	s and s	eas		
PO6 Course The stud CO1 CO2 CO3 CO4	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga Elaborate the safe methods of cold and ho	ies. ers, rule ng a saf ood wor arding fo s cutting t workir	s and ro e work work king m or relev g to pre	egulation ing environment achiner vant mary vent the etals to	y. chines. e hazarc	and protection of the emphasis	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga	ies. ers, rule ng a saf ood wor arding fo s cutting t workir	s and ro e work work king m or relev g to pre	egulation ing environment achiner vant mary vent the etals to	y. chines. e hazarc	and protection of the emphasis	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga Elaborate the safe methods of cold and ho	ies. ers, rule ng a saf ood wor arding fo s cutting t workir	s and ro e work work king m or relev g to pre	egulation ing environment achiner vant mary vent the etals to	y. chines. e hazarc	and protection of the emphasis	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga Elaborate the safe methods of cold and ho Apply the safe methods in finishing, inspe- ntion Matrix	ies. ers, rule ng a saf ood wor arding fo s cutting t workin ection an	s and ro e work work king m or relev g to pre ng of m id testir	egulatic ing env achiner achiner vant ma vent the etals to ng to pro	y. chines. e hazaro minimi event ac	and protection of the emphasis	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga Elaborate the safe methods of cold and ho Apply the safe methods in finishing, inspe- ntion Matrix CO. PO1 PO2	ies. ers, rule ng a saf ood wor arding fo s cutting t workir	s and ro e work work king m or relev g to pre	egulation ing environment achiner vant mary vent the etals to	y. chines. e hazarc	and protection of the emphasis	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga Elaborate the safe methods of cold and ho Apply the safe methods in finishing, inspe- ntion Matrix	ies. ers, rule ng a saf ood wor arding fo s cutting t workin ection an	s and ro e work work king m or relev g to pre ng of m id testir	egulatic ing env achiner achiner vant ma vent the etals to ng to pro	y. chines. e hazaro minimi event ac	and protection of the emphasis	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga Elaborate the safe methods of cold and ho Apply the safe methods in finishing, inspe- ntion Matrix CO. PO1 PO2	ies. ers, rule ng a saf ood wor arding fo s cutting t workin ection an	s and ro e work work king m or relev g to pre ng of m id testir	egulatic ing env achiner achiner vant ma vent the etals to ng to pro	y. chines. e hazaro minimi event ac	and protection of the emphasis	revent	s and s	eas		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	Conduct investigation, analyse the root of prevent recurrence of accidents in industr Effectively communicate the safety mattresistic safe handling of equipment and maintaining Outcomes (COs) lents will be able to Identify the safe operation of metal and w Demonstrate the principles of machine gu Apply the safe methods in welding and ga Elaborate the safe methods of cold and ho Apply the safe methods in finishing, inspection Atom Matrix CO. No.	ies. ers, rule ng a saf ood wor arding fo s cutting t workin ection an PO3	s and re e works king m or relev g to pre ng of m id testir PO4	egulatic ing env achiner achiner vant ma vent the etals to ng to pro	y. chines. e hazarc minimi event ac PO6	and protection of the emphasis	revent	s and s	eas		

Jnit I Safety In Metal Working Machinery And Wood Working Machines	9 Hours
General safety rules, principles, maintenance, Inspections of turning machines, boring ma machines, planning machines and grinding machines, CNC machines, Woodworking machiner principles, electrical guards, work area, inspection, standards and codes- saws, types, hazards. ma principle and methods of manual handling.	y, types, safety
Unit II Principles Of Machine Guarding	9 Hours
Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS - guar point of operation protective devices, machine guarding, types, fixed guard, interlock guard, ar rip guard, electron eye, positional control guard, fixed guard fencing- guard construction- enefits of good guarding systems flywheels-shafts- couplings- gears-sprockets wheels and cha elts-Lifting tackles.	utomatic guard, guard opening.
Unit III Safety In Welding And Gas Cutting	9 Hours
election, care and maintenance of the associated equipment and instruments - safety in generati nd handling of industrial gases-colour coding - flashback arrestor - leak detection-pipe line saf andling of gas cylinders. Juit IV Safety In Cold Forming And Hot Working Of Metals	
nechanism, hand or foot-operated presses, power press electric controls, power press set up an	nd die removal,
nspection and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Deration, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes.	nd die removal, mill operation, in Gas Furnace
nspection and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Operation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun	mill operation, in Gas Furnace
nspection and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Operation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes.	nd die removal, g mill operation, in Gas Furnace dry Production 9 Hours Inspection And ssels, Air Leak
Anteresting and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Operation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes. INIT V Safety In Finishing, Inspection And Testing Heat treatment operations, Electro Plating, Paint Shops, Sand And Shot Blasting, Safety In Festing, Dynamic Balancing, Hydro Testing, Valves, Boiler Drums And Headers, Pressure Ve Cest, Steam Testing, Safety In Radiography, Personal Monitoring Devices, Radiation Hazards, E Administrative Controls, Indian Boilers Regulation.	nd die removal, mill operation, in Gas Furnace dry Production 9 Hours Inspection And ssels, Air Leak ngineering And
Image: Section and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Operation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes. JNIT V Safety In Finishing, Inspection And Testing Heat treatment operations, Electro Plating, Paint Shops, Sand And Shot Blasting, Safety In Festing, Dynamic Balancing, Hydro Testing, Valves, Boiler Drums And Headers, Pressure Ve Test, Steam Testing, Safety In Radiography, Personal Monitoring Devices, Radiation Hazards, E Administrative Controls, Indian Boilers Regulation.	nd die removal, g mill operation, in Gas Furnace dry Production 9 Hours Inspection And ssels, Air Leak ngineering And 1 45 Hours
Association and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Operation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes. INIT V Safety In Finishing, Inspection And Testing Heat treatment operations, Electro Plating, Paint Shops, Sand And Shot Blasting, Safety In Festing, Dynamic Balancing, Hydro Testing, Valves, Boiler Drums And Headers, Pressure Ve Set, Steam Testing, Safety In Radiography, Personal Monitoring Devices, Radiation Hazards, E Administrative Controls, Indian Boilers Regulation. Tota References 1. Philip E. Hagan, John Franklin Montgomery, James T. O"Reilly, Accident Prevention	nd die removal, g mill operation, in Gas Furnace dry Production 9 Hours Inspection And ssels, Air Leak ngineering And 1 45 Hours
Inspection and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Deparation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes. JNIT V Safety In Finishing, Inspection And Testing Heat treatment operations, Electro Plating, Paint Shops, Sand And Shot Blasting, Safety In Festing, Dynamic Balancing, Hydro Testing, Valves, Boiler Drums And Headers, Pressure Velest, Steam Testing, Safety In Radiography, Personal Monitoring Devices, Radiation Hazards, Edministrative Controls, Indian Boilers Regulation. Tota Tota Comparison of the provide the treatment operation for the provide the treatment operation and maintenance of the provide the treatment operation and the provide the provide the treatment operation and the provide the provide the treatment operation and the provide	nd die removal, mill operation, in Gas Furnace dry Production 9 Hours Inspection And ssels, Air Leak ngineering And 45 Hours n Manual NSC,
nspection and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Operation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes.	nd die removal, g mill operation, in Gas Furnace dry Production 9 Hours Inspection And ssels, Air Leak ngineering And 1 45 Hours n Manual NSC,
nspection and maintenance-metal sheers-press brakes - Hot-working safety in forging, hot rolling afeguards in hot rolling mills - hot bending of pipes, hazards and control measures - Safety Deperation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Foun Cleaning and Finishing Foundry Processes. INIT V Safety In Finishing, Inspection And Testing Heat treatment operations, Electro Plating, Paint Shops, Sand And Shot Blasting, Safety In Cesting, Dynamic Balancing, Hydro Testing, Valves, Boiler Drums And Headers, Pressure Ve Cest, Steam Testing, Safety In Radiography, Personal Monitoring Devices, Radiation Hazards, E Administrative Controls, Indian Boilers Regulation. Tota References 1. Philip E. Hagan, John Franklin Montgomery, James T. O"Reilly, Accident Prevention Chicago, 2009. 2. Charles D. Reese, Occupational Health and Safety Management, CRC Press, 2003. 3. Grimaldi, J.V. and Simonds, R.H, Safety Management, 5th edition, Richard d Irwin, 199 4. John Davies, Alastair Ross, Brendan Wallace, Safety Management: A Qualitative Systemine Actional States and States and States and States Research and States States States and States States States and States St	nd die removal, mill operation, in Gas Furnace dry Production 9 Hours Inspection And ssels, Air Leak ngineering And 1 45 Hours n Manual NSC, 94 ems Approach,

24IS22	FIRE	ENGIN	IEERI	NG AN	ND EX	PLOSI	ON CC	ONTROL			T 1) (
					_					3	0 (_
	Pre-requ	isite						Assessment P	attern	1		
•	Knowledge of Fire Pr	otection	System	n.	N	lode of	Assess	ment		Weig	ghtag	e(%
	Knowledge of Fire Pr				n. C	ontinuc	ous Inte	rnal Assessmer	nt		40	
					S	emester	End E	xaminations			60	
Course	Objectives											
•	To introduce the topic	of phys	ics and	l chemi	stry of	fire.						
	To impart knowledge				•							
	To study the industria	-			-							
	To develop knowledg											
			-		•							
•	To provide knowledge	e on exp	losion	protecti	ion syst	tems.						
Program	nme Outcomes (POs))										
PO2	Establish, implemen	nt, and r	naintai	n conti	nuous	improv	ement	on industrial s	afety m	anag	emen	t to
	ensure a risk-free wo	orking e	nvironi	nent.		-			-	_		
PO3	Recognise and evaluation	uate occ	upation	nal heal	lth safe	ty and	legal is	sues at the wo	orkplace	to d	etern	ine
	appropriate hazard c	controls,	follow	ving the	hierar	chy of c	controls	relevant to oc	cupation	nal he	ealth	and
	safety practices.											
PO6	Effectively commun									nd so	ciety	for
	safe handling of equ	ipment a	and ma	intainin	ng a saf	e worki	ng envi	ronment in inc	ustries.			
<u> </u>												
	Outcomes (COs)											
he stud	lents will be able to											
CO1	Introduce the topic								<i>y</i> .			
CO2	Impart knowledge							strial unit.				
000	Study the industrial	l fire pro	tection	system	. f :	nlemer	ntation.					
CO3												
CO4	Develop knowledge		lding fi	re safet	y for b	etter pra	actice.					
	Develop knowledge Provide knowledge		lding fi	re safet	y for b	etter pra	actice.	strial unit.				
CO4 CO5			lding fi	re safet	y for b	etter pra	actice.	strial unit.				
CO4 CO5	Provide knowledge		lding fi osion p	re safet protectio	ty for b on syste	etter pra ems of	actice. an indu					
CO4 CO5	Provide knowledge	on expl	lding fi	re safet protectio	ty for b on syste	etter pra	actice. an indu					
CO4 CO5	Provide knowledge	CO. No.	lding fi osion p	PO2	pO3	etter pra ems of	actice. an indu	PO6				
CO4 CO5	Provide knowledge	on expl	lding fi osion p	re safet protectio	ty for b on syste	etter pra ems of	actice. an indu					
CO4 CO5	Provide knowledge	CO. No.	lding fi osion p	PO2 3	PO3	etter pra ems of	actice. an indu	PO6				
CO4 CO5	Provide knowledge	CO. No.	lding fi osion p	PO2	pO3	etter pra ems of	actice. an indu	PO6				
CO4 CO5	Provide knowledge	CO. No.	lding fi osion p	PO2 3	PO3	etter pra ems of	actice. an indu	PO6				
CO4 CO5	Provide knowledge	CO. No. 1 2 3 3	lding fi osion p	PO2 3 3 3 3	PO3 2 2	etter pra ems of	actice. an indu	PO6 2 2 3				
CO4 CO5	Provide knowledge	CO. No. 1 2	lding fi osion p	PO2 3 3	PO3 3 2	etter pra ems of	actice. an indu	PO6 2 2				
CO4 CO5	Provide knowledge	CO. No. 1 2 3 3	lding fi osion p	PO2 3 3 3 3	PO3 2 2	etter pra ems of	actice. an indu	PO6 2 2 3				
CO4 CO5 Articula	Provide knowledge	CO. No. 1 2 3 4 5 5	PO1	PO2 3 3 3 2 2	PO3 2 2 3 2 3 3	etter pra ems of	actice. an indu	PO6 2 2 3 3 3				
CO4 CO5	Provide knowledge	CO. No. 1 2 3 4 5 5	PO1	PO2 3 3 3 2 2	PO3 2 2 3 2 3 3	etter pra ems of	actice. an indu	PO6 2 2 3 3 3			9 H	our

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 - Bombay Victoria dock ship explosions, Mahul refinery explosion, Nagothane vapour cloud explosion and Vizag refinery disaster.

Unit II	Fire Prevention And Protection	9 Hour
systems - Halon alt hydrant p	of ignition - fire triangle-IS 2190 - principles of fire extinguishing - active and passive various classes of fires Fire extinguishing agents Water, Foam, Dry chemical powder, of ternatives Halocarbon compounds Inert gases, dry powders - types of fire extinguishers pipes hoses monitors fire watchers - layout of stand pipes - fire station fire alarms and sire tacks foam generators escape from fire rescue operations - fire drills notice-first aid for	Carbon-dioxide - fire stoppers ens maintenance
Unit III	Industrial Fire Protection Systems	9 Hour
the above suppressi halon rep	r-hydrants-stand pipes - special fire suppression systems like deluge and emulsifier, sele e installations, reliability, maintenance, evaluation and standards - alarm and detection ion systems -CO2 system, foam system, Dry chemical powder (DCP) system, halon sy placement - smoke venting. Portable extinguishers - flammable liquids - tank farms ility-firefighting systems. IS-15105 (guidelines for installation of sprinklers).	systems. Othe stem - need fo
Unit IV	Building Fire Safety	9 Hour
	es of fire safe building design, Fire load, fire resistant material and fire testing -structura ral integrity -concept of egress design - exit - width calculations - fire certificat	
	ents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985.	
		9 Hour
requireme UNIT V Principle: Flame Ar gases, pla based on	ents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985.	9 Hour n, Containment on venting-iner pression system
requireme UNIT V Principle: Flame Ar gases, pla based on	Explosion Protecting Systems Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protection rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosion and for generation of inert gas rupture disc in process vessels and lines explosion, suppression dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system.	9 Hour n, Containment on venting-iner pression systen (SO2), chlorine
requirement UNIT V Principles Flame An gases, pla based on (Cl) etc	Explosion Protecting Systems Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protection rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosion and for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Tota	9 Hour n, Containment on venting-iner pression systen (SO2), chlorine
requirement UNIT V Principles Flame Au gases, pla based on (Cl) etc	ents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985. Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protectio rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosio ant for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Totaces	9 Hour n, Containment on venting-iner pression systen (SO2), chlorine
requirement UNIT V Principles Flame Angases, pla based on (Cl) etc Reference 1. R	ents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985. Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protectio rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosio ant for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Tot: ces R.S.Gupta., Hand Book of Fire Technology, Orient Blackswan, 2010	9 Hour n, Containment on venting-iner pression systen (SO2), chlorine
requirement UNIT V Principles Flame Angases, pla based on (Cl) etc Reference 1. R 2. A 3. J	ents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985. Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protectio rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosio ant for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Totaces	9 Hour n, Containment on venting-iner pression systen (SO2), chloring al 45 Hour
requirement UNIT V Principles Flame Angases, pla based on (Cl) etc (Cl) etc Reference 1. R 2. A 3. J E	ents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985. Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protectio rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosio ant for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Tota Cess R.S.Gupta., Hand Book of Fire Technology, Orient Blackswan, 2010 Arthur E Cote Fire protection Handbook NFPA 2008. Fain V K, Fire Safety in Buildings, New Age International (P) Limited Publishers,	9 Hour n, Containment on venting-iner pression systen (SO2), chloring al 45 Hour
requirement UNIT V Principles Flame Angases, pla based on (Cl) etc Reference 1. R 2. A 3. J E 4. N 5. C	ents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985. Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protectio rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosio ant for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Tota ces R.S.Gupta., Hand Book of Fire Technology, Orient Blackswan, 2010 Arthur E Cote Fire protection Handbook NFPA 2008. Iain V K, Fire Safety in Buildings, New Age International (P) Limited Publishers, Edition, 2015.	9 Hour n, Containment on venting-iner pression systen (SO2), chloring al 45 Hour
requirement UNIT V Principle: Flame Angases, pla based on (Cl) etc (Cl) etc Reference 1. R 2. A 3. J E 4. N 5. C	tents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985. Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protection rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosion ant for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Tot: Ces R.S.Gupta., Hand Book of Fire Technology, Orient Blackswan, 2010 Arthur E Cote Fire protection Handbook NFPA 2008. Iain V K, Fire Safety in Buildings, New Age International (P) Limited Publishers, P. Edition, 2015. Nolan, Handbook of Fire and protection principles, Elseiver ,2014. Charles J. Baker, Fire Fighter"s Handbook of Hazardous Materials, Van No strand Rein	9 Hour n, Containment on venting-iner pression systen (SO2), chloring al 45 Hour
requirement UNIT V Principles Flame Angases, pla based on (Cl) etc Reference 1. R 2. A 3. J 4. N 5. C E 6. E 7. E	tents for high rise buildings - Snookers-Tamil Nadu fire and rescue services act-1985. Explosion Protecting Systems s of explosion-detonation and blast waves-explosion parameters - Explosion Protection rrestors, isolation, suppression, venting, explosion relief of large enclosure- explosion and for generation of inert gas rupture disc in process vessels and lines explosion, sup carbon dioxide (CO2) and halons - hazards in LPG, ammonia (NH3), Sulphur dioxide -Installation of fire protection system. Tot: Tot: Ces R.S.Gupta., Hand Book of Fire Technology, Orient Blackswan, 2010 Arthur E Cote Fire protection Handbook NFPA 2008. Value of the protection principles, Elseiver ,2014. Colspan="2">Colspan="2" Colspan="2"	9 Hour n, Containment on venting-iner pression system (SO2), chloring al 45 Hour New Delhi, 2nd Hold, Jones and

24IS23			ELI	ECTRIC	CALS	AFETY	Y			L	T P	(
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•	Pre-req Knowledge of Electr		arde		- N	lode of	· 1		nent Pattern	Wai	ghtage	(0/
	Concept and statutor			felectric					essment		<u>gntagt</u> 40	/ /0
	safety.	<i>, , , , , , , , , , , , , , , , , , , </i>						xaminat			60	
Course	Objectives											
• '	To introduce the con	cepts an	d statut	ory requ	iremer	nts of el	ectrical	safety.				
•	To impart knowledge	e on elec	trical h	azards.								
•	To understand electric	ical prot	ection s	vstems f	for avo	iding a	ccident	s.				
	To study the selectio	-		•		-			al devices.			
	To introduce the clas			-								
				enieurn	uzur ac	<i>us 201</i>						
Progran	mme Outcomes (PO	s)										
PO2	Establish, impleme				nuous	improv	ement	on indu	strial safety n	nanag	ement	to
PO3	ensure a risk-free w Recognise and eva				th safe	ty and	legal i	ssues at	the workplac	e to (letermi	ne
105	appropriate hazard											
	safety practices.			-		-			_			
PO6	Effectively commu										ociety f	for
	safe handling of eq	uipment	and ma	intainin	g a saf	e worki	ing env	ironmen	t in industries			
CO1 CO2 CO3 CO4	Indicate the conce Estimate the hazar Derive the importa Formulate the met	ds in ha ance of e hod of s	ndling o electrica electior	electrica al protec n, install	l syste tion sy ation, o	m to pro stems f	event a for prev	ccidents enting a naintena	ccidents.	cal de	evices.	
CO5	Explain the impor	tance of	classify	ing elec	trical	hazardo	ous zone	es.				
Articula	ation Matrix											
		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6				
		1		3	2			2				
		2		3	2			2				
		3		3	3			3				
		4		2	2			3				
		5		2	2			3				
		L	1	<u> </u>		1	1	<u> </u>				
Unit I	Concepts	And St	atutory	Requir	ement	.e					9 Ho	mr

electrical in (CPR).	spectorate-international standards on electrical safety - first aid-cardio pulmonary	
Unit II	Electrical Hazards	9 Hours
leakage-clea current and - definition, arc-ignition	secondary hazards - shocks, burns, scalds, falls - human safety in the use of electric rances and insulation-classes of insulation-voltage classifications excess energy-current short circuit current-heating effects of current-electromagnetic forces-corona effect-stat sources, hazardous conditions, control, electrical causes of fire and explosion ionization energy-national electrical safety codes - IS codes - Lightning hazards, lightning arrestor ons, earth resistance, earth pit maintenance.	t surges-over ic electricity on, spark and
Unit III	Protection Systems	9 Hours
and protecti earth fault p earth leakag of low volt	breakers and overload relays - safe limits of amperage - voltage - safe distance from li on of conductor- Joints and connections, overload and short circuit protection - no load protection. FRLS insulation-insulation and continuity test-system grounding equipment e circuit breaker (ELCB) - cable wires-maintenance of ground - ground fault circuit inte- age - electrical guards - Personal protective equipment - safety in handling handhe bools and medical equipment.	protection - nt grounding errupter - use
Unit IV	Selection, Installation, Operation And Maintenance	9 Hours
Role of envi and fail-safe	Selection, Installation, Operation And Maintenance ronment in selection-safety aspects in application - protection and interlock self-diagnose concept-lock out and work permit system discharge rod and earthing devices-safety aspects is cabling and cable joints-preventive maintenance.	ostic features
Role of envi and fail-safe portable too	ronment in selection-safety aspects in application - protection and interlock self-diagnors concept-lock out and work permit system discharge rod and earthing devices-safety	ostic features
Role of envi and fail-safe portable too UNIT V Classificatio equipment -	ronment in selection-safety aspects in application - protection and interlock self-diagno concept-lock out and work permit system discharge rod and earthing devices-safety ls-cabling and cable joints-preventive maintenance.	ostic features in the use of 9 Hours ncrease safe
Role of envi and fail-safe portable too UNIT V Classificatic equipment - isolators-equ	ronment in selection-safety aspects in application - protection and interlock self-diagnor concept-lock out and work permit system discharge rod and earthing devices-safety ls-cabling and cable joints-preventive maintenance. Hazardous Zones n of hazardous zones - intrinsically safe and explosion proof electrical apparatus - i their selection for different zones-temperature classification - grouping of gases-use of	ostic features in the use of 9 Hours ncrease safe
Role of envi and fail-safe portable too UNIT V Classificatic equipment - isolators-equ References 1. John	ronment in selection-safety aspects in application - protection and interlock self-diagnor concept-lock out and work permit system discharge rod and earthing devices-safety ls-cabling and cable joints-preventive maintenance. Hazardous Zones n of hazardous zones - intrinsically safe and explosion proof electrical apparatus - i their selection for different zones-temperature classification - grouping of gases-use of ipment certifying agencies.	ostic features in the use of 9 Hours ncrease safe barriers and 45 Hours
Role of envi and fail-safe portable too UNIT V Classificatio equipment - isolators-equ References 1. John Mc 2. Rao	ronment in selection-safety aspects in application - protection and interlock self-diagnor concept-lock out and work permit system discharge rod and earthing devices-safety ls-cabling and cable joints-preventive maintenance. Hazardous Zones n of hazardous zones - intrinsically safe and explosion proof electrical apparatus - i their selection for different zones-temperature classification - grouping of gases-use of ipment certifying agencies. Total n Cadick Mary Capelli-Schellofeffer, Dennis K Neitzel and Al Winfield, Electrical Safet	ostic features in the use of 9 Hours ncrease safe barriers and 45 Hours y Handbook,
Role of envi and fail-safe portable too UNIT V Classificatic equipment - isolators-equ References 1. John Mc 2. Rao Pub 3. W.	ronment in selection-safety aspects in application - protection and interlock self-diagnor concept-lock out and work permit system discharge rod and earthing devices-safety ls-cabling and cable joints-preventive maintenance. Hazardous Zones n of hazardous zones - intrinsically safe and explosion proof electrical apparatus - i their selection for different zones-temperature classification - grouping of gases-use of ipment certifying agencies. Total n Cadick Mary Capelli-Schellofeffer, Dennis K Neitzel and Al Winfield, Electrical Safety Graw Hill Education, 4 th Edition, 2012. S, Saluja H L, Electrical Safety, Fire Safety Engineering and Safety Management	ostic features in the use of <u>9 Hours</u> ncrease safe barriers and <u>45 Hours</u> y Handbook, ent, Khanna
Role of envi and fail-safe portable too UNIT V Classificatic equipment - isolators-equ References 1. John Mc 2. Rao Pub 3. W. edit	ronment in selection-safety aspects in application - protection and interlock self-diagnode concept-lock out and work permit system discharge rod and earthing devices-safety is ls-cabling and cable joints-preventive maintenance. Hazardous Zones Hazardous zones - intrinsically safe and explosion proof electrical apparatus - i their selection for different zones-temperature classification - grouping of gases-use of appendix entry in their selection for different zones-temperature classification - grouping of gases-use of appendix entry is a selection of the sele	ostic features in the use of <u>9 Hours</u> ncrease safe barriers and <u>45 Hours</u> y Handbook, ent, Khanna
Role of envi and fail-safe portable too UNIT V Classificatic equipment - isolators-equ References 1. John Mc 2. Rao Pub 3. W. edit 4. Dr.	ronment in selection-safety aspects in application - protection and interlock self-diagno concept-lock out and work permit system discharge rod and earthing devices-safety ls-cabling and cable joints-preventive maintenance. Hazardous Zones n of hazardous zones - intrinsically safe and explosion proof electrical apparatus - i their selection for different zones-temperature classification - grouping of gases-use of ipment certifying agencies. Total n Cadick Mary Capelli-Schellofeffer, Dennis K Neitzel and Al Winfield, Electrical Safety Graw Hill Education, 4 th Edition, 2012. S, Saluja H L, Electrical Safety, Fire Safety Engineering and Safety Manageme lishers, New Delhi, 2009. Fordham Cooper, Electrical Safety Engineering, Butterworth and -Heinemann Ltd, Lo ion, 1998.	ostic features in the use of 9 Hours ncrease safe barriers and 45 Hours y Handbook, ent, Khanna

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		•••								3	0 0		
- 1	Pre-requ					Todo of			ment Pattern	Wa	abtaaa	.(0/	
Basics of instrumentation.Knowledge about various hazards assessment.				aaaamaa		Mode of Assessment Continuous Internal Assessment					Weightage(% 40		
					Semester End Examinations					60			
Course	Objectives												
• 7	To introduce hazard,	risk issu	ies and	hazard	assessn	nent.							
• 7	To learn about the bas	sics of i	nstrume	entation									
• ,	To study the method	of risk a	nalvsis	quantif	ication	and so	ftware.						
	To get exposed to the		-	-									
	To educate on the cre			-	-		a						
•	To educate on the ere	uioiiity	UI IISK	a5505511		iiiiques	5.						
Progran	nme Outcomes (POs)											
PO2	Establish, implemen	nt, and	maintai	in conti	nuous	improv	ement	on indu	strial safety m	nanag	ement	to	
	ensure a risk-free w												
PO3	Recognise and eval												
	appropriate hazard of safety practices.	controls	, 101100	ing the	nierar	cny of o	controls	s relevai	nt to occupatio	mai n	eaith a	na	
PO4	Conduct investigation	on, ana	lvse the	root ca	ause an	d gene	rate coi	rective	and preventive	e mea	asures.	to	
101	prevent recurrence of					e Bene			p			•••	
PO6	Effectively commun	nicate th	ne safet	y matte	rs, rule	s and re	egulatio	ons to th	ne employees a	and so	ociety f	for	
	safe handling of equ	ipment	and ma	intainir	ng a saf	è worki	ing env	ironmer	nt in industries.	•			
	Outcomes (COs)												
The stud	ents will be able to												
CO1	Indicate the hazard	, risk is	sues an	d hazaro	d assess	sment f	or the b	etterme	nt of an indust	ry.			
CO2	Select the appropri	ate inst	rument	for mea	suring	parame	eters to	find out	the healthines	s.			
<u>CO3</u>	Analyze the metho									rea			
CO4	Formulate the meth												
CO5	Explain the strengt	h of risl	k assess	ment te	chniqu	es for b	etter ut	ilizatior	1.				
Articula	tion Matrix		r	,		1		,					
		CO .	PO1	PO2	PO3	PO4	PO5	PO6					
		No.	101	102	100	101	100	100					
		1		3	3	3		2					
		2		3	2	2		2					
		3		2	2	2		3					
		4		2	2	2		3					
				3	2	3							
		5		3	3	3		3					
	Hazard, R	isk Issı	ies and	Hazar	d Asse	ssment					9 Ho	our	
Unit I													
	• · · ·												
Introduc	tion, hazard monitori												
ntroduc	tion, hazard monitori what-if analysis, s												

Unit II	Instrumentation	9 Hours
(DSC), The Deflagration	s of Advanced Equipment and Instruments, Thermo calorimetry, Differential Scanning ermo Gravimetric Analyser(TGA), Accelerated Rate Calorimeter(ARC). Explos a Test, Detonation Test, Ignition Test, Minimum ignition energy Test, Sensitive est (BAM) and Friction Sensitive Test (BAM), Shock Sensitive Test, Card Gap Test.	ive Testing,
Unit III	Risk Analysis Quantification and Software's	9 Hours
explosion a	Analysis and Event Tree Analysis, Logic Symbols, Methodology, minimal cut set r nd toxicity index(FETI), various indices - Hazard analysis(HAZAN)- Failure Mod MEA)- Bow Tie Analysis, Introduction to LOPA, Basic concepts of Software on Risk an	e and Effect
Unit IV	Consequences Analysis	9 Hours
dispersion-	id release, two phase release- Heat radiation effects, BLEVE, Pool fires and Jet fire Explosion, UVCE and Flashfire, Explosion effects and confined explosion- Toxic effects and plot plant/layout.	
dispersion-	Explosion, UVCE and Flashfire, Explosion effects and confined explosion- Toxic effects	- Gas/vapour
dispersion- the damage UNIT V Past accide accident, M convey repo	Explosion, UVCE and Flashfire, Explosion effects and confined explosion- Toxic effects and plot plant/layout.	- Gas/vapour ects- Plotting 9 Hours of chemical lson disaster- ze potentially ant.
dispersion- the damage UNIT V Past accide accident, M convey repo Hazardous I	Explosion, UVCE and Flashfire, Explosion effects and confined explosion- Toxic effects distances on plot plant/layout. Credibility Of Risk Assessment Techniques nt analysis as information sources for Hazard analysis and consequences analysis exico disaster, Flixborough, Bhopal, Seveso, Pasadena, Feyzin disaster(1966), Port Hucort, hazard assessment of nonnuclear installation- Rijnmond report, risk analysis of sizendustrial objects- Rasmussen masses report, Reactor safety study of Nuclear power Plant	- Gas/vapour ects- Plotting 9 Hours of chemical lson disaster- ze potentially ant.
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 Center for Chemical Process Safety (CCPS), Quantitative Risk assessment in Chemical Indus Institute of Chemical Industries, Centre for Chemical process safety. second Edition, 2000.
 Guidelines for Hazard Evaluation Procedures, Centre for Chemical Process safety, AICHE 2008

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	Pre-requ	isito						A 66064	sment Pat	torn	0	0 4	2
• 5			ective	equinme	nt N	Inde of	Assess		sment rat		Weid	ghtage	(%
• Selection of Personal protective equipment Apply fire mock drill in industries.									ssessment		VV CIĘ	100	(/ 0
 Various methods of vibration measurement 					Semester End Examinations								
Course (Objectives												
• 7	Fo study the selection	n of Pers	sonal pr	otective	equip	ment.							
	Fo provide basic knov		-				oration	measur	ement.				
	Fo provide knowledg	-											
	Γο provide knowledg				-			•		drill in	indu	stries	
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Program	nme Outcomes (POs	a)											
	× *												
PO1	Apply knowledge of												se
PO4	the cause of an incid Conduct investigati												to
PO4	prevent recurrence of					u gene	rate con	rective	e and prev	entive	mea	sures,	10
				maasure									
Course	Outcomes (COs)												
	ents will be able to												
ne studi													
004	1												
CO1	Demonstrate the us	sage diff	ferent P	ersonal I	Protect	tive Eq	uipmen	t (PPE) relevant	to the i	ndus	stry.	
CO1 CO2	Determine earth re	sistance	and gr	ound resi	istivity	and st	atic ele	ctricity	v hazards v	vithin t	he ir	ndustrie	
	Determine earth re Identify suitable fi	sistance	and gr	ound resi	istivity	and st	atic ele	ctricity	v hazards v	vithin t	he ir	ndustrie	
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Unit III	Experiment 3	5 Hours
Study on Astivo	and Passive Fire protection system.	
Study on Active	and Passive File protection system.	
Unit IV	Experiment 4	5 Hours
C(1 CD		
Study of Persona	ll Protective Equipment.	
UNIT V	Experiment 5	5 Hours
Study on Static I areas.	Electricity Hazards, Discharging of The same and use of Antistatic Materials In Vu	lnerable
UNIT VI	Experiment 6	5 Hours
	· •	
Determination of	f Frictional Sensitivity of An Energetic Material using Friction Tester.	
UNIT VII	Experiment 7	5 Hours
Whirling of Shat	t-Determination of Critical Speed of Shaft With Concentrated Loads.	
UNIT VIII	Experiment 8	5 Hours
G 1 D 1		
Sound Pressure	Level Measurement.	
UNIT IX	Experiment 9	5 Hours
Assessment of E	rgonomic impact using RULA .	
UNIT X	Experiment 10	5 Hours
<u> </u>		
l oxic release dis	persion modelling using ALOHA Software.	
UNIT XI	Experiment 11	5 Hours
G 16 L		
Self-Learning - S	balety Audit.	
UNIT XII	Experiment 12	5 Hours
<u> </u>		
Self-Learning - I	energy Audit	
	Total	60 Hours

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	Pre-requisite				Assess	ment l	Patter	n	<u> </u>		
٠	Develop skills to identify and convert a	real- N	lode of	Assess	ment			Wei	ighta	ge(%
	world problem into a technical problem	C	ontinuc	ous Inte	rnal As	sessme	nt		10		
		S	emestei	End E	xamina	tions					
Course	Objectives										
•	To develop skills to identify and convert a	a real-wor	ld prob	lem int	o a tech	nical r	roblei	n.			
	To teach use of new tools and techniques		-			-					
	To teach use of new tools and techniques	-									
	•	-		out inc	e projec	ι.					
	To make familiar in developing the proof	-									
•	To provide guidelines to prepare standard	project re	eport.								
Program	mme Outcomes (POs)										
PO1	Apply knowledge of engineering special	isation fo	r hazar	d identi	fication	and ri	sk asse	essmen	t ana	alvs	e
101	the cause of an incident, and control occ										-
PO2	Establish, implement, and maintain con	ntinuous	improv	ement	on indu	strial	safety	manag	geme	nt t	0
	ensure a risk-free working environment.		•				2		-		
PO3	Recognise and evaluate occupational he										
	appropriate hazard controls, following t	he hieraro	chy of o	controls	s releva	nt to o	ccupat	ional h	lealth	an	d
	safety practices.										
PO4	Conduct investigation, analyse the root		d gene	rate cor	rective	and p	eventi	ive me	asure	s, t	0
DO (prevent recurrence of accidents in indust										
			1				1	1	•	0	
PO6	Effectively communicate the safety mat								ociet	y fo	or
PU6	safe handling of equipment and maintain								ociet	y fo	or
PU6									ociet	y fo	or
	safe handling of equipment and maintain								ociet	y fo	or
Course	safe handling of equipment and maintain Outcomes (COs)								ociet	y fo	or
Course The stuc	safe handling of equipment and maintain Outcomes (COs) dents will be able to	ning a saf	e worki							y fo	or
Course The stuc CO1	safe handling of equipment and maintain Outcomes (COs) lents will be able to Develop the solutions for the real-work	ning a saf	è worki	ing envi	ironmer	nt in in				y fo	Dr
Course The stuc CO1 CO2	safe handling of equipment and maintain Outcomes (COs) lents will be able to Develop the solutions for the real-world Identify the suitable strategies and meth	ning a saf	e worki	ry out 1	he proj	nt in in				y fo	or
Course The stuc CO1 CO2 CO3	safe handling of equipment and maintain Outcomes (COs) lents will be able to Develop the solutions for the real-work Identify the suitable strategies and meth Use of required new tools and technique	ning a saf d problen hodologie es to carr	e worki n. es to cai ry out th	ry out 1	he proj	nt in in				y fc	or
Course The stuc CO1 CO2 CO3 CO4	safe handling of equipment and maintain Outcomes (COs) dents will be able to Develop the solutions for the real-work Identify the suitable strategies and meth Use of required new tools and techniqu Test and validate the developed proof of	d problen hodologic res to carr of concept	è worki n. es to can y out th t.	ry out 1	he proj	nt in in				y fc	or
Course The stuc CO1 CO2 CO3	safe handling of equipment and maintain Outcomes (COs) lents will be able to Develop the solutions for the real-work Identify the suitable strategies and meth Use of required new tools and technique	d problen hodologic res to carr of concept	è worki n. es to can y out th t.	ry out 1	he proj	nt in in				y fc	or
Course The stuc CO1 CO2 CO3 CO4 CO5	safe handling of equipment and maintain Outcomes (COs) dents will be able to Develop the solutions for the real-work Identify the suitable strategies and meth Use of required new tools and techniqu Test and validate the developed proof of	d problen hodologic res to carr of concept	è worki n. es to can y out th t.	ry out 1	he proj	nt in in					
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Course The stuc CO1 CO2 CO3 CO4 CO5	Safe handling of equipment and maintain Outcomes (COs) lents will be able to Develop the solutions for the real-work Identify the suitable strategies and meth Use of required new tools and techniqu Test and validate the developed proof of Prepare a standard project report with of ation Matrix CO. PO1 PO2 1 3 3 2 3 3	d problen hodologie les to carr of concept lemonstra 2 PO3 3 3	n. es to can y out th t. ation. PO4 3 2	ry out t re proje	he proj ct. PO6 2 2	nt in in				y fc	

Total 4 Hours

	DISSERTA	TION PHASE I				L	T P	(
						0	0 12	2 (
	Pre-requisite			ment P	attern			
•	Develop skills to identify and convert a re-					Wei	ghtage	e(%
	world problem into a technical problem	Continuous Inte			nt		60	
~		Semester End E	xamina	tions			40	
Course	Objectives							
•	To develop skills to identify and convert a r	eal world problem int	o a tech	nical p	oblem			
•	To provide knowledge on methodology of c	arrying out project in	phases.					
•	To teach use of new tools and techniques re-	quired to carry out the	e projec	t.				
•	To make familiar in developing the proof of		1 5					
•		-						
•	To provide guidelines to prepare standard pr	roject report.						
Duoguo	mme Outcomes (POs)							
rrogra	mine Outcomes (FOS)							
PO1	Apply knowledge of engineering specialisation							/se
	the cause of an incident, and control occur							
PO2	Establish, implement, and maintain conti	nuous improvement	on indu	istrial s	afety 1	nanag	ement	to
DO	ensure a risk-free working environment.	14 04 11 1		.1	1 1	. 1		
PO3	Recognise and evaluate occupational heat							
	appropriate hazard controls, following the safety practices.	e nierarchy of controls	s releva	nt to oc	cupati	onal n	eaith a	na
DO (
РОА	Conduct investigation analyse the root of	ause and generate con	rective	and pr	ventiv	le mer	curec	to
PO4	Conduct investigation, analyse the root ca prevent recurrence of accidents in industri		rective	and pr	eventiv	/e mea	isures,	to
	prevent recurrence of accidents in industri	es.		-				
PO4 PO6	prevent recurrence of accidents in industri Effectively communicate the safety matte	es. rs, rules and regulation	ons to t	ne empl	oyees	and so		
	prevent recurrence of accidents in industri	es. rs, rules and regulation	ons to t	ne empl	oyees	and so		
	prevent recurrence of accidents in industri Effectively communicate the safety matte	es. rs, rules and regulation	ons to t	ne empl	oyees	and so		
PO6 Course	prevent recurrence of accidents in industri Effectively communicate the safety matte safe handling of equipment and maintainin Outcomes (COs)	es. rs, rules and regulation	ons to t	ne empl	oyees	and so		
PO6 Course	prevent recurrence of accidents in industri Effectively communicate the safety matte safe handling of equipment and maintainin	es. rs, rules and regulation	ons to t	ne empl	oyees	and so		
PO6 Course The stud	prevent recurrence of accidents in industri Effectively communicate the safety matte safe handling of equipment and maintainin Outcomes (COs) dents will be able to	es. rs, rules and regulation ng a safe working env	ons to t	ne empl	oyees	and so		
PO6 Course The stud CO1	prevent recurrence of accidents in industri Effectively communicate the safety matte safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world p	es. rs, rules and regulation ng a safe working env	ons to the	ne empl nt in inc	oyees	and so		
PO6 Course The stud	prevent recurrence of accidents in industri Effectively communicate the safety matte safe handling of equipment and maintainin Outcomes (COs) dents will be able to	es. rs, rules and regulations as afe working env problem. dologies to carry out	ons to the proj	ne empl nt in inc	oyees	and so		
PO6 Course The stud CO1 CO2	prevent recurrence of accidents in industri Effectively communicate the safety matte safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world p Identify the suitable strategies and metho	es. rs, rules and regulation ng a safe working env problem. dologies to carry out to carry out the proje	ons to the proj	ne empl nt in inc	oyees	and so		
PO6 Course The stud CO1 CO2 CO3	prevent recurrence of accidents in industri Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world p Identify the suitable strategies and metho Use of required new tools and techniques	es. rs, rules and regulation ng a safe working env problem. dologies to carry out to carry out the projection	ons to the proj	ne empl nt in inc	oyees	and so		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	prevent recurrence of accidents in industri Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world provide the suitable strategies and methor Use of required new tools and techniques Test and validate the developed proof of the prepare a standard project report with determine the strategies and methor the standard project report with determine the st	es. rs, rules and regulation ng a safe working env problem. dologies to carry out to carry out the projection	ons to the proj	ne empl nt in inc	oyees	and so		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	prevent recurrence of accidents in industri Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world p Identify the suitable strategies and metho Use of required new tools and techniques Test and validate the developed proof of Prepare a standard project report with der	es. rs, rules and regulation ng a safe working env problem. dologies to carry out to carry out the projection	ons to the proj	ne empl nt in inc	oyees	and so		
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PO6 Course The stud CO1 CO2 CO3 CO4 CO5	prevent recurrence of accidents in industri Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world p Identify the suitable strategies and metho Use of required new tools and techniques Test and validate the developed proof of Prepare a standard project report with der ation Matrix CO. No. PO1 PO2 1 3	es. rs, rules and regulation ng a safe working env problem. dologies to carry out to carry out the projeconcept. monstration. PO3 PO4 PO5 3 3	the project.	ne empl nt in inc	oyees	and so		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	prevent recurrence of accidents in industri Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world properties and metho Use of required new tools and techniques Test and validate the developed proof of prepare a standard project report with der ation Matrix	es. rs, rules and regulation rs, rules and regulation ga safe working env problem. dologies to carry out to carry out the projeconcept. monstration. PO3 PO4 PO5	ons to the project.	ne empl nt in inc	oyees	and so		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	prevent recurrence of accidents in industri Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world p Identify the suitable strategies and metho Use of required new tools and techniques Test and validate the developed proof of Prepare a standard project report with der ation Matrix CO. No. PO1 PO2 1 3	es. rs, rules and regulation ng a safe working env problem. dologies to carry out to carry out the projeconcept. monstration. PO3 PO4 PO5 3 3	the project.	ne empl nt in inc	oyees	and so		
PO6 Course The stud CO1 CO2 CO3 CO4 CO5	prevent recurrence of accidents in industri Effectively communicate the safety matter safe handling of equipment and maintaining Outcomes (COs) dents will be able to Develop the solutions for the real world p Identify the suitable strategies and metho Use of required new tools and techniques Test and validate the developed proof of the prepare a standard project report with der ation Matrix CO. PO1 No. PO1 1 3 3 2 3 3	es. rs, rules and regulation a safe working environ problem. dologies to carry out the to carry out the projeconcept. monstration. PO3 PO4 PO5 3 3 3 2	ens to the project.	ne empl nt in inc	oyees	and so		

Total 12 Hours

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									0 0	24 1
	Pre-requisite						Assess	ment Patter	n	I
•]	Develop skills to identify a	nd conve	rt a real-	• M	ode of	Assess	ment		Weigh	tage(
	world problem into a technic	al proble	m					sessment		60
				Se	mester	End E	xaminat	tions		40
Course	Objectives									
• ′	To develop skills to identify	and conv	vert a real	worl	d prob	lem int	o a tech	nical probler	n.	
• '	To provide knowledge on m	ethodolog	gy of carr	ving	out pro	oject in	phases.			
	To teach use of new tools an	-			-	-	-			
	To make familiar in develop	-					project			
	-			-						
•	To provide guidelines to pre-	pare stand	dard proj	ect re	port.					
Program	nme Outcomes (POs)									
PO1	Apply knowledge of engine									inalyse
DO	the cause of an incident, and									
PO2	Establish, implement, and ensure a risk-free working			ous I	mprov	ement	on mau	istrial safety	managen	ient u
PO3	Recognise and evaluate of			safet	v and	legal is	ssues at	the workpla	ace to det	ermine
100	appropriate hazard control									
	safety practices.	<i>.</i>	e		5			1		
PO4	Conduct investigation, and			se and	l gener	rate con	rective	and prevent	ive measu	ires, to
	prevent recurrence of accid									
PO6	Effectively communicate t									ety for
	safe handling of equipment	t and mai	ntaining	a saie	e worki	ng env	ironmer	it in industrie	es.	
Course	Outcomes (COs)									
	lents will be able to									
CO1	Develop the solutions for	the real_v	vorld pro	hlem						
	Identify the suitable strate					ry out 1	the proj	ect		
CO2										
CO2 CO3	Use of required new tools	and iccn		carry	v out th	ie proie				
CO2 CO3 CO4	Use of required new tools Test and validate the deve					ie proje				
CO3		eloped pro	oof of co	ncept.		ie proje				
CO3 CO4 CO5	Test and validate the deve	eloped pro	oof of co	ncept.		ie proje				
CO3 CO4 CO5	Test and validate the deve Prepare a standard project	eloped pro	oof of convith demo	ncept. nstrat	tion.					
CO3 CO4 CO5	Test and validate the deve Prepare a standard project ation Matrix	eloped pro	oof of convith demo	ncept. nstrat		PO5	PO6			
CO3 CO4 CO5	Test and validate the deve Prepare a standard project ation Matrix CO.	eloped pro	oof of convith demo	ncept. nstrat	tion.					
CO3 CO4 CO5	Test and validate the deve Prepare a standard project ation Matrix CO. No. 1	PO1 3	PO2 P 3	ro3 3	<u>tion.</u> PO4		PO6 2			
CO3 CO4 CO5	Test and validate the deve Prepare a standard project ation Matrix CO. No. 1 2	PO1 3 3	PO2 P 3 3	rog 03 3 3	tion. PO4 3 2		PO6 2 2			
CO3 CO4 CO5	Test and validate the deve Prepare a standard project ation Matrix CO. No. 1 2 3	PO1 PO1 3 3 3 3 3 3 3 3 3	PO2 P 3 3 3	ncept.nstratO3332	PO4 3 2 3 3		PO6 2 2 3			
CO3 CO4 CO5	Test and validate the deve Prepare a standard project ation Matrix CO. No. 1 2 3 4	PO1 3 3 3 2	PO2 P 3 3 3 3 3	ncept.nstratO33323	PO4 3 2 3 2 3 2		PO6 2 2 3 3			
CO3 CO4 CO5	Test and validate the deve Prepare a standard project ation Matrix CO. No. 1 2 3	PO1 PO1 3 3 3 3 3 3 3 3 3	PO2 P 3 3 3	ncept.nstratO3332	PO4 3 2 3 3		PO6 2 2 3			

	ARTIFICIAL INTEL	LIGENCI	E ANI	D IND	USTRI	AL SA	FETY	r		L	T P	0
										3	0 0	3
	Pre-requisite					Assessi	nent	Patte				
	Concepts of Artificial Intelligence				Assess					Wei	ghtage	e(%)
	Knowledge on predictive models	for hazar				rnal Ass		ent			40	
	identification.		Se	emester	End E	xaminat	ions				60	
	Objectives											
•	To study the concepts of Artificial	Intelligenc	e in sa	fety.								
•	To provide knowledge on predictiv	ve models f	or haz	ard ide	entificat	tion.						
•	To learn the activities involved in a	computer v	ision a	and sen	sor tec	hnologie	es for	safety	y sup	bervi	sion.	
•	To introduce the Fuzzy logic conce	epts and rel	ated o	peratic	ons.	_		-	-			
	To infer the operational methods o	-		-								
-	To mer the operational methods o	i neurur net	OIK	urenne	etures.							
Program	mme Outcomes (POs)											
8	· · · ·											
PO1	Apply knowledge of engineering											/se
	the cause of an incident, and cont											
PO2	Establish, implement, and maint		uous i	mprov	ement	on indu	strial	safet	y ma	anag	ement	to
DO2	ensure a risk-free working enviro		f		11 :		41	1	1	4. 1		
PO3	Recognise and evaluate occupation appropriate hazard controls, follow											
	safety practices.	Jwing the h	liciale		Jonnois	sieleval	11 10 0	ccup	ation	1a1 11		nu
PO4	Conduct investigation, analyse th	he root cau	ise and	d gene	rate con	rective	and p	rever	ntive	mea	sures.	to
_	prevent recurrence of accidents in			0			1				,	
Course												
	Outcomes (COs)											
	Outcomes (COs) dents will be able to											
The stuc	dents will be able to Identify the fundamental concep						y.					
The stuc CO1 CO2	dents will be able to Identify the fundamental concep Demonstrate the predictive mod	els to ident	tify po	tential	hazard	s.	у.					
The stuc CO1 CO2 CO3	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor	els to ident technologi	tify po les for	tential safety	hazard monite	s. oring.	•					
The stuc CO1 CO2 CO3 CO4	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h	els to ident technologi andle uncer	ify po les for rtaintic	tential safety es in sa	hazard monitc fety-cr	s. oring. itical ap	plicat					
CO1 CO2 CO3 CO4 CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods	els to ident technologi andle uncer	ify po les for rtaintic	tential safety es in sa	hazard monitc fety-cr	s. oring. itical ap	plicat		ation	15.		
CO1 CO2 CO3 CO4 CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods ation Matrix	els to ident technologi andle uncer	ify po les for rtaintic	tential safety es in sa	hazard monitc fety-cr	s. oring. itical ap	plicat		ation	15.		
CO1 CO2 CO3 CO4 CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods ation Matrix CO.	els to ident technologi andle uncer s of neural	ify po es for rtaintie netwo	tential safety es in sa	hazard monitc fety-cr	s. oring. itical ap	plicat		ation	15.		
CO1 CO2 CO3 CO4 CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods ation Matrix	els to ident technologi andle uncer s of neural	ify po es for rtaintie netwo	tential safety es in sa rk arch	hazard monito ifety-cr iitecture	s. oring. itical ap es for sa	plicat		ation			
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CO1CO2CO3CO4CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods ation Matrix CO. No. POI	els to ident technologi andle uncer s of neural	rify po ris for rtaintic netwo	tential safety es in sa rk arch PO4	hazard monito ifety-cr iitecture	s. oring. itical ap es for sa	plicat		ation	 ns.		
CO1CO2CO3CO4CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods ation Matrix CO. POI 1 3 2 2	els to ident technologi andle uncer s of neural : I PO2 I 2 3	rtaintid netwo PO3 3 2	tential safety es in sa rk arch PO4 3 2	hazard monito ifety-cr iitecture	s. oring. itical ap es for sa	plicat		ation	15.		
CO1CO2CO3CO4CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods ation Matrix CO. POI 1 3 2 2 3 2	els to ident technologi andle uncer s of neural : PO2 1 2 3 3	ify po ies for rtaintie netwo PO3 3 2 2 2	tential safety es in sa rk arch PO4 3 2 2	hazard monito ifety-cr iitecture	s. oring. itical ap es for sa	plicat		ation	15.		
CO1CO2CO3CO4CO5	dents will be able to Identify the fundamental concep Demonstrate the predictive mod Use computer vision and sensor Apply fuzzy logic concepts to h Execute the operational methods ation Matrix CO. POI 1 3 2 2	els to ident technologi andle uncer s of neural : I PO2 I 2 3	rtaintid netwo PO3 3 2	tential safety es in sa rk arch PO4 3 2	hazard monito ifety-cr iitecture	s. oring. itical ap es for sa	plicat		ation	15.		

U nit I	Concept Of AI	9 Hours
	of AI-Foundation of Artificial Intelligence- State of Art- Intelligent Agents- Agents and of Agents and scope of AI in industrial safety, AI tools and frameworks for industrial ap	
Unit II	Predictive Modelling For Hazard Detection	9 Hours
and clean	e of data in AI for industrial safety-Techniques for data collection and storage-Data particle for industrial datasets-Introduction to predictive modelling for hazard identification ing potential accidents using AI-Hands-on exercises with data and model building.	
Unit III	Computer Vision And Sensor Technologies For Safety Monitoring	9 Hours
Application Internet o	computer vision in industrial safety-Object detection, image classification, and viden of computer vision for monitoring unsafe conditions-Overview of sensors for induft Things (IoT) and its role in safety monitoring-Integrating sensor data with AI for real	strial safety
insights.		
Unit IV Basic con relational Logic – In based syst	Fuzzy Logic cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types.	ce – Predicate – fuzzy rule
Unit IV Basic con relational Logic – In based syst UNIT V Fundamer methods -	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architecture Taxonomy of Neural network architectures –Standard back propagation algorithms –	tions – Fuzzy ce – Predicata – fuzzy rule 9 Hour s – Learning
Unit IV Basic con relational Logic – In based syst UNIT V Fundamer methods -	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architecture	tions – Fuzzy ce – Predicata – fuzzy rule 9 Hour s – Learning
Unit IV Basic con relational Logic – It based syst UNIT V Fundamen methods - various pa	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architecture - Taxonomy of Neural network architectures –Standard back propagation algorithms – rameters – variations. Applications of back propagation algorithms. Total	tions – Fuzzy ce – Predicata – fuzzy rule 9 Hour s – Learning
Unit IV Basic con relational Logic – Ir based syst UNIT V Fundamer methods - various pa Reference 1. R	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architecture - Taxonomy of Neural network architectures –Standard back propagation algorithms – rameters – variations. Applications of back propagation algorithms. Total	tions – Fuzzy e – Predicate – fuzzy rule 9 Hours s – Learning - selection o 45 Hours
Unit IV Basic con relational Logic – In based syst UNIT V Fundamen methods - various pa Reference 1. R S	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architecture - Taxonomy of Neural network architectures –Standard back propagation algorithms – rameters – variations. Applications of back propagation algorithms. Total 28 ajasekaran. S. Vijayalakshmi Pai. G.A. Neural Networks, Fuzzy Logic and Genetic	tions – Fuzz e – Predicate – fuzzy rule 9 Hour s – Learning - selection o 45 Hour
Unit IV Basic con relational Logic – Ir based syst UNIT V Fundamer methods - various pa Reference 1. R Si 2. T	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architecture • Taxonomy of Neural network architectures –Standard back propagation algorithms – rameters – variations. Applications of back propagation algorithms. Total es ajasekaran. S. Vijayalakshmi Pai. G.A. Neural Networks, Fuzzy Logic and Genetic rathesis and Applications, Prentice Hall of India Private Limited, 2003.	tions – Fuzz e – Predicate – fuzzy rule 9 Hour s – Learning - selection o 45 Hour
Unit IV Basic con relational Logic – In based syst UNIT V Fundamer methods - various pa Reference 1. R Sp 2. T 3. Z 4. A	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relat equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference ference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architecture - Taxonomy of Neural network architectures –Standard back propagation algorithms – rameters – variations. Applications of back propagation algorithms. Total s ajasekaran. S. Vijayalakshmi Pai. G.A. Neural Networks, Fuzzy Logic and Genetic ruthesis and Applications, Prentice Hall of India Private Limited, 2003. mothy J.Ross, Fuzzy logic with Engineering Applications, McGraw Hill, 1995.	tions – Fuzzy ee – Predicate – fuzzy rule 9 Hour s – Learning - selection o 45 Hour Algorithms
Unit IV Basic con relational Logic – Ir based syste UNIT V Fundamer methods - various pa Reference 1. R S 2. T 3. Z 4. A Pr	cepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference ems – fuzzification and defuzzification – types. Neural Networks tals of neural networks – model of an artificial neuron –neural network architectures - Taxonomy of Neural network architectures –Standard back propagation algorithms – rameters – variations. Applications of back propagation algorithms. Total ajasekaran. S. Vijayalakshmi Pai. G.A. Neural Networks, Fuzzy Logic and Genetic /nthesis and Applications, Prentice Hall of India Private Limited, 2003. mothy J.Ross, Fuzzy logic with Engineering Applications, McGraw Hill, 1995. urada J.M, Introduction to Artificial Neural Systems, Jaico Publishing House,1994. rtificial Intelligence, A modern approach, Stuart Russel, Peter Norvig, Third Edit	tions – Fuzzy ee – Predicate – fuzzy rule 9 Hour s – Learning - selection o 45 Hour Algorithms

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0	Pre-requ					T .J f			ment Pattern	XX7.:	-14	(0/
	afety of Nuclear Rea learn about the Radia					Iode of			sessment	Wei	ghtag 40	ge(%)
• L	earn about the Radia	ition Co	ontrol.					xaminat			60	
Course (Objectives					emester		Multillia			00	
	To know about the rad	dioactiv	e mater	rial and	its effe	ects						
	To know about the rea						le and c	neration	al problems			
			-					-	-			
	To learn the role of re		-	-			uclear]	power p	iants in India.			
	o learn the Safety of			ors wit	h case s	studies.						
• T	To learn about the rad	liation c	control.									
Program	me Outcomes (POs)										
	Apply knowledge of											lyse
	the cause of an incid											
PO4	Conduct investigation prevent recurrence of					d gene	rate co	rrective	and preventiv	e mea	asures	s, to
				industri								
	Outcomes (COs)											
The stude	ents will be able to											
CO1	Demonstrate the ra	dioactiv	ve mate	rial and	l its effe	ects on]	human	being.				
CO2	Explain the reactor	, design	consid	leration	in cont	rols and	d opera	tional p	roblems.			
CO3	Indicate the role of									a.		
CO4	Explain the Safety							industri	al unit.			
CO5	Interpret about the	radiatio	on contr	ol of ar	i indust	rial uni	t.					
Articulat	tion Matrix		r	r	1	1	1					
		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6				
		110.										
		1	3			2						
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			۷.			3						
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Unit I	Introducti	on									9 H	lours
Bindina -	narmy fingion and	ng	o octive	try al-	ha hata	and ac	mmer	ve Dal	anotiva dagar	daaa	Wooh	amaa
	energy - fission proce of radiation - neutro											
										muni	pricat	- 1101
	g- collision. last fissio	on, reso	manue e	scape -	unerma	u utiliza	ation cr	iticality.				
	g- collision, fast fissio	on, reso		scape -	therma	u utiliza	ation cr	iticality				

Design considerations in Control requirements -means of control-control and shutdown rods- their operation and operational problems - control rod worth - control instrumentation and monitoring - online central data processing system.

Unit III Reactors	9 Hours
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Boiling water reactors-radioactivity of steam system-direct cycle and dual cycle power plants- pressurized water reactors and pressurized heavy water reactors-fast breeder reactors and its role in power generation in the Indian context conversion and breeding -doubling time-liquid metal coolants-nuclear power plants in India.

Unit IV	Safety Of Nuclear Reactors	9 Hours

Safety design principles - engineered safety features - site related factors - safety related systems - heat transport systems - reactor control and protection system-fire protection system - quality assurance in plant components - operational safety-safety regulation process-public awareness and emergency preparedness. Accident Case Studies-Three Mile Island and Chernobyl accident.

UNIT V Radiation Control 9 Ho	
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Radiation shielding - radiation dose, dose measurements units of exposure, exposure limits, barriers for control of radioactivity release, control of radiation exposure to plant personnel health physics surveillance-waste management and disposal practices- environmental releases.

1. Robert E Masterson, Nuclear Engineering Fundamentals-A Practical Perspective, CRC Press, 1st Edition, 2017.

Total

45 Hours

- 2. Micheal R Greenberg, Nuclear Waste, Management, Nuclear Power and Energy Choices, Springer, 2013.
- 3. Sam Mannan, Lees Loss Prevention in Process Industries, Vol1, Vol2, Vol3, Butterworth-Heinemann,, London, 4th Edition 2012.
- 4. John R Marsh, Introduction to Nuclear Engineering, Prentice Hall, 2001
- 5. Frank P. Lees Butterworth- Hein-UK, Loss prevention in the process Industries, 2004.
- 6. R.L Loffness, Nuclear Power Plant Vann strand Publications, 2008.

Lucco Course O Tu Tu	Pre-reque Enowledge on Noise Learn about the indust									3 0 0
Loco Course O To To	Inowledge on Noise							Accorer	ent Pattern	
Lucco Course O Tu Tu	-				N	Inde of	Assess		lent r attern	Weightage(%
Course O				1 vibratio				rnal Asse	essment	40
• To	ontrol.							xaminati		60
• T	Objectives									l .
• T	o introduce the topic	e of indu	ıstrial r	noise and	vibrat	tion cor	ntrol.			
	o provide knowledg							noise.		
• T	To study the source of					-				
	o develop knowledg		-			J				
	o learn the methods									
• 1	o learn the methods	of noise	abater	nem.						
Program	me Outcomes (POs)								
PO1	Apply knowledge of	engine	ering si	necialisat	tion fo	r hazar	d identi	fication	and risk asse	ssment analyse
	the cause of an incid									
	Conduct investigation									
	prevent recurrence of									
CO1 CO2 CO3 CO4	Demonstrate the ra Explain the reactor Indicate the role of Explain the Safety	, design reactor	consid s in pov	leration i wer gene	n cont ration	rols and and the	d operat e nuclea	tional pro r power	plants in Ind	ia.
CO5	Interpret about the									
Articulat	tion Matrix		r	,		·	'n			
		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6		
		1	3			3				
		2	2			2				
		3	2			2				
		4	3			2				
		5	3			3				
Unit I	Introducti	on								9 Hour
	Introducti									> 110 u

systems - Natural frequencies and vibration modes - continuous systems and wave theory concept - wave equation and relation to acoustics - theory of sound propagation and terminology involved - Plane wave and spherical waves - Concepts of free field and diffuse field, near field and far field - frequency analysis and vibration and noise spectrum - Signature analysis and condition monitoring.

Unit I	I	Instrumentation And Auditory	9 Hour
necha	nism - relat	ibration and measurements - Frequency and spectrum analyzers - Weighting netw tion between subjective and objective sounds -Auditory effects of noise and audi ence levels and its importance.	
U nit I	II	Sources Of Noise And Ratings	9 Hour
Directi ndusti	ivity index rial, constr	ise generation and propagation in various machinery and machine components, - Concept of Leq and estimation - Noise ratings and standards for variou uction, traffic, aircraft community etc industrial safety and OSHA regul nanagement.	s sources like
U nit I	V	Noise Control	9 Hour
	y covered e	g and damping materials, Dynamic absorbers, Mufflers and silencers, Path: Conclosures - Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design	n coefficient o
nateri noise.	y covered e als and stru Receiver: N	nclosures - Acoustic treatment and materials - Transmission loss and absorption	n coefficient o for minimun
nateri noise. UNIT Active combu	v covered e als and stru Receiver: M V noise atte astion noise bles, sound	nclosures - Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prot	n coefficient o for minimum ective devices 9 Hours engine noise e noise contro
nateria noise. UNIT Active combu princip analys	v covered e als and stru Receiver: M V noise atte stion noise bles, sound is, Anechoi	Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prot Abatement Of Noise enuators and scope for abatement of industrial noise - Methods of control of e, mechanical noise, predictive analysis, palliative and enclosures, automotive in enclosures, sound energy absorption, sound transmission through barr	n coefficient o for minimum ective devices 9 Hours engine noise noise contro iers- spectrum
nateri noise. U NIT Active combu	v covered e als and stru Receiver: M V noise atte stion noise bles, sound is, Anechoi	Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prot Abatement Of Noise muators and scope for abatement of industrial noise - Methods of control of e, mechanical noise, predictive analysis, palliative and enclosures, automotive in enclosures, sound energy absorption, sound transmission through barr ic chamber. Total	coefficient o for minimum cective devices 9 Hour for noise e noise contro iers- spectrum 45 Hour
nateria noise. UNIT Active combu princip analys	v covered e als and stru Receiver: M V noise atte stion noise bles, sound is, Anechoi	Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prote Abatement Of Noise enuators and scope for abatement of industrial noise - Methods of control of e, mechanical noise, predictive analysis, palliative and enclosures, automotive in enclosures, sound energy absorption, sound transmission through barr ic chamber. Total pukkipati and J.Srinivas, Text book of Mechanical Vibrations, Prentice-Hall of In	coefficient o for minimum cective devices 9 Hour for noise e noise contro iers- spectrum 45 Hour
nateria noise. UNIT Active combu princip malys Refere 1.	v covered e als and stru Receiver: M V noise atte stion noise bles, sound is, Anechoi ences V,Rao. D Delhi.200	Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prote Abatement Of Noise muators and scope for abatement of industrial noise - Methods of control of e, mechanical noise, predictive analysis, palliative and enclosures, automotive in enclosures, sound energy absorption, sound transmission through barr ic chamber. Total	coefficient o for minimum cective devices 9 Hour for noise e noise contro iers- spectrum 45 Hour
nateria noise. UNIT Active combu princip malys Refere 1.	v covered e als and stru Receiver: N V noise atte stion noise oles, sound is, Anechoi ences V,Rao. D Delhi.200 David A.	Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prote Abatement Of Noise enuators and scope for abatement of industrial noise - Methods of control of e, mechanical noise, predictive analysis, palliative and enclosures, automotive in enclosures, sound energy absorption, sound transmission through barr ic chamber. Total pukkipati and J.Srinivas, Text book of Mechanical Vibrations, Prentice-Hall of In 04.	coefficient o for minimum cective devices 9 Hour for noise e noise contro iers- spectrum 45 Hour
Nateria noise. UNIT Active combu princip analys Reference 1. 2.	v covered e als and stru Receiver: M V v noise atte stion noise oles, sound is, Anechoi ences V,Rao. D Delhi.200 David A.1 Frank Fal John Fer	Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prot Abatement Of Noise muators and scope for abatement of industrial noise - Methods of control of e, mechanical noise, predictive analysis, palliative and enclosures, automotive in enclosures, sound energy absorption, sound transmission through barr ic chamber. Total pukkipati and J.Srinivas, Text book of Mechanical Vibrations, Prentice-Hall of In 04. Bies, Colin Hansen, Carl Howard, Engineering Noise Control - 2017	n coefficient o for minimum ective devices 9 Hours e engine noise e noise contro iers- spectrum 45 Hours dia P Ltd, New
Nateria noise. UNIT Active combu princip malys Refere 1. 2. 3.	v covered e als and stru Receiver: N V v noise atte stion noise oles, sound is, Anechoi ences V,Rao. D Delhi.200 David A.I Frank Fal John Fer Engineeri	Acoustic treatment and materials - Transmission loss and absorption uctures and their estimation - Reverberation time and room constant - Design Measure to control at the receiver end- use of enclosures, earmuffs and other prot Abatement Of Noise muators and scope for abatement of industrial noise - Methods of control of e, mechanical noise, predictive analysis, palliative and enclosures, automotive in enclosures, sound energy absorption, sound transmission through barr ic chamber. Total pukkipati and J.Srinivas, Text book of Mechanical Vibrations, Prentice-Hall of In 04. Bies, Colin Hansen, Carl Howard, Engineering Noise Control - 2017 hy, David Thompson, Fundamentals of Sound and Vibration-2015 nton, Handbook of Automotive body Construction and Design Analysis	n coefficient o for minimum ective devices 9 Hour engine noise e noise contro iers- spectrum 45 Hour dia P Ltd, New

24IS54		SA	FETY	IN PO	WDER	HANI	DLING			L	T P	(
										3	0 0	3
	Pre-requ	isite						Assessme	ent Pattern	U		
•	The characteristics of		ig powd	lers.	N	lode of	Assess			Wei	ghtage	e(%
	Knowledge of dus		• •		and C	ontinuc	ous Inte	rnal Asses	ssment		40	
	electrostatic hazards.		0 1		S	emester	End E	xaminatio	ns		60	
Course	Objectives											
•	To introduce the safe	handlin	g of po	wders.								
	To understand the cha				a nowd	lers						
	To study the process				5 poind	e 15.						
	• •		-		. 1	1 .	1	1				
	To develop knowledg			• •			static h	azards.				
•	To learn the method of	of dust e	valuatio	on and o	control							
D		<u>,</u>										
rogram	nme Outcomes (POs)										
DO1	Establish inveloperation	.4 1				•					4	4 -
PO2	Establish, implement ensure a risk-free w				nuous	improv	ement	on industi	rial safety n	nanag	gement	to
PO3	Recognise and eval				lth safe	ty and	legal i	ssues at th	e worknlac	e to c	letermi	ne
105	appropriate hazard											
	safety practices.		, 10110						io ottopune			
PO4	Conduct investigati	on, anal	yse the	root ca	ause an	d gene	rate con	rective an	d preventiv	e mea	asures,	to
	prevent recurrence of	of accide	ents in i	ndustri	es.	-			-			
Course	Outcomes (COs)											
The stuc	lents will be able to											
CO1	Indicate the safe m	ethods (of hand	ling nov	wders o	f an inc	lustrial	unit				
CO2	Analyze the hazard								ant Industry			
CO3	Identify Industrial									-		
CO4	Explain the working								c hazards.			
CO5	Resolve dust evalu											
	ation Matrix											
Articula	ation matrix	CO.	1				İ					
		No.	PO1	PO2	PO3	PO4	PO5	PO6				
		110.										
		1		3	3	3						
					2							
		2		3	3	2						
		3		3	3	2						
						2						
		4		2	2	2						
				-								
		5		3	2	3						
		L	L		I							
U nit I	Introducti										9 Ho	

Powder classification-physical, chemical and other properties-metal powders-other non- metallic powdershandling methods-manual, mechanical - Synthesis of Nano powders - automatic-charges on powders-charge distribution-charging of powders.

Unit II	Metal Powders And Characterization	9 Hours
Titanium - s distribution-	, types - milling - electro deposition - spray drying, Production of iron powder, Alumin creening and cleaning of metals - Explosivity and pyrophoricity - toxicity Particle s measurement, types and significance-particle shape analysis-SEM, AFM, particle sidensity, porosity, flow rate - testing.	size and size
Unit III	Dust Explosion	9 Hours
minimum ig	ist, dust explosion accidents - explosibility characteristics, minimum explosive continue energy, explosion pressure characteristics, maximum permissible oxygen contests, Hartmann vertical tube apparatus, horizontal tube apparatus, inflammatory apparated furnace.	ncentration -
Unit IV	Dust Handling Plants And Electro Static Hazards	9 Hours
UNIT V	Dust Evaluation And Control	9 Hours
role of work Environmen	nethodology, Quantitative, sampling, measurements - control of dust sources, dust tr ers, PPE and work practice - Housekeeping - storage -labeling - warning sign - restr	onemiecion
	tal protections. Evaluation procedures and control measures for particulates (Respirable pers, silica in coal mine - NIOSH guide to the selection and use of particulate respi	ricted areas - le), Asbestos
studies.	al protections. Evaluation procedures and control measures for particulates (Respirable	ricted areas - le), Asbestos
studies. References	tal protections. Evaluation procedures and control measures for particulates (Respirable bers, silica in coal mine - NIOSH guide to the selection and use of particulate respination of the selection and use of particulate respination of the selection and use of the select	icted areas - le), Asbestos rators - case 45 Hours
References 1. SRN 2. A.S.	tal protections. Evaluation procedures and control measures for particulates (Respirable bers, silica in coal mine - NIOSH guide to the selection and use of particulate respi	icted areas - le), Asbestos rators - case 45 Hours nennai, 2000
References 1. SRN 2. A.S. Fran 3. Mar	Total IC, Hazard recognition and prevention in the work place-airborne dust, Vol. I and II, Ch Edelstein and R.C. Cammarata, Nano materials: Synthesis, Properties and Applications cis, New York, 1996. Ein Glor, Electro Static Hazard in Powder Handling, Research studies Press Ltd., Engla	icted areas - le), Asbestos rators - case 45 Hours nennai, 2000. s, Taylor and
studies. References 1. SRN 2. A.S. Fran 3. Mar 4. Inter	Total In the work place-airborne dust, Vol. I and II, Che Edelstein and R.C. Cammarata, Nano materials: Synthesis, Properties and Applications cis, New York, 1996. Tin Glor, Electro Static Hazard in Powder Handling, Research studies Press Ltd., Engla national Labour Organization, Major hazard control, Geneva, 1991.	icted areas - le), Asbestos rators - case 45 Hours nennai, 2000. s, Taylor and and, 1988.
studies. References 1. SRN 2. A.S. Fran 3. Mar 4. Inter 5. Safe	Total IC, Hazard recognition and prevention in the work place-airborne dust, Vol. I and II, Ch Edelstein and R.C. Cammarata, Nano materials: Synthesis, Properties and Applications cis, New York, 1996. Ein Glor, Electro Static Hazard in Powder Handling, Research studies Press Ltd., Engla	icted areas le), Asbestos rators - case 45 Hours nennai, 2000 s, Taylor and and, 1988.

6. http://www.chilworth.co.uk/

24IS55		SAFI	ETY IN	CHE	MICAI	L INDU	STRI	ES			P (
		• /							· D · / /	3 0	0 (
	Pre-requi					T 1 C	•		nent Pattern	XX7 • 1 4	(0/
	Safety in process d	esign,	pressu	re syst		lode of		ment rnal Ass		Weightag	ge(%
	design.	frania		atuiaa				rnal Ass xaminati		40 60	
	Operational methods o	i vario	us indu	stries.	5	emester	EndE	xaminati	ons	60	
	Objectives										
• [To study the safety in	process	s design	and pr	essure	system	design.				
• 7	To provide knowledge	on pla	nt com	mission	ing and	l inspec	tion pro	ocedures			
• 7	To learn the activities	involve	ed in pla	ant mai	ntenanc	e, mod	ification	n and em	nergency plan	ning.	
	To introduce the vario		-						0 11	•	
				-			ponun		ardous enem	icuis.	
•	To infer the operationa	il meth	ods of v	various	industr	ies.					
Progran	nme Outcomes (POs)										
PO1	Apply knowledge of	engine	ering sp	oecialis	ation fo	or hazar	d identi	fication	and risk asses	sment, ana	lyse
	the cause of an incide										
PO2	Establish, implemen				nuous	improv	ement	on indus	strial safety r	nanagemen	t to
	ensure a risk-free wo										
PO3	Recognise and evalu		1			-	0		1		
	appropriate hazard c	ontrols	, follow	ving the	hierar	chy of o	controls	s relevan	t to occupation	onal health	and
201	safety practices.								<u> </u>		
PO4	Conduct investigatio					id gener	rate cor	rective a	and preventiv	e measures	5, to
DOC	prevent recurrence of					1	1	4 41	1	1	C
PO6	Effectively communisafe handling of equi										ior
	sale handling of equi	pment	and ma	IIIIaIIIII	ig a sai	e worki	ing envi	ITOIIIIEII	i III IIIdusti ies	•	
Course	Outcomes (COs)										
	ents will be able to										
CO1	Formulate the steps	ofpro	ress des	sion and	1 nressi	ire syste	em desi	σn			
CO2	Identify the safety f								procedures		
CO3	Use the safe method									ev nlannino	,
CO4	Identify the method									ey plaining	,•
CO5	Execute the operation						or nuzu		cimeans.		
000					ub maa						
Articula	tion Matrix	~ ~ ~	1	1	1	1					
		C O .	PO1	PO2	PO3	PO4	PO5	PO6			
		No.	101	102	105	104	105	100			
		1	2			2					
		1	3	2	2	3		3			
		2	3	3	2	2		2			
		-									
		3	2	2	2	3		3			
		4	2	3	3	2		2			
		-									
		5	3	3	2	2		2			
	l		ļ	ļ	I	!		ļ			
U nit I	Safety In P		_			_					lour

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

Unit II	Plant Commissioning And Inspection	9 Hours
commissionin system, r	ng phases and organization, pre-commissioning documents, process cong problems, post commissioning documentation. Plant inspection, pressure vessel, pro-destructive testing, pressure testing, leak testing and pring, performance monitoring, condition, vibration, corrosion, acoustic emission	monitoring-
Unit III	Plant Maintenance, Modification And Emergency Planning	9 Hours
spaces, permi maintenance	of maintenance, hazards- preparation for maintenance, isolation, purging, clean it system- maintenance equipment- hot works- tank cleaning, repair and demolition- o of protective devices- modification of plant, problems- controls of modifications aster planning, onsite emergency- offsite emergency, APELL.	nline repairs-
Unit IV	Storages And Transportation	9 Hours
separating di flame arrest	sideration, petroleum product storages, storage tanks and vessel- storages layout- stance, secondary containment- venting and relief, atmospheric vent, pressure, va- ors, fire relief- fire prevention and protection-LPG storages, pressure stora	cuum valves, ages, layout,
separating di flame arrest instrumentati storages, amr	stance, secondary containment- venting and relief, atmospheric vent, pressure, va	cuum valves, ages, layout, ges, chlorine
separating di flame arrest instrumentati storages, amr	stance, secondary containment- venting and relief, atmospheric vent, pressure, valors, fire relief- fire prevention and protection-LPG storages, pressure storation, vaporizer, refrigerated storages-LNG storages, hydrogen storages, toxic storation nonia storages, loading and unloading facilities- drum and cylinder storage- ware h	cuum valves, ages, layout, ges, chlorine
separating di flame arrest instrumentati storages, amr hazard assess UNIT V Operating dis system- start activities and	stance, secondary containment- venting and relief, atmospheric vent, pressure, va- ors, fire relief- fire prevention and protection-LPG storages, pressure stora on, vaporizer, refrigerated storages-LNG storages, hydrogen storages, toxic stora nonia storages, loading and unloading facilities- drum and cylinder storage- ware h ment of LPG and LNG Hazards during transportation - pipeline transport.	cuum valves, ages, layout, ges, chlorine ouse, storage 9 Hours er and permit ge- operating
separating di flame arrest instrumentati storages, amr hazard assess UNIT V Operating dis system- start activities and pharmaceutic	stance, secondary containment- venting and relief, atmospheric vent, pressure, va- ors, fire relief- fire prevention and protection-LPG storages, pressure stora on, vaporizer, refrigerated storages-LNG storages, hydrogen storages, toxic stora nonia storages, loading and unloading facilities- drum and cylinder storage- ware h ment of LPG and LNG Hazards during transportation - pipeline transport. Plant Operations scipline, operating procedure and inspection, format, emergency procedures-hand ov up and shut down operation, refinery units- operation of fired heaters, driers, stora hazards- trip systems- exposure of personnel. Specific safety consideration for Co	cuum valves, ages, layout, ges, chlorine ouse, storage 9 Hours er and permit ge- operating
separating di flame arrest instrumentati storages, amr hazard assess UNIT V Operating dis system- start activities and pharmaceutic References	stance, secondary containment- venting and relief, atmospheric vent, pressure, va- ors, fire relief- fire prevention and protection-LPG storages, pressure stora on, vaporizer, refrigerated storages-LNG storages, hydrogen storages, toxic stora nonia storages, loading and unloading facilities- drum and cylinder storage- ware h ment of LPG and LNG Hazards during transportation - pipeline transport. Plant Operations scipline, operating procedure and inspection, format, emergency procedures-hand ov up and shut down operation, refinery units- operation of fired heaters, driers, stora hazards- trip systems- exposure of personnel. Specific safety consideration for Co cal, petroleum, Petro-chemical, rubber, fertilizer and distilleries. Total	cuum valves, ages, layout, ges, chlorine ouse, storage 9 Hours er and permit ge- operating ement, paper,
separating di flame arrest instrumentati storages, am hazard assess UNIT V Operating dis system- start activities and pharmaceutic References 1. Lees,	stance, secondary containment- venting and relief, atmospheric vent, pressure, valors, fire relief- fire prevention and protection-LPG storages, pressure storation, vaporizer, refrigerated storages-LNG storages, hydrogen storages, toxic storation is storages, loading and unloading facilities- drum and cylinder storage- ware himment of LPG and LNG Hazards during transportation - pipeline transport. Plant Operations cipline, operating procedure and inspection, format, emergency procedures-hand ov up and shut down operation, refinery units- operation of fired heaters, driers, storation hazards- trip systems- exposure of personnel. Specific safety consideration for Coreal, petroleum, Petro-chemical, rubber, fertilizer and distilleries. Total , F.P. Loss Prevention in Process Industries Butterworths and Company, 2012.	cuum valves, ages, layout, ges, chlorine ouse, storage 9 Hours er and permit ge- operating ement, paper
separating di flame arrest instrumentati storages, amr hazard assess UNIT V Operating dis system- start activities and pharmaceutic References 1. Lees, 2. Green 3. Fawc	stance, secondary containment- venting and relief, atmospheric vent, pressure, va- ors, fire relief- fire prevention and protection-LPG storages, pressure stora on, vaporizer, refrigerated storages-LNG storages, hydrogen storages, toxic stora nonia storages, loading and unloading facilities- drum and cylinder storage- ware h ment of LPG and LNG Hazards during transportation - pipeline transport. Plant Operations scipline, operating procedure and inspection, format, emergency procedures-hand ov up and shut down operation, refinery units- operation of fired heaters, driers, stora hazards- trip systems- exposure of personnel. Specific safety consideration for Co cal, petroleum, Petro-chemical, rubber, fertilizer and distilleries. Total	cuum valves, ages, layout, ges, chlorine ouse, storage 9 Hours er and permit ge- operating ement, paper, 45 Hours
separating di flame arrest instrumentati storages, amr hazard assess UNIT V Operating dis system- start activities and pharmaceutic References 1. Lees, 2. Green 3. Fawc Edition 4. Guid	stance, secondary containment- venting and relief, atmospheric vent, pressure, valors, fire relief- fire prevention and protection-LPG storages, pressure storation, vaporizer, refrigerated storages-LNG storages, hydrogen storages, toxic storation is storages, loading and unloading facilities- drum and cylinder storage- ware himment of LPG and LNG Hazards during transportation - pipeline transport. Plant Operations cipline, operating procedure and inspection, format, emergency procedures-hand ov up and shut down operation, refinery units- operation of fired heaters, driers, storate hazards- trip systems- exposure of personnel. Specific safety consideration for Contail, petroleum, Petro-chemical, rubber, fertilizer and distilleries. F.P. Loss Prevention in Process Industries Butterworths and Company, 2012. n, A.E., High Risk Safety Technology, John Wiley and Sons, 2003. cett, H.H. and Wood, Safety and Accident Prevention in Chemical Operations Wiley	cuum valves ages, layout ges, chlorine ouse, storage 9 Hours er and permit ge- operating ement, paper 45 Hours

241856	E	NVIRC	ONME	NTAL F	POLLU	JTION	CONT	rol		L 3	T P 0 0	3
	Pre-requ	isite						Assess	ment Pattern	-	UU	
•	Control measures of g		polluta	nts.	N	lode of	Assess				ghtage	(%
	Knowledge on Water		-						sessment		40	(
	management, Hazardo	ous was	te.		S	emester	r End E	xamina	tions		60	
Course	Objectives											
• ′	To introduce the elem	ents of	Air pol	lution a	nd equi	ipment.						
• ′	To study the control n	neasure	s of gas	seous po	llutant	s.						
• '	To learn the effects of	water	pollutio	n.								
• ,	To impart knowledge	on soli	d waste	manage	ement.							
	To provide knowledge					es adop	oted in v	various	hazardous ind	ustries		
Progran	nme Outcomes (POs)										
PO1	Apply knowledge of	engine	ering st	necialisa	ation fo	r hazar	d identi	fication	and risk asses	ssment	analy	se
101	the cause of an incid											,0
PO3	Recognise and evaluation	late oc	cupatio	nal heal	th safe	ty and	legal is	ssues at	the workplac	e to d	etermi	
	appropriate hazard c	ontrols	, follow	ving the	hierar	chy of o	controls	s releva	nt to occupation	onal he	ealth a	ıd
DO (safety practices.		1			1			1			
PO4	Conduct investigation prevent recurrence of	on, anal	lyse the	e root ca	ause an	d gene	rate con	rective	and preventiv	ve mea	sures,	to
PO6	Effectively commun					s and r	eoulatic	ons to th	ne employees	and so	ciety f	or
100	safe handling of equ										cicty i	51
CO1 CO2 CO3 CO4 CO5	Gain knowledge on Predict the effect of Find out the effects Identify the method Evaluate the polluti	f gaseou of wat ls for so	us pollu er pollu olid was	itants of ition on ste mana	an ind the rec	ustrial eiving it of an	unit. body. industr	ial unit.	-			
	tion Matrix			asures a	uopieu		ous mu	usuies.				
- ii ticula		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6				
		1	3		3	3		3				
		2	3		2	2		3				
		3	2		3	2		2				
		4	2		2	2		2				
		5	3		2	3		2				
			Į	ļļ								
Unit I	Air Polluti	on	Į	· · · · ·							9 Ho	ur

Unit II	Control Of Gaseous Pollutants	9 Hours
	sion of Air pollutants -Plume behaviour - The Gaussian Plume Model- Control of gaseour dioxides, nitrogen oxides, Carbon monoxide and Hydrocarbons. Air pollution laws and Sta	
Unit II	I Water Pollution	9 Hours
	pollution- Classification of water pollutant and their effects on receiving bodies. Advanced ents by Physical, Chemical, Biological and Thermal Methods-Effluent quality standards.	d wastewater
Unit IV	V Solid Waste Management	9 Hours
radioac	tive wastes - Incineration and Verification. Vermicomposting, Pyrolysis.	
UNIT '	V Pollution Control In Industries	9 Hours
	V Pollution Control In Industries on control in process industries - Cement, paper, petroleum, fertilizer and petrochemical.	9 Hours
Pollutio	on control in process industries - Cement, paper, petroleum, fertilizer and petrochemical. Total	9 Hours 45 Hours
Pollutio	on control in process industries - Cement, paper, petroleum, fertilizer and petrochemical. Total	
Pollutio Refere	on control in process industries - Cement, paper, petroleum, fertilizer and petrochemical. Total	45 Hours
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	E	NVIRC	DNME	NTAL I	MPA	CT ASS	SESSM	IENT			T P	(
	Pre-requ	isita						A 55055	ment Pat	3	0 0	
• K	Knowledge on EIA as		nt and t	echnique	-s N	lode of	Access				ightage	·(%
	Environmental Manag			connique					sessment		40	(/)
- 1		sement i	1411.					xamina			60	
Course (Objectives				•							
• 1	To introduce the Envi	ronmen	tal Imp	act Asse	ssmen	t.						
• 1	To study the Environn	nental I	mpact	Assessm	ent teo	hnique	s.					
	To learn the Environn		-			-		aues.				
	To impart knowledge		-					1				
	To provide knowledge				-			nniects				
			, nonn			55055111		projects	•			
-	nme Outcomes (POs)										
PO2	Establish, implement ensure a risk-free wo				nuous	improv	ement	on indu	istrial safe	ety manag	gement	to
PO3	Recognise and evalu				th safe	ty and	legal is	ssues at	the work	place to	determi	ne
	appropriate hazard c											
	safety practices.											
PO4	Conduct investigation					d gene	rate coi	rrective	and prev	entive me	easures,	to
	prevent recurrence o	of accide	ents in i	ndustrie	s.							
	ents will be able to	Enviro	nmonto	1 Impo	at A a	acama	nt (EI	A) Im	naat Stat	tomont (EIS) a	nd
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CO1 CO2 CO3 CO4 CO5	Demonstrate the Environmental Risl Compute the enviro Determine the Enviro Execute the Enviro Justify previous env	k Assess onmenta ironmen nmental vironme 1 2 3 4 5	sment (il asses ital Imp Manaj ental ca	ERA.) sment ter pact Asse gement I ses and t PO2 3 3 2 2 2	chniqu essmer Plan ar their ca PO3 3 2 2 2 3	PO4 PO4 3 2 2 2	Enviror he evalution ment it	uation c	Analysis.		EIS) a	
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CO1 CO3 CO4 CO5 Articular	Demonstrate the Environmental Risl Compute the enviro Determine the Enviro Justify previous env tion Matrix	k Assess onmenta ironmen nmental vironme 1 2 3 4 5 on	PO1 (EIA) atory as	ERA.) sment ter pact Assec gement I ses and t PO2 3 3 2 2 3 - Envir spects in	chniquessmer Plan ar their ca PO3 3 2 2 3 3 3 ronme India	PO4 3 2 2 3 mtal Im - Types	PO5	PO6	Analysis. riteria.	Environm	9 Ho nental F	

Unit II	Environmental Analysis And Assessment Techniques	9 Hours
Components -	screening - setting - analysis - prediction of impacts - mitigation. Matrices Network	s - Checklists
- Importance a	sessment techniques - cost benefit analysis - analysis of alternatives - methods for F	Prediction and
assessment of	mpacts. Standards and guidelines for evaluation. Public Participation in environme	ntal decision-
making.		

Unit III	Environmental Impact Assessment Evaluation	9 Hours

Trends in EIA practice and evaluation criteria - capacity building for quality assurance. Expert System in EIA - use of regulations and AQM.

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Document planning - collection and organization of relevant information - use of visual display materials - team writing - reminder checklists. Environmental monitoring - guidelines - policies - planning of monitoring programmes. Environmental Management Plan. Post project audit.

UNIT V	Case Studies	9 Hours

Case studies of EIA of developmental projects.

Total	45 Hours
References	

- 1. L W Canter, Environmental Impact Assessment, McGraw Hill, New York, 1996.
- 2. J Petts, Handbook of Environmental Impact Assessment, Vol. I and II, Blackwell Science, London, 1999.
- 3. The World Bank Group, Environmental Assessment Sourcebook, Vol. I, II and III, World Bank, Washington, 1991.
- 4. G. Burke, B. R. Singh and L. Theodore, Handbook of Environmental Management and Technology, 2nd Ed., John Wiley and Sons, 2000
- 5. C. H. Eccleston, Environment Impact Statements: A Comprehensive Guide to Project and Strategic Planning, John Wiley and Sons, 2000.
- 6. www.cpcb.nic.inhttp://www.chilworth.co.uk/

24IS58	S	AFETY	IN PE	TROC	HEMI	CAL II	NDUST	RIES		L 3	T P 0 0	3
	Pre-req	iisite						Assess	ment Pattern	3	0 0	3
•	Controlling of safety		ief syst	ems.	N	lode of	Assess			Wei	ghtage	e(%
	Knowledge on var				rds C	ontinuc	ous Inte	rnal Ass	sessment		40	
	involved in petrocher	nical ind	dustries	•	S	emester	End E	xaminat	tions		60	
Course	Objectives											
	To recognize the va Measures To impart knowledg						-					
•	planning in petrol ch To acquire knowledg on design activities o	emical in ge on Co	ndustrie ontrollir	es ng of sat	fety sy		-	-			_	-
Prograi	mme Outcomes (PO	s)										
DO1		f an ain a			tion fo		1 : 1 au t :	fination	and male and a		t an al	
PO1 PO2	Apply knowledge o the cause of an inci Establish, impleme ensure a risk-free w	dent, and nt, and	d contro mainta	ol occup in conti	ational	l health	safety a	and env	ironmental pro	blem	s.	
PO3	Recognise and eva appropriate hazard safety practices.	luate oc controls	cupatio , follov	nal heal ving the	hierar	chy of o	controls	s releva	nt to occupatio	nal h	ealth a	nd
PO4	Conduct investigation prevent recurrence					id gener	rate con	rective	and preventive	e mea	asures,	to
	Outcomes (COs)											
The stuc	dents will be able to											
CO1	Familiarize with the											
CO2	Understand Risk a											
CO3	Control the risk f		by apply	ying the	e vario	us safe	ty tech	niques	in mitigating t	he h	azards	1n
CO4	Attain ability to de		e protec	tion fac	ilities i	n oil re	fineries	denots	and terminals			
CO5	Attain ability to de											
Articul	ation Matrix		•	•			0					
an ticuli		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6				
		1	3	3	3	3						
		2	3	2	3	2						
		3	2	3	3	2						
		4	2	2	2	2						
		5	3	2	2	3						
		1	1			1	t	L				
Unit I	Introduct	ion									9 Ho	ur

Unit II	Control Of Safety Systems		9 Hours
	ot of risk, selection of design bases for safety systems, guidelines for risk toler		
	s safety systems and design solutions. Control of safety systems, safety system character		
	system computer control - Control of trip, interlock and emergency shut-down systems	- Prog	rammable
ogic ar	nd electronic system - Layered control systems for safety.		
U nit II	II Control Of Relief System		9 Hour
	Systems: Preventive and protective management from fires and explosion-inert,		
	ation, ventilation, and sprinkling, proofing, relief systems- relief valves, flares, scrubbers.		
	ers and condensers for toxic release from chemical process industries; Design of	tank	farms for
liquid/g	gaseous fuel storage.		
Unit IV	Tarriaglamy Of Datus Chamical Industries		0.11
Unitiv	V Toxicology Of Petro Chemical Industries		9 Hours
— • •	4		. 1 . 0 .
	logy: Hazards identification-toxicity, fire, static electricity, noise and dust concentration		
data she	eet, hazards indices- Dow and Mond indices, hazard operability (HAZOP) and hazard an	alysıs (HAZAN)
	V Construiting Of Looks and And Annovinted Honorda		0.11
Leaks a	V Controlling Of Leakages And Associated Hazards and Leakages: Spill and leakage of liquids, vapours, gases and their mixture from s nent; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal an		tanks and
Leaks a equipm of gase Natural for leak	and Leakages: Spill and leakage of liquids, vapours, gases and their mixture from s nent; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal an es, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxic lly buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mit ks and releases. Hazards Associated with Hydrocarbon and Other Chemical Products: O PG, CNG, LNG, oxygenated hydrocarbons, chlorine, ammonia, hydrogen fluoride.	d adiab and c igation Crude c	tanks and patic flow: lispersion measure pil, natura
Leaks a equipm of gases Natural for leak gas, LP	and Leakages: Spill and leakage of liquids, vapours, gases and their mixture from s nent; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal an is, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxic lly buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mit ks and releases. Hazards Associated with Hydrocarbon and Other Chemical Products: O PG, CNG, LNG, oxygenated hydrocarbons, chlorine, ammonia, hydrogen fluoride. To	d adiab and c igation Crude c	tanks and patic flows lispersion measures pil, natura
equipm of gases Natural for leak gas, LP Referes	and Leakages: Spill and leakage of liquids, vapours, gases and their mixture from s nent; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal an es, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxic lly buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mit ks and releases. Hazards Associated with Hydrocarbon and Other Chemical Products: O PG, CNG, LNG, oxygenated hydrocarbons, chlorine, ammonia, hydrogen fluoride. To ences	d adiab and c igation Crude c	atic flows lispersion measures
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	Pre-requ	isita						Assass	ment Patte	3 rn	0 0	13
• k	Knowledge about haza		oods		N	lode of	Assess				ghtage	<u>(</u> %
	Roles and responsib			riving.					sessment		40	(/ 0
	*			U		emester	End E	xamina	tions		60	
Course (Objectives											
• 1	To provide the steps to	be follo	owed f	for safe	handlii	ng of ha	izardou	s goods	during tran	sportatio	on	
	Fo illustrate the road a for the drivers.	ccident a	and the	roles a	nd resp	onsibil	ities of a	a driver	and the Safe	ety train	ing nee	ded
• 7	To inculcate the need	for safe	driving	g and gi	ive an c	over vie	w of th	e motor	vehicle act	and rule	es.	
• 1	Fo develop knowledge	e on road	d safet	y inclu	ling the	e laying	of road	l and tra	affic control	lines.		
	To educate safety aspe				-						op floo	r.
Program	me Outcomes (POs))										
PO2	Establish, implemen				nuous	improv	ement	on indu	strial safety	/ manag	ement	to
PO3	ensure a risk-free wo Recognise and evalu				1th cofe	triand	logali	anag at	the workn	ago to (latarmi	n 0
POS	appropriate hazard c											
	safety practices.	ond only	10110 H	ing the	, morar	ony or v		101010	in to occupe	uronur n	ountil u	
PO4	Conduct investigation	on, analy	se the	root c	ause an	d gene	rate con	rective	and preven	tive me	asures,	to
	prevent recurrence o					-			-			
Course (Dutcomes (COs)											
	ents will be able to											
The stude	ents will be able to	easures i	in hand	lling of	`hazard	ous goo	ods duri	ing tran	sportation.			
										he Safet	y trainii	ng
The stude CO1	ents will be able to Apply the safety me	es for acc								he Safet	y trainii	ng
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The stude CO1 CO2 CO3 CO4 CO5	Apply the safety mo Formulate the cause needed for the drive Identify the need fo Demonstrate the rul Indicate the safety floor.	es for accers. or safe dr les on ro aspects CO. No. 1 2 3	riving a pad safe in han	PO2 3 2	roles ar lerstanc uding t naterial PO3 3 3 3	A response A an over the layin and the PO4 3 2 2	onsibilit er view ng of ro e mate	ries of a of the r ad and t rial han PO6 3 3 2	driver and the second term of the second sec	e act and ol lines.	d rules.	
The stude CO1 CO2 CO3 CO4 CO5	Apply the safety mo Formulate the cause needed for the drive Identify the need fo Demonstrate the rul Indicate the safety floor.	es for accers. or safe dr les on ro aspects CO. No. 1 2 3 4 5	riving a ad safa in han PO1	PO2 3 2 3 3 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3	roles ar lerstanc uding t naterial PO3 3 3 3 2 2 2	A response of the laying and the lay	onsibilit er view ng of ro e mate	ries of a of the r ad and t rial han PO6 3 3 2 2 2	driver and the second term of the second sec	e act and ol lines.	d rules.	op
The stude CO1 CO2 CO3 CO4 CO5 Articula	ents will be able to Apply the safety me Formulate the cause needed for the drive Identify the need fo Demonstrate the rul Indicate the safety floor. tion Matrix	es for accers. or safe dr les on ro aspects CO. No. 1 2 3 4 5 ation of	riving a ad safa in han PO1 Hazai	PO2 3 2 3 cdous C	roles ar lerstand uding t naterial PO3 3 3 3 3 2 2 2 Goods	A response of the laying and the lay	PO5	rial han PO6 3 2 2 2	driver and the notor vehicle traffic control dling equip	e act and ol lines. ment in	d rules. the sha	op
The stude CO1 CO2 CO3 CO4 CO5 Articula	ents will be able to Apply the safety mo Formulate the cause needed for the drive Identify the need fo Demonstrate the rui Indicate the safety floor. tion Matrix	es for accers. r safe dr les on ro aspects CO. No. 1 2 3 4 5 ettion of REM) - o	riving a bad safe in han PO1 Hazat driver ker lor	PO2 3 3 2 2 3 rdous C training rries -s	roles ar lerstanc uding t naterial PO3 3 3 3 3 2 2 2 500ds g-parkir tatic el	PO4 an over he layin and th PO4 3 2 2 2 3 mg of ta ectricity	PO5 PO5 nkers o y respo	rial han PO6 3 3 2 2 2 2 2	driver and the notor vehicl traffic contra- dling equip	e act and ol lines. ment in ed of th	d rules. the sho 9 Ho e vehic	

Introduction - factors for improving safety on roads- signage and mandatory signs - causes of ac drivers and pedestrians-design, selection, operation and maintenance of motor trucks preventive	
check lists-motor vehicles act - motor vehicle insurance and surveys.	
Unit III Driver and Safety	9 Hours
Driver safety programme - selection of drivers - driver training-tacho-graph-driving test driver naccident reporting and investigation procedures-fleet accident frequency-safe driving incentive driver cabin-motor vehicle transport workers act- driver relaxation and rest pauses - speed and fue emergency planning and Hazmat codes.	ves-slogans in
Unit IV Road Safety	9 Hours
vehicle-skidding-restriction of speeds- significance of speeds- Pavement conditions - Sight distar intersections - Traffic control lines and guide posts- guard rails and barriers - street lighting and overloading-concentration of driver. Plant railway: Clearance-track-warning methods-loading an moving cars safety practices.	d illumination
UNIT V Shop Floor Safety	
Transport precautions-safety on manual, mechanical handling equipment operations safe driving	9 Hours
cranes-conveyors etc., equipment.	9 Hours
Total	
Total	movement of 45 Hours
Total References 1. Kadiyali, Traffic Engineering and Transport Planning Khanna Publishers, New Delhi, 198	movement of 45 Hours
Total References 1. Kadiyali, Traffic Engineering and Transport Planning Khanna Publishers, New Delhi, 198 2. Motor Vehicles Act, 1988, Government of India, Universal Law Publishing,2016	movement of 45 Hours
Total References 1. Kadiyali, Traffic Engineering and Transport Planning Khanna Publishers, New Delhi, 198 2. Motor Vehicles Act, 1988, Government of India, Universal Law Publishing,2016 3. Accident Prevention Manual for Industrial Operations, NSC, Chicago, 1982.	movement of 45 Hours 83.
 References 1. Kadiyali, Traffic Engineering and Transport Planning Khanna Publishers, New Delhi, 198 2. Motor Vehicles Act, 1988, Government of India, Universal Law Publishing,2016 	movement of 45 Hours 83. 999.

6. V.F Babkov, Road Conditions and Traffic Safety MIR Publications, Moscow, 1986.

24IS60	SAFET	Y IN C)N-SH	ORE A	AND O	FF-SH	ORE D	RILLI	NG	L	T P	C
										3	0 0	3
	Pre-requis		1	1		<u>, , , ,</u>	•		ment Pattern			(0())
	Knowledge about vario					Iode of			sessment	we	i <mark>ghtag</mark> 40	e(%)
• (Onshore and offshore d	irilling	operati	ions.		emester				-	60	
Course (Objectives				~		2110 2					
	Γο provide knowledge neasures.	on vari	ious pe	troleun	n produ	icts, the	hazard	s involv	ved, the contro	ol and	prever	ntive
	Fo impart knowledge or equirements.	on shor	e and	off sho	re oper	ations,	the haz	ards as	sociated with	it and	the sa	ıfety
•]	Гo develop knowledge	on oil	drilling	g, the h	azards a	associat	ed with	it and	the safety requ	uireme	ents.	
	Fo provide knowledge protective measures.	on petr	oleum	extract	ion and	transpo	ortation	, the ha	zards associate	ed wit	h it and	l the
	To impart knowledge associate with it.	on stor	rage of	f petrol	eum pr	roducts	and th	e storag	ge equipment	and t	he haz	ards
Program	nme Outcomes (POs)											
PO2	Establish, implement	-			inuous	improv	ement	on indu	ustrial safety 1	nanag	gement	to
	ensure a risk-free wor				1.1 0						-	
PO3	Recognise and evaluation appropriate hazard constrained safety practices.											
PO4	Conduct investigation	n, analy	yse the	root c	ause ar	nd gene	rate con	rective	and preventiv	/e me	asures,	to
	prevent recurrence of											-
PO6	Effectively communi safe handling of equi										ociety	for
	sale handling of equi	pinent	and ma	IIIIaIIIII	lig a sai	C WOLK	ing env	nonne	III III IIIdusti ies			
Course (Outcomes (COs)											
	ents will be able to											
CO1	Identify various petr	roleum	produc	cts, the	hazard	s invol	ved, an	d sugge	est the control	and p	revent	ive
	measures.											
CO2	Compare with on s	hore a	nd offs	shore c	operatio	ons, the	hazard	ls assoc	ciated with it	and t	he saf	ety
CO3	requirements. Indicate about oil dr	illing t	ho hoz	orda oa	cogisto	d with i	t and th	o sofot	, requirements	1		
CO3	Explain the petroleur							-			arotect	ive
04	measures.	III CAU a		inu tran	sportat	ion, me	nazaru	5 855001	ated with it all	u ine j	JOICEL	ive
CO5	Determine the metho	od of st	torage	of petro	oleum p	oroducts	s and th	e storag	ge equipment a	and th	e haza	rds
	associate with it.											
Articula	tion Matrix											
	Γ	CO.	PO1	PO2	PO3	PO4	PO5	PO6				
		No.	rui	r02	rus	r04	r05	ruo				
	Ī	1		3	3	3		3]			
	-	2		3	3	2		3	1			
	-	3		2	3	2		2				
	-	4		2	2	2		2				
	F	5		3	2	3		2	1			
		5		5	2	5		2				

Unit I	Petroleum Products	9 Hours
D 1		
Petroleum ai Miscellaneou	nd Petroleum products - Fuels- Petroleum solvents - Lubricating oils - Petroleum w	ax, greases-
Iviiscenaneou		
Unit II	On and Off Shore Operations	9 Hours
	hore oil operation - Construction of Installation - Pipe Line Construction - Maintenand afety and associated hazards.	ce and repair
Unit III	Drilling	9 Hours
Drilling oil- lightning and	Technique and equipment- Work position - Working condition - safety and associal its effects.	ted hazards-
Unit IV	Extraction and Transportation	9 Hours
oil hazards.		
oil hazards. UNIT V	Storage and Cleaning	9 Hours
UNIT V	Storage and Cleaning roduct storage and transport - Storage equipment - Precaution - Tank cleaning.	9 Hours
UNIT V		9 Hours 45 Hours
UNIT V	oduct storage and transport - Storage equipment - Precaution - Tank cleaning.	
UNIT V Petroleum pr References 1. Ency	oduct storage and transport - Storage equipment - Precaution - Tank cleaning.	45 Hours
UNIT V Petroleum pr References 1. Ency 1985 2. Dr. I	roduct storage and transport - Storage equipment - Precaution - Tank cleaning. Total vclopaedia of Occupational Health and Safety, Vol. II, International Labour Organisat	45 Hours ion, Geneva, renth Edition
UNIT V Petroleum pr References 1. Ency 1985 2. Dr. I publ 3. S. Ta in E	roduct storage and transport - Storage equipment - Precaution - Tank cleaning. Total Vclopaedia of Occupational Health and Safety, Vol. II, International Labour Organisat is and I. Paul Bommer A Primer of Oilwell Drilling A Basic Text of Oil and Gas Drilling Sev	45 Hours ion, Geneva, renth Edition 2008 Engineering,
UNIT V Petroleum pr References 1. Ency 1985 2. Dr. I publ 3. S. Ta in E Publ 4. Man	roduct storage and transport - Storage equipment - Precaution - Tank cleaning. Total Velopaedia of Occupational Health and Safety, Vol. II, International Labour Organisat is and I. Paul Bommer A Primer of Oilwell Drilling A Basic Text of Oil and Gas Drilling Sev ished by The University of Texas Continuing Education petroleum extension service.2 anaka, Y. Okada, Y. Ichikawa, Offshore Drilling And Production Equipment, in Civil ncyclopaedia of Life Support Systems, Developed under the Auspices of the UNE	45 Hours ion, Geneva, eenth Edition 2008 Engineering, ESCO, Eolss
UNIT V Petroleum pr References 1. Ency 1985 2. Dr. I publ 3. S. Ta in E Publ 4. Man and 7	roduct storage and transport - Storage equipment - Precaution - Tank cleaning. Total Total reclopaedia of Occupational Health and Safety, Vol. II, International Labour Organisat is and I. Paul Bommer A Primer of Oilwell Drilling A Basic Text of Oil and Gas Drilling Sev ished by The University of Texas Continuing Education petroleum extension service.2 anaka, Y. Okada, Y. Ichikawa, Offshore Drilling And Production Equipment, in Civil ncyclopaedia of Life Support Systems, Developed under the Auspices of the UNE ishers, Oxford, UK, 2005 agement and Engineering of Fire Safety and Loss Prevention: Onshore and offshore,	45 Hours ion, Geneva, eenth Edition 2008 Engineering, ESCO, Eolss

			S.	AFETY	IN M	INES						(
	Pre-requ	usite						Assess	ment Patteri	3	00	
•	Knowledge about haz		goods.		N	lode of	Assess				ghtage	(%
	Roles and responsib			lriving.					sessment		40	
	-			-	S	emester	r End E	xamina	tions		60	
	Objectives											
• ′	To create knowledge	on vario	ous type	es of mi	nes and	l the ha	zards a	ssociate	ed with it.			
• ′	To develop knowledg	ge on un	dergrou	ınd min	es, occ	upation	al haza	rds and	the safety asp	pects.		
• ′	To impart knowledge	on tunn	nelling a	and the	persona	al prote	ction.					
• ′	To identify the risk, p	otential	hazard	s and d	o the ri	sk asses	ssment.					
	To give an exposure accidents.	to vario	ous acci	dents h	appene	d in m	ines and	d the w	ay to manage	e situat	ion dur	in
Program	nme Outcomes (POs	5)										
PO1	Apply knowledge o											se
DOA	the cause of an incid											
PO2	Establish, impleme ensure a risk-free w				inuous	improv	ement	on indu	istrial safety	manag	ement	to
PO3	Recognise and eval				lth safe	ety and	legal is	ssues at	t the workpla	ce to c	letermi	16
	appropriate hazard											
	safety practices.											
PO4	Conduct investigati					d gene	rate coi	rrective	and preventi	ve mea	asures,	to
	prevent recurrence (muusui	05.							
	Outcomes (COs)											
	lents will be able to											
CO1								n it.				
	Identify various ty	-							£			
CO2	Demonstrate under	rground	mining	, the oc	cupatio	nal haz			afety aspects.			
CO2 CO3	Demonstrate under Explain on tunnell	rground ing and	mining the pers	, the oc sonal pi	cupatic otectio	onal haz n.	ards an		ifety aspects.			
CO2	Demonstrate under	rground ing and otential	mining the pers hazards	, the oc sonal pi s and do	cupation otection the rist	onal haz n. k asses	ards an sment.		fety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	rground ing and otential	mining the pers hazards	, the oc sonal pi s and do	cupation otection the rist	onal haz n. k asses	ards an sment.		afety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p	rground ing and otential	mining the pers hazards estigate	, the oc sonal pr s and do and an	cupatic rotectio the ris alyze th	nal haz n. k asses ne acció	sment. lents	d the sa	afety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	rground ing and otential ents, invo	mining the pers hazards	, the oc sonal pi s and do	cupation otection the rist	onal haz n. k asses	ards an sment.		afety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	rground ing and otential ents, invo	mining the pers hazards estigate	, the oc sonal pr s and do and an	cupatic rotectio the ris alyze th	nal haz n. k asses ne acció	sment. lents	d the sa	afety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	rground ing and otential ents, invo	mining the pers hazards estigate PO1	, the oc sonal pro- s and do and an PO2	eupatic otectio o the ris alyze th PO3	nal haz n. k asses ne accid	sment. lents	d the sa	afety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	rground ing and otential ents, invo CO. No. 1	mining the pers hazards estigate PO1 2	, the oc sonal prosent of the sonal prosent of the	eupatic rotectio o the ris alyze th PO3 3	nal haz n. k asses ne accic PO4 3	sment. lents	d the sa	ifety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	CO. No. 2	mining the pers hazards estigate PO1 2 3	, the oc sonal prosent of the sonal prosent of the	PO3 2	nal haz n. k asses ne accic PO4 3 2	sment. lents	d the sa	afety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	rgrounding andotentialotentialents, invoCO.No.123	mining the pers hazards estigate PO1 2 3 2	, the oc sonal prosent of the sonal and	eupatic rotectio b the ris alyze th PO3 3 2 3	nal haz n. k asses ne accio PO4 3 2 2	sment. lents	d the sa	ifety aspects.			
CO2 CO3 CO4 CO5	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide	rground ing and otential ents, invo CO. No. 1 2 3 4 5	mining the pers hazards estigate PO1 2 3 2 3	, the oc sonal pro- s and do and an PO2 3 3 3 2	eupatic rotectio o the ris alyze th PO3 3 2 3 3 3	nal haz n. k asses ne accio PO4 3 2 2 2	sment. lents	d the sa	afety aspects.		9 Ho	
CO2 CO3 CO4 CO5 Articula	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide ation Matrix	rground ing and otential ents, invo CO. No. 1 2 3 4 5 Mines	mining the pers hazards estigate PO1 2 3 2 3 3 3	, the oc sonal pro- sonal da and an PO2 3 3 3 3 2 2 2	eupatic rotectio b the ris alyze th PO3 3 2 3 3 3 3 3	nal haz n. k asses ne accio PO4 3 2 2 2 2 3	ards an sment. lents PO5	PO6				
CO2 CO3 CO4 CO5 Articula	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide ation Matrix Opencast and prevention of ac	rground ing and otential ents, invo CO. No. 1 2 3 4 5 Mines	mining the pers hazards estigate PO1 2 3 2 3 3 3	, the oc sonal pro- sonal pro- and and and and PO2 3 3 3 3 2 2 2 2 eavy m	eupatic rotectio o the ris alyze th PO3 3 2 3 3 3 3 3 achine:	nal haz n. k asses ne accio PO4 3 2 2 2 2 3 ry, belt	ards an sment. lents PO5 and bu	PO6	onveyors, dril		and too	ol
CO2 CO3 CO4 CO5 Articula	Demonstrate under Explain on tunnell Identify the risk, p Classify the accide ation Matrix	rground ing and otential ents, invo CO. No. 1 2 3 4 5 Mines	mining the pers hazards estigate PO1 2 3 2 3 3 crom: H dust, elo	, the oc sonal pro- sonal pro- and da and an PO2 3 3 3 2 2 2 2 eavy meetrical	eupatic rotectio b the ris alyze th PO3 3 2 3 3 3 3 3 achine system	nal haz n. k asses ne accio PO4 3 2 2 2 2 3 ry, belt s, fire p	ards an sment. lents PO5 and bu preventi	PO6	onveyors, dril		and too	01

9 Ho	t II Underground Mines
ors - as detector	of roof and sides - effect of gases - fire and explosions - water flooding-warning se
ors - gas detector	ipational hazards - working conditions-winding and transportation.
9 Ho	t III Tunneling
l hazards- noise a	ards from: ground collapse, inundation and collapse of tunnel face, falls from platting bodies. Atmospheric pollution (gases and dusts) - trapping -transport-noise- electration from - pneumatic tools and other machines - ventilation and lighting - personal
9 Hor	t IV Risk Assessment
	ic concepts of risk-reliability and hazard potential-elements of risk assessment - statists-appraisal of advanced techniques-fault tree analysis-failure mode and effect activity relationship analysis-fuzzy.
lysis - quantitat	ts-appraisal of advanced techniques-fault tree analysis-failure mode and effect cture-activity relationship analysis-fuzzy. TV Accident Analysis and Management
lysis - quantitat 9 Hor afety audits- rec ence- investigatio	ts-appraisal of advanced techniques-fault tree analysis-failure mode and effect eture-activity relationship analysis-fuzzy. IT V Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents elopment of safety engineering approaches for mines-frequency rates-accident occ
lysis - quantitat 9 Hou afety audits- rec ence- investigation management.	ts-appraisal of advanced techniques-fault tree analysis-failure mode and effect cture-activity relationship analysis-fuzzy. TV Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents
lysis - quantitat 9 Hor afety audits- rec ence- investigatio	ts-appraisal of advanced techniques-fault tree analysis-failure mode and effect cture-activity relationship analysis-fuzzy. IT V Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents elopment of safety engineering approaches for mines-frequency rates-accident occ sures for improving safety in mines-cost of accident-emergency preparedness - disas
lysis - quantitat 9 Hou afety audits- rec ence- investigation management.	ts-appraisal of advanced techniques-fault tree analysis-failure mode and effect eture-activity relationship analysis-fuzzy. IT V Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents elopment of safety engineering approaches for mines-frequency rates-accident occ
lysis - quantitat 9 Hou afety audits- rec ence- investigation management.	ts-appraisal of advanced techniques-fault tree analysis-failure mode and effect cture-activity relationship analysis-fuzzy. IT V Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents elopment of safety engineering approaches for mines-frequency rates-accident occ sures for improving safety in mines-cost of accident-emergency preparedness - disas erences
lysis - quantitat 9 Hou afety audits- rec ence- investigation management. Total 45 Hou	ts-appraisal of advanced techniques-fault tree analysis-failure mode and effect cture-activity relationship analysis-fuzzy. TV Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents elopment of safety engineering approaches for mines-frequency rates-accident occ sures for improving safety in mines-cost of accident-emergency preparedness - disas erences 1. Michael Karmis, Mine Health and Safety Management, SME, Littleton, Co. 200
lysis - quantitat 9 Hou afety audits- rec ence- investigation management. Total 45 Hou	Its-appraisal of advanced techniques-fault tree analysis-failure mode and effect entre-activity relationship analysis-fuzzy. IT V Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents elopment of safety engineering approaches for mines-frequency rates-accident occ sures for improving safety in mines-cost of accident-emergency preparedness - disast erences 1. Michael Karmis, Mine Health and Safety Management, SME, Littleton, Co. 200 2. B.K Kejiriwal, Safety in Mines, Publisher Gyan Prakashan, Dhanbad, 2002. 3. DGMS Circulars-Ministry of Labour, Government of India press, OR Lovely Prepared press of the
lysis - quantitat 9 Hou afety audits- rec ence- investigation management. Total 45 Hou	Its-appraisal of advanced techniques-fault tree analysis-failure mode and effect eture-activity relationship analysis-fuzzy. IT V Accident Analysis and Management idents classification and analysis-fatal, serious, minor and reportable accidents elopment of safety engineering approaches for mines-frequency rates-accident occ sures for improving safety in mines-cost of accident-emergency preparedness - disaster disas

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										3	0 0	3
	Pre-req		<u> </u>	1		1			nent Patte		-1-4	(0/
	Basic principles of m Basic understanding		U			Iode of		ment rnal Ass	essment	wei	ghtage 40	(%)
•	basic understanding	or logist	ic layou	π.				xaminati			60	
Course	Objectives				~		2114 2			I	00	
	To learn the basic co	ncept of	mainta	inabilit	v engin	eering.						
	To gain knowledge o	-		-		-	ntenanc	e policie	s and repla	acement	models	
	To obtain informatio					,						
	To develop knowled			U		various	analysi	S				
	To learn about Total	-		-		various	anarysi	5.				
•	To learn about Total	FIOUUCU		menan								
Progran	nme Outcomes (PO	s)										
PO2	Establish, impleme	nt, and	maintai	n conti	nuous	improv	ement	on indus	strial safet	y manag	gement	to
	ensure a risk-free w	orking e	environ	nent.		_						
PO3	Recognise and eva											
	appropriate hazard safety practices.	controls	, follow	ing the	hierar	chy of c	controls	relevan	t to occup	ational h	ealth ar	ıd
PO4	Conduct investigation	ion. anal	lvse the	root c	ause an	d gene	rate cor	rective a	and prever	ntive me	asures.	to
101	prevent recurrence					8-11-1			ma provor			
CO1 CO2 CO3	Explain the basic of Implement various Demonstrate main Compute maintena	s mainter tenance ance qua	nance n logistic llity by	nethods s of an various	, maint Industr analys	enance ial Unit is.	policies t.			models.		
CO4	Indicate Total Pro				f an Ind	lucture 1	Unit.					
CO4 CO5	Indicate Fotal From	ductive 1	Mainter	ance of	i an inc	lustrial						
CO5	tion Matrix	ductive 1	Mainter	iance of	i an ind	lustrial						
CO5		CO .	PO1	PO2		PO4	PO5	PO6				
CO5		CO. No.		PO2	PO3	PO4	PO5	PO6				
CO5		CO. No.		PO2 3	PO3	PO4 3	PO5	PO6				
CO5		CO. No.		PO2	PO3	PO4	PO5	PO6				
CO5		CO. No.		PO2 3	PO3	PO4 3	PO5	PO6				
CO5		CO. No.		PO2 3 3	PO3 3 3	PO4 3 2	PO5	PO6				
CO5		CO. No. 1 2 3		PO2 3 3 2	PO3 3 3 3	PO4 3 2 2	PO5	PO6				
CO5		CO. No. 1 2 3 4 5	PO1	PO2 3 3 2 2 2	PO3 3 3 2	PO4 3 2 2 2	PO5	PO6			9 Ho	

management - Tero technology - Scope of maintenance department - Maintenance costs.

Unit I	I Maintenance Models	9 Hours
Optima	tive/Reactive maintenance - Imperfect maintenance - Maintenance policies - PM versus b/d nal PM schedule and product characteristics - Optimal Inspection frequency: Maximizing profitme - Replacement models.	
Unit I	II Maintenance Logistics	9 Hours
Optima	n factors - Crew size decisions: Learning curves - Simulation - Maintenance resource real size of service facility - Optimal repair effort - Maintenance planning - Maintenance scher control - Capital spare.	
Unit F	V Maintenance Quality	9 Hours
Mainta		Design for
	enance excellence - Five Zero concept - FMECA - Root cause analysis - System effectivenes ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance.	- Design for
mainta	ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance.	9 Hours
mainta UNIT TPM f	ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance.	9 Hours
mainta UNIT TPM 1 Effecti	ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance. V Total Productive Maintenance features - Chronic and sporadic losses - Equipment defects - Six major losses - Overa iveness - TPM pillars - TPM implementation Autonomous maintenance. Total Total Total Total	9 Hours
mainta UNIT TPM f	ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance. V Total Productive Maintenance features - Chronic and sporadic losses - Equipment defects - Six major losses - Overa iveness - TPM pillars - TPM implementation Autonomous maintenance. Total Total	9 Hours
mainta UNIT TPM 1 Effecti	ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance. V Total Productive Maintenance features - Chronic and sporadic losses - Equipment defects - Six major losses - Overa iveness - TPM pillars - TPM implementation Autonomous maintenance. Total Total	9 Hours
mainta UNIT TPM 1 Effecti Referee 1.	ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance. V Total Productive Maintenance features - Chronic and sporadic losses - Equipment defects - Six major losses - Overa iveness - TPM pillars - TPM implementation Autonomous maintenance. Total Total	9 Hours
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mainta UNIT TPM f Effecti Refere 1. 2. 3.	ainability - Maintainability allocation - CMMS - Reliability Centered Maintenance. V Total Productive Maintenance features - Chronic and sporadic losses - Equipment defects - Six major losses - Overa iveness - TPM pillars - TPM implementation Autonomous maintenance. Total Total Total Total Total Total Total Ences Higgins & Morrow , Maintenance Engineering Handbook,Eighth Edition,2008 K.S Andrew, Jardine and Albert H.C.Tsang, Maintenance, Replacement and Reliability Francis, 2006. Bikas Badhury and S.K.Basu, Tero Technology: Reliability Engineering and Maintenance	9 Hours 11 Equipment 45 Hours y, Taylor and Management,
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	Pre-requ	isite						Assessi	ment Pat	-			0
•]	Basic principles of erg		cs.		N	lode of	Assess				eigł	itage(%
	Personal Protective Ed	-			С	ontinuo	ous Inte	rnal Ass	sessment		U	40	
					S	emester	r End E	xaminat	tions			60	
Course	Objectives												
• 7	To learn about the cor	icepts o	f work	study									
• 7	To develop knowledg	e on ap	plicatio	n of erg	gonomi	e princi	ples and	d physic	ology of w	vorkers.			
• 7	To study the concept of	of perso	onal pro	tective	equipm	ent, see	ction an	d usage					
•	To understand process	s and ec	uipmer	nt desig	n incor	poratin	g safety	·					
	To understand the ma			-									
			liit ojot	•									
Program	nme Outcomes (POs)											
PO1	Apply knowledge of	engine	ering st	pecialis	ation fo	r hazar	d identi	fication	and risk a	assessme	nt.	analvs	se
_	the cause of an incid											5	
PO4	Conduct investigation					d gene	rate con	rective	and prev	entive m	eas	ures, 1	iO
	prevent recurrence of	of accide	ents in i	industri	es.								
Course	Outcomes (COs)												
	ents will be able to												
CO1	Compare the work	and ind	icate m	ethods	for safe	operat	ion.						
CO2	Implement ergonor												
CO3	Identify different P						-	ed on the	e hazard.				
CO4	Explain built in saf												
CO5	Indicate the human	risk fa	ctors in	the ma	n mach	ine syst	em.						
Articula	tion Matrix												
		CO.	PO1	PO2	PO3	PO4	PO5	PO6					
		No.											
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Unit I	Work Stud	lv										9 Hoi	ars
Unit I	Work Stud	ły										9 Ho)(

Selection of plant locations, Safe layout, equipment layout, Study of operations - work content - work procedure - breakdown - human factors - safety and method study - methods and movements at the workplace - substitution with latest devices - robotic concepts - applications in hazardous workplaces - productivity, quality and safety (PQS).

58 Syllabi: M.E.-Industrial Safety Engineering | Minimum Credits to be Earned:71 | Regulations 2024

Unit II	Ergonomics	9 Hours
of electrical	applications of ergonomic principles in the shop floor - work benches - seating arrangen panels- switch gears - principles of motion economy - location of controls - displa ndations - work platforms, fatigue, physical and mental strain - accident- physiology o	y locations -
Unit III	Personal Protection	9 Hours
	personal protective equipment - types selection of PPE - invisible protective barriers - pection and testing - quality - standards - ergonomic considerations in personal protective	
Unit IV	Process and Equipment Design	9 Hours
machine lay	gn - equipment - instrument - selection concept modules - various machine tools - in- out-machine guarding-safety devices and methods - selection, inspection, maintenan tory provisions, operator training and supervision - hazards and prevention.	
machine lay usage - statu UNIT V Job and per	out-machine guarding-safety devices and methods - selection, inspection, maintenant tory provisions, operator training and supervision - hazards and prevention. Man Machine Systems rsonal risk factors - standards-selection and training-body size and posture body	nce and safe 9 Hours y dimension
machine lay usage - statu UNIT V Job and pe (static/dynar	out-machine guarding-safety devices and methods - selection, inspection, maintenant tory provisions, operator training and supervision - hazards and prevention. Man Machine Systems	nce and safe 9 Hours y dimension
machine lay usage - statu UNIT V Job and pe (static/dynar of reducing)	out-machine guarding-safety devices and methods - selection, inspection, maintenant tory provisions, operator training and supervision - hazards and prevention. Man Machine Systems rsonal risk factors - standards-selection and training-body size and posture body nic) - adjustment range - penalties - guide lines for safe design and postures - evaluation	nce and safe 9 Hours y dimension
machine lay usage - statu UNIT V Job and pe (static/dynar of reducing] References	out-machine guarding-safety devices and methods - selection, inspection, maintenant tory provisions, operator training and supervision - hazards and prevention. Man Machine Systems rsonal risk factors - standards-selection and training-body size and posture body nic) - adjustment range - penalties - guide lines for safe design and postures - evaluation posture strain. Total	nce and safe 9 Hours y dimension and methods 45 Hours
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Course (Objectives				~		2110 2				00	
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	To impart knowledge filtration, electro dialy		sical tr	eatmen	ts proc	esses si	ich as s	sedimen	tation, revers	e osm	osis, l	Nanc
	To provide knowledge flotation, ion exchange				nt proc	esses su	ich as c	oagulat	ion flocculati	on, pre	ecipita	tion,
• 7	To develop skill in De	sign of	Conver	ntional	Water '	Treatmo	ent Plar	nts.				
•	To afford knowledge o	on Desi	gn of Ir	ndustria	l Wate	r Treatr	nent an	d Recla	mation.			
Program	nme Outcomes (POs))										
PO2	Establish, implemen	t, and	maintai	n conti	inuous	improv	ement	on indu	strial safety	manae	emen	t to
101	ensure a risk-free wo									C	,	
PO3	Recognise and evalu											
	appropriate hazard c	ontrols	, follow	ing the	e hierar	chy of o	controls	s relevai	nt to occupation	onal h	ealth	and
DO (safety practices.	1	.1			1			1			
PO4	Conduct investigation					d gene	rate coi	rective	and preventi	ve me	asures	, to
	prevent recurrence o			nausui	CS .							
Course	Outcomes (COs)											
	ents will be able to											
CO1	Explain the character	aristic c	fwatar	• the sc	urces o	fwater	nollute	nts and	wastewater t	rontme	nt	
CO1	Indicate the physica											ion
02	electro dialysis etc.	ii iicaii	nemo p	1000330	5 Such	as sean	montati	011, 1000	ise osmosis,	Ivano	minai	UII,
CO3	Identify and explain	the che	emical t	reatme	nt proce	esses su	ch as co	agulatio	on flocculatio	n, prec	ipitat	ion,
	flotation, ion excha				1			U		1	1	
CO4	Assess the Design of											
CO5	Execute the Industr	ial Wat	er Trea	tment a	nd Rec	lamatic	n					
Articula	tion Matrix											
		C O .										
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		4		2	3	2						
		5		3	3	3						
Unit I	Introductio	on	L	L	ı	·	ı	ıI			9 H	ours

Characteristics of wastewater - Aerobic Treatment of Wastewater - Suspended growth processes, Activated sludge process, Aerated lagoons Anaerobic Treatment of Wastewater - Sludge digesters, Suspended growth

Processes, Attached growth Processes Standards for performance - Significance and need for physico-chemical treatment.

Unit II	Physical Treatment Principles	9 Hours

Principles of Screening - Mixing, equalization- Sedimentation - Filtration - Modelling - Back washing - Evaporation - Incineration - Gas transfer - Mass transfer coefficients - Adsorption - Isotherms Principles, equilibrium and kinetics, reactors, regeneration, membrane separation, Reverse Osmosis, Nano filtration ultra-filtration and hyper filtration - Electro dialysis, distillation - Stripping and crystallization - Recent Advances.

Unit III	Chemical Treatment Principles	9 Hours

Principles of Chemical treatment - Coagulation flocculation - Precipitation - flotation, solidification and stabilization - Disinfection - Ion exchange, Electrolytic methods, Solvent extraction - advance oxidation reduction - Recent Advances.

Unit IV	Design of Conventional Treatment Plants	9 Hours	1
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Aerators chemical, feeding-Flocculation-clarifier filters Rapids and filter, slow sand filter, pressure filter Chlorinators Displacement and gaseous type. Layouts - flow charts- Hydraulic Profile O and M aspects Case studies Residue management- Up gradation of existing plants Recent Advances.

UNIT V Design Of Industrial Water Treatment and Reclamation	
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9 Hours

45 Hours

Total

60

Selection of process - Design of softeners- Demineralizers - Wastewater reclamation - Reverse osmosis plants - Residue management - O and M aspects - Recent Advances - Case studies.

References

- 1. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse, Tata McGraw-Hill, Fourth Edition, 2009
- 2. Lee, and Shundar Lin, Handbook of Environmental Engineering Calculations, McGraw-Hill, 1999.
- 3. S.R Qasim, E M Motley, and G Zhu, Water works Engineering Planning, Design and Operation, Prentice Hall, 2002.
- 4. T J.Casey, Unit Treatment Processes in Water and Wastewater Engineering, John Wiley and Sons, 1993.
- 5. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, 1999.
- 6. www.gpcb.gov.in

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	To impart knowledge			•	-							
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	To provide knowledg			•	-	tion mo	delling	•				
	To create knowledge			-	ment.							
• ′	To inculcate knowled	ge on ri	sk asse	ssment.								
Program	nme Outcomes (POs	5)										
PO1	Apply knowledge o	f engine	ering s	pecialis	ation fo	or hazar	d identi	ification	n and risk asses	ssmen	t. anal	/se
101	the cause of an incid											
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PO4	Conduct investigati	on, ana	yse the	e root c	ause an	id gene	rate co	rrective	and preventiv	e me	asures,	to
	prevent recurrence	of accide	ents in	industri	es.							
Course	Outcomes (COs)											
	lents will be able to											
CO1	Understand the rel		-				ess.					
CO2	Do Failure data an											
CO3	Gain knowledge or					n model	ling.					
CO4	Familiarise with R			gement	•							
CO5	Do risk assessmen	t in indu	stry.									
Articula	tion Matrix											
						r	r					
		CO .	PO1	PO2	PO3	PO4	PO5	PO6				
		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6				
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		No.	3	PO2	PO3	3	PO5	PO6				
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Unit II	Failure Data Analysis	9 Hours
Time to far	ilure distributions-Exponential, normal, Gamma, Weibull, ranking of data probabi	lity plotting
techniques-	Hazard plotting.	
Unit III	Reliability Prediction Models	9 Hours
	arallel systems -RBD approach -Standby systems - m/n configuration-Application of Ba set method - Markov analysis - Fault Tree Analysis - limitations.	yes theorem
Unit IV	Reliability Management	9 Hours
Reliability a	esting - Reliability growth monitoring - Non-parametric methods - Reliability and life illocation - Replacement model.	
UNIT V	Risk Assessment	9 Hours
Definition a assessment.	nd measurement of risk- risk analysis techniques -risk reduction resources-industrial sa	fety and risk
	Total	45 Hours
References		
1. L.S.	Srinath, Reliability Engineering, Affiliated East-West Press, New Delhi, 2005	
	rles Ebling, An Introduction to Reliability and Maintainability Engineering, Tata McGra hi, 2000.	w Hill, New
3. Sing	giresu S.Rao, Reliability Engineering, Pearson Education India, New Delhi, 2016.	
4. K.C	. Kapur and L.R. Lamberson, Reliability in Engineering Design, Wiley India, New Dell	ni, 2009
5. Rog	er D. Leitch, Reliability Analysis for Engineers – An Introduction, Oxford University I	Draga 1005

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	ISO 45001- Dev certification proc											

Unit II	Policy and Planning, Implementation and Operation	9 Hours
controls -Leg roles respon participation	airements, OH and S policy, Planning- Hazard identification, risk assessment and gal and other requirements-Objectives and program (s), Implementation and operatio sibility, accountability and authority- Competence, training and awareness -Cor and consultation Documentation - Control of documents - Operational control and response.	n-Resources, nmunication,
Unit III	Checking and Review Guidelines	9 Hours
nonconformi guidelines fo	Performance measurement and monitoring-Evaluation of compliance-Incident is ty, corrective action and preventive action- Control of records-Internal audit-Manager r implementation of ISO 45001 -Examples of items for hazard identification checklist sment tool and methodologies.	nent review -
Unit IV	ISO 14001 and ISO 9000	9 Hours
management	ion plan, Registration, Importance of ISO 14000 to the Management. Guidelines for e systems auditing -General principles, Managing audit programme - Audit activities, s	nvironmental
management Audit plan. (ion plan, Registration, Importance of ISO 14000 to the Management. Guidelines for en systems auditing -General principles, Managing audit programme - Audit activities, s Competence of auditors.	nvironmental steps in audit,
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6. http://pozhproekt.ru/nsis/bs/management/BS-8800-2004.pdf

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	Basic information	•	rious hoo					sessment	vve	igi	40	(/0
	construction machiner		nous nea				xamina				60	
	Objectives	y.			emester	Liid L	Xamma	.10115			00	
	0	1					<i></i>					
	To study the accident		-	•		constru	ction.					
•	To understand the haz	ards of con	struction an	nd prev	ention.							
•	To provide knowledge	e on safety	while worki	ing at h	neights.							
•	To educate on the safe	e operation	and mainter	nance c	of const	ruction	machir	neries.				
	To expose to the cond	-										
•	To expose to the cond	1110115 01 5a	iety in deniv	onnon	WOIKS.							
Program	mme Outcomes (POs))										
PO1	Apply knowledge of	engineerin	g specialisa	tion fo	r hazaro	d identi	fication	and risk ass	sessmen	it, a	analy	se
	the cause of an incid										2	
PO3	Recognise and evalu										termi	ne
	appropriate hazard c	ontrols, fol	lowing the	hierarc	chy of c	controls	s releva	nt to occupa	tional h	nea	lth a	nd
	safety practices.											
DOI		n analyse	the meat as	use and	d gener	rate con	rective	and nreven	tive me	0.01		
PO4	Conduct investigation				u gener			and preven		ası	ares,	to
	prevent recurrence o	f accidents	in industrie	es.	-			-				
PO4 PO6		f accidents icate the sa	in industrie afety matter	es. rs, rules	s and re	egulatio	ons to th	e employee	es and se			
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Unit I	Accidents Causes and Management Systems	9 Hour
related to contractua	impeding safety in construction industry- causes of fatal accidents, types and causes various construction activities, human factors associated with these accident- construction al clauses-Pre contract activates, preconstruction meeting-design aids for safe constructio lity assurance in construction - compensation - Recording of accidents and safety measure ng.	n regulations n -permits to
Unit II	Hazards Of Construction and Prevention	9 Hour
inspection and post-l	ons, basement and wide excavation, trenches, shafts - scaffolding, types, causes of accide a checklist - false work - erection of structural framework, dismantling -tunnelling - blast blast inspection-confined spaces-working on contaminated sites- work over water-road v structions-construction of high rise buildings.	ing, pre blas
Unit III	Working at Heights	9 Hour
ystems -	working on fragile roofs, work permit systems, height pass- accident case studies.	
Unit IV	Construction Machinery	9 Hour
Selection, checklist safety in e machines,	Construction Machinery , operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crar -builders hoist, winches, chain pulley blocks- use of conveyors - concrete mixers, concret earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pur , use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoi nveyors and mobile cranes- manual handling.	ne inspectio te vibrators nps, weldin
Selection, checklist safety in e machines, use of cor	, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crar -builders hoist, winches, chain pulley blocks- use of conveyors - concrete mixers, concre earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pur , use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoi	ne inspectio te vibrators nps, weldin sting cranes
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checklist - safety in e machines, <u>use of cor</u> <u>UNIT V</u> Safety in e method st girders an	, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crar- builders hoist, winches, chain pulley blocks- use of conveyors - concrete mixers, concre- earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pur , use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoi- nveyors and mobile cranes- manual handling. Safety In Demolition Work demolition work, manual, mechanical, using explosive-keys to safe demolition, pre surve atement, site supervision, safe clearance zone, health hazards from demolition -Indian stan id beams - first aid - fire hazards and preventing methods - interesting experiences at the st the fire accidents.	ne inspection te vibrators nps, welding sting cranes 9 Hour y inspection dard-trusses construction
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	Hazards in textile proce	•						sessment		// CI	40	(70
- 1	iuzurus in textite prote	units					xamina		-		60	
Course (Objectives											
•]	Γo provide the knowled	dge on texti	le Machi	neries, j	product	s and th	ne hazar	ds involv	ved.			
•]	Γo learn the hazards in	textile proc	essing su	ich as lo	ooms, k	nitting	and nor	n-ovens.				
•]	Γo study various hazard	ls in textile j	processin	g such a	as bleac	hing, d	yeing, p	unting, f	inishing	and	lefflue	nts.
t	Γο enhance and develop o textile industry, statu n textile industry.											
Progran	nme Outcomes (POs)											
PO1	Apply knowledge of e											se
	the cause of an incide											
PO3	Recognise and evalua appropriate hazard co											
	safety practices.	101015, 10110	owing in			Controls	sieleva		upation	ai ii	cann a	lu
PO4	Conduct investigation	n, analyse t	he root c	ause an	d gene	rate con	rective	and pre-	ventive	mea	sures,	to
	prevent recurrence of	accidents in	n industri	ies								
PO6	Effectively communic safe handling of equip	cate the saf	ety matte	ers, rule						d so	ociety f	òr
Course (safe handling of equip Dutcomes (COs) ents will be able to	cate the saf	ety matte	ers, rule ng a saf	è work	ing env	ironmer	nt in indu	astries.	d sc	ociety f	òr
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Course (The stud CO1 CO2 CO3 CO4 CO5	safe handling of equip Outcomes (COs) ents will be able to Analyze the overview Identify the hazards Explain various haz effluents. Infer knowledge on industry Implement the statue in textile industry.	cate the safe pment and r w of the tex in textile pr ards in textile pr ards in text Health haz es applicable No. 1 3 2 3 3 2	tile Mach ocessing tile processing tile processing	rrs, rule ng a saf nineries such as essing s textile e indus PO3 3 2 2 2	e work , produ- slooms such as industr try, inc PO4 3 2 2	cts and , knittin bleach y and y luding e	the haz g and n ing, dy welfare effluent PO6 3 2 2	ards invo on-oven veing, pu measure	olved. s. inting, f	inis fic 1	hing a	nd
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Unit I	Introduction	9 Hours
synthet manufa	uction to process flow charts of i) short staple spinning, ii) long staple spinning, iii) viscose tic fiber, manufacturer, iv) spun and filament yarn to fabric manufacture, v) jute spinning and acture-accident hazard, guarding of machinery and safety precautions in opening, carding ag, flyer frames and ring frames, doubles, rotor spinning, winding, warping, softening/spinning	d jute fabric g, combing,
Unit II	I Textile Hazards I	9 Hours
	ent hazards i) sizing processes- cooking vessels, transports of size, hazards due to steam ii) looms and shuttle less looms iii) knitting machines iv) nonwovens.	Loom shed
Unit II	II Textile Hazards II	9 Hours
Scourii	ng, bleaching, punting, mechanical finishing operations and effluents in textile processes.	
Health	hazards in textile industry related to dust, fly and noise generated control measures- relevant o	occupationa
Health disease precaut	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments.	try, Special
disease	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments.	occupational
Health disease precaut UNIT Releva	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments.	ccupationa try, Specia 9 Hours
Health disease precaut UNIT Releva	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments. V Safety Status ant provision of factories Act and rules and other statues applicable to textile industry effluer aste disposal in textile industry	ecupationa try, Specia 9 Hours nt treatmen
Health disease precaut UNIT Releva and wa	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments. V Safety Status ant provision of factories Act and rules and other statues applicable to textile industry effluer aste disposal in textile industry	ecupationa try, Specia 9 Hours nt treatmen
Health disease precaut UNIT Releva and wa	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments. V Safety Status ant provision of factories Act and rules and other statues applicable to textile industry effluer aste disposal in textile industry Total ences Safety in Textile Industry, Thane Belapur Industries Association, Mumbai,2007.	ecupationa try, Specia 9 Hours nt treatmen
Health disease precaut UNIT Releva and wa Refere	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments. V Safety Status ant provision of factories Act and rules and other statues applicable to textile industry effluer aste disposal in textile industry Total ences	ccupationa try, Specia 9 Hours
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Health disease precaut UNIT Releva and wa Refere 1. 2.	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments. V Safety Status Int provision of factories Act and rules and other statues applicable to textile industry effluer aste disposal in textile industry Total ences Safety in Textile Industry, Thane Belapur Industries Association, Mumbai,2007. 100 Textile fires analysis, findings and recommendations LPA,2008. E.B.Groover and D.S.Hamby, Hand book of textile testing and quality control, New York: T Publishers, 1960.	9 Hour 179, Specia 9 Hour 10 Hour 145 Hour
Health disease precaut UNIT Releva and wa Refere 1. 2. 3.	hazards in textile industry related to dust, fly and noise generated control measures- relevant o es, personal protective equipment-health and welfare measures specific to textile indust tions for specific hazardous work environments. V Safety Status Int provision of factories Act and rules and other statues applicable to textile industry effluer aste disposal in textile industry Total ences Safety in Textile Industry, Thane Belapur Industries Association, Mumbai,2007. 100 Textile fires analysis, findings and recommendations LPA,2008. E.B.Groover and D.S.Hamby, Hand book of textile testing and quality control, New York: T Publishers, 1960.	9 Hour 179, Specia 9 Hour 10 Hour 145 Hour

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	P	Pre-requis	site					A	Assessment Pattern	-		Ū
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	e	1				Co	ntinuou	us Intern	nal Assessment		100	
						Se	mester	End Ex	aminations			
Course Ob	jectives											
• Illu	strate that	how to in	nprove	your w	riting sl	kills an	d level o	of reada	bility.			
• Lea	arn about v	vhat to wr	ite in e	ach sec	tion.							
• Re	cognize the	e skills ne	eded w	hen wri	iting a 🛛	Fitle.						
• Ens	sure the go	od quality	of pap	er at ve	ery first	time s	ubmissi	on.				
Programm	e Outcom	es (POs)										
PO2	An ability	to write a	nd pres	sent a si	ubstanti	ial tech	nical rej	port/doc	cument.			
Course Ou												
The studen	ts will be a	ble to										
CO1	Illustrate th	ne researc	h ideas	and wr	iting jo	urnal p	apers.					
	Creating re				85	1	1					
	0			- 0								
Articulatio	on Matrix											
		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6				
		1	101	2	1.00		100	100				
		2		3								
Unit I											6 H	ours
Planning a	nd Prenara	ation Wo	rd Ord	er Bree	akina u	n long	senten	res Str	ucturing Paragraphs	and	Sente	nces
Being Cond										anu	Jenter	ices,
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Unit II											6 H	ours
Clarifying	Who Did V	What Hig	hliohtir	ng You	· Findir	ngs Her	loino a	nd Criti	cising, Paraphrasing	and F	Plaoria	rism
Sections of					i i indii	155, 110		na enu	ensing, i urupinusing	una 1	iugiui	15111,
	-											
Unit III											<u>6 H</u>	ours
Review of	the Literati	ure, Metho	ods, Re	sults, D	oiscussi	on, Cor	clusior	ns, The	Final Check.			
Unit IV											9 H	ours
									eded when writing			
		eded wh	en wi	riting	an In	troducti	on, sł	cills n	eeded when writi	ng a	ı Re	view
of the Liter	ature.											

UNIT	V	6 Hours
	are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Conclusions.	needed when
D.f.	Total	30 Hours
Refere	nces Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books	2)
2.	Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press	·)
3.	Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM.	
4.	Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrech London, 2011.	t Heidelberg

		COST	MANAC	GEME	NT OF	ENGI	NEER	ING PF	ROJECT	S	L		
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	executio	1	s and s	tages o	or proje				nal Asses	smont	wei	ghtage 100	(%
	executio	011.							aminatio			100	
Course	Objecti	ves				50	mester		ammation	15			
	Č.	erstand the cost	concen	ts and a	lifferent	stages	ofpro	iect eve	cution an	d its activ	ities		
			-			-				u ns acuv	nies.		
•	10 unde	rstand cost be	laviour,	manag	ement a	na its c	Juantita	liive lec	nniques.				
Program	nme Ou	tcomes (POs)											
PO1	Anahi	lity to indepen	dently c	arry ou	t researc	h / inv	esticati	on and a	levelonm	ent work i	to solve	practic	-a1
101	proble		dentry ca	arry ou	t researe	/11 / 111 V	cstigati		ie veropin		10 30170	practic	aı
PO3	1.1	nts should be	able t	to dem	onstrate	e a de	egree d	of mast	ery over	the are	a of C	Comput	er
		e and Enginee										-	
PO4		ently design, b							vare for $\overline{\mathbf{c}}$	listributed	1 and ce	entraliz	ed
		ting environm											
PO5		stand the wor											
		onents and desi											
		professionals							research	i orientati	on for a	a lifeloi	ng
	protes	sional develop	ment in	compu	ter and a	automa	ation are	enas.					
[°] he stud CO1	lents wil	tes (COs) l be able to y the cost conc					nd its a	otivities					
The stud CO1 CO2 CO3	lents wil Apply Analy Analy	l be able to	stages o haviour	of proje and va	ect exect rious typ	ution at	costing.						
CO1 CO2 CO3 CO4	lents wil Apply Analy Analy	l be able to y the cost conc yze the various yze the cost be yze the cost ma	stages o haviour	of proje and va	ect exect rious typ	ution at	costing.						
CO1 CO2 CO3 CO4	lents wil Apply Analy Analy Analy	l be able to y the cost conc yze the various yze the cost be yze the cost ma atrix	stages o haviour	of proje and van ent and	ect exect rious typ budget 1	ution at the sof of the second	costing. decisio	ons.					
CO1 CO2 CO3 CO4	lents wil Apply Analy Analy Analy	l be able to y the cost conc yze the various yze the cost be yze the cost ma atrix	stages of haviour anageme	of proje and van ent and	ect exect rious typ budget 1	ution at the sof of the second	costing. decisio	ons.					
CO1 CO2 CO3 CO4	lents wil Apply Analy Analy Analy	l be able to y the cost conc yze the various yze the cost be yze the cost ma atrix CO. No	stages of haviour anageme	of proje and van ent and	ect exect rious typ budget 1 PO3	ution at oes of c related PO4	costing. decisio PO5	ons.					
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The stud CO1 CO2 CO3 CO4 Articula	lents wil Apply Analy Analy Analy	l be able to y the cost conc yze the various yze the cost be yze the cost matrix CO. No 1 2 3 4 Cost Conce	stages of haviour anageme PO1 1 1 epts in E	of proje and van ent and PO2 Decision	PO3 1 1 n-Makin	PO4 1	PO5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	PO6					
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CO1 CO2 CO3 CO4 Articula	Analy Analy	l be able to y the cost conc yze the various yze the cost be yze the cost matrix CO. No 1 2 3 4 Cost Conce Differential co	stages of haviour anageme PO1 1 1 1 pts in E ost, Incr Creation	PO2 PC2 PC2 PC2 PC2 PC2 PC2 PC2	PO3 1 1 1 n-Makin 1 cost a	PO4 1 ng	PO5 1 1 1 1 pportun	PO6	t. Objecti			g Syste	en ro

documents Project team: Role of each member. Importance Project site: Data required wit Unit III Cost Behaviour and Profit Planning Marginal Costing	th significa	ance.
Unit III Cost Behaviour and Profit Planning Marginal Costing		
		9 Hours
Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pri- Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time Requirement Planning, Enterprise Resource Planning.	icing strate	gies: Pareto
Unit IV Total Quality Management and Theory of Constraints		9 Hours
UNIT V Quantitative Techniques for Cost Management		9 Hours
Relevant provision of factories Act and rules and other statues applicable to textile indus	stry effluer	
Relevant provision of factories Act and rules and other statues applicable to textile indus	stry effluer	9 Hours
Relevant provision of factories Act and rules and other statues applicable to textile indus and waste disposal in textile industry	stry effluer Total	
Relevant provision of factories Act and rules and other statues applicable to textile indus and waste disposal in textile industry References	Total	nt treatmen
Relevant provision of factories Act and rules and other statues applicable to textile indus and waste disposal in textile industry References 1. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book C	Total	nt treatmen
Relevant provision of factories Act and rules and other statues applicable to textile indus and waste disposal in textile industry References	Total	nt treatmen

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										aminations		100	
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• To	overco	ome	stress by]	practic	ing yog	a.							
Programn	ne Out	com	es (POs)										
												<u> </u>	
			independ	lently c	arry ou	t resear	ch / inv	estigati	on and	development work to	solve	practio	cal
	oroblem		•.	1	. 1		1. 1 .	1	. / 1				
PO2 <i>A</i>	An abili	ty to	write and	d prese	nt a sub	ostantia	l techni	cal repo	ort/doci	iment.			
Course Ou	utcome	s (C											
The studen													
1110 510000													
CO1	Develo	p he	althy min	d in a l	healthy	body th	nus imp	roving	social l	nealth also.			
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Unit I												10 Ho	urs
Definition	f D	1. 4		() -	1. 4								
Definitions	s of E1g	nt pa	arts of yo	ga. (As	ntanga)							
Unit II												10 Ha	ure
												10 110	Juis
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santosh, ta						mnsa, s	satya, a	sincya,	orannia	aonarya and aparigra	11a, 11) Shau	JIIa,
builtobii, tu	p.,	, and je											
Unit III												10 Ho	ours
Asan and	Pranaya	am, i	i) Variou	s yog p	oses a	nd their	r benefi	its for r	nind &	body ii)Regularizati	ion of	breatl	ning
techniques										5 7 8			0
-													
										Tota	al	30 Ho	ours
Reference	S												
1. Yo	ogic As	sanas	s for Gr	oup T	rainino	-Part-I	Janard	an Swa	ami Yo	ogabhyasi Mandal,	Nagn	ur. Ma	odel
			Engineer										
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	ne strengtns			of disa	ster				aminations		100	
	bjectives	ippioaene				30	mester		ammations			
• L	earn to demo	nstrate a	critical	unders	tanding	ofkey	concep	ts in dis	aster risk reduction	and hu	manitar	ian
	esponse.											
	ritically eval erspectives.	uate disa	ster ris	k reduc	tion and	d huma	nitarian	respor	se policy and practi	ce fro	m multi	iple
• D	-					humani	tarian r	esponse	e and practical relev	vance	in spec	ific
	-						ofdia	stor m	ana comant annua ak		nnina	and
									anagement approach y or the countries th			and
P	logiaillillig			nines, p	anticult	ing the		count	y of the countries th	cy wo	IK 111.	
Program	me Outcom	es (POs)										
PO1	An ability to	independ	lently c	arry ou	t resear	ch / inv	esticati	on and	development work to	solve	practic	al
	problems.	macpene	ientry e	uiiy ou	t resear		ostigati	on and	development work a	5 50170	praetie	ai
	An ability to	write an	d prese	nt a sub	ostantia	l techni	cal repo	ort/doci	iment.			
	•		- I				<u>r</u>					
	Outcomes (C											
The stude	ents will be al	ole to										
CO1			icepts i	n disast	an minte							
CO2	Interpret th								tarian response.			
	-	-							tarian response. ement approaches,	plan	ning aı	nd
	programmi	-								plan	ning aı	nd
	-	-								planı	ning ar	nd
	-	-								plan	ning ar	nd
	programmin	-	gths ar		knesses					plan	ning ar	nd
	programmin	ng.	gths ar	nd wea	knesses	s of d	isaster	manag		plan	ning ar	nd
	programmin	ng. CO. No. 1	gths ar PO1 1	nd wea	knesses	s of d	isaster	manag		plan	ning ar	nd
	programmin	ng. CO. No.	gths ar	nd wea	knesses	s of d	isaster	manag		plan	ning ar	nd
Articulat	programmin	ng. CO. No. 1 2	PO1 1 2	nd wea	knesses	s of d	isaster	manag		plan		
	programmin	ng. CO. No. 1	PO1 1 2	nd wea	knesses	s of d	isaster	manag		plan	ning ar	
Articulat Unit I	programmin ion Matrix	ng. CO. No. 1 2 roductio	PO1 1 2 n	PO2 1	PO3	PO4	PO5	manag PO6	ement approaches,		5 Ho	urs
Articulat Unit I Disaster:	programmin ion Matrix Int Definition,	CO. No. 1 2 roduction Factors	PO1 1 2 n And S	PO2 1 ignifica	PO3	PO4	PO5	manag PO6			5 Ho	urs
Articulat Unit I Disaster:	programmin ion Matrix	CO. No. 1 2 roduction Factors	PO1 1 2 n And S	PO2 1 ignifica	PO3	PO4	PO5	manag PO6	ement approaches,		5 Ho	urs
Articulat Unit I Disaster:	programmin ion Matrix Int Definition, Disasters: D	CO. No. 1 2 roduction Factors	PO1 1 2 n And S c, Natur	PO2 1 ignifica re, Type	PO3	PO4	PO5 ce Betude.	manag PO6	ement approaches,		5 Ho	urs And
Articulat Unit I Disaster: Manmade Unit II	ion Matrix ion Matrix Definition, Disasters: D Rej	CO. No. 1 2 roduction Factors Difference	PO1 1 2 n And S c, Natur	PO2 1 ignifica re, Type Disaster	PO3	PO4 PO4 Differen Magnit	PO5 ce Bet ude.	PO6	ement approaches,	er; Na	5 Ho atural A 5Ho	urs And urs
Articulat Unit I Disaster: Manmade Unit II Economic	programmin ion Matrix Int Definition, Definition, Disasters: D Rep c Damage, Lo	CO. No. 1 2 roduction Factors Difference percussion percussion	PO1 1 2 And S c, Natur ons of I man an	PO2 1 ignifica re, Type Disaster d Anim	PO3 PO3 al Life,	PO4 PO4 Differen Magnit Hazard	PO5 ce Bet ude.	PO6	ement approaches,	er; Na	5 Ho atural A 5Ho urthqual	urs And urs (ces,
Articulat Unit I Disaster: Manmade Unit II Economic Volcanism	ion Matrix ion Matrix Definition, Disasters: D Rep c Damage, Lo ns and Cyclo	CO. No. 1 2 roduction Factors Difference Dercussion Doss of Hunnes, Tsur	PO1 1 2 And S And S And S Matur ons of I man and mamis a	PO2 1 ignifica re, Type Disaster d Anim nd Floo	PO3 PO3 Res And Res An	PO4 PO4 Differen Magnit Hazard Destru ughts a	PO5 ce Bet ude. ls ction of nd Fam	PO6	ement approaches,	er; Na ers: Ea nches	5 Ho atural A 5Ho arthqual Man-m	urs And urs ces, ade
Articulat Articulat Unit I Disaster: Manmade Unit II Economic Volcanism disaster N	ion Matrix ion Matrix Definition, Disasters: D Rep c Damage, Lo ns and Cyclo Juclear React	CO. No. 1 2 roduction Factors Difference Difference Difference Difference Difference	PO1 1 2 And S And S And S Matur ons of I man and mamis a	PO2 1 ignifica re, Type Disaster d Anim nd Floo	PO3 PO3 Res And Res An	PO4 PO4 Differen Magnit Hazard Destru ughts a	PO5 ce Bet ude. ls ction of nd Fam	PO6	ement approaches,	er; Na ers: Ea nches	5 Ho atural A 5Ho arthqual Man-m	urs And urs ces, ade
Articulat Articulat Unit I Disaster: Manmade Unit II Economic Volcanism disaster N	ion Matrix ion Matrix Definition, Disasters: D Rep c Damage, Lo ns and Cyclo	CO. No. 1 2 roduction Factors Difference Difference Difference Difference Difference	PO1 1 2 And S And S And S Matur ons of I man and mamis a	PO2 1 ignifica re, Type Disaster d Anim nd Floo	PO3 PO3 Res And Res An	PO4 PO4 Differen Magnit Hazard Destru ughts a	PO5 ce Bet ude. ls ction of nd Fam	PO6	ement approaches,	er; Na ers: Ea nches	5 Ho atural A 5Ho arthqual Man-m	urs And urs ces, ade
Articulat Unit I Disaster: Manmade Unit II Economic Volcanism disaster N	ion Matrix ion Matrix Definition, Definition, Disasters: D Rep c Damage, Lo ns and Cyclo Juclear React s War and Co	CO. No. 1 2 roduction Factors Difference Difference Difference Difference Difference	PO1 1 2 n And S c, Natur man and amis a lown, I	PO2 1 ignifica re, Type Disaster d Anim nd Floc ndustria	PO3 PO3 al Life, ods, Drc	PO4 PO4 Differen Magnit Hazard Destru ughts a	PO5 ce Bet ude. ls ction of nd Fam	PO6	ement approaches,	er; Na ers: Ea nches	5 Ho atural A 5Ho arthqual Man-m	urs And urs ces, ade and

Study of Seism	c Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Ar	eas Prone To
Cyclonic And C	oastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And I	Epidemics.
Unit IV	Disaster Preparedness and Management	5 Hours
	Ionitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: A	
	g, Data From Meteorological And Other Agencies, Media Reports: Govern	nmental And
Community Pre	paredness.	
Unit V	Disaster Mitigation	9 Hours
	Total	30 Hours
References		
1. R. Nish book C	th, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "	, New Royal
	ompany.	
New De	ardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice 1	Hall Of India,
3. Goel S	ardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice 1	

24XE05				VA	LUE E	DUCA	TION			L 2	T P 0 0	C 0
	P	re-requis	ite						Assessment Pattern		1 - 1 -	
• Aw	areness ab	out ethics	and hu	uman va	alue	M	ode of .	Assessi	ment	Wei	ghtage	e(%)
						Co	ontinuo	us Inter	nal Assessment		100	
						Se	mester	End Ex	aminations			
Course Ob	jectives											
	erpret value				develoj	pment.						
• Im	bibe good v	values in s	student	s.								
• Let	the should	l know ab	out the	import	ance of	fcharac	ter.					
Programm	e Outcom	es (POs)										
	n ability to roblems.	independ	lently c	arry ou	t resear	ch / inv	estigati	on and	development work to	solve	practi	cal
	n ability to	write and	d prese	nt a sub	ostantia	l techni	cal repo	ort/docu	ument.			
			1				-1.					
Course Ou	tcomes (C	Os)										
The studen	ts will be al	ble to										
	Knowledge											
	Learn the ir											
CO3	Developing	g the over	all pers	onality	•							
Articulatio	on Matrix											
				r	1	r	1	1	1			
		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6				
		1	1									
		2	1									
		3		1								
		11							J			
Unit I											8 Ho	nurs
		1							k ethics- Indian visio	n of l	iumani	ism-
Moral and	non- morai	valuation	i-Stand	ards an	a princ	ipies-v	aiue juc	igemen	Its.			
Unit II											7 Ho	ours
-						•			reliance- Confidence Unity- Patriotism- I			
Unit III											8 Ho	ours
Punctuality	- Love an d and relig	id Kindn gious tole	ess- A rance-	void fa True fri	ault Th iendshi	ninking∙ p-Happ	- Free iness V	from a s suffe	ve Thinking- Integrit anger- Dignity of 1 ering- love for truth ire.	abour	-Unive	ersal

Unit IV		7 Hours
Character and C	ompetence -Holy books vs Blind faith, Self-management and Good health.	Science of
reincarnation, Eq	uality, Nonviolence ,Humility, Role of Women. All religions and same message	e, Mind your
Mind, Self-contro	l. Honesty, Studying effectively.	
	Total	30 Hours
References		

24XE06				PED	AGOO	GY STU	JDIES			L T P 0 2 0 0 0
	P _	re-requis	ite						Assessment Pattern	
• A	wareness abo			ng techr	niques	M	ode of .			Weightage(%
				-8					mal Assessment	100
						Se	mester	End Ex	kaminations	
Course O	bjectives									·
u: • Ic	ndertaken by lentify critica	the DfID al evidence	, other	agenci	es and 1	esearcl	ners	n prog	grammer design and	l policy making
PO1			lently c	arry ou	t resear	ch / inv	estigati	on and	development work to	o solve practical
	problems.									
Course O	Outcomes (C	Os)								
	ints will be al									
						a a d 1	41			-1
CO1				es are t	being u	sed by	teache	rs in f	formal and informal	classrooms in
CO2	developing What is the			e effec	tivenes	of the	se nede	unging	l practices, in what	conditions and
02	with what p				rvenes	s or the	se peuz	igogica	ii practices, iii what	conditions, and
CO3					culum :	and pra	cticum) and t	he school curriculun	n and guidance
000	materials be									ir and guraanee
		1 1		1	0 0,		1	5		
A 1 - 4	ion Matrix									
Articulat	Ion Matrix									
		CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	7	
				102	105	104	105	100	_	
		1	1							
		2	1							
		3	1							
J nit I	Int	roductio	n and l	Method	lology					8 Hours
	Int	rouuctio	i ana i	incense	lology					0 Hours
	m- Teacher								terminology-Theor ions-Overview of m	
U nit II	The	ematic O	vervie	W						7 Hours
00	cal practices m, Teacher e		-	by teac	hers in	formal	and in	formal	classrooms in devel	loping countries
Unit III	Evi	dence on	the E	ffective	eness of	' Pedao	ogical	Practio	ces	8 Hours
		achee on				15	-S-cul			0 Hours
(curriculu Theory of	im and practi f change, Stre	cum) and ength and	the scl nature	hool, cu e of the	irriculu body c	m and g of evide	guidanc nce for	e mate effecti	studies. How can te rials best support effe ve pedagogical, prac dagogic strategies.	ective pedagogy

U nit I V	7 Professional Development	7 Hours
	ent with classroom practices and follow up, Support Peer support, Support from the head nity, Curriculum and assessment, Barriers to learning: limited resources and large class si	
	Total	30 Hours
Refere	nces	
1.	Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compar 261.	e, 31 (2): 245-
2.	Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal Studies, 36 (3): 361-379	of Curriculum
3.	Akyeampong K (2003) Teacher training in Ghana - does it count. Multi-site teacher educ project (MUSTER) country report 1. London: DFID	cation research
4.	Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning and reading in Africa: Does teacher preparation count? International Journal Educational 33 (3): 272-282	
5.	Alexander RJ (2001) Culture and pedagogy: International comparisons in primary eduand Boston: Blackwell.	cation. Oxford
6.	Chavan M (2003) Read India: A mass scale, rapid, "learning to read" campaign.	

24XE07		BUSI	NESS A	ANAL	YTICS			L	T P	C
								2	0 0	0
	Pre-requi						Assessment Patte			
•]	Business analytics with	nin an organiza	tion.			Assessn		Wei	ghtage	(%)
							nal Assessment		100	
0				Se	mester	End Ex	aminations			
	Objectives									
•]	llustrate the role of bu	siness analytics	s within	an org	anizatio	on.				
	Analyze data using sta inderlying business pro				hniques	and u	nderstand relatio	nships be	etween	the
	To gain an understand problems and to support					analyt	ics to formulate	and solv	e busin	ess
• 7	To become familiar wi	th processes ne	eded to	develo	p, repo	rt, and	Analyze business	s data.		
	Jse decision-making malytical and manager		ons rese	earch t	echniqu	ues and	l Manage busir	ness proc	cess us	ing
Progran	nme Outcomes (POs)									
PO1	An ability to independ	lently corry out	trecente	h / intr	etionti	on and a	levelonment wor	k to solve	nractio	<u>_1</u>
101	problems.	ucinity carry ou	i researc	/11 / 11110	Joingaille	JII allu (evelopment wor	K IU SUIVE	practic	aı
PO4	Efficiently design, b	uild and devel	op syst	em an	olicatio	n softw	are for distribut	ed and ce	entralize	ed
101	computing environme									
PO5	Understand the work						ardware architec	tures, the	softwa	re
	components and desig									
	with professionals i	n various eng	gineering	g field	s and	pursue	research orienta	ation for a	a lifeloi	ıg
	professional develop	ment in compu	ter and a	automa	tion are	enas.				
PO6	Model a computer							that exp	lore t	ne
	understanding of the	tradeoffs invol	ved in d	ligital t	ransfor	mation.				
<u>C</u>	$\mathbf{D}_{\mathbf{r}}$									
	Dutcomes (COs) ents will be able to									
	ents will be able to									
	Implement the know	/ledge of data a	analytics	5.						
The stud	Implement the know Apply the ability of				isions l	based of	n data and deep a	inalytics.		
The stud CO1	*	think critically	in maki	ing dec					o suppo	ort
The stud CO1 CO2 CO3	Apply the ability of Analyze the ability business decision-m	think critically to use technic aking.	in maki cal skill	ing dec s in pi	redicati	ve and	prescriptive mo		o suppo	ort
The stud CO1 CO2 CO3 CO4	Apply the ability of Analyze the ability business decision-m Determine the abilit	think critically to use technic aking. y to translate d	in maki cal skill ata into	ing dec s in pi clear, a	redicati actional	ve and	prescriptive mo		o suppo	ort
The stud CO1 CO2 CO3	Apply the ability of Analyze the ability business decision-m	think critically to use technic aking. y to translate d	in maki cal skill ata into	ing dec s in pi clear, a	redicati actional	ve and	prescriptive mo		o suppo	rt
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit	think critically to use technic aking. y to translate d	in maki cal skill ata into	ing dec s in pi clear, a	redicati actional	ve and	prescriptive mo) suppo	rt
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit Analyze the decision tion Matrix	think critically to use technic aking. y to translate d problems in b	in maki cal skill ata into pusiness	ing dec s in pr clear, a analyt	redicati actional ics.	ve and ble insig	prescriptive mo		o suppo	rt
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit Analyze the decision	think critically to use technic aking. y to translate d problems in b	in maki cal skill ata into	ing dec s in pi clear, a	redicati actional	ve and	prescriptive mo		o suppc	rt
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit Analyze the decision tion Matrix	think critically to use technic aking. y to translate d problems in b	in maki cal skill ata into pusiness	ing dec s in pr clear, a analyt	redicati actional ics.	ve and ble insig	prescriptive mo) suppo	ort
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit Analyze the decision tion Matrix	think critically to use technic aking. y to translate da problems in b PO1 PO2	in maki cal skill ata into pusiness	ing dec s in pr clear, a analyt PO4	redicati actional ics. PO5	ve and ble insig	prescriptive mo) suppo	ort
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit Analyze the decision tion Matrix CO. No. 1 2	think critically to use technic aking. y to translate da problems in b PO1 PO2 2 2 2	in maki cal skill ata into pusiness	ing dec s in pr clear, a analyt PO4 2 2	redicati actionatics. PO5	ve and ble insig PO6	prescriptive mo		o suppo	ort
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit Analyze the decision tion Matrix CO. No. 1 2 3	think critically to use technic aking. y to translate da problems in b PO1 PO2 2 2 1	in maki cal skill ata into pusiness	ing dec s in pr clear, a analyt PO4 2	redicati actionatics. PO5	ve and ble insig PO6	prescriptive mo		o suppo	ort
The stud CO1 CO2 CO3 CO4 CO5	Apply the ability of Analyze the ability business decision-m Determine the abilit Analyze the decision tion Matrix CO. No. 1 2	think critically to use technic aking. y to translate da problems in b PO1 PO2 2 2 2	in maki cal skill ata into pusiness	ing dec s in pr clear, a analyt PO4 2 2	redicati actionatics. PO5	ve and ble insig PO6	prescriptive mo) suppo	ort

Unit I	Business Analytics and Statistical Tools	6 Hours
Business Anal Statistical Not	Business analytics, Scope of Business analytics, Business Analytics Process, Re lytics Process and organisation, competitive advantages of Business Analytics-Stati tation, Descriptive Statistical methods, Review of probability distribution and dat estimation methods overview.	istical Tools:
Unit II	Trendiness and Regression Analysis	6 Hours
Analytics Pers	elationships and Trends in Data, simple Linear Regression. Important Resources sonnel, Data and models for Business analytics, problem solving, Visualizing and Expyrics Technology.	
Unit III	Organization Structures of Business Analytics	6 Hours
Measuring con predicative Mo	ment, Management Issues, Designing Information Policy, Outsourcing, Ensuring I ntribution of Business analytics, Managing Changes. Descriptive Analytics, predicti odelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimiza	ve analytics, Prescriptive
Measuring compredicative Measuring analytics and in	ntribution of Business analytics, Managing Changes. Descriptive Analytics, prediction of Business analytics analysis, Data Mining, Data Mining Methodologies,	ve analytics, Prescriptive tion.
Measuring con predicative Me analytics and in Unit IV Qualitative and Series, Forecas	ntribution of Business analytics, Managing Changes. Descriptive Analytics, prediction of Business analytics analysis, Data Mining, Data Mining Methodologies, its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimiza	ive analytics, Prescriptive tion. 6 Hours tionary Time
Measuring con predicative Me analytics and in Unit IV Qualitative and Series, Forecas	Analytics, Managing Changes. Descriptive Analytics, prediction odelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimiza Forecasting Techniques d Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Statisting Models for Time Series with a Linear Trend, Forecasting Time Series with	ive analytics, Prescriptive tion. 6 Hours tionary Time
Measuring con predicative Me analytics and in Unit IV Qualitative and Series, Forecas Regression For Unit V Formulating D	Antribution of Business analytics, Managing Changes. Descriptive Analytics, prediction odelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimiza Forecasting Techniques d Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Statistical Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with precasting with Casual Variables, Selecting Appropriate Forecasting Models.	ive analytics, Prescriptive tion. 6 Hours tionary Time Seasonality, 6 Hours cision Trees,
Measuring cor predicative Me analytics and in Unit IV Qualitative and Series, Forecas Regression For Unit V Formulating D The Value of I	Antribution of Business analytics, Managing Changes. Descriptive Analytics, prediction odelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimiza Forecasting Techniques d Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Statistical Forecasting Models for Statistical Forecasting Models, Forecasting Time Series with a Linear Trend, Forecasting Models. Decision Analysis Decision Problems, Decision Strategies with the without Outcome Probabilities, De	ive analytics, Prescriptive tion. 6 Hours tionary Time Seasonality, 6 Hours
Measuring cor predicative Me analytics and in Unit IV Qualitative and Series, Foreca: Regression For Unit V Formulating D The Value of I References 1. Busine	Antribution of Business analytics, Managing Changes. Descriptive Analytics, prediction odelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimiza Forecasting Techniques d Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Statistical Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with recasting with Casual Variables, Selecting Appropriate Forecasting Models. Decision Analysis Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision, Utility and Decision Making.	ve analytics, Prescriptive tion. 6 Hours tionary Time Seasonality, 6 Hours cision Trees, 30 Hours