

ALAGAPPA UNIVERSITY

(Accredited with A+ Grade by NAAC (CGPA: 3.64) in the Third Cycle,
Graded as Category-I University and granted autonomy by MHRD-UGC)

DIRECTORATE OF COLLABORATIVE PROGRAMMES



MBA in Rail Safety Management

Regulations and Syllabus

[For those who join the Course in July 2023 and after]

CHOICE BASED CREDIT SYSTEM

GENERAL INSTRUCTIONS AND REGULATIONS

MBA Rail Safety conducted by Alagappa University, Karaikudi, Tamil Nadu through its Collaborative Institution. Applicable to all the candidates admitted from the academic year **2023** onwards.

1. Eligibility:

Candidate for admission to **MBA Environment and Industrial Safety** shall be required to have passed in any bachelor degree with 55% marks from recognized University/Institution.

2. For the Degree:

The candidates shall have subsequently undergone the prescribed programme of study in a institute for not less than two academic years comprising 4 semesters, passed the examinations prescribed and fulfill such conditions as have been prescribed therefore.

3. Admission:

Admission based on the marks in the qualifying examination.

4. Duration of the course:

The course shall extend over a period of two years under semester pattern accounting to four semesters.

5. Standard of Passing and Award of Division:

a. Students shall have a minimum of 50% of total marks of the University examinations in each subject. The overall passing minimum is 50% both in aggregate of Continuous Internal Assessment and external in each subject.

b. The minimum marks for passing in each theory / Lab course shall be 50% of the marks prescribed for the paper / lab.

c. A candidate who secures 50% or more marks but less than 60% of the aggregate marks, shall be awarded **SECOND CLASS**.

d. A candidate, who secures 60% or more of the aggregate marks, shall be awarded **FIRST CLASS**.

e. The Practical / Project shall be assessed by the two examiners, by an internal examiner and an external examiner.

6. Continuous internal Assessment:

a. Continuous Internal Assessment for each paper shall be by means of Written Tests, Assignments, Class tests and Seminars

b. **25 marks** allotted for the Continuous Internal assessment is distributed for Written Test, Assignment, Class test and Seminars.

c. Two Internal Tests of 2 hours duration may be conducted during the semester for each course / subject and the best marks may be considered and one Model Examination will be conducted at the end of the semester prior to University examination. Students may be asked to submit at least five assignments in each subject. They should also participate in Seminars conducted for each subject and marks allocated accordingly.

d. Conduct of the continuous internal assessment shall be the responsibility of the concerned faculty.

e. The continuous internal assessment marks are to be submitted to the University at the end of every year.

- f. The valued answer papers/assignments should be given to the students after the valuation is over and they should be asked to check up and satisfy themselves about the marks they have scored.
- g. All mark lists and other records connected with the continuous Internal Assessments should be in the safe custody of the institution for at least one year after the assessment.

7. Attendance:

- Students must have earned 75% of attendance in each course for appearing for the examination.
- Students who have earned 74% to 70% of attendance to be applied for condonation in the prescribed form with the prescribed fee.
- Students who have earned 69% to 60% of attendance to be applied for condonation in the prescribed form with the prescribed fee along with the medical certificate.
- Students who have below 60% of attendance are not eligible to appear for the examination. They shall re-do the semester(s) after completion of the programme.

8. Examination:

Candidate must complete course duration to appear for the university examination. Examination will be conducted with concurrence of Controller of Examinations as per the Alagappa University regulations. **University may send the representatives as the observer during examinations.** University Examination will be held at the end of the each semester for duration of 3 hours for each subject. Certificate will be issued as per the AU regulations. **Hall ticket will be issued to the 1st year candidates and upon submission of the list of enrolled students along with the prescribed course fee, subsequent 2nd year hall tickets will be issued.**

9. Miscellaneous

- a. Each student possess the prescribed text books for the subject and the workshop tools as required for theory and practical classes.
- b. Each student is issued with an identity card by the University to identify his / her admission to the course
- c. Students are provided library and internet facilities for development of their studies.
- d. Students are to maintain the record of practicals conducted in the respective laboratory in a separate Practical Record Book and the same will have to be presented for review by the University examiner.
- e. Students who successfully complete the course within the stipulated period will be awarded the degree by the University.

10. Fee structure

Course fee shall be as prescribed by the University and 50% of the course fee should be disbursed to University. Special fees and other fees shall be as prescribed by the Institution and the fees structure must be intimated to the University. Course fees should be only by Demand draft / NEFT and AU has right to revise the fees accordingly.

Pattern	Course Fee payment deadline
Semester	Fee must be paid before 10 th September of the academic year

11. Other Regulations:

Besides the above, the common regulation of the University shall also be applicable to this programme.

Course Structure

S. No	Study Components	Int.	Ext.	Marks	No. of Subjects	Total
1.	Core course	25	75	100	15	1500
2.	Elective Course	25	75	100	3	300
3.	Non – Major Elective Course	25	75	100	2	200
4.	Project	25	75	100	1	200
	TOTAL	-	-	-	28	2200

VISION

- To Produce competent safety professional of excellent technical and managerial skills for national and global development

MISSION

- To provide best education in safety engineering & management , encouraging innovation and entrepreneurship though professional and moral ethics to improve the Environmental Health , safety & Quality of the people world wide.
- To provide knowledge based technological fire safety and hazard management measures to meet the infrastructural urban development needs of the society and the industry.
- To help in building national capabilities in fire safety engineering, security management, disaster management, hazard management industrial safety education and research to ensure a fire safenation.
- To pursue research and development R&D in fire safety engineering, hazard management and disseminate its findings.

Program Outcome (POs)-On successful completion of the MBA Rail Safety

PO1	Students acquire fundamental knowledge and skills on the Industrial Safety and Hygiene
PO2	Gain advanced level knowledge, techniques, skills and modern tools in the field of Industrial Safety and Hygiene
PO3	Recognize, assess and manage hazards and health risks prevailing at different occupational and environmental settings
PO4	Understand the Hygiene risk factors prevailing in communities and inform appropriate policy actions to improve Hygiene of Workers at Factories and Industries.
PO5	Enhance the research and analytical skills to design and conduct quality research in the area of occupational and environmental health
PO6	Acquire in-depth knowledge on the various disciplines related to the field of occupational and environmental health
PO7	Critically think, analyze the data and interpret information on the basis of economic, political, social, ethical and cultural context
PO8	Be efficient in occupational and environmental health practice with leadership qualities and relevant skills
PO9	Demonstrate knowledge and understanding of the Industrial Safety and Hygiene and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary
P10	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological

Program Specific Outcome (PSOs)

After the successful completion of the Industrial Safety and Hygiene program, the students are expected to

PSO1	Prevent harm to workers, property, the environment and the general public by identifying hazardous conditions and practices and implementing alternative practices and/or corrective measures.
PSO2	Promote occupational health and safety within organizations by communicating to workers and management about risks and hazards and training workers how to prevent risks and hazards and how to protect themselves while performing various job-related tasks.
PSO3	Advise management on how to increase worker productivity through raising morale and reducing absenteeism and equipment downtime while saving on insurance, workers' comp. benefits, and litigation expenses by presenting cost effective safety and health prevention measures.
PSO4	Respond to an accident or incident by utilizing emergency response plans, investigating the event, assisting the worker(s) with immediate and long term rehabilitation with a focus on returning to work and by promoting corrective action to prevent a similar incident from happening again.

PSO5

Maintain complete safety and health records as required by law and by company policy and preparing.

Program Education Objective- MBA (Rail Safety) Program

1. An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to occupational safety and health.
2. An ability to formulate or design a system, process, procedure or program to meet desired needs.
3. An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.
5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.
6. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

Program Specific Objective MBA (Rail Safety)

1. Anticipate, recognize, evaluate and control hazardous conditions and practices affecting people, property and the environment;
2. Communicate and interact effectively with technical and non-technical audiences;
3. Integrate ethical, social, current, and global issues and responsibilities in their practice as a professional in the field;
4. Work individually or on a team to critically analyze, interpret, and provide leadership to address and manage problems in occupational safety and health; and
5. Recognize that the practice of occupational safety and health requires ongoing learning, and undertake appropriate activities to address this need.

MBA in Rail Safety Management

S. No	Course Code	Courses	Title of the paper	T/P	Credits	Hours/Week	Marks			
							I	E	Total	
I Semester										
1	84211	Core 1	Organisational Behaviour and Management	T	4	4	25	75	100	
2	84212	Core 2	History and Evolution of Indian Railways	T	4	4	25	75	100	
3	84213	Core 3	Process Safety Management in Rail Sectors	T	4	5	25	75	100	
4	84214	Core 4	Basics of Fire Safety	T	4	5	25	75	100	
5	84215	Core 5	Management of Stress, Time and Project	T	4	4	25	75	100	
6	84216A	DSE-1	I)Electrical and Chemical Safety Management	T	4	5	25	75	100	
	84216B		II)Safety in Tunneling							
			Library/ Yoga/counseling/Field Visit			3				
					24	30	150	450	600	
II Semester										
7	84221	Core 6	EHS law and Acts w.r.t Rail Industry	T	4	4	25	75	100	
8	84222	Core 7	Standard on Rail Safety	T	4	4	25	75	100	
9	84223	Core 8	Safety in Material handling	T	4	4	25	75	100	
10	84224	Core 9	Environmental Safety	T	4	4	25	75	100	
11	84225	Core 10	Accident Investigation and Reporting	T	4	4	25	75	100	
12	84226A	DSE- 2	I) Health Hazards in Rail Industries	T	4	5	25	75	100	
	84226B		II) Human Psychology and Ergonomics							
	84226C		III) Hazard Identification ,Risk Assessment and RiskControl							
13	84227	NME	Non-Major Elective: Emerging Food trends	T	2	3	25	75	100	
15	84228	SLC	Self-learning course MOOCs	T	Extra credit					
			Library/ Yoga/ counseling/Field Visit			2				
					26	30	175	525	700	
III Semester										
16	84231	Core 11	Construction Safety	T	4	4	25	75	100	
15	84232	Core 12	Rail Industries Safety	T	4	4	25	75	100	
16	84233	Core 13	Behaviour Based safety	T	4	4	25	75	100	
17	84234	Core 14	Food Safety and Hygiene in Rail Catering	T	4	4	25	75	100	
18	84235	Core 15	Safety Inspection and Audit	T	4	4	25	75	100	
19	84236A	DSE-3	I) Handling, Storage and Transportation of DangerousGoods & Wastes	T	4	5	25	75	100	
	84236B		II) Disaster Management							
	84236C		III)Logistics and Supply Chain Management							
20	84237		Non-Major Elective: Entrepreneurship	T	2	3	25	75	100	
21	84238	SLC	Self-learning course MOOCs **	T	Extra credit					
			Library/ Yoga/ Counselling/ Field Visit	-		2				
					26	30	175	525	700	
IV Semester										
22	84241A 84241B	Core 16	***Dissertation Work or Internship Programme	D/ I	14	30	50	150	200	
Total						14	30	50	150	200
						90+Extra Credit	120	550	1650	2200

MBA (Rail Safety) (2023 Onwards)

1stSemester

CORE	Course code:84211	Organisational Behavior and Management	T	Credits:4	Hours:4
Pre-requisite				Syllabus Revised	2023-2024
Course Objectives	<ol style="list-style-type: none"> To familiarize the basic information about principles of management. To educate on leadership and social and ethical responsibilities of management. To learn about elements of good control system. To provide knowledge about organizational behaviour and conflict. To learn about work stress and international business. 				
UNIT I	Management- Meaning- Characteristics-Concepts –Approaches -Evolution- Fayol’s Principles of Management. - Management Theories-Planning –importance -merits & Demerits –principles –steps –planning & Forecasting- Decision Making –methods –process-Organisation –Principles –Formal & Informal Organisation				
UNIT II	Leadership-Elements -Characteristics -Principles -Theories-Styles- Motivation-Importance – Theories-Delegation of Authority- Centralization & Decentralization-Span of Management-Line & Staff-Manpower Planning- Recruitment & Selection-Steps in Selection Procedure-Management Development -Social & Ethical Responsibilities of Management -Criteria for Social Responsibilities- 10 Commandments of Corporate Social Responsibilities-Ethics of Managers				
UNIT III	Controlling-Elements of Control-Essential of Good Control System-Functions of Controller-Techniques of Control-Characteristics of Effective Control System-Management Information Systems -International Management-Role of Global Managers.				
UNIT IV	Organizational Behaviour- Nature –Scope -Elements -Genesis and Concept - Theories on Personality- Factors Influencing Perception-Process of Learning-Group Behaviour-Classification of Groups-Group Development- Functions of Group-Size of Group- Group Structure-Characteristics of Effective Groups Communication-Conflict- Genesis of Conflict-Stages of Conflict- Conflict Process-Symptoms among Conflicting Persons-Managing Conflict.Hersey-Blanchard’s Situational Theory				
UNIT V	Work Stress-Sources of Stress-Coping Strategies for Stress-Nature of Organisational Effectiveness-Approaches to Effectiveness-Managerial Implication. International Organisational Behaviour-Growth of International Business- Trends in International Business-Cultural Differences and Similarities-Culture Shock-Motivation across Cultures- Organization Structures across Cultures				
References					
1. Robert Krcitner, Management, ATTBS					
2. Weirich & Koontz, Management - A Global perspective, McGraw Hill					
3. Helliregarl, Management, Thomson Learning, 2002					
4. Robbins.S.P.Fundamentals of Management, Pearson, 2003					
Related online content (MOOC, Swayam, NPTEL, Website etc.)					
https://onlinecourses.swayam2.ac.in/cec20_ge19/preview					
https://onlinecourses.nptel.ac.in/noc22_ce70/preview					
Course outcomes					Knowledge level
CO-1	To describe the basic concepts of management principles.				K1
CO-2	To illustrate about leadership and recruitment shipping.				K2
CO-3	To identify the elements of good control system.				K3
CO-4	To explain the importance of organizational behaviour and conflict.				K4
CO-5	Determine the concepts of work stress and organizational culture.				K5

On what level it correlated with COs & POs -based on that we have to give marks

Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1(L)	-	1(L)	-	-	1(L)	-	1(L)	-	1(L)
CO2	-	1(L)	-	-	1(L)	-	1(L)	-	1(L)	-
CO3	1(L)	1(L)	-	1(L)	-	1(L)	-	1(L)	-	1(L)
CO4	-	1(L)	-	1(L)	-	1(L)	-	-	1(L)	-
CO5	1(L)	-	1(L)	-	1(L)	-	1(L)	-	-	1(L)
W.AV	1	1	1	1	1	1	1	1	1	1

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1(L)	-	1(L)	-	-
CO2	-	1(L)	-	-	1(L)
CO3	1(L)	-	-	1(L)	-
CO4	-	1(L)	1(L)	-	-
CO5	1(L)	-	1(L)	-	-
W.AV	1	1	1	1	1

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) (2023 Onwards)					
Ist Semester					
CORE	Course code:84212	History & Evolution of Indian Railways	T	Credits:4	Hours:4
Pre-requisite			Syllabus Revised	2023-2024	
Course Objectives	1. To familiarize the basic information about History of Indian Railways. 2. To educate on Evolution of Indian Railways 3. To learn about Infrastructure of Indian Railways 4. To provide knowledge about Manufacturing Capacity of Indian Railways. 5. To learn about Major Rail Accidents in India.				
UNIT I	History of Indian Railways: Introduction - History of Indian Railways - Bombay to Thane Service - Inaugural to Victoria Terminus -Howrah Station - GIPR Motor Coach - Train in Bhore Ghats - Vyasarpaady to Arcot-Allahabad to Kanpur - Narrow Gauge -Meter Gauge - Broad Gauge - Electrified Locomotives-Coaching Vehicles - Freight Wagons-Stations - Yards-GoodSheds - Repair Shops-Workforce				
UNIT II	Evolution of Indian Railways: Launch of Passenger Rail Services Famine & Economic Growth Moves towards Centralization Electrification & Hard Times - Partition & Zonal Creation - Technology & Phasing Out Steam-Moving Online - Future of Indian Railways				
UNIT III	Infrastructure of Indian Railways: Manufacturing - Network - Services - Urban Rail Private Railways - UNESCO World Heritage Sites-Station Categories - Travel Classes-Train Types-Tourism - Ticketing				
UNIT IV	Manufacturing Capacity of Indian Railways: Integral Coach Factory - Rail Coach Factory - Modem Coach Factory-Different Categories & Types of Coaches in Indian Railways-Different Classes of Travel in Indian Rails				
UNIT V	Major Rail Accidents in India: Bihar train disaster Firozabad rail disaster Collision of Awadh-Assam Express and Brahmaputra Mail Khanna rail disaster - Gyaneshwari Express train derailment - Pamban- Dhanuskodi passenger train - Howrah-New Delhi Rajdhani Express				
References					
1. Udai Pareek, Understanding Organisational Behaviour, 2 Edition, Oxford HigherEducation, 2004. 2. Sanoy Banerjee, "Industrial hazards and plant safety", Taylor & Francis, London, 2003. 3. Mc Shane & Von Glinov, Organisational Behaviour, 4 Edition, Tata Mc Graw Hill, 2007.					
Related online content (MOOC, Swayam,NPTEL, Website etc.)					
https://nptel.ac.in/courses/109103171					
https://nptel.ac.in/courses/105107123					
Course outcomes				Knowledgelevel	
CO-1	To the basic concepts of History of Indian Railways			K1	
CO-2	To summarizes the knowledge about Evolution of Indian Railways.			K2	
CO-3	To Discuss the Infrastructure of Indian Railways			K4	
CO-4	To compare the different Rail coach Factories			K5	
CO-5	To Elaborate the Major Rail Accidents			K6	

On what level it correlated with COs & POs -based on that we have to give marks
Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1(L)	-	1(L)	-	-	1(L)	-	1(L)	-	1(L)
CO2	-	1(L)	-	-	1(L)	-	1(L)	-	1(L)	-
CO3	1(L)	1(L)	-	1(L)	-	1(L)	-	1(L)	-	1(L)
CO4	-	1(L)	-	1(L)	-	1(L)	-	-	1(L)	-
CO5	1(L)	-	1(L)	-	1(L)	-	1(L)	-	-	1(L)
W.AV	1	1	1	1	1	1	1	1	1	1

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1(L)	-	1(L)	-	-
CO2	-	1(L)	-	-	1(L)
CO3	1(L)	-	-	1(L)	-
CO4	-	1(L)	1(L)	-	-
CO5	1(L)	-	1(L)	-	-
W.AV	1	1	1	1	1

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) (2023 Onwards)					
I st -Semester					
CORE	Course code:84213	Process safety management in rail sectors	T	Credits:4	Hours:5
Pre-requisite				Syllabus Revised	2023-2024
Course Objectives	1. To familiarize the basic information about process safety. 2. To provide technical knowledge in process hazard analysis. 3. To educate on process safety elements. 4. To analyze the incident investigation methods. 5. To learn about emergency planning and response.				
UNIT I	Process Safety Information: Hazards of Regulated Substance – Block Flow Diagram – Process Chemistry –Maximum Intended Inventory–Upper&LowerLimits–Consequences of Deviation – Materials of Construction – Piping & Instrumentation Diagrams –Electrical Classification – Relief System Design – Ventilation System Design –Design Codes &Standards–Materials &Energy Balances– Safety Systems				
UNIT II	Process Hazard Analysis, Operating Procedures & Training: Introduction –Deciding the Methods of PHA – Limitations of PHA’s – Prioritizing PHA’s– Methods for Conducting the PHA: What If, Checklist, HAZOP, FMEA,FTA – PHA Team – PHA Findings – Review & Revalidation – Description of Operating Procedure– Elements of Operating Procedure–Availability of Operating Procedure–Initial Training– Intermittent Training–On the Job Training– Refresher Training– Training Documentation				
UNIT III	Mechanical Integrity, Management of Change, Prestart up Review & Compliance Audits: Mechanical Integrity–Training–Equipment Deficiencies&Quality Assurance–Management of Change–Prestart Up Review–Compliance Audits				
UNIT IV	Incident Investigation, Employee Participation & Trade Secrets: Incident Investigation–Investigation Methodologies –Investigation Questionnaire–Employee Participation–Trade Secrets				
UNIT V	Hot Work Permit, Contractors & Emergency Response: Hot Work Permit–Contractor Selection–Principle Employer Responsibilities–Contractor Employer Responsibilities – Emergency Planning & Response				
References <ol style="list-style-type: none"> 1. “Process Safety Management Manual” US Department of Labor, OSHA3132, Reprinted on 2000 2. “DOE Handbook–Process Safety Management for Highly Hazardous Chemicals”, US Department of Energy 3. “Risk Management Plan (RMP) & Process Safety Management (PSM) Manual”, Newington Energy, General Electric Contractual Services, Triton Environmental Inc 4. “Chemical Process Safety : Learning from Mistakes ”, Roy E. Sanders, Butterworth-Heinemann, Elsevier. 					
Related online content (MOOC, Swayam, NPTEL, Website etc.) <ul style="list-style-type: none"> • https://archive.nptel.ac.in/courses/103/107/103107156 • https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ch19 					
Course outcomes				Knowledge level	
CO-1	To describe the fundamental concepts of process safety management.			K1	
CO-2	To Identify the process hazard analysis methods.			K3	
CO-3	To Generate the importance of process safety elements			K4	
CO-4	To determine the knowledge about incident investigation.			K5	
CO-5	To Discuss about handling of emergencies.			K6	

On what level it correlated with COs & POs -based on that we have to give marks
Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	M(2)	L(1)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)
CO2	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO3	-	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)
CO4		L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	L(1)	M(2)	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)
W.AV	1	1.6	1.6	1.8	1.4	1.4	1.6	1.4	1.6	1.6

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	L(1)	M(2)	M(2)	M(2)
CO2	L(1)	M(2)	L(1)	M(2)	L(1)
CO3	L(1)	L(1)	M(2)	M(2)	M(2)
CO4	L(1)	L(1)	L(1)	M(2)	M(2)
CO5	L(1)	M(2)	L(1)	L(1)	L(1)
W.AV	1.2	1.4	1.4	1.8	1.6

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) (2023 Onwards)

I-Semester

Core	Course code:84214	Basics of Fire Safety	T	Credits:4	Hours:5
Pre-requisite	Basic Knowledge of Basics of Fire Safety		Syllabus Revised	2023-2024	
Course Objectives	<ol style="list-style-type: none"> To provide an in depth knowledge about the science of fire. To understand the causes and effects of fire. To know the various fire prevention systems and protective equipments. To understand the science of explosion and its prevention techniques. To understand the various fire prevention techniques to be followed in a building. 				
UNIT I	FUNDAMENTALS OF FIRE SAFETY: Introduction-physical and chemicals properties of fire- mode of heat transfer-flash point-n fire point-AIT(auto ignition temperature- flammable and combustible-fire triangle-fire tetrahedron-explosion pentagon-BLEVE- classification of fire-causes of fire-extinguishing methods-fire extinguisher- fire load calculation-hazardous area classification- fire safety in public place, high rise building, educational institution, shopping malls, chemical labs, warehouse and garages				
UNIT II	SELECTION ,INSTALLATION& MAINTENANCE OF FIRE EXTINGUISHER: Terminology-classification of hazards-number &size of fire extinguisher-fire extinguisher size and placement- selection of location-initial inspection-installation-selection of fire extinguisher -suitability of fire extinguisher- inspection and maintenance-testing of fire extinguisher-maintenance record-rejected extinguisher-refilling-spares-maintenance- checklist				
UNIT III	SELECTION ,INSTALLATION AND MAINTENANCE OF FIRE DETECTION & ALARMSYSTEM: Terminology-general requirements-detection zone-automatics fire detectors-heat detector-smoke detectors-opticalsmoke detectors-air sampling detectors- UV flame detectors-IR flame detectors-sitting of manual call points- inspection &maintenance-test-system disconnecting during testing-spares, checklist				
UNIT IV	INSTALLATION & MAINTENANCE OF INTERNAL AND EXTERNAL FIRE HYDRANTS: Terminology-hydrant installation-underground static water tank-terrace tanks-fire pumps & pump house-risers-fireservice inlet-typical fire fighting installations/ requirements-size of mains-hose reels-water supplies & pumping arrangements-testing-maintenance-check list				
UNIT V	FIRE EXIT AND SPECIAL HAZARDS: Introduction-exit requirements-types of exits-occupant load-capacity of exit-arrangements of exits-travel distance-number of exits-fire escape & staircase –flammable and combustible liquids-upper and lower explosive limits-handling and storage of flammable & combustible liquids-hot work activities- hazards and precaution steps.				
References					
<ol style="list-style-type: none"> “Accident Prevention manual for industrial operations” N.S.C., Chicago, 1982. “Davis Daniel et al, “Hand Book of fire technology” “Fire Prevention and firefighting”, Loss prevention Association, India. Derek, James, “Fire Prevention Hand Book”, Butter Worths and Company, London, 1986. Dinko Tuhtar, “Fire and explosion protection 					
Related online content (MOOC, Swayam,NPTEL, Website etc.)					
https://archive.nptel.ac.in/courses/105/102/105102176/ https://onlinecourses.nptel.ac.in/noc20_ce09/preview					
Course outcomes					Knowledge level
CO-1	To Recall about basic concepts of fire and explosion science.				K1
CO-2	To Practice the operation of various types of fire extinguishers				K3
CO-3	To Summarise the different source of ignition and their prevention techniques				K3
CO-4	To Explain the students to effectively employ explosion protection techniques and their significances to suit the industrial requirement				K2
CO-5	To Interpret the emergency evacuation methods				K5

On what level it correlated with COs & POs -based on that we have to give marks
Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	M(2)	-	S(3)	M(2)
CO2	M(2)	M(2)	S(3)	S(3)	L(1)	M(2)	L(1)	L(1)	M(2)	L(1)
CO3	L(1)	M(2)	S(3)	S(3)	L(1)	S(3)	L(1)	M(2)	S(3)	M(2)
CO4	L(1)	L(1)	M(2)	M(2)	M(2)	S(3)	M(2)	L(1)	S(3)	L(1)
CO5	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	M(2)	M(2)	M(2)	L(1)
W.AV	1.8	1.6	2.4	2.6	1.2	2.4	1.6	1	1.6	1.4

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	L(1)	L(1)	M(2)
CO2	M(2)	M(2)	L(1)	L(1)	M(2)
CO3	M(2)	L(1)	M(2)	S(3)	S(3)
CO4	S(3)	M(2)	M(2)	L(1)	M(2)
CO5	M(2)	M(2)	L(1)	M(2)	S(3)
W.A V	2.2	1.8	1.4	1.6	2.4

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) (2023 Onwards)
I- Semester

Course code:84215	Management of Stress, Time & Project	T	Credits:4	Hours:4
Pre-requisite		Syllabus Revised	2023-2024	
Course Objectives	1.To familiarize the basic information about Stress Management 2.To educate on Techniques of Stress Management 3.To learn about Time Management 4.To provide knowledge about Project Management 5.To learn about Kaizen			
UNIT I	Stress Management: Historical Foundations - Types of Stress - Models - Fight or Flight Response - General Adaptation Syndrome -Stress Model - Transactional Stress Model - Theory of Resource Conservation Transactional Models - Health Realization Model Stress Prevention & Resilience-Measuring Stress-Effectiveness			
UNIT II	Techniques of Stress: 4 A's of Stress Management - Autogenic Training - Social Activity - Cognitive Therapy - Conflict Resolution-Cranial Release Technique-Nootropics-Physical Exercise - Stress Balls			
UNIT III	Time Management: Introduction- ABCD Analysis-Pareto Analysis - The Eisenhower Method - POSEC Method - Implementation of Goals-Task List Organization - GTD - Pomodoro			
UNIT IV	Project Management: Introduction - Project Management Types -Approaches - Benefits Realization Management -Critical Chain ProjectManagement - Earned Value Management Iterative & Incremental- Project Management - Phased Approach - Process Based Management Project Production-Management - Product Based Planning			
UNIT V	Kaizen: Overview - Point Kaizen - System Kaizen - Line Kaizen - Plane Kaizen - Cube Kaizen -Implementation			
References				
.1. Fred Luthans, Organisational Behaviour, McGraw Hill, 11 Edition, 2001. Schermerhorn, Hunt and Osbom, Organisationalbehaviour, John Wiley, 9th Edition, 2008. 2. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.				
Related online content (MOOC, Swayam,NPTEL, Website etc.)				
https://onlinecourses.nptel.ac.in/noc23_hs138/preview https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ge26/				
Course outcomes			Knowledge level	
CO-1	To the basic concepts of Stress management with Transactional Models		K1	
CO-2	To summarizes the knowledge about Techniques of Stress management		K2	
CO-3	To Discuss the Time Management with ABCD analysis		K4	
CO-4	To Explain the Project Management with Product Based Planning		K5	
CO-5	To Elaborate the Kaizen with System Kaizen		K6	

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1(L)	-	1(L)	-	-	1(L)	-	1(L)	-	1(L)
CO2	-	1(L)	-	-	1(L)	-	1(L)	-	1(L)	-
CO3	1(L)	1(L)	-	1(L)	-	1(L)	-	1(L)	-	1(L)
CO4	-	1(L)	-	1(L)	-	1(L)	-	-	1(L)	-
CO5	1(L)	-	1(L)	-	1(L)	-	1(L)	-	-	1(L)
W.AV	1	1	1	1	1	1	1	1	1	1

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1(L)	-	1(L)	-	-
CO2	-	1(L)	-	-	1(L)
CO3	1(L)	-	-	1(L)	-
CO4	-	1(L)	1(L)	-	-
CO5	1(L)	-	1(L)	-	-
W.A V	1	1	1	1	1

S –Strong (3), M-Medium (2), L- Low (1)

MBA(Rail Safety) (2023 Onwards)
I -Semester

Course code:84216A	Electrical and Chemical Safety Management	T	Credits:4	Hours:5
Pre-requisite		Syllabus Revised	2023-2024	
Course Objectives	1. To familiarize the basic information about electricity and hazards. 2. To educate on electrical hazard analysis. 3. To learn about protection from electrical hazards. 4. To provide technical knowledge in chemical exposure and safety. 5. To analyse the handling and storage of hazardous chemicals.			
UNIT I	Basics of Electricity & Hazards of Electricity: Introduction-Current-Voltage-Power-Resistance-Capacitor-Inductor - Ohm's Law -Types of Electrical Faults- Overloads -Short Circuits-Hazard Analysis-Shock-Arc- Blast - Body Parts & Effects of Shock- Heart, Pulmonary System - Indian Electricity Rules - Statutory Requirements from Electrical Inspectorate-International Standards onElectrical Safety-CPR.			
UNIT II	Electrical Hazard Analysis: Primary & Secondary Hazards - Shocks - Burns-Scalds Falls - Safety in the Use of Electricity Energy Leakage - Clearances & Insulation - Classes of Insulation - Voltage Classifications - Excess Energy - Current Surges - Over Current & Short Circuit Current- Heating Effects of Current - Electromagnetic Forces - Corona Effect - Static Electricity Sources - Electrical Causes of Fire & Explosion ionization - Spark & Arc - National Electrical Safety Code-Lightning Hazards -Lightning Arrestor -Earthing			
UNIT III	Minimizing Electrical Hazards: Fuses -Circuit Breakers & Overload Relays - Protection Against Over Voltage & Under Voltage-Safe Limits of Amperage -Safe Distance from Lines - Short Circuit Protection- No Load Protection - Earth Fault Protection - Earthing Standards-Grounding - Equipment Grounding - Miniature Circuit Breaker - Earth Leakage Circuit Breaker -Ground Fault Circuit Interrupter - Electrical Guarding - Personal Protective Equipment's.			
UNIT IV	Evaluating Hazards & Assessing Risks of Chemicals: Introduction- Types of Chemicals - Routes of Entry Sources of Information-Toxicity- Flammable, Reactive & Explosive Hazards Physical Hazards Nano materials Biohazards- Radioactive Hazards - Labeling of Chemicals - Safety Data Sheet-Globally Harmonized System - Exposure Limits WHMIS Symbols -CLP Hazard Pictogram Toxicological Properties: LC50 & LD50 Flammable Limits - Atmospheric Monitoring-Health Surveillance.			
UNIT V	Classification & Management of Hazardous Chemicals: Classification of Hazardous Chemicals Green Chemistry Acquisition of Chemicals - Inventory & Tracking of Chemicals - Transportation of Hazardous Chemicals - Emergency Information Panel HAZCHEM Code - Personal Protective Equipment for Chemicals - Chemical Exposure Risk Assessment-Hierarchy of Risk Controls-General Guidelines for Safe Storage & Handling - Chemical Storage Tanks Design Considerations.			
References				
1. Electrical Safety Handbook, Hardcover – by <u>John Cadick</u> (Author), <u>Mary Capelli-Schellpfeffer</u> (Author), <u>Dennis Neitzel</u> (Author) 2. <u>Practical Guide to Electrical Safety</u> ,Author(s) : <u>R K Jain</u>				
Related online content (MOOC, Swayam, NPTEL, Website etc.)				
https://onlinecourses.swayam2.ac.in/nou20_cs08/preview https://alison.com/course/chemical-safety-process-safety-managment				
Course outcomes				Knowledge level
CO-1	To define the fundamental concepts of electricity and risks.			K1
CO-2	To express the knowledge about analysis of electrical hazards.			K2
CO-3	To identify the concepts about electrical protection devices.			K3
CO-4	To simplify the hazards and risks of chemicals.			K4
CO-5	To evaluate the safe storage and transportation of chemicals.			K5

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.A	1.8	2.2	1.8	2.6	2.2
V					

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) (2023 Onwards)

Ist Semester

DSE-I	Course code:84216B	Safety in Tunneling	T	Credits:4	Hours:5
Pre-requisite				Syllabus Revised	2023-2024
Course Objectives	1.To familiarize the basic information about Opencast Mines 2.To educate on Underground Mines 3.To learn about Tunneling Safety 4.To provide knowledge about Risk Assessment in Tunneling 5.To learn about Accident analysis and management in Tunneling				
UNIT I	Opencast Mines: Causes And Prevention Of Accident From: Heavy Machinery, Belt And Bucket Conveyors, Drilling. Hand Tools- Pneumatic Systems, Pumping. Water, Dust, Electrical Systems, Fire Prevention- Garage Safety-Accident Reporting System-Working Condition-Safe Transportation -Handling of Explosives.				
UNIT II	Underground Mines: Fall of Roof and Sides-Effect of Gases-Fire and Explosions-Water Flooding-Warning Sensors- Gas Detectors-Occupational Hazards-Working Conditions-Winding and Transportation.				
UNIT III	Tunneling: Hazards From Ground Collapse, Inundation And Collapse Of Tunnel Face, Falls From Platforms And Danger From Falling Bodies. Atmospheric Pollution (Gases And Dusts) - Trapping - Transport-Noise Electrical Hazards-Noise And Vibration From: Pneumatic Tools And Other Machines-Ventilation And Lighting - Personal Protective Equipment.				
UNIT IV	Risk Assessment: Basic Concepts of Risk-Reliability and Hazard Potential-Elements Of Risk Assessment Statistical Methods Control Charts-Appraisal Of Advanced Techniques-Fault Tree Analysis- Failure Mode And Effect Analysis-Quantitative Structure-Activity Relationship Analysis-Fuzzy Model For Risk Assessment.				
UNIT V	Accident Analysis and Management: Accidents Classification And Analysis-Fatal, Serious, Minor And Reportable Accidents - Safety Audits Recent Development Of Safety Engineering Approaches For Mines-Frequency Rates- Accident Occurrence Investigation-Measures For Improving Safety In Mines-Cost Of Accident- Emergency Preparedness - Disaster Management.				
References					
1. "Mine health and safety management", Michael karmis ed., sme, littleton, co.2001. 2. Kejiriwal, b.k.safety in mines, gyanprakashan, dhanbad, 2001. 3. DGMS circulars-ministry of labour, government of india press, or lovely prakashan- dhanbad, 2002					
Related online content (MOOC, Swayam,NPTEL, Website etc.)					
https://onlinecourses.nptel.ac.in/noc21_ce76/preview https://nptel.ac.in/courses/105102206					
Course outcomes					Knowledge level
CO-1	To the basic concepts of Open Cast Mines				K1
CO-2	To summarizes the knowledge about Underground Mines				K2
CO-3	To Discuss the Tunneling with Hazards and Protective Measures				K4
CO-4	To Explain the Risk Assessment in Tunneling				K5
CO-5	To Elaborate the Accident Analysis and Management in Tunneling				K6

On what level it correlated with COs & POs -based on that we have to give marks
Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.AV	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) II-Semester				
Course code: 84221	EHS law and Acts w.r.t Rail Industry	T	Credits:4	Hours:4
Pre-requisite	Basic Knowledge of EHS Laws & Acts		Syllabus Revised	2023-2024
Course Objectives	<ul style="list-style-type: none"> ➤ To provide exposure to the students about safety and health provisions related to hazardous processes as laid out in Factories act 1948 ➤ To Interpret General powers of the central government, prevention, control and abatement of environmental pollution. ➤ To familiarize students with powers of inspectorate of factories. ➤ To help students to learn about Environment act 1986 and rules framed under the act. ➤ To provide wide exposure to the students about various legislations applicable to an industrial 			
UNIT I	<p>FACTORIES ACT – 1948 Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young persons – special provisions – penalties and procedures-Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948. Forms, Registers and notices Tamilnadu Safety Officer Rules 2005- with updated Amendments.</p>			
UNIT II	<p>ENVIRONMENT ACT – 1986 General powers of the central government, prevention, control and abatement of environmental pollution- Biomedical waste (Management and handling Rules, 1989- The noise pollution (Regulation and control) Rules, 2000-The Batteries (Management and Handling Rules) 2001- No Objection certificate from statutory authorities like pollution control board. Air Act 1981 and Water Act 1974: Central and state boards for the prevention and control of air pollution-powers and functions of boards – prevention and control of air pollution and water pollution –fund – accounts and audit, penalties and procedures.</p>			
UNIT III	<p>MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES 1989 AND MAJOR ACCIDENT HAZARD CONTROL RULES AND AMENDMENT Definitions – duties of authorities – responsibilities of occupier – notification of major accidents – information to be furnished – preparation of offsite and onsite plans – list of hazardous and toxic chemicals – safety reports – safety data sheets. Major Accident Hazard Control Rules. Hazardous Wastes (management, handling and Transboundary Movement) Rules 2016.</p>			
UNIT IV	<p>OTHER ACTS AND RULES Indian Boiler (Amendments) Act 2007, static and mobile pressure vessel rules (SMPV), motor vehicle rules, The Mines and Minerals (Development & Regulation) Amendment Act, 2015, workman compensation act, rules – electricity act and rules – hazardous wastes (management, handling and transboundary) rules, 2008 - the building and other construction workers act 1996., Petroleum rules, Gas cylinder rules 2016, Explosives Act 1884 - Pesticides Act – E waste (management) rules 2016</p>			

UNIT V	<p>INTERNATIONAL ACTS AND STANDARD Occupational Safety and Health act of USA (The Williames - Steiger Act of 1970) – Health and safety work act (HASAWA 1974, UK) – ISO 14001 – ISO 45001 , European Safety and Health Legislations, American Petroleum Institute (API) Standards, Oil Industry Safety Directorate (OISD) Standards, National Fire Protection Association (NFPA) Standards, Atomic Energy Regulatory Board (AERB), American National Standards Institute(ANSI)</p>	
<p>References</p> <ol style="list-style-type: none"> 1. The Factories Act 1948, Madras Book Agency, Chennai, 2000 2. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt.Ltd., New Delhi. 3. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India)Pvt.Ltd.,New Delhi. 4. Air (Prevention and control of pollution) act 1981, Commercial Law Publishers (India) Pvt.Ltd.,New Delhi. 5. The Indian boilers act 1923, Commercial Law Publishers (India) Pvt.Ltd., Allahabad. 		
<p>Related online content (MOOC, Swayam,NPTEL, Website etc.)</p>		
<p>https://onlinecourses.nptel.ac.in/noc23_lw03/preview</p>		
<p>https://archive.nptel.ac.in/noc/courses/noc21/SEM1/noc21-ce16/</p>		
Course outcomes		Knowledge level
CO-1	To list out important legislations related to health, Safety and Environment.	K1
CO-2	To list out requirements mentioned in factories act for the prevention of accidents.	K1
CO-3	To Interpret the health and welfare provisions given in factories act.	K4
CO-4	To Justify the statutory requirements for an Industry on registration, license and its renewal	K5
CO-5	To Develop onsite and offsite emergency plan	K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L-
Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.A V	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) II-Semester				
CORE	Course code: 84222	Standard on Rail Safety	T	Credits:4 Hours:4
Pre-requisite		Syllabus Revised	2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To familiarize the basic information about IRIS 2.To educate on IRTS Standard ➤ To learn about IRIS Certification Procedure ➤ To provide knowledge about ISO/TS 22163 Rail Quality Management5.To learn about Occupational Health & Safety 			
UNIT I	Information on IRIS Background-IKIS Benefits-equipment Manufacturers- System Integrators- Operators- Guiding Principles-Evaluation Methodology Evolutions of IRIS-Impact of Changes			
UNIT II	Content of IRTS Standard Scope-Normative References Terms & Definitions - Quality Management System-Management Responsibility-Resource Management Product Realization Measurement-Analysis & Improvement Assessment Methodology			
UNIT III	IRIS Certification Procedure Organization Registration for Membership at the UNIFE Portal - Compilation of Information-Questionnaire-Pre-Audits to Verify Potential Gaps in Compliance with IRIS Standard-Readiness Review AuditsCertification Audit-issue of Certification - Annual Supervision Audits-Recertification Audits			
UNIT IV	ISO/TS 22163 Rail Quality Management What is ISO/TS 22163-Why is ISO/TS 22163 is Important-Certification Bodies-Leadership-Planning-Support-Operation-Performance Evaluation-Improvement			
UNIT V	ISO 45001-Occupational Health & Safety Introduction-Normative References-Leadership & Worker Participation-Planning-Support Operation-PerformanceEvaluation-Improvement-Annex			
References				
1. The Factories Act, 1948- Universal Law Publishing Co Pvt Ltd, Delhi, 2011 2. The Public Liability Insurance Act, 1991-Universal Law Publishing Co Pvt Ltd, Delhi,2011. 3. The Dangerous Machines Act, 1953- Universal Law Publishing Co Pvt Ltd, Delhi,2011.				
Related online content (MOOC, Swayam, NPTEL, Website etc.)				
https://erp.iitkgp.ac.in/InfoCellDetails/resources/external/cepdata?course_id=IIT/CEP/STC/SP/2023-2024/RE/35				
http://www.nitttrc.edu.in/nptel/courses/video/114106039/lec15.pdf				
Course outcomes				Knowledge level
CO-1	To the basic concepts of IRIS			K1
CO-2	To summarizes the knowledge about IRIS Standard			K2
CO-3	To Discuss the IRIS Certification Procedure			K4
CO-4	To Explain the ISO/TS22163 with Leadership planning and Support			K5
CO-5	To Elaborate the ISO 45001 with Performance evaluation and Improvement			K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.A V	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

DIP (Rail Safety) II- Semester					
CORE	Course code: 84223	Safety inMaterial Handling	T	Credits:4	Hours:4
Pre-requisite	Basic Knowledge of Heavy Material Handling- Methods &Systems		Syllabus Revised	2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To study the applications of ergonomic principles and physiology of workers ➤ To know the concepts of personal protective equipment and its usages ➤ To create the knowledge in process and equipment design in safetyaspects ➤ To Prioritise Concept modules in Equipment design ➤ To Justify Job and personal risk factors 				
UNIT I	WORK STUDY 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).				
UNIT II	ERGONOMICS Definition – applications of ergonomic principles in the shop floor – work benches – seating arrangements – layout of electrical panels- switch gears – principles of motion economy – location of controls – display locations – machine foundations – work platforms, fatigue, physical and mental strain – incidents of accident – physiology of workers.				
UNIT III	PERSONAL PROTECTION Concepts of personal protective equipment – types – selection of PPE – invisible protective barriers – procurement, storage, inspection and testing – quality – standards – ergonomic considerations in personal protective equipment design.				
UNIT IV	PROCESS AND EQUIPMENT DESIGN Process design – equipment – instrument – selection – concept modules – various machine tools - in- built safety – machine layout-machine guarding-safety devices and methods – selection, inspection, maintenance and safe usage – statutory provisions, operator training and supervision – hazards and prevention.				
UNIT V	MAN MACHINE SYSTEMS Job and personal risk factors – standards-selection and training-body size and posture-body dimension (static/dynamic) – adjustment range – penalties – guide lines for safe design and postures – evaluation and methods of reducing posture strain. Man-machine interface-controls -types of control-identification and selection-types of displays- compatibility and stereotypes of important operations-fatigue and vigilance-measurement characteristics and strategies for enhanced performance				

References

1. "Accident Prevention Manual for Industrial Operations", NSC Chicago, 1982.
2. "Work Study", National Productivity Council, New Delhi, 1995.
3. E.J.Mc Cormick and M.S.Sanders "Human Factors in Engineering and Design", TMH,New Delhi,1982.
4. Hunter, Gomas, "Engineering Design for Safety", Mc Graw Hill Inc., 1992.
5. Introduction to Work Study", ILO, Oxford and IBH Publishing company, Bombay, 1991".

Related online content (MOOC, Swayam,NPTEL, Website etc.)

<https://www.youtube.com/watch?v=KNFZXNWYVno>

Course outcomes		Knowledge level
CO-1	To describe work procedure and applications in hazardous	K 1
CO-2	To Illustrate the human factors in design of Personal protective equipment	K2
CO-3	To Explain the risk factors, guide lines for safe design of man machine systems considering human factors	K5
CO-4	To Justify the Guideline for safe design	K5
CO-5	To elaborate the Strategies for enhanced performance in ManMachine systems	K6

On what level it correlated with COs & POs -based on that we have to give marks

Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	M(2)	L(1)	-	M(2)	L(1)	S(3)	M(2)	L(1)
CO2	L(1)	M(2)	M(2)	L(1)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	-	L(1)	L(1)	L(1)	M(2)	M(2)
CO5	L(1) L	L(1)	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)
W.AV	1.4	2	1.6	1.4	0.6	1.6	1.2	1.8	1.6	1.6

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	L(1)	M(2)	L(1)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	L(1)	L(1)	M(2)	L(1)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	M(2)
CO5	M(2)	L(1)	L(1)	M(2)	L(1)
W.A V	1.6	1.6	1.4	1.8	1.4

S –Strong (3), M-Medium (2), L- Low (1)

CORE	Course code: 84224	Environmental Safety	T	Credits:4	Hours:4
Pre-requisite	Basic Knowledge of environmental safety		Syllabus Revised	2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To provide in depth knowledge in Principles of Environmental safety and its applications in various fields. ➤ To give understanding of air and water pollution and their control. ➤ To expose the students to the basis in hazardous waste management. ➤ To design emission measurement devices. ➤ To design emission measurement devices. 				
UNIT I	AIR POLLUTION Classification and properties of air pollutants – Pollution sources – Effects of air pollutants on human beings, Animals, Plants and Materials - automobile pollution- hazards of air pollution-concept of clean coal combustion technology - ultra violet radiation, infrared radiation, radiation from sun-hazards due to depletion of ozone - deforestation-ozone holes-automobile exhausts-chemical factory stack emissions-CFC.				
UNIT II	WATER POLLUTION Classification of water pollutants-health hazards-sampling and analysis of water-water treatment - different industrial effluents and their treatment and disposal - advanced wastewater treatment - effluent quality standards and laws- chemical industries, tannery, textile effluents-common treatment.				
UNIT III	HAZARDOUS WASTE MANAGEMENT Hazardous waste management in India-waste identification, characterization and classification- technological options for collection, treatment and disposal of hazardous waste-selection charts for the treatment of different hazardous wastes-methods of collection and disposal of solid wastes-health hazards-toxic and radioactive wastes- incineration and verification - hazards due to bio-process-dilution-standards and restrictions – recycling and reuse.				
UNIT IV	ENVIRONMENTAL MEASUREMENT AND CONTROL Sampling and analysis – dust monitor – gas analyzer, particle size analyzer – lux meter- pH meter – gas chromatograph – atomic absorption spectrometer. Gravitational settling chambers-cyclone separators-scrubbers-electrostatic precipitator - bag filter – maintenance - control of gaseous emission by adsorption, absorption and combustion methods- Pollution Control Board-laws.				
UNIT V	POLLUTION CONTROL IN PROCESS INDUSTRIES Pollution control in process industries - cement, paper, petroleum-petroleum products- textile- tanneries-thermal power plants – dyeing and pigment industries - eco-friendly energy.				
References					
<ol style="list-style-type: none"> 1. E. C Wolfe, Race to Save to Save Planet, Wadsworth Publishing Co., Belmont, CA 2006. 2. G. T Miller, Environmental Science: Working with the Earth, 11th Edition, Wadsworth Publishing Co., Belmont, CA, 2006 3. M.J Hammer,, and M.J Hammer,, Jr., Water and Wastewater Technology, Pearson PrenticeHall, 2006 4. Rao, CS, “Environmental pollution engineering:, Wiley Eastern Limited, New Delhi, 1st January 2018. 5. S. P. Mahajan, “Pollution control in process industries”, Tata McGraw Hill Publishing Company, New Delhi, 2006. 					

Varma and Braner, “Air pollution equipment”, Springer Publishers, Second Edition		
Related online content (MOOC, Swayam, NPTEL, Website etc.)		
https://nptel.ac.in/courses/112106177		
https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Seasonal-fire-causes/Firework		
Course outcomes		Knowledge level
CO-1	To Describe about the air pollution its classifications and control measures	K1
CO-2	To Explain the water pollutants its classifications and control measures	K2
CO-3	To Simplify the Hazardous waste management its classifications and recycling methods	K4
CO-4	To Justify the environmental measurement and control with sampling and analysis	K5
CO-5	To Elaborate safe practices for Pollution handling in Process industries	K6

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2(M)	1(L)	1(L)	2(M)	1(L)	2(M)	2(M)	1(L)	1(L)	1(L)
CO2	2(M)	1(L)	2(M)	1(L)	1(L)	2(M)	1(L)	2(M)	1(L)	2(M)
CO3	1(L)	1(L)	1(L)	2(M)	2(M)	1(L)	2(M)	1(L)	2(M)	1(L)
CO4	2(M)	2(M)	2(M)	1(L)	1(L)	1(L)	1(L)	1(L)	2(M)	2(M)
CO5	2(M)	1(L)	1(L)	2(M)	1(L)	2(M)	1(L)	2(M)	1(L)	1(L)
W.AV	1.8	1.2	1.4	1.6	1.2	1.6	1.4	1.4	1.4	1.4

On what level it correlated with COs & POs -based on that we have to give marks Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2(M)	1(L)	2(M)	1(L)	1(L)
CO2	1(L)	2(M)	1(L)	2(M)	1(L)
CO3	2(M)	2(M)	1(L)	1(L)	1(L)
CO4	1(L)	1(L)	1(L)	2(M)	2(M)
CO5	2(M)	1(L)	2(M)	1(L)	1(L)
W.AV	1.6	1.4	1.4	1.4	1.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA(Rail Safety) II -Semester				
Course code: 84225	Accident Investigation and Reporting	T	Credits:4	Hours:4
Pre-requisite	Basic Knowledge of Accident Investigation and reporting	Syllabus Revised		2023-2024
Course Objectives	<ol style="list-style-type: none"> 1. To give basic information about accident and accident reporting system 2. To learn about various accident theory 3. To provide knowledge on hierarchy of accident prevention and control 4. To provide technical knowledge about accident investigation and analysis 5. To learn about computation of frequency and severity rate for industrialinjuries. 			
UNIT I	ACCIDENT REPORTING SYSTEM Accident-Causes of Accident-Types of Accident-Reportable and Non-Reportable accidents-accident record maintaining-accident internal management-accident reporting as per the factories act 1948-form no18-accident reporting as per the BOCW act 1996-form no 14.			
UNIT II	THEORIES OF ACCIDENT CAUSATION Heinrich's Domino Theory-Heinrich domino-Process-critical issues-Human Factors theory-Accident/Incident Theory-Birds Triangle-system theory-Behavioral theory-bird's triangle-accident proneness theory-multiple causation theory.			
UNIT III	ACCIDENT PREVENTION AND RISK CONTROL Hierarchy of risk control: Elimination, substitution, Engineering control, Administrative control, PPE. Preventive measure-control measure.			
UNIT IV	ACCIDENT INVESTIGATION Introduction-what is accident investigation-process of accident investigation: collecting evidence &facts, analysis of evidence and facts, recommendation &reporting-methods of accident investigation-root cause analysis-Fish Bone Diagram-systematic cause analysis technique (SCAT)-Accident Analysis and Barrier Function (AEB).			
UNIT V	METHOD FOR COMPUTATION OF FREQUENCY AND SEVERITY RATES FOR INDUSTRIAL INJURIES & CLASSIFICATION OF INDUSTRIAL ACCIDENTS Accident- fatal-disabling injury-reportable disabling injury-days of displacement (cost time)-partial displacement-total displacement-man hours worked-classification of accidents-assessment of work injury-computation of frequency, severity, incident rates.			
References				
<ol style="list-style-type: none"> 1. Accident Prevention Manual for Business and Industry Administration and Programs, 13 th edition <ol style="list-style-type: none"> a. ISBN number is 978-0-87912-280-5 2. 11/2 – 2 inch 3 ring binder with pockets <ol style="list-style-type: none"> b. Notebook paper for binder c. Organization of notebook; contents should include: 3. Cover page with first and last name <ul style="list-style-type: none"> -Title of course -Day and time of weekly class meeting Dividers labeled, syllabus, PPT. lectures, study questions, handouts, exam 				
Related online content (MOOC, Swayam, NPTEL, Website etc.)				
https://onlinecourses.nptel.ac.in/noc22_mg97/preview				
https://freevideolectures.com/course/4411/nptel-industrial-safety-engineering/47				

Course outcomes		Knowledge level
CO-1	To define the fundamental concept of accident reporting system	K1
CO-2	To compare various accident caution theory	K4
CO-3	To Discuss about principle of accident prevention	K6
CO-4	To Explain the methods for accident investigation	K5
CO-5	To Evaluate the computation of frequency and severity for industrial injuries	K5

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.AV	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) II -Semester				
Course code: 84226A	Health Hazards in Rail Industries	T	Credits: 4	Hours: 5
Pre- requisite	Basic knowledge of Industrial hygiene	Syllabus Revised		2023-2024
Course Objectives	<ul style="list-style-type: none"> ➤ To familiarize with Introduction to Industrial Hygiene, Human Physiology and Industrial diseases ➤ To Express Hazard Recognition and evaluation ➤ 3.To Interpret the fundamentals of toxicology ➤ To Discuss the Industrial Ergonomics ➤ To Practice Air Sampling, Biological monitoring and Health surveillance 			
UNIT I	INTRODUCTION TO INDUSTRIAL HYGIENE, HUMAN PHYSIOLOGY & INDUSTRIAL DISEASES Introduction to Industrial Hygiene-Human Systems Units of Cells and Cell structure- Structure of the body – Muscles and Bones-Nervous system-Digestive system-Respiratory system-Defense system-Skin & sense organs.			
UNIT II	HAZARD RECOGNITION AND EVALUATION Industrial Hazard -Evaluation Industrial Noise- Ionizing Radiation-Nonionizing Radiation, Thermal Stress,Ergonomics-Blood bone diseases-Hepatitis B& C, HIV,leptospirosis- Ventilation-Local Exhaust Ventilation, Dilution Ventilation of Industrial Workplaces-Administrative controls-PPE-Determining the control measures.			
UNIT III	FUNDAMENTALS OF TOXICOLOGY Introduction of toxicology-Classification of Toxic materials in Air: Irritants, Asphyxiants, Anesthetics, Blood damaging agents, Lung Damaging Agents-Metabolism-Excretion-Response to toxin- Stages of Toxicology Evaluation-Exposure limits-ACGIH-Threshold Limit Values-HAZCHEM.			
UNIT IV	INDUSTRIAL ERGONOMICS Introduction-Workplace Risk Assessment-Factors Affecting Performance of physical tasks-Manual Handling- Repetitive Tasks-Display Screen Equipment-Carpal tunnel Syndrome-White finger-MSD-WRLUD-Minimum requirements for Workstations-Design of the job-Design of the workplace- Administrative Controls.			
UNIT V	AIR SAMPLING, BIOLOGICAL MONITORING & HEALTH SURVEILLANCE Introduction-Sampling Particulates – Sampling Gases & Vapors- Sampling & Analytical Methods-Indoor Air quality-HVAC-Microorganism & AAQ-Urine-Blood-Skin-Breath-Vision-X Rays-Neurological Tests- Audiometry-Lung Function tests: Lung Volume,Airway Resistance-Biological Exposure indices(BEI).			

References

1. Toxicology Fundamentals, Target organs, and Risk Assessment, 2nd edition, Hemisphere Publishing Corps, 1991Lu, Frank C, Basic,
2. The Basic Science of Poisons Amdur M. Doull, J and Klassen, C.D.
3. Handbook of Occupational Safety & Health Lawrance Slote,
4. U S Department of Labor, Occupational Outlook Handbook
5. Industrial toxicology Philip L. Williams and James L. Burson,
6. Inhalation Toxicology Research Methods, Applications and Evaluationm, Harry Salem
7. Industrial hygiene & Toxicology, Volume –2, Frank a. Petty
8. Environmental Occupational Medicine, Third Edition, William N.Rom

Related online content (MOOC, Swayam,NPTEL, Website etc.)

https://onlinecourses.nptel.ac.in/noc20_de12/preview

<https://freevideolectures.com/course/4040/nptel-chemical-process-safety/10>

Course outcomes		Knowledge level
CO-1	To Describe the basics of Industrial Hygiene, Human physiology and Industrial diseases	K1
CO-2	To Interpret the Hazard recognition and Evaluation	K4
CO-3	To Prioritize the Fundamentals of Toxicology	K5
CO-4	To Assess the Industrial Ergonomics	K5
CO-5	To Elaborate Air sampling, Biological monitoring and health surveillance	K6

On what level it correlated with COs & POs -based on that we have to give

marks Mapping Course Outcome Vs Programme

Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

S –Strong (3), M-Medium (2), L-
Low (1)

Mapping Course Outcome Vs Programme Specific
outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.A V	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) II -Semester				
Course code: 84226B	Human Psychology and Ergonomics	T	Credits: 4	Hours:5
Pre-requisite	Basic Knowledge of Human Psychology and ergonomics		Syllabus Revised	2023-2024
Course Objectives	<ul style="list-style-type: none"> ➤ To study the applications of ergonomic principles and physiology of workers ➤ To know the concepts of personal protective equipment and its usages ➤ To create the knowledge in process and equipment design in safety aspects ➤ To Prioritise Concept modules in Equipment design ➤ To Justify Job and personal risk factors 			
UNIT I	WORK STUDY 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).			
UNIT II	ERGONOMICS Definition – applications of ergonomic principles in the shop floor – work benches – seating arrangements – layout of electrical panels- switch gears – principles of motion economy – location of controls – display locations – machine foundations – work platforms, fatigue, physical and mental strain – incidents of accident – physiology of workers.			
UNIT III	PERSONAL PROTECTION Concepts of personal protective equipment – types – selection of PPE – invisible protective barriers – procurement, storage, inspection and testing – quality – standards – ergonomic considerations in personal protective equipment design.			
UNIT IV	PROCESS AND EQUIPMENT DESIGN Process design – equipment – instrument – selection – concept modules – various machine tools - in- built safety – machine layout-machine guarding-safety devices and methods – selection, inspection, maintenance and safe usage – statutory provisions, operator training and supervision – hazards and prevention.			
UNIT V	MAN MACHINE SYSTEMS Job and personal risk factors – standards-selection and training-body size and posture-body dimension (static/dynamic) – adjustment range – penalties – guide lines for safe design and postures– evaluation and methods of reducing posture strain. Man-machine interface-controls -types of control-identification and selection-types of displays-compatibility and stereotypes of important operations-fatigue and vigilance-measurement characteristics and strategies for enhanced performance			

References

- “Accident Prevention Manual for Industrial Operations”, NSC Chicago, 1982.
 “Work Study”, National Productivity Council, New Delhi, 1995.
 E.J.Mc Cormick and M.S.Sanders “Human Factors in Engineering and Design”,
 TMH, New Delhi, 1982.
 Hunter, Gomas, “Engineering Design for Safety”, Mc Graw Hill Inc., 1992.
 Introduction to Work Study”, ILO, Oxford and IBH Publishing company, Bombay, 1991”.

Related online content (MOOC, Swayam, NPTEL, Website etc.)

<https://www.youtube.com/watch?v=KNFZXNWYVno>

Course outcomes		Knowledge level
CO-1	To describe work procedure and applications in hazardous	K 1
CO-2	To Illustrate the human factors in design of Personal protective equipment	K2
CO-3	To Explain the risk factors, guide lines for safe design of man machine systems considering human factors	K5
CO-4	To Justify the Guideline for safe design	K5
CO-5	To elaborate the Strategies for enhanced performance in ManMachine systems	K6

On what level it correlated with COs & POs -based on that we have to give

marks Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	M(2)	M(2)	M(2)	L(1)	S(3)	L(1)	L(1)	M(2)	M(2)
CO2	-	M(2)	M(2)	S(3)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO3	L(1)	L(1)	M(2)	S(3)	L(1)	S(3)	M(2)	L(1)	M(2)	L(1)
CO4	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	M(2)	L(1)
CO5	-	L(1)	L(1)	L(1)	-	L(1)	L(1)	L(1)	L(1)	M(2)
W.AV	1.2	1.6	1.8	2	1.2	1.8	1.6	1.2	1.8	1.6

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	L(1)	M(2)	M(2)
CO2	L(1)	S(3)	M(2)	S(3)	M(2)
CO3	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	M(2)	M(2)	L(1)	M(2)	M(2)
CO5	L(1)	L(1)	M(2)	L(1)	M(2)
W.AV	1.4	2	1.4	2	2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) II -Semester				
Course code: 84226C	Hazard Identification , Risk Assessment and Risk Control	T	Credits: 4	Hours:5
Pre-requisite	Basic Knowledge of Hazard Identification , Risk Assessment and Risk Control		Syllabus Revised	2023-2024
Course Objectives	<ul style="list-style-type: none"> ➤ To Describe fundamentals of Hazard and risk with Human error analysis ➤ To Express Risk analysis with Root cause analysis methods and Cost benefit analysis ➤ To Evaluate HAZOP studies with its methodologies ➤ To Prioritise Hazard Identification & Risk Assessment with Qualitative and Quantitative site assessment ➤ To Develop credibility of risk assessment techniques through Past accident analysis 			
UNIT I	FUNDAMENTALS OF HAZARD, RISK Introduction- hazard & Risk-Risk register-Checklist-hazard characterization-horseplay-hazardous event- unsafe act- unsafe condition preliminary hazard analysis-ALARP- Concept of ALARP and its application in Risk Assessment - Safety Warning System-Human error analysis.			
UNIT II	RISK ANALYSIS METHODS Risk analysis-What Is Risk Identification- <i>What Is Risk Analysis-benefits of risk analysis-risk analysis process</i> -Root Cause Analysis.Job safety analysis-Risk-Benefit and Cost-Benefit Analysis.			
UNIT III	SAFETY MANAGEMENT TOOLS Hazard and Operability Studies (HAZOP)-HAZOP METHODOLOGY-Hazard analysis (HAZAN)-Fault Tree Analysis (FTA)-Event Tree Analysis (ETA)-Failure Mode & Effect Analysis (FMEA)- FMEA Methodology-Types Of FMEA-When To Use FMEA-FMEA Procedure-Steps-Risk Priority Number-Control Measure OF FMEA.			
UNIT IV	HAZARD IDENTIFICATION & RISK ASSESSMENT HIRA- Objectives of HIRA study-Principles of risk assessment Steps involved in Hazard identification and risk assessment- Identification of the Hazard- Risk Analysis- Evaluation of Hazard and Risk –Risk Matrix-Risk Control Method-Preventive Measure- Control Measure-Reporting-Implementation & Monitoring-Reviewing-Types of Risk Assessment-Quantitative and Qualitative Risk Assessment-Specific Site Assessment.			
UNIT V	CREDIBILITY OF RISK ASSESSMENT TECHNIQUES Past accident analysis as information sources for Hazard analysis and consequences analysis of chemical accident, Mexico disaster, Flixborough, Bhopal, Seveso, Pasadena, Feyzin disaster (1966), Port Hudson disaster-convey report.			

References

1. ENVH 577 Readings (On Canvas site)
2. Harr, J., A Civil Action. Vintage Press, 1996 (on reserve at HS Library)
3. Devra Davis, When Smoke Ran Like Water: Tales of Environmental Deception and the Battle Against Pollution.
4. Phil Brown (editor), Health and the Environment (**HTE**)

Related online content (MOOC, Swayam, NPTEL, Website etc.)

www.atsdr.cdc.gov/HAC/HAGM/

www.epa.gov/superfund/programs/risk/ragsa/index.htm

Course outcomes		Knowledge level
CO-1	To Recall Fundamentals of Hazard and Risk with concept of ALARP	K1
CO-2	To Illustrate Risk analysis methods with Risk Identification	K2
CO-3	To Interpret Safety Management tools with HAZOP	K4
CO-4	To Justify HIRA with Risk Matrix and Risk Control Methods	K5
CO-5	To Elaborate credibility of Risk Assessment Techniques	K6

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

On what level it correlated with COs & POs -based on that we have to give marks

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.AV	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) II -Semester				
Course code: 84227	NME-1: Emerging food trends	T	Credits: 2	Hours: 3
Pre-requisite	Basic Knowledge of Emerging food trends	Syllabus Revised	2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To Understand the food preservation techniques ➤ To Acquire knowledge on Pulse light techniques, ohmic heating and microwave processing ➤ To Gain ideas related to Food irradiation, high pressure processing and biocatalysts.4.To Interpret processing of food using High Pressure processing technology ➤ 5.To Justify Food irritation and recent non thermal methods in emerging food trends 			
UNIT I	<p>Hurdle Technology Hurdle technology - principles and applications - hurdle effect in fermented food - shelf stable Products - intermediate moisture foods - minimally processed foods - total quality of foods - optimal range of hurdles and potential safety - application of hurdle technology - fruit preservation, dairy products and meat</p>			
UNIT II	<p>Pulse light and UV Technique High-intensity pulse technique- Processing systems- design of static chambers- continuous chambers- other chamber designs- generation of different voltage waveforms-oscillation magnetic fields for food processing- generation of magnetic fields - mechanisms of inactivation of microorganisms in food preservation – UV treatment – principle involved – mechanism of inactivation – Pulsed electric field – principles of microbial inactivation – Generation of PEF – application in food processing.</p>			
UNIT III	<p>Microwave and Ohmic Heating Microwave properties – principle – design aspects of microwave equipment - interaction with food materials, material properties - application of microwave in food processing – merits and demerits – recent advancement in microwave processing - inactivation of microorganisms and enzymes – electrical resistance heating of food - ohmic heating - treatment of products - Elsteril process - influence on microorganisms - food ingredients</p>			
UNIT IV	<p>Ultrasound & High Pressure Processing Ultra sound – introduction – types of pressure waves – generation of ultrasound – mechanism of microbial inactivation – application in food processing – High pressure processing – Principles – concepts – basic laws related to HPP - design of equipment - processing of food using HPP - effect on microorganisms – Application in industry</p>			
UNIT V	<p>Food irradiation and recent non thermal methods Food irradiation – principle of irradiation – radioactive substances – types of irradiation – construction and working of equipment – effect of irradiation on the nutritional and biochemical changes – application in food sectors – social and ethical issues – cold plasma technology – electron beam radiation - application in food processing.</p>			

References

1. Nonthermal Preservation of Foods. Gustavo V. Barbosa-Canovas, Usha R. Pothakamury, Enrique Palou and Barry G. Swanson. Published by Marcel Dekker, Inc., 270, Madison Avenue, New Yorkm 10016, 1998.
2. Biosensors for food analysis, A O Scott, The Tetley Group Limited, UK, Woodhead Publishing Limited, Abington Hall, Abington, Cambridge, CB21 6AH, England, 2008.
3. Trends in Food Engineering, Jorge E. Lozano, Cristina Anon, Efren Parada-Arias, Gustavo V. Barbosa-Canovas, Contributor Jorge E. Lozano, Published by CRC Press, 2000.
4. Gould G.W., “New Methods of Food Preservation”, Aspen Publishers, Great Britain, ISBN No. 0834213419, 1999.

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<https://www.digimat.in/nptel/courses/video/126105011/L01.html>

<https://archive.nptel.ac.in/courses/126/105/126105013/>

Course outcomes		Knowledge level
CO-1	Recall the principles of preservation	K1
CO-2	Interpret the various emerging techniques available for food processing	K4
CO-3	Identify the techniques for preservation of foods	K3
CO-4	Elaborate the most suitable method for processing foods	K6
CO-5	Evaluate the suitability of the techniques for specific foods	K5

On what level it correlated with COs & POs -based on that we have to give marks Mapping

Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	L(1)	M(2)	M(2)
CO2	-	L(1)	L(1)	M(2)	-	L(1)	L(1)	L(1)	L(1)	L(1)
CO3	M(2)	-	L(1)	M(2)	M(2)	-	-	L(1)	-	-
CO4	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO5	-	-	L(1)	M(2)	-	-	L(1)	M(2)	L(1)	L(1)
W.AV	0.6	0.6	1.2	1.8	0.8	1	0.8	1.2	1	1

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	L(1)	L(1)	L(1)
CO3	L(1)	L(1)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	L(1)	L(1)	L(1)
CO5	L(1)	M(2)	L(1)	L(1)	L(1)
W.A V	1.2	1.6	1.2	1.4	1.2

MBA (Rail Safety) III -Semester					
Core	Course code: 84231	Construction safety	T	Credits:4	Hours:4
Pre-requisite	Basic Knowledge of Construction safety			Syllabus Revised	2023-2024
Course Objectives	<p>1. To know causes of accidents related to construction activities and human factors associated with these accident</p> <p>2. To understand the construction regulations and quality assurance in construction</p> <p>3. To have the knowledge in hazards of construction and their prevention methods</p> <p>4. To know the working principles of various construction machinery</p> <p>5. To gain knowledge in health hazards and safety in demolition work</p>				
UNIT I	<p>ACCIDENTS CAUSES AND MANAGEMENT SYSTEMS</p> <p>Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident –construction regulations, contractual clauses – Pre contract activates, preconstruction meeting -design aids for safe construction – permits to work – quality assurance in construction - compensation– Education and training</p>				
UNIT II	<p>HAZARDS OF CONSTRUCTION AND PREVENTION</p> <p>Excavations, basement and wide excavation, trenches, shafts – scaffolding , types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work, dismantling –tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water - road works – power plant constructions – construction of high rise buildings.</p>				
UNIT III	<p>WORKING AT HEIGHTS</p> <p>Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings , requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection , safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.</p>				
UNIT IV	<p>CONSTRUCTION MACHINERY</p> <p>Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder’s hoist, winches, chain pulley blocks – use of conveyors – concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes – manual handling.</p>				
UNIT V	<p>SAFETY IN DEMOLITION WORK</p> <p>Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition- Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods –interesting experiences at the construction site against the fire accidents</p>				

References

1. Handbook of OSHA Construction safety and health Charles D. Reese and James V. Edison
2. Hudson, R., "Construction hazard and Safety Hand book, Butter Worth's, 1985.
3. Jnathea D.Sime, "Safety in the Build Environment", London, 1988.
4. V.J.Davies and K.Thomasin "Construction Safety Hand Book" Thomas Telford Ltd., London, 1990

Related online content (MOOC, Swayam,NPTEL, Website etc.)

https://onlinecourses.nptel.ac.in/noc21_ce16/preview

<https://archive.nptel.ac.in/courses/105/102/105102206/>

Course outcomes		Knowledge level
CO-1	To Recall the problems impeding safety in construction industries.	K1
CO-2	To Summarise the types and causes of accidents, and designing aids for safe construction.	K2
CO-3	To Categorise the hazards during construction of power plant, road works and high rise buildings.	K4
CO-4	To Interpret construction regulations and Indian standards for construction and demolition work.	K5
CO-5	To Elaborate the safety procedure for working at heights during construction.	K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L-
Low (1)

Mapping Course Outcome Vs Programme Specific
outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.A V	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) IIIrd Semester					
CORE	Course code: 84232	Rail Industries Safety	T	Credits: 4	Hours:4
Pre-requisite		Syllabus Revised		2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ 1.To familiarize the basic information about the Railways Act,1989 ➤ 2.To educate on Evolution of Basics of Electricity in Rail Industry ➤ 3.To learn about Electrical Safety in Rail Industry ➤ 4.To provide knowledge about Chemical Safety related to Rail Industry ➤ 5.To learn about Mechanical Safety in Rails 				
UNIT I	The Railways Act, 1989 Carriage of Passengers Carriage of Goods Railway Accidents Liability of Railway Administration for Death & Injury to Passengers due to Accidents				
UNIT II	Basics of Electricity Introduction-Current - Voltage-Power-Resistance-Capacitor-Inductor - Ohm's Law- Types of Electrical Faults- Overloads-Short Circuits-Hazard Analysis-Shock-Arc-Blast - Body Parts & Effects of Shock: Skin, Nervous System, Muscular System, Heart, Pulmonary System Indian Electricity Rules Statutory Requirements from Electrical Inspectorate International Standards on Electrical Safety - CPR.				
UNIT III	Electrical Safety Primary& Secondary Hazards - Shocks - Burns Scalds - Falls Safety in the Use of Electricity - Energy Leakage - Clearances & Insulation Classes of Insulation - Voltage Classifications- Excess Energy - Current Surges - Over Current & Short Circuit Current - Heating Effects of Current - Electromagnetic Forces - Corona Effect - Static Electricity Sources Electrical Causes of Fire & Explosion Ionization - Spark & Arc- National Electrical Safety Code-Lightning Hazards-Lightning Arrestor-Earthing-Earth Resistance- Earth Pit Maintenance.				
UNIT IV	Chemical Safety Recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases, types, concentration, vs. dose, TLV-Methods of Evaluation, process or operation description, Field Survey. Sampling methodology, Industrial Hygiene calculations, Comparison with OSHAS Standard. Air Sampling 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 V	Mechanical Safety Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS- guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing-guard construction-guard opening Selection and suitability: lathe-drilling-boring-milling-grinding-shaping-sawing-shearing- presses-forge hammer-flywheels-shafts- couplings-gears-sprockets wheels and chains-pulleys and belts-authorized entry to hazardous installations-benefits of good guarding systems.				

References

- 1.The Public Liability Insurance Act,1991-Universal Law Publishing Co Pvt Ltd, Delhi,2011
- 2.The Dangerous Machines Act,1983-Universal Law Publishing Co Pvt Ltd, Delhi, 2011
- 3.The Indian Boilers Act, 1923-Universal Law Publishing Co Pvt Ltd, Delhi,2011.
- 4.The Workmen's Compensation Act, 1923-Universal Law Publishing Co Pvt Ltd, Ltd, Delhi, 2011
- 5.The Noise Rules,2000-Universal Law Publishing Co Pvt Ltd, Delhi,2011

Related online content (MOOC, Swayam,NPTEL, Website etc.)

https://erp.iitkgp.ac.in/InfoCellDetails/resources/external/cepdata?course_id=IIT/CEP/STC/SP/2023-2024/RE/35

https://indianrailways.gov.in/railwayboard/uploads/directorate/safety/downloads/Safety_Review_05-06_Ch_4.pdf

Course outcomes		Knowledge level
CO-1	To the basic concepts of Indian Railways with Liability and administration	K1
CO-2	To summarizes the Principles of Electricity with Indian Electricity Rules	K2
CO-3	To Discuss the Electrical safety in Railways with Primary and secondary hazards with control measures	K4
CO-4	To Explain the Chemical Safety in Rail Industries with Methods of control of Hazards	K5
CO-5	To Elaborate the Mechanical Safety with Zero Mechanical State	K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L-
Low (1)

Mapping Course Outcome Vs Programme Specific
outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.A V	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) III -Semester					
CORE	Course code: 84233	Behaviour based safety	T	Credits: 4	Hours:4
Pre-requisite		Syllabus Revised		2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To learn the basic information about human behavior ➤ To provide knowledge of group behaviour. ➤ To educate the concepts of behaviour based safety. ➤ To familiarize the information about workplace ergonomics. ➤ To learn about ergonomical system design of workers.. 				
UNIT I	<p>INDIVIDUAL BEHAVIOUR Personality types - Factors influencing personality - Theories - Learning - Types of learners-The learning process-Learning theories-Organizational behavior modification-Misbehavior-Types-Management Intervention Emotions Emotional Labor-Emotional Intelligence Theories- Attitudes Characteristics Components Formation- Measurement Values. Perceptions Importance Factors influencing perception Interpersonal perception Impression Management- Motivation - Importance-Types -Effects on work behavior.</p>				
UNIT II	<p>GROUP BEHAVIOUR Organization structure dynamics Emergence of informal leaders and working norms - Group decision making- Formation Groups in organizations Influence Group techniques-Team building - Interpersonal relations-Communication - Control.</p>				
UNIT III	<p>BEHAVIOUR BASED OBSERVATION AND FEEDBACK Introduction to BBS(Behavior based safety)-Why behavior based safety-ABC model of behavior change- ABC behavior model-ABC behavior model consequences-ABC behavior model feedback -Safety coaching through observation and feed back-Integrating behavioral safety principles in to other management systems-Critical impact of social comparison feedback-Seven lessons from behavior based safety for increasing PPE use-Addressing ergonomic hazards through behavior based observation and feedback- Safety culture.</p>				
UNIT IV	<p>ERGONOMICS Definition-applications of ergonomic principles in the shop floor-work benches-seating arrangements - layout of electrical panels- switch gears - principles of motion economy-location of controls-display locations-machine foundations-work platforms, fatigue,physical and mental strain - incidents of accident- physiology of workers.</p>				
UNIT V	<p>WORK DESIGN FOR STANDING AND SEATED WORKS Design For Everyone, Anthropometry And Personal Space, Effectiveness And Cost Effectiveness Fundamental Aspects Of Standing And Sitting, An Ergonomics Approach To Work Station Design, Design For Standing Workers, Design For Seated Workers, Work Surface Design -Guidelines For Design Of Static Work, Effectiveness And Cost.</p>				

References

1. Behaviour-Based Safety in Organizations: Life Before the Accident Paperback – 30 April 2017 by H.L. Kaila (Author)

Related online content (MOOC, Swayam, NPTEL, Website etc.)

<https://archive.nptel.ac.in/courses/110/105/110105160>

<https://alison.com/course/behaviour-based-safety-revised>

Course outcomes		Knowledge level
CO-1	Understand the fundamental concepts of human behaviour.	K2
CO-2	Identify the information about workplace groups.	K3
CO-3	Acquire knowledge about behaviour based safety and model.	K4
CO-4	Discuss the ergonomic principles in workplace.	K4
CO-5	Evaluate the ergonomical system design of workplace and work	K5

On what level it correlated with COs & POs -based on that we have to give

marks Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	L(1)	M(2)	M(2)
CO2	-	L(1)	L(1)	M(2)	-	L(1)	L(1)	L(1)	L(1)	L(1)
CO3	M(2)	-	L(1)	M(2)	M(2)	-	-	L(1)	-	-
CO4	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO5	-	-	L(1)	M(2)	-	-	L(1)	M(2)	L(1)	L(1)
W.AV	0.6	0.6	1.2	1.8	0.8	1	0.8	1.2	1	1

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	L(1)	L(1)	L(1)
CO3	L(1)	L(1)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	L(1)	L(1)	L(1)
CO5	L(1)	M(2)	L(1)	L(1)	L(1)
W.AV	1.2	1.6	1.2	1.4	1.2

Mapping Course Outcome Vs Programme Specific outcomes

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) -3 rd Semester					
CORE	Course code: 84234	Food Safety and Hygiene in Rail Catering	T	Credits: 4	Hours: 4
Pre-requisite			Syllabus Revised	2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To familiarize the basic information about hygiene. ➤ To educate on contamination methods and safe storage of foods. ➤ To learn about various food borne diseases. ➤ To provide knowledge about sanitation risk management. ➤ To learn about HACCP and its applications. 				
UNIT I	Introduction To Hygiene Define Hygiene-Importance of Hygiene – Personal Hygiene – Kitchen Hygiene- Equipment Hygiene- Protectiveclothing – use of deodorants and Cosmetics in kitchen: Rest, Exercise and Recreation				
UNIT II	Food Contamination and Storage Daily Cleaning Procedures in Commercial Kitchen.-Food storage – temperature – danger Zone -microbiology- Foodcontamination – food poisoning – food adulteration-hot holding temperature – kitchen layout- sanitation & disinfectant-cross contamination-				
UNIT III	Food Borne Diseases Define Food Borne illness – Food Infections – Food Poisoning- Bacterial infections -Types of Food Inspections				
UNIT IV	Sanitary Procedures in Catering Industry. Sanitary Procedures for purchasing foods -categories of commodities – Storage areas Temperature Zones- Thawing,Blanching, maceration, Blast, Freezing, Pasturization				
UNIT V	Haccp & its Principles HACCP- its Importance -Principles HACCP, CCP and CP HACCP program - critical implementation- CCP.				
Reference Book					
1. Food hygiene and safety, Dr.Sunetra roday, Tata McGraw Hill.					
Related online content (MOOC, Swayam, NPTEL, Website etc.)					
https://onlinecourses.swayam2.ac.in/cec20_ge19/preview					
https://onlinecourses.nptel.ac.in/noc22_ce70/preview					
Course outcomes					Knowledge level
CO-1	To define the basic concepts of food hygiene.				K1
CO-2	To express the knowledge about food contamination and storage.				K2
CO-3	To Discuss about various food borne diseases.				K4
CO-4	To determine the importance of sanitary procedures in catering industry.				K5
CO-5	To elaborate thevarious principles of HACCP.				K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	L(1)	M(2)	M(2)
CO2	-	L(1)	L(1)	M(2)	-	L(1)	L(1)	L(1)	L(1)	L(1)
CO3	M(2)	-	L(1)	M(2)	M(2)	-	-	L(1)	-	-
CO4	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO5	-	-	L(1)	M(2)	-	-	L(1)	M(2)	L(1)	L(1)
W.AV	0.6	0.6	1.2	1.8	0.8	1	0.8	1.2	1	1

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low

(1) Mapping Course Outcome Vs Programme Specific

outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	L(1)	L(1)	L(1)
CO3	L(1)	L(1)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	L(1)	L(1)	L(1)
CO5	L(1)	M(2)	L(1)	L(1)	L(1)
W.A V	1.2	1.6	1.2	1.4	1.2

MBA (Rail Safety) III -Semester					
Core	Course code: 84235	Safety Inspection and Audit	T	Credits: 4	Hours:4
Pre-requisite	Basic Knowledge of Safety Audit and inspection		Syllabus Revised	2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To achieve understanding of safety inspection and audit ➤ To enable students to conduct safety audit and write audit report effectively in auditing situation ➤ The course could provide basic knowledge of OHSMS and EMS ➤ To educate about the various steps to be taken for certification of ISO 14001(EMS) ➤ To impart knowledge on environmental impact assessment, life cycle assessment of product and principles of eco labeling 				
UNIT I	SAFETY INSPECTION Importance of Workplace Inspection Planning of Workplace Inspection Purpose of Workplace Inspection Hazards in Workplace Information's Required in Workplace Inspection Report Inspection Team Duration of Inspection - Frequency of Inspection - Follow up & Monitoring - Summary				
UNIT II	SAFETY AUDIT Introduction Types of Audits Audit Objectives Methodology to Conduct Safety Audit- Pre Audit Activities - Background Information to be Gathered Data to be Gathered - On Site Activities - Understanding Management Systems Assessing Strengths & Weaknesses - Collecting Audit Evidence - Interviewing - Observation Evaluating Audit Evidence Reporting Audit Findings - Post Audit Activities.				
UNIT III	OH & S MANAGEMENT SYSTEM STANDARD Introduction to ISO 45001 – Development of various OHSMS standards – aim of OH & S management system–success factors– plan do check act cycle- contents and scope of ISO 45001- terms and definitions –leadership and worker participation –leadership and commitment - OH & Spolicy- organizational roles and responsibilities and authorities – consultation and participation of workers				
UNIT IV	ISO 14001 EMS, ISO 14001, specifications, objectives, Environmental Policy, Guidelines and Principles (ISO 14004), clauses 4.1 to 4.5. Documentation requirements, 3 levels of documentation for a ISO 14000based EMS, steps in ISO 14001				
UNIT V	ENVIRONMENT IMPACT ASSESSMENT ISO 14040(LCA), General principles of LCA, Stages of LCA, Report and Review. ISO 14020 (Eco labeling) – History, 14021, 14024, Type I labels, Type II labels, ISO 14024, principles, rules for eco labeling before company attempts for it. Advantages. EIA in EMS, Types of EIA, EIA methodology EIS, Scope, Benefits.				

References

1. ISO 45001: 2018 –Occupational Health and safety management systemsRequirements with guidance for use
2. ISO14001:2004, Environmental Management SystemsRequirements with Guidance for Use” ,ISO, 2004.
3. “Guidelines on Occupational Health and Safety Management Systems (OSH-MS)” International Labour Organization, 2001
4. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980
5. John Ridley, “Safety at Work”, Butterworth and Co., London, 1983

Related online content (MOOC, Swayam,NPTEL, Website etc.)

<https://archive.nptel.ac.in/courses/110/105/110105160/>

https://onlinecourses.nptel.ac.in/noc23_mg48/preview

Course outcomes		Knowledge level
CO-1	To recall basic safety audit and prepare a report for safety audit	K1
CO-2	To Illustrate safety inspection and prepare a report for safety inspection	K2
CO-3	To interpret various standards for maintaining OHSMS	K4
CO-4	To Justify ISO 14001standards on Safety audit and inspection	K5
CO-5	To Discuss EIA and ecosystem development	K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	M(2)	L(1)	-	M(2)	L(1)	S(3)	M(2)	L(1)
CO2	L(1)	M(2)	M(2)	L(1)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	-	L(1)	L(1)	L(1)	M(2)	M(2)
CO5	L(1) L	L(1)	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)
W.AV	1.4	2	1.6	1.4	0.6	1.6	1.2	1.8	1.6	1.6

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	L(1)	M(2)	L(1)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	L(1)	L(1)	M(2)	L(1)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	M(2)
CO5	M(2)	L(1)	L(1)	M(2)	L(1)
W.AV	1.6	1.6	1.4	1.8	1.4

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) III -Semester					
DSE-3	Course code: 84236A	Handling, Storage and Transportation of Dangerous Goods & Wastes	T	Credits:4	Hours: 5
Pre-requisite		Syllabus Revised		2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To familiarize students with laws and regulations governing hazardous waste storage, transport and treatment ➤ To provide an introduction to different pollution prevention and waste minimization opportunities for hazardous waste ➤ To identify environmental concerns for hazardous waste on water, land and air ➤ To offer necessary equations and design examples to evaluate the effectiveness of different physicochemical, biological and thermal treatment technologies for hazardous waste ➤ To identify containment technologies and land treatment techniques for hazardous waste. 				
UNIT I	SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management — Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes, plastics and fly ash – Elements of integrated waste management and roles of stakeholders -Financing and Public Private Participation for waste management.				
UNIT II	WASTE CHARACTERIZATION AND SOURCE REDUCTION Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan -Source reduction of wastes – Waste exchange - Extended producer responsibility - Recycling and reuse				
UNIT III	STORAGE, COLLECTION AND TRANSPORT OF WASTES Handling and segregation of wastes at source – storage and collection of municipal solid wastes –Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport				
UNIT IV	WASTE PROCESSING TECHNOLOGIES Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous waste- treatment of biomedical wastes - Health considerations in the context of operation of facilities,handling of materials and impact of outputs on the environment-				
UNIT V	WASTE DISPOSAL Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation				

References

1. Hazardous waste management Charles A. Wentz. Second edition 1995. McGraw Hill International.
2. Environmental Sciences by Daniel B. Botkin and Edward A. Keller, Wiley student, 6th edition-2009.
3. Harry M. Freeman, Standard handbook of Hazardous waste treatment and disposal McGraw Hill 1997
4. Hazardous Waste (Management and Transboundary Movement) Rules, Ministry of Environment and Forests, Government of India, New Delhi, 1989

Related online content (MOOC, Swayam, NPTEL, Website etc.)

<https://archive.nptel.ac.in/courses/105/106/105106056/>

<https://archive.nptel.ac.in/content/storage2/courses/105106056/Introduction.pdf>

Course outcomes		Knowledge level
CO-1	To Describe the sources, classification and regulatory framework in Hazardous waste management	K1
CO-2	To Summarise Waste characterization and source reduction with different methods	K2
CO-3	To Examine the storage, collection and transportation of waste with optimization techniques	K4
CO-4	To Compare Waste Processing technologies handling and impact of outputs on the environment	K5
CO-5	To Elaborate Global Issues and provide solutions with corporate social responsibility	K6

On what level it correlated with COs & POs -based on that we have to give marks

Mapping Course Outcome Vs Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

S –Strong (3), M-Medium (2), L-
Low (1)

Mapping Course Outcome Vs Programme Specific
outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.A V	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) III -Semester					
Elective	Course code: 84236B	Disaster Management	T	Credits:4	Hours:5
Pre-requisite	Basic Knowledge Disaster management		Syllabus Revised		2023-2024
Course Objectives	<ul style="list-style-type: none"> ➤ To provide students an exposure to disasters, their significance and types. ➤ To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction ➤ To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR) ➤ To enhance awareness of institutional processes in the country ➤ To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity 				
UNIT I	<p>INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.</p>				
UNIT II	<p>APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.</p>				
UNIT III	<p>INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.</p>				
UNIT IV	<p>DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.</p>				
UNIT V	<p>DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial</p>				

	Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.
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References

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

<https://nptel.ac.in/courses/105104183>

Course outcomes	Knowledge level	
CO-1	To Describe basics of disaster and their differential impacts	K1
CO-2	To Illustrate approaches to disaster reduction with roles and responsibilities of state and national bodies	K2
CO-3	To Classify the types of disasters, causes and their impact on environment and society	K4
CO-4	To Interpret vulnerability and various methods of risk reduction measures as well as mitigation.	K5
CO-5	To Estimate hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.	K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	L(1)
CO2	M(2)	S(3)	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)
CO3	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	L(1)	M(2)	L(1)	M(2)	S(3)	L(1)	M(2)	L(1)	M(2)	L(1)
CO5	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)	M(2)	L(1)
W.AV	1.8	2	1.4	1.8	2	1.2	1.8	1.2	1.8	1.2

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	L(1)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	L(1)
CO3	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	M(2)	M(2)	M(2)	S(3)	S(3)
CO5	M(2)	M(2)	M(2)	S(3)	S(3)
W.AV	1.8	2.2	1.8	2.6	2.2

S –Strong (3), M-Medium (2), L- Low (1)

MBA (Rail Safety) III -Semester					
Elective	Course code: 84236C	Logistics and Supply Chain Management	T	Credits: 4	Hours: 5
Pre-requisite			Syllabus Revised		2023-2024
Course Objectives	<ul style="list-style-type: none"> ➤ To familiarize the basic information about factories act 1948. ➤ To educate on environment act 1986. ➤ To learn about manufacture ,storage and import of hazardous chemicals rules 1989. ➤ To provide knowledge about important EHS legislations. ➤ To learn about international health and safety laws. 				
UNIT I	Logistics Role in the Economy/Organization - Definition of Logistics- Objectives of Logistics-Functions of Logistics. Logistics and Customer Service - Definition of Customer Service-Elements of Customer Service-Phases in Customer Service-Customer Retention				
UNIT II	Logistics and supply chain management - Five P's of logistics management- 7 R's of logistics management -logistics management in export business- International commercial terms - FCL - LCL -Modes of transportation-carriage of goods by land- carriage of goods by sea- types of vessels -types of aircrafts and airlines -ocean freight rates -ocean freight calculation				
UNIT III	World sea routes - major and minor ports in India -containerisation-origin - container sizes & classification -ICD - functions -benefits -CONCOR -CFS - Ocean shipping procedure - Shipping Intermediaries -customs brokers - functions -duties -Freight forwarders and consolidators-functions -Shipping agents -roles -Stevedores -functions- shipping formalities -logistics and documentation.				
UNIT IV	Packing and Materials Handling - Functions of Packaging-Communication- Packaging Cost-Types of Packaging Material-Unitization-Containerization- Designing a Package-Factors affecting choice of Packaging Materials -Global Logistics - Global Supply Chain-Organizing for Global Logistics-Strategic Issues in Global Logistics-Forces driving Globalization-Modes of Transportation in Global Logistics-Barriers to Global Logistics-Markets and Competition.				
UNIT V	Logistics Strategy - Requirements for an Effective Logistics Strategy - Strategic Logistics Planning -Implementation of Strategy. Logistics Information Systems - Functions of Logistics Information System (LIS)-LIS Flow-RFID Principles of Logistics Information Organization for Effective Logistics Performance - Centralized and Decentralized Structures-Stages of Functional Aggregation in Organization. Financial Issues in Logistics Performance - Supply Chain Performance Measures-Steps in ABC Costing-Financial Gap Analysis. Integrated Logistics - Need for Integration-Activity Centers in Integrated Logistics. Role of 3PL&4PL - Principles of LIS				
References					
<ol style="list-style-type: none"> 1. Logistics Management For International Business: Text And Cases, Sudalaimuthu& S.Anthony Raj, PHI Learning, First Edition, 2009. 2. Fundamentals of Logistics Management, David Grant, Douglas M. Lambert, James R.Stock, Lisa M. Ellram, McGraw Hill Higher Education, 1997. 					

Related online content (MOOC, Swayam,NPTEL, Website etc.)		
https://onlinecourses.swayam2.ac.in/cec20_ge19/preview		
https://onlinecourses.nptel.ac.in/noc22_ce70/preview		
Course outcomes		Knowledge level
CO-1	Understand the basic concepts of factories act 1948.	K2
CO-2	Acquire knowledge about environment act 1986.	K4
CO-3	Discuss manufacture, storage, import of hazardous chemicals rules 1989.	K4
CO-4	Analyse the important industrial safety laws.	K4
CO-5	Determine the various international health and safety laws and standards.	K5

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	L(1)	M(2)	M(2)
CO2	-	L(1)	L(1)	M(2)	-	L(1)	L(1)	L(1)	L(1)	L(1)
CO3	M(2)	-	L(1)	M(2)	M(2)	-	-	L(1)	-	-
CO4	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO5	-	-	L(1)	M(2)	-	-	L(1)	M(2)	L(1)	L(1)
W.AV	0.6	0.6	1.2	1.8	0.8	1	0.8	1.2	1	1

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1) Mapping Course Outcome Vs Programme

Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	L(1)	L(1)	L(1)
CO3	L(1)	L(1)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	L(1)	L(1)	L(1)
CO5	L(1)	M(2)	L(1)	L(1)	L(1)
W.AV	1.2	1.6	1.2	1.4	1.2

MBA (Rail Safety)					
III -Semester					
	Course code: 84237	Non-Major Elective: Entrepreneurship	T	Credits: 2	Hours: 3
Pre-requisite	Basic knowledge of Entrepreneurship		Syllabus Revised	2023-2024	
Course Objectives	<ul style="list-style-type: none"> ➤ To give basic information about Entrepreneurship ➤ To Illustrate about entrepreneurial motivation ➤ To Discover the Creativity in a Entrepreneurship role ➤ To critique the organizational assistance of small and large scale industries ➤ To Discuss the Rules and regulations in an Industry 				
UNIT I	INTRODUCTION Meaning and Importance-Evolution of term ‘Entrepreneurship’-Factors influencing entrepreneurship’-Psychological factors-Social factors-Economic factor-Environmental factors-Characteristics of an entrepreneur-Entrepreneur and Entrepreneur-Types of entrepreneur-According to Type of Business-According to Use of Technology-According to Motivation-According to Growth-According to Stages-New generations of entrepreneurship-social entrepreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc-Barriers to entrepreneurship				
UNIT II	ENTREPRENEURIAL MOTIVATION Motivation-Maslow’s theory-Herjburg’s theory-McGragor’s Theory-McClelland’s Need – Achievement Theory- Culture & Society-Values / Ethics-Risk taking behavior.				
UNIT III	CREATIVITY Creativity and entrepreneurship-Steps in Creativity-Innovation and inventions-Using left brain skills to harvest right brain ideas-Legal Protection of innovation-Skills of an entrepreneur-Decision making and Problem Solving (steps indecision making).				
UNIT IV	ORGANISATION ASSISTANCE Assistance to an entrepreneur-New Ventures-Industrial Park (Meaning, features, & examples)-Special Economic Zone (Meaning, features & examples)-Financial assistance by different agencies-MSME Act Small Scale Industries- Carry on Business (COB) licence-Environmental Clearance-National Small Industries Corporation (NSIC)- Government Stores Purchase scheme (e-tender process)-Excise exemptions and concession-Exemption from income tax-Quality Standards with special reference to ISO-Financial assistance to MSME-Modernisation assistance to small scale unit-The Small Industries Development Bank of India(SIDBI)-The State Small Industries Development Corporation(SSIDC).				
UNIT V	RULES AND LEGISLATION Applicability of Legislation-Industries Development (Regulations) Act, 1951-Factories Act, 1948-The Industrial Employment (Standing Orders) Act, 1946-Suspension-Stoppage of work-Termination of employment-Environment (Protection) Act, 1986-The sale of Goods Ac, 1950-Industrial Dispute Act 1947				

References

1. Zero to One: Notes on Startups, or How the Build the Future by Peter Thiel
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to CreateRadically Successful Businesses by Eric Ries
3. India as Global Start-up Hub: Mission with Passion by C B Rao
4. Elon Musk: Tesla, SpaceX, and the Quest for a Fantastic Future by Ashlee Vance
5. Steve Jobs by Walter Isaacson
6. Innovation and Entrepreneurship: Practice and Principles by Peter F Drucker
7. The Innovator's Solution: Creating and Sustaining Successful Growth by Clayton M Christensen

Related online content (MOOC, Swayam,NPTEL, Website etc.)

https://onlinecourses.nptel.ac.in/noc20_mg35/preview

<https://archive.nptel.ac.in/courses/110/106/110106141/>

Course outcomes		Knowledge level
CO-1	To Recall the Introduction to Entrepreneurship with concerning factors and characteristics	K1
CO-2	To Express the Entrepreneurial motivation with different theories	K2
CO-3	To Develop Creativity in Entrepreneurship roles	K6
CO-4	To Evaluate Organizational assistance of Small and Large scale Industries	K5
CO-5	To Elaborate the Rules and legislation for Industries	K6

On what level it correlated with COs & POs -based on that we have to give marks

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	L(1)	L(1)	M(2)	M(2)
CO2	-	L(1)	L(1)	M(2)	-	L(1)	L(1)	L(1)	L(1)	L(1)
CO3	M(2)	-	L(1)	M(2)	M(2)	-	-	L(1)	-	-
CO4	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO5	-	-	L(1)	M(2)	-	-	L(1)	M(2)	L(1)	L(1)
W.AV	0.6	0.6	1.2	1.8	0.8	1	0.8	1.2	1	1

Mapping Course Outcome Vs Programme Outcomes

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome Vs Programme Specific outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L(1)	M(2)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	L(1)	L(1)	L(1)
CO3	L(1)	L(1)	L(1)	M(2)	M(2)
CO4	L(1)	L(1)	L(1)	L(1)	L(1)
CO5	L(1)	M(2)	L(1)	L(1)	L(1)
W.AV	1.2	1.6	1.2	1.4	1.2