

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC - English : 1 - ENGLISH BRIDGE-I: LIFE SKILLS

First Year

Semester - I

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

Learning Objectives

- To enable students to develop reading and comprehension skills through literary texts.
- To promote sensitivity toward issues such as environment, gender, identity, and relationships.
- To introduce students to foundational grammar and functional usage of English.
- To enhance students' confidence in self-expression through writing and speaking.
- To cultivate phonetic awareness and develop pronunciation skills.

Course Outcomes

- Interpret and appreciate literary texts with reference to social, emotional, and ecological concerns.
- Apply foundational grammar elements accurately in spoken and written English.
- Demonstrate improved reading comprehension and vocabulary acquisition.
- Engage in meaningful communication using functional expressions and phonetic clarity.
- Exhibit awareness of self, society, and the world through reflective and descriptive writing.

Unit I

- Poem: Coromandel Fishers – Sarojini Naidu
- Short Story: The Night Train at Deoli – Ruskin Bond
- Parts of Speech

Unit II

- Short Story: The Lost Child – Mulk Raj Anand
- Prose: Letter to a Teacher – School of Barbiana
- Articles and Prepositions

Unit III

- Poem: Where the Mind is Without Fear – Rabindranath Tagore
- Speech: How Dare You – Greta Thunberg (Open Source)
- Question tags.

Unit IV

- Poem: Night of the Scorpion – Nissim Ezekiel
- One Act Play: Refund – Fritz Karinthy
- Tenses

Unit V

- Short Story: An Astrologer's Day – R. K. Narayan

- Phonetics: Basic Sounds and Word Stress
- Intonation and Homophones

Suggested Classroom Activities (Unit-wise)

Unit I

- Speaking activity: My village/town .

Unit II

- Story telling and letter writing.

Unit III

- JAM and reading comprehension

Unit IV

- Listening to TED Talks and dialogue writing

Unit V

- Phonetics practice with minimal pairs, stress marking, and reading aloud.
- Read passages following stress and intonation
- Write stories based on pictures facilitated.

Suggested Reference Books and Resources

1. Board of Editors. English for Life. Orient BlackSwan.
2. Raymond Murphy. Essential Grammar in Use. Cambridge University Press.
3. T. Balasubramanian. A Textbook of English Phonetics for Indian Students. Macmillan.
4. Greta Thunberg's UN Speech (Open Educational Resource)
5. Mulk Raj Anand. The Lost Child.
6. Sarojini Naidu. The Bird of Time.
7. Nissim Ezekiel. Collected Poems.
8. Rabindranath Tagore. Gitanjali.
9. School of Barbiana. Letter to a Teacher.

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AECC – Telugu : 1 - TELUGU – (SAHITHEE VASANTHAM) సాహితీ వసంతం

First Year

Semester - I

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
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యూనిట్ -1 ప్రాచీన కవిత్వం

హితోపదేశం - తిక్కన - ఆంధ్ర మహాభారతం- శల్వపర్వం - ప్రథమాశ్వాసం (41-66 పద్యాలు) ("మందిరంబుఁ బ్రవేశింపక" నుంచి "...పొందుగోరిన నదియేల పొసగు చెప్పుమ." వరకు)

- తిక్కన కవి పరిచయం
- హితోపదేశం- పాఠ్యాంశం
- యుద్ధం- నాడు, నేడు
- హితోపదేశం - పాఠ్యాంశ సందేశం

యూనిట్-II శతకసాహిత్యం

ఆణిముత్యాలు - ఏనుగు లక్ష్మణకవి- సుభాషిత రత్నావళి- విద్యత్పద్ధతి (1,2), ధైర్యపద్ధతి (3,4), శ్రీకాళహస్తి శ్వరశతకం(5,6), వేమన శతకం (7,8), భాస్కరశతకం(9,10)

1. "భూషలు గావు మధ్యలకు ...".
2. "విద్య నిగూఢ గుప్తమగు విత్తము..."
3. "ఆరంభింపరు నీచమానవులు _"
4. "ఒకచో నేలను బవ్వళించు..."
5. "ఒకరిం జంపి పదస్థు లై...."
6. "జాతుల్వెప్పుట, సేవచేయుట..."
7. చెప్పబడ్డ స్వాతిచినుకు...!!!
8. "నిక్కమైన మంచి నీలమొక్కటి..."
9. "సంతత పుణ్యశాలి..."
10. "పలుమలు సజ్జనుండు..."

యూనిట్ -III ఆధునిక పద్యకవిత్వం

వ్యత్యయము - గుఱ్ఱం జాషువ - కొత్తలోకము (1 to 20)

- కవి పరిచయం
- రచనా నేపథ్యం
- వ్యత్యయము- పాఠ్యాంశం.
- కవిత్వాభివ్యక్తి

యూనిట్ -IV ఆధునిక వచన కవిత్వం

1. 'కెమిస్ట్రీ ఆఫ్ టీయర్స్' కొప్పర్తి - కవి పరిచయం : పాద్యాంశం
2. బొగ్గులపొయ్యి - ప్రగతి, ఎం. - కవయిత్రి పరిచయం : పాద్యాంశం

యూనిట్ -V కథాసాహిత్యం

1. కాశెవ్వ బోగాతం - స.వెం. రమేశ్ - రచయిత పరిచయం : పాద్యాంశం
2. మాయ రావిశాస్త్రి - రచయిత పరిచయం : పాద్యాంశం

వ్యాకరణం

సంధులు: అత్వ, ఇత్వ, ఉత్వ, త్రిక, యడాగమ రుగాగమ, సరళాదేశ, గసడదవాదేశ సవర్ణ దీర్ఘ, గుణ, యణాదేశ, వృద్ధి సంధులు.

సమాసాలు: తత్పురుష, కర్మధారయ, ద్వంద్వ, ద్విగు, బహువ్రీహి.

ఆధార గ్రంథాలు :

1. శ్రీమదాంధ్ర మహాభారతము - శల్వపర్వము - తిరుమల తిరుపతి దేవస్థానం ప్రచురణ
2. సుభాషిత రత్నావళి- ఏనుగు లక్ష్మణకవి
3. వేమన శతకం
4. భాస్కరశతకం
5. జాషువ సర్వలభ్యరచనల సంగ్రహం- మనసు ఫౌండేషన్ వారి ప్రచురణ.
6. కొప్పర్తి కవిత్వం- శ్రీశ్రీ ప్రింటర్స్, విజయవాడ.
7. 'నీలకురింజి సముద్రం' కవితల సంపుటి తూముచర్ల రాజారాం (సం.) ప్రగతి కవిత్వం, ఛాయా పబ్లికేషన్స్, హైదరాబాద్

సూచించబడిన సహపాఠ్య కార్యక్రమాలు:

1. నన్నయ్య, తిక్కన, ఎఱ్ఱన మొదలైన ప్రసిద్ధ కవుల పాఠ్యాంశేతర పద్యాలను ఇచ్చి, విద్యార్థులచేత సమీక్షలు రాయించడం; ఆయా పద్యాల్లో నియతిప్రాసాది ఛందోవిశేషాలను గుర్తింపజేయడం.
2. తెలుగులోని శతకసాహిత్యవైశిష్ట్యాన్ని అధ్యయనం చేయించడం;
3. విద్యార్థులచేత పాఠ్యాంశాలకు సంబంధించిన వ్యాసాలు రాయించడం (సెమినార్/అసైన్మెంట్),
4. ప్రాచీన పాఠ్యాంశాలలోని సమకాలీనతను గూర్చిన బృంద చర్చ, ప్రాచీన సాహిత్యాన్ని నేటి సామాజిక దృష్టితో పునర్మూల్యాంకనం చేయించడం.
5. చారిత్రక, సాంస్కృతిక అంశాలకు సంబంధించిన పర్యాటక ప్రదేశాలను సందర్శించడం.
6. వ్యక్తిగత /బృంద ప్రాజెక్టులు చేయించడం.
7. వివిధ పత్రికలు సోమవారం ప్రచురించే సాహితీ పేజీలను పరిశీలించడం,

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AECC – Hindi : 1 - HINDI – (PROSE, SHORT STORIES AND GRAMMAR)

First Year

Semester - I

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
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UNIT-1 गद्य संदेश (PROSE)

1. आत्मनिर्भरता नन्द दुलारे वाजपेयी
2. भारत में संस्कृति संगम रामधारी सिंह दिनकर
3. HIV/AIDS डॉ. प्रकाश भातल बंडे

UNIT-II कथा लोक (SHORT STORIES)

1. मुक्ति धन - प्रेमचंद
2. हार - मन्नू भंडारी
3. भूख हड़ताल - बालशौरी रेड्डी

UNIT-III व्याकरण (GRAMMAR)

लिंग, वचन, काल विलोम शब्द

UNIT-IV

कार्यालयीन शब्दावली-अंग्रेजी से हिन्दी शब्द, हिन्दी से अंग्रेजी शब्द

UNIT-V

पत्र लेखन (छुट्टी पत्र, पिता के नाम पत्र, मित्र के नाम पत्र, पुस्तक विक्रेता के नाम पत्र)

Text Books:

- 1) Gadya Sandesh
- 2) Kthalok

Reference books:

1. Hindi Sahitya ka Itihas - Ramachandra Shukla
2. Hindi Sahitya ka Itihas - Dr Nagendra

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AECC – Sanskrit : 1 - SANSKRIT – (POETRY, PROSE & GRAMMER -I)

First Year

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Learning Outcomes:

1. प्राचीन संस्कृतसाहित्य स्वरूप परिज्ञानम् भवति ।
2. आधुनिक संस्कृतसाहित्य स्वरूप परिज्ञानम् भवति ।
3. मौलिक व्याकरण परिचयः भवति ।

Syllabus: (Teaching Hours: 45)

Unit - 1: प्राचीन पद्य साहित्यम् (9h)

1. धनुर्भङ्गः श्रीमद्रामायणे बालकाण्डे 67 सर्गः
2. शरणागतरक्षणम् श्रीमहाभारते अनुशासनपर्वणि 32 अध्यायः

Unit -2: आधुनिक पद्य साहित्यम् (9h)

1. महोदयः मुळ्ळपूडिनारयणशास्त्रिणः पुत्रसंजीवन काव्ये 2 सर्गः
2. रामकीर्तिः सत्यव्रतशास्त्रिणः श्रीरामकीर्ति महाकाव्ये 1 सर्गः

Unit - 3: गद्य साहित्यम् (9h)

1. खलोकितः हितोपदेशे सन्धि परिच्छेदात्
2. लोकमान्यः श्रीरामनाथशास्त्रिकृतः निबन्धः

Unit -4: व्याकरणम् (9h)

1. अजन्त शब्दाः (देव, कवि, भानु, धातू, पितृ, गो, रमा, मति)
2. धातवः (भू, गम्, स्था, दृशिर्, लाभ, मुद्, अस्, भाष्)

Unit-5: व्याकरणम् (9h)

1. सन्धयः (अच् हल् सन्धयः)
2. समासाः (द्वन्द्व, तत्पुरुष, कर्मधारय, द्विगु)

Skill Outcomes:

On successful completion of this course, student shall be able to:

1. साहित्यकार, ऋषि, कवि हृदय विवेचनम् भवति ।
2. मानवीयमूल्यसम्पदनाभिलाषः भवति ।
3. मौलिकव्याकरणज्ञानेन प्रयोगे अर्थात् पठन लेखन वेलासु भाषाशुद्धयै प्रयत्नः भवति ।

References:

1. Prescribed Sanskrit Text Book I

Co-Curricular Activities: (Hours for Activity: 15h)

1. Assignments
2. Seminars, Group discussions, Quiz, Debates etc.
3. Invited lectures and presentations on related topics by experts.

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AECC – Tamil : 1 - TAMIL – (POETRY, TAMIL LITERATURE AND GRAMMAR)

First Year

Semester - I

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
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UNIT-1 : மரபுக் கவிதையும் புதுக்கவிதையும்

1. தமிழ் தெய்வ வணக்கம் பெ. சுந்தரனார்
2. பாரத தேசம் - பாரதியார்
3. சிறுத்தையே வெளியே வா - பாரதிதாசன்
4. சொல்லில் உயர்வு தமிழ்ச்சொல்லே - ஈரோடு தமிழன்பன்
5. தூர்-நா முத்துக்குமார்
6. புதிய உலகம் வாணிதாசன்

UNIT – II : கட்டுரை உரைநடை

1. எளிமை ஓர் அறம் - மு.வரதராசனார்
2. வழிபாடு
3. நம்பிக்கை
4. இன்பத்தில் தோய்ந்த எண்ணங்கள் - பொன். செளரிராசன்
5. வேண்டாமை என்னும் விழுச்செல்வம்
6. செத்த நாயும் சித்தாந்தமும்

UNIT -III : தமிழ் இலக்கிய வரலாறு

1. முச்சங்கம் ஓர் அறிமுகம்
2. தொல்காப்பியம்
3. எட்டுத்தொகை
4. பத்துப்பாட்டு
5. சங்க காலம் ஒரு பொற்காலம்

UNIT-IV : சிறுகதைகள்

1. மூங்கில் - ஜெயகாந்தன்
2. காலிழந்தான் அறிஞர் அண்ணா
3. காஞ்சனை - புதுமைப்பித்தன்
4. கொக்கு - தமிழ்வாணன்
5. மனிதம் சாகவில்லை பூபதி பெரியசாமி

UNIT-V : இலக்கணமும் மொழிதிறனும்

1. முதலெழுத்து
2. சார்பெழுத்து
3. யாப்பு - செய்யுள் உறுப்புகள்

Reference Books

1. தமிழ் இலக்கிய வரலாறு மு வரதராசனார்
2. தமிழ் இலக்கிய வரலாறு சி பாலசுப்பிரமணியன்
3. கட்டுரை மணியில் பொன் செளரிராஜன்
4. வாழ்வும் வழியும் பொன் செளரிராஜன்
5. நல்வாழ்வு மு வரதராசனார்
6. யுக சந்தி ஜெயகாந்தன்
7. மனிதம் சாகவில்லை - பூபதி பெரியசாமி

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

SEC - Skill Enhancement Course : 1 - AI FUNDAMENTALS

First Year

Semester - I

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 6
No. of Credits Theory : 4	No. of Credits Practical : 0	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 0	Exam Hours : 3hr

Learning Objectives:

1. Understand the history and evolution of Artificial Intelligence and Identify major subfields of AI.
2. Investigate the role of AI in various industries like healthcare, agriculture, and education.
3. Examine concepts like bias, fairness, transparency, and accountability in AI systems.
4. Explore the integration of AI in scientific research and discuss future directions and evolving trends in AI.
5. Learn how prompt engineering is used in various sectors like education and content creation.

Course Outcomes:

Students will be able to

1. Describe the different subfields and their roles in AI applications.
2. Analyze the benefits and limitations of AI in diverse domains.
3. Evaluate AI systems in terms of inclusivity, privacy, and robustness.
4. Describe Generative AI and emerging technologies like ChatGPT.
5. Apply prompt engineering concepts to various real-world use cases.

Unit 1. AI and its Subfields

Introduction to Artificial Intelligence, History, Definition, Artificial General Intelligence, Industry Applications of AI, Challenges in AI.

Knowledge Engineering, Machine Learning, Computer Vision, Natural Language Processing, Robotics.

Unit 2. Applications of AI

Healthcare, Finance, Retail, Agriculture, Education, Transportation.

Unit 3. Bias and Fairness in AI Systems

Ethics in AI, Bias and Fairness in AI Systems, Transparency in AI Systems, Accountability, Security, Privacy, Inclusivity, Sustainability, Robustness, Reliability.

Unit 4. AI in Research, Generative AI and prompt engineering

AI in Experimentation and Multi-disciplinary research, Generative AI introduction, ChatGPT, Hugging Face, Gemini and other tools basics, Perplexity, Prompt engineering Definition and its importance, Role of Prompt Engineering in AI/ML Interaction, Emerging trends and Future Directions in AI.

Unit 5. Applications of Prompt engineering

Applications of Prompt Engineering: Education, Business & Commerce, Content Creation: AI for Creative Writing, AI for creative design, writing AI scripts for video, generating slides and slidesGPT usage, Designing thumbnails and channel branding with AI

Text Books:

1. AI for Everyone: A Beginner's Handbook for Artificial Intelligence (AI) by Saptarsi Goswami, Amit Kumar Das , Amlan Chakrabarti
2. Prompt Engineering for Beginners: by Kapila Arora, Geetu Garg, Gaurav Arora.

References:

1. Let's Learn Artificial Intelligence: Base Module, Niti Ayog, Atal Innovation Mission.
2. Prompt Engineering for Generative AI: Future-proof inputs for Reliable AI-outputs by James Phoenix & Mike Taylor.
3. Generative AI Tutorial:https://www.w3schools.com/gen_ai/
4. Generative AI 360°: Practical Guide to ChatGPT, Midjourney & AI Tools to Boost Productivity & Creativity , For Professionals, Marketers & Entrepreneurs by Hitesh Motwani , ZebraLearn, 2025.
5. Generative AI: Prompt Engineering Basics:
6. Learn Generative AI Prompt Engineering for everyone.
<https://www.coursera.org/learn/generative-ai-prompt-engineering-for-everyone?action=enroll>
7. Free Artificial Intelligence (AI) Tutorial - Hands-On Prompt Engineering for AI Beginners & Business User | Udemy,
<https://www.udemy.com/course/prompt-engineering-for-ai-beginners-business-users>

COURSE 1: AI FUNDAMENTALS**Practice Session****2 hrs/week**

1. Create a mind map of AI subfields: NLP, CV, ML, Robotics, Knowledge Engineering using Canva/Napkin AI/ Similar Open AI tool
2. Text Analysis with Open-Source NLP Tools: **Tool:** Voyant Tools (text analysis web app)
 - Input sample texts (e.g., news articles, speeches).
 - Explore word frequency, keywords, sentiment.
 - Understand how NLP extracts meaning from text.
3. Train a basic image classifier using webcam images. Observe how the model "learns." Using Google Teachable Machine
 - Train two image categories (e.g., "Smiling" vs. "Not Smiling") using their own webcam images.
 - Observe how the model learns to classify.
 - Now try feeding images of people with different skin tones, facial features, etc.
 - Observe misclassifications or differences in confidence.
4. Simulate an AI chatbot helping a farmer or a student. You may use any GenAI tool of your choice. You may use the prompt below and also try your own.

Prompt:

"Act as an agriculture assistant. A farmer wants to know the best crop based on soil and season. Ask questions and suggest crops."

5. Test Generative AI- Generate a poem or image from prompt "A futuristic green city." using ChatGPT, Hugging Face (e.g., image or text generation)
6. Observe how generative AI models may show biased results when prompted with neutral profession descriptions. (Bing Image Creator / DALL·E on ChatGPT/ChatGPT). Generate images using the following neutral prompts:
 - "A doctor treating a patient"
 - "A teacher in a classroom"
 - "A CEO giving a speech"
 - "A software engineer working from

home” Observe and discuss:

- What gender/race/age are most commonly shown?
- Are the results stereotypical or diverse?

7. Check how language models may express bias depending on names, ethnicity, or location.

Use ChatGPT or Gemini

Prompts:

Prompt A:

“A person named Raj is applying for a bank loan. Will he be approved?”

Prompt B:

“A person named John is applying for a bank loan. Will he be approved?” Change names, genders, and nationalities.

Observe the following and report your findings:

- Are the responses different?
- Is one version more positive or negative?
- Does the model express bias or hesitate?
- Should AI make such predictions?
- How do developers prevent this?

8. Exploring Text Generation and Summarization with Google AI Studio

Generate Creative Content

“Write a short story (150 words) about a robot who wants to become a chef.”

- Submit and read the AI-generated story.
- Discuss how detailed and creative the output is.

Summarize a Paragraph

Prompt:

Summarize the following paragraph in 3 sentences:

“Artificial Intelligence is a branch of computer science that aims to create intelligent machines that can mimic human thinking. It includes various subfields like machine learning, natural language processing, and robotics. AI is widely used in industries such as healthcare, finance, and transportation to improve efficiency and decision-making.”

- Submit and review the summary.
- Evaluate how well AI extracts key points.

Refine Your Prompt

Try changing the summary prompt to:

“Summarize the paragraph above in simple language for 10-year-olds.”

- Compare this output to the previous one.
- Note how prompt wording changes results.

9. AI for Creative Writing

Prompt:

“Write a short motivational story for 10-year-old students in under 150 words.”

10. Generate **Slides**: Tool: SlidesGPT/Other Free AI tool

Prompt:

“Create a 5-slide presentation on ‘AI in Smart Farming’.”

11. YouTube Thumbnails / Branding: Tool: Canva + Magic

Media AI Design a thumbnail using Canva’s AI tools

with a prompt like:

“Design a YouTube thumbnail for a video titled ‘Top 5 AI Tools for Students’.”

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 1 - FUNDAMENTALS OF FIRE AND INDUSTRIAL SAFETY

First Year

Semester - I

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

On completion of the course, the learner is expected to be familiar with the techniques of firefighting and safe operations. He is also made aware of risk, hazards, accidents and illnesses related to common day to day, industrial activities and jobs and ways to prevent / protect themselves from such situations.

Learning Outcomes

1. Understand Fire Science Principles
2. To Describe the classification of fires
3. To Explain the basic principles and concepts of Work permit systems
4. Understand and implement fire prevention strategies
5. Safely and effectively use basic firefighting equipments

Unit – I

Fundamentals of safety, Accidents-causes, classification of industrial accidents, Chemistry of combustion or Heat, Fire Prevention Mechanism, Fire Extinguishing methods

Unit – II

Fire Triangle and Fire Tetrahedron, Classification of Fire, Fire Prevention Techniques, Safe Guards against Fire Risk.

Unit – III

Portable Fire Fighting aps, Fixed Fire Fighting Systems, Hose and Hose fittings, pumps & primers, IC Engine, Tank Cooling System, Foams and Foam Making Equipment, Fire Alarm System.

Unit – IV

Work Permit Systems – Types of permit with details of each, Personal Protective Equipments, and Hazard Analysis.

Unit – V

Risk Assessment, Emergency Control Plan – Safety Policy, Proper Usage & Maintenance Of Tools, Industrial psychology.

Student Activities

By the end of the subject, students should be able to:

1. Explain the principles of fire science and industrial safety (**Oral or PPT presentation**).
2. Identify and mitigate fire and workplace hazards (**Group activity/Project**).
3. Operate basic firefighting equipment and fire safety protocols (**on-the job-training**).
4. Understand and apply relevant safety regulations (**Safety Quiz**)
5. Develop basic emergency response and evacuation plans(**Mock drill**)
6. Industrial Visits
7. Field Visits
8. Assignments

List of References

1. Industrial Safety Health and Environmental Management system
Publication: Khanna Publishers, Authors: R.K Jain and Sunil S. Rao
2. Industrial Safety Management Publication: Tata Mc Graw-Hill Publishing
Company Ltd. Author: L. M. Deshmukh
3. ABC of Industrial Safety Remember ABC Publication: MEEDS Author: V P
M Mani.
4. Fire Protection Hand Book – Publication: National Fire Protection
Association USA Author: Quincy – Massachusetts
5. Fire and explosion Hazards Handbook of Industrial Chemicals Publication:
Jaico Publishing House Author: Tatyana A. Devletshina& Nicholas P.
Cheremisinoff, Ph. D.

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(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 2 - SAFETY ENGINEERING-1

First Year

Semester - I

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable the students to know about fire and explosion, material handling, safe operating procedures, industrial lighting, ventilation, heat control, noise and vibration which will be look after in every industry. The student is also aware of promoting the same in the industry to come day to day.

Learning Outcomes

1. Understand Fundamental Safety Concepts
2. Apply Safety Standards and Regulations
3. Conduct Hazard and Risk Assessments
4. Understand Safety Protocols and their communication

Unit-I

Introduction to Safe Guarding Machinery, Principles of machine guarding, Introduction of Ergonomics; Ergonomics of machine guarding; Type of guards.

Unit-II

Safety in the use of Machines - Need of selection and care of cutting tools Preventive maintenance, Periodic checks for safe operation Associated hazards and their prevention

Unit-III

Work place design, Plant layout, design, and safe distance; improving safety and productivity through work place design. Plant Layout and Design, Road safety.

Unit-IV

Good House Keeping – 5S House Keeping method, important standards and codes of practice for plant and equipment. Employee assignment, Inspections and check-lists

Unit-V

Lighting and safety, Purpose of lighting, advantages of good illumination, lighting and the work, sources and types; principles of good illumination; minimum standards of illumination; design, maintenance of lighting.

Student Activities

1. Understand Principles of machine guarding (**Group Discussion**)
2. A written **report or presentation** summarizing industrial hazards and risk levels
3. **Pre/Post Quiz** - multiple-choice quiz on safety rules/ Plant Layout and Design
4. Encourage creative communication of safety protocols(**AV presentation**)
5. Industrial Visits
6. Field Visits
7. Assignments

List of References

- 1) Introduction Ergonomics, WHO by Singleton
- 2) Industrial Safety hand Book, Mc Graw Hill by Handley
- 3) Principle of exhaust ventilation by HMSO

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC - English : 2 - ENGLISH BRIDGE-II: COMMUNICATE AND CONNECT

First Year

Semester - II

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

Learning Objectives (LOs):

- Recognize and reflect on civil and respectful communication in social and professional settings.
- Understand dramatic narratives and short fiction to enhance reading and speaking skills.
- Apply basic grammar and vocabulary in structured communication.
- Practice effective written formats for workplace communication.
- Interpret visual data and convert it into written content using note-making and report writing.

Course Outcomes (COs):

- Demonstrate improved communication etiquette through readings on civility and motivation.
- Employ skimming, scanning, and note-making strategies in academic and workplace writing.
- Display awareness of societal values and professional conduct through literature.
- Draft structured texts like reports, agendas, and notices with clarity.
- Integrate vocabulary and grammar in writing and speaking activities effectively.

Unit I

- Prose: "On Saying Please" – A.G. Gardiner
- Short Story: "Half a Rupee Worth" – R.K. Narayan
- Conversion of Words.

Unit II

- Poem: "If" – Rudyard Kipling
- Prose: "I Have a Dream" – Martin Luther King Jr.
- Skimming & Scanning

Unit III

- One-Act Play: "Never, Never Nest" – Cedric Mount
- Short Story: "The Gift of the Magi" – O. Henry
- Report Writing

Unit IV

- Short Story: "How I Taught My Grandmother to Read" – Sudha Murty
- Information Transfer: Pie Charts, tree diagram and flow chart.
- Note-making

Unit V

- Prose: “The Secret of Work” – Swami Vivekananda
- Notices, Agendas, and Minutes
- One-Word Substitutes

Unit-wise Suggested Activities:

Unit I

- Vocabulary games
- Role-play

Unit II

- Presentation on a dream job.
- Group Discussion

Unit III

- Debate on EMI
- Report Writing college events

Unit IV

- Presentation using ppt (charts/photos)
- Preparing notes from a short lecture/podcast

Unit V

- Drafting a Notice and Agenda for a student meeting
- Vocabulary Quiz

Reference Books:

- Fluency in English – Part II, Board of Editors, Orient BlackSwan
- Effective Technical Communication by M. Ashraf Rizvi (McGraw Hill)
- English Grammar in Use by Raymond Murphy (Cambridge)
- Professional Communication by Aruna Koneru (McGraw Hill)
- Selected Stories by R.K. Narayan (Indian Thought Publications)
- Collected Essays of A.G. Gardiner
- Collected Poems by Rudyard Kipling
- The Gift of the Magi and Other Stories by O. Henry
- Selected Speeches of Swami Vivekananda
- Short Stories by Sudha Murty (Penguin India)

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Telugu : 2 - TELUGU – (SAHITHI KUSUMAALU)

First Year

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

Semester - II

I. గజేంద్రమోక్షం - పోతన - (ఆంధ్ర మహాభాగవతం - అష్టమస్కంధం - 86-105 పద్యాలు)

("కలడందురు దీనుల యెడ... నుంచి "వినువీధిం జనుదేర గాంచి రమరుల్..." అనే పద్యం వరకు)

పోతన - కవిపరిచయం, రచనాశైలి

గజేంద్రమోక్షం - పాఠ్యాంశం, సందేశం

II. సీతాసాంత్వనం - కంకంటి పాపరాజు - (ఉత్తరరామాయణము - షష్ఠా శ్వాసము- 311- 325 వరకు)

("యతి మూర్ఖుని" నుంచి ".... తొల్లి బుధులాడిన మాటలు విను తెల్పెదన్" వరకు)

కంకంటి పాపరాజు - కవిపరిచయం, రచనాశైలి

సీతాసాంత్వనం - పాఠ్యాంశం, సందేశం

III. 'అతడు అడవిని జయించాడు' (నవల- సంక్షిప్త పరిచయం) - డా. కేశవరెడ్డి

డా. కేశవరెడ్డి - రచయిత పరిచయం, రచనాశైలి

'అతడు అడవిని జయించాడు' నవల- సారాంశం, సందేశం

IV. 'గురుశిష్యులు' (కన్యాశుల్కం నాటకం - ద్వితీయాంకం /- గురుజూడ వేంకట అప్పారావు

గురుజూడ వేంకట అప్పారావు- రచయిత పరిచయం, రచనాశైలి

"గురుశిష్యులు" పాఠ్యాంశం- సారాంశం, సందేశం

V. జానపద కళారూపాలు (ఆంధ్రుల జానపద విజ్ఞానం- జానపదకళలు)- డాక్టర్ ఆర్వీయస్ సుందరం

రచయిత పరిచయం, తెలుగువారి జానపద కళారూపాల పరిచయం.

తోలుబొమ్మలాట, యక్షగానం, బుర్రకథ, కోలాటం ఊ తిప్పిటగుళ్ళు

అలంకారాలు

అర్థాలంకారాలు: ఉపమ, ఉత్పేక్ష, రూపక, స్వభావోక్తి, అర్థాంతర వ్యాస, అతిశయోక్తి శ్లేష

శబ్దాలంకారాలు వృత్త్యనుప్రాస, చేకానుప్రాస, లాటానుప్రాస, అంత్యానుప్రాస ఛందస్సు

వృత్తాలు ఉత్పలమాల, చంపకమాల, శార్దూలము, మత్తేభము

జాతులు: కంఠం

ఉపజాతులు : వీసం, ఆటవెలది, తేటగి

ఆధార గ్రంథాలు/వ్యాసాలు

1. ఆంధ్ర మహాభాగవతం- బమ్మెర పోతన- తిరుమల తిరుపతి దేవస్థానం, తిరుపతి ప్రచురణ
2. ఉత్తర రామాయణము - కంకంటి పాపరాజు- సి.వి కృష్ణ బుక్ డిపో (1951), మద్రాసువారి ప్రచురణ.
3. అతడు అడవిని జయించాడు- డా. కేశవరెడ్డి (2015)- విశాలాంధ్ర ప్రచురణలు.
4. కన్యాశుల్కం - గురజాడ వేంకట అప్పారావు- జయంతి పబ్లికేషన్సు (1991)
5. జానపద కళారూపాలు- డా. ఆర్వీయస్ సుందరం - పొట్టి శ్రీరాములు తెలుగు విశ్వవిద్యాలయం(2018), హైదరాబాదు.

సూచించబడిన సహపాఠ్య కార్యక్రమాలు

1. పోతన పద్యరచనాశైలిని పరిశీలించడం, శబ్దాలంకారప్రయోగాలను గుర్తించడం
2. కంకంటి పాపరాజు రచనా శైలిని, పాత్రల మనస్తత్వ చిత్రణను పరిశీలించడం
3. తెలుగునవలా సాహిత్యంలో కేశవరెడ్డి నవల ప్రత్యేకతలను గుర్తించడం
4. ఈ పాఠ్యాంశం ఆధారంగా రంగస్థలంపై ప్రదర్శన చేయించడం, సామాజికాంశాలపై నాటికలను రూపొందించడం
5. స్థానిక జానపదకళారూపాలపై నివేదిక తయారు చేయడం, కళారూపాలను ప్రదర్శించడం

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Hindi : 2 - HINDI – (PROSE, SHORT STORIES AND GRAMMAR)

First Year

Semester - II

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

UNIT-I : काव्यदीप

1. साखी - 1-5
2. तुलसीदास - 1-5
3. सूरदास - बाल वर्णन

UNIT-II : हिन्दी साहित्य का इतिहास (History of Hindi Literature)

सामान्य परिचय

काल विभाजन

UNIT-III व्याकरण (GRAMMAR)

कारक

संक्षेपण

UNIT-IV कार्यालय शब्द - अंग्रेजी से हिन्दी पदनाम, हिन्दी से अंग्रेजी पदनाम

UNIT-V प्रयोजनमूलक हिन्दी

परिपत्र

ज्ञापन

सूचना

Text Books:

1. Kaavya deep

Reference books:

1. Hindi Sahitya ka Itihas - Ramachandra Shukla
2. Hindi Sahitya ka Itihas - Dr Nagendra

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Sanskrit : 2 - SANSKRIT – (POETRY, PROSE & GRAMMER -II)

First Year

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

Semester - II

Learning Outcomes:

1. संस्कृत पद्यकविप्रयोग माधुर्यानुभूतिः भवति ।
2. संस्कृत गद्यकविप्रयोग माधुर्यानुभूतिः भवति ।
3. व्याकरणज्ञानात् लेखनशुद्धिः भवति ।

Syllabus: (Teaching Hours: 45)

Unit - 1: प्राचीन पद्य साहित्यम् (9h)

1. पाणिग्रहणम् - रघुवम्शमहाकाव्ये 7 सर्गः
2. पत्रार्चनम् - नानाग्रन्थेभ्यः

Unit -2: आधुनिक पद्य साहित्यम् (9h)

1. पन्नाधात्री श्रीमत्प्रतापरणायने मेवाडकाण्डे 13 सर्गः
2. सुखवर्गः धम्मपदम् (Sanskrit Version of Prof. P.Sriramachandrudu)

Unit - 3: गद्य साहित्यम् (9h)

1. अमोघदर्शनम् वाणस्य कादंबरीतः
2. चारुचेष्टितम् - कविकोपकलापतः

Unit - 4: व्याकरणम् (9h)

1. अजन्त शब्दाः (नदी, तनु, वधू, मातृ, वन, फल, वारि, मधु)
2. धातवः (इष्, लिख, कृञ्, क्रीञ्, चुर, रमु, वन्द, युध्)

Unit -5: व्याकरणम् (9h)

1. सन्धयः (हल् सन्धिः विसर्गसन्धिः)
2. समासाः (अव्यायीभावः, बहुव्रीहिः)

Skill Outcomes:

On successful completion of this course, student shall be able to:

1. संस्कृतकवीनां पदवाक्यप्रयोगसरणेरवगतिः भवति ।
2. संस्कृतकवीनां भावगम्भीर्यं परिज्ञानम् भवति ।
3. वाक्यरचनायाम् दोषराहित्यप्राप्तिः भवति ।

References:

1. Prescribed Sanskrit Text Book II

Co-Curricular Activities: (Hours for Activity: 15h)

1. Assignments
2. Seminars, Group discussions, Quiz, Debates etc.
3. Invited lectures and presentations on related topics by experts.

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY
AECC – Tamil : 2 - TAMIL – (POETRY, TAMIL LITERATURE AND GRAMMAR)

First Year

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

Semester - II

UNIT-1 : பக்தி இலக்கியம்

1. திருஞானசம்பந்தர் தேவாரம் "தோடுடைய சிவனே போற்றி" முதல் பதிகம் முழுவதும்
2. மாணிக்கவாசகர் திருவாசகம் 'திருச்சதகம்', "மெய் உணர்தல்" பதிகம் முழுவதும்
3. ஆண்டாள் திருப்பாவை 1 முதல் 10 பாசுரங்கள்
4. குலசேகர ஆழ்வார் - பெருமாள் திருமொழி " நான்காம் பதிகம் முழுவதும்
5. சீறாப்புராணம் - "நாட்டு படலம்" முதல் 5 பாடல்
6. இரட்சணிய மனோகரம் "உள்ளம் பெருங்கோயில்"

UNIT-II : அற இலக்கியம்

1. திருக்குறள்
அ. கூடா நட்பு (அறம்)
ஆ. குற்றம் கடிதல் (பொருள்)
இ. பிரிவாற்றாமை (இன்பம்)
2. நாலடியார்
அ. இளமை நிலையாமை
ஆ. குடிபிறப்பு
3. ஆசாரக்கோவை - முதல் 10 பாடல்கள்

UNIT-III : சிற்றிலக்கியமும், தமிழ் இலக்கிய வரலாறும்

1. சிற்றிலக்கியமும்
1. உலா, கலம்பகம், அந்தாதி, பிள்ளைத்தமிழ், மடல், தூது, குறவஞ்சி, பரணி பள்ளு, கோவை.
2. ஐரோப்பியர் தமிழ் தொண்டு
தமிழில் உரைநடை வளர்ச்சி; மேனாட்டுக் கிறித்தவர்கள் - வீரமாமுனிவர்-சீகன் பால்கு ஐயர் எல்லிஸ் துரை -இரேனியுஸ் ஐயர் - போப்பையர் -கால்டு வெல் ஐயர்

UNIT-IV : உரைநடை நூல்கள்

1. நாகரிகம்-மு. வரதராசன்.
2. அஞ்சாமை -மு.வரதராசன்
3. வஞ்சினம் கூறல் - மு. வரதராசன்
4. அறிவியலும் கலையும் மு. வரதராசன்
5. அறிஞர் குறித்த பேராசிரியர் கருத்துகள் - ந. சுப்பு ரெட்டியார்
6. நினைவுக் குமிழிகள் - ந.சுப்பு ரெட்டியார்

UNIT- V : இலக்கணத் திறன்

1. பாயிரவியல்
 - அ. பொதுப் பாயிரம்
 - ஆ. சிறப்புப் பாயிரம்
2. கடிதம் வரைதல்
3. மொழிபெயர்ப்பு

Reference Books:

- 1.1 தமிழ் இலக்கிய வரலாறு- மு. வரதராசனார்
- 2 தமிழ் இலக்கிய வரலாறு - சி. பாலசுப்பிரமணியன்
3. தமிழ் நெஞ்சம் - மு. வரதராசனார்
4. இந்திய இலக்கிய சிற்பிகள் - த. விஷ்ணுகுமாரன்
5. நன்னூல் -அ.ச. ஞான சம்பந்தன்
6. இலக்கியத்திறன் மு.வரதராசனார்

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 1 - PRINCIPLES OF PHYSICAL SCIENCES

First Year

Semester - II

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

Course Objective:

The course "Principles of Physical Sciences " is designed to introduce arts students to fundamental concepts and principles of physical sciences, fostering a deeper understanding of the physical world and its interconnections with various disciplines.

Learning outcomes:

Upon completion of the course "Principles of Physical Sciences for Arts Students," students from arts backgrounds will be able to:

1. Understand the foundational principles of physical sciences: Students will develop a comprehensive understanding of the core principles and concepts in physical sciences.
2. Analyse and interpret scientific information: Students will acquire the ability to critically analyse scientific information and data related to physical sciences.
3. Apply physical science principles to real-world scenarios: Students will develop the skills to apply physical science principles to solve real-world problems and scenarios.

Syllabus:

Unit 1: Introduction to Physics

Nature of Physics: Overview of physics as a discipline, its scope, and its relationship to other sciences. Scientific Method in Physics: Introduction to the scientific method and its application in the study of physics. Measurement and Units: Understanding the principles of measurement, SI units, and the importance of accurate and precise measurements. Scalars and Vectors: Differentiating between scalars and vectors, understanding vector addition and subtraction.

Unit 2: Mechanics for Arts Students

Motion and Forces: Introduction to the principles of motion, including velocity, acceleration, and the laws of motion. Energy and Work: Understanding the concept of energy, different forms of energy, and the relationship between work and energy. Circular Motion: Exploring the principles of circular motion, centripetal force, and applications in real-world scenarios. Gravity: Introduction to the concept of gravity, Newton's law of universal gravitation, and its implications.

Unit 3: Waves and Optics for Arts Students

Waves: Understanding the properties and characteristics of waves, including wave types, wave motion, and wave interference. Sound Waves: Exploring the nature of sound waves, including properties of sound, sound propagation, and the Doppler effect. Light and Optics: Introduction to the behavior of light, reflection, refraction, and the formation of images by mirrors and lenses. Wave Optics: Understanding the principles of interference, diffraction, and polarization of light waves.

Reference Books:

1. "Principles of Physics" by David Halliday, Robert Resnick, and Jearl Walker: This textbook covers the fundamental principles of physics, including mechanics, electromagnetism, thermodynamics, and modern physics. It provides a comprehensive introduction to the subject and includes numerous examples and exercises for practice.
2. "University Physics" by Hugh D. Young and Roger A. Freedman: This textbook is widely used in university-level physics courses. It covers a wide range of topics in classical physics, modern physics, and thermodynamics. It is known for its clear explanations and problem-solving approach.
3. "Concepts of Modern Physics" by Arthur Beiser: This book provides an introduction to the principles and concepts of modern physics, including quantum mechanics, atomic and nuclear physics, and relativity. It is suitable for students with a basic background in physics and mathematics.
4. "The Feynman Lectures on Physics" by Richard P. Feynman, Robert B. Leighton, and Matthew Sands: This three-volume set is based on the famous lectures given by physicist Richard Feynman. It covers a wide range of topics in physics, including mechanics, electromagnetism, quantum mechanics, and statistical mechanics. The lectures are known for their engaging style and intuitive explanations.
5. "Physical Science" by Bill Tillery: This textbook provides a comprehensive introduction to the principles of physical science, covering topics such as motion, forces, energy, waves, electricity, and magnetism. It is designed for introductory-level courses and includes numerous examples, illustrations, and practice problems.
6. "Fundamentals of Physics" by Jearl Walker, David Halliday, and Robert Resnick: This textbook is widely used in physics courses and covers the fundamental principles of classical physics. It includes a strong emphasis on problem-solving and conceptual understanding.

Student activities:

1. Conduct research on a famous physicist or a significant discovery in the field of physics. Write a short report highlighting the physicist's contributions or explaining the importance of the discovery. Include information about how the discovery impacted other scientific fields or technological advancements.
2. Watch videos or animations demonstrating circular motion, such as the motion of objects on a Ferris wheel or a car turning on a curved track. Identify the forces involved, including the centripetal force, and explain how they contribute to the object's circular motion. Discuss real-world examples where circular motion is significant, such as satellites orbiting the Earth.
3. Set up a wave demonstration using a rope or a slinky to visualize the properties of waves, such as wavelength, frequency, amplitude, and wave speed. Observe how these properties change when altering the parameters of the wave, such as tension or length.

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

SEC - Skill Enhancement Course : 2 - APPLICATIONS OF ARTIFICIAL INTELLIGENCE - PRACTICAL

First Year

Semester - II

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

(4. APPLICABLE TO MATHEMATICS, PHYSICS, CHEMISTRY AND ANY OTHER MATHEMATICAL SCIENCES)

Course Objectives

1. Provide a foundational understanding of AI platforms, data pipelines, and their importance in the physical sciences.
2. Introduce real-world datasets and public repositories relevant to physics, chemistry, mathematics, and earth sciences.
3. Explain how AI is applied to solve scientific problems, discover patterns, and support research in physical sciences in a simple, non-coding manner.
4. Highlight ethical concerns, data challenges, and the future of AI-driven discoveries in physical sciences.

Course Outcomes

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

1. Explain the AI ecosystem (hardware, cloud, and edge devices) in relation to physical sciences applications.
2. Identify scientific data types and public repositories relevant to physics, chemistry, mathematics, and earth sciences.
3. Describe the process of preparing and managing scientific data pipelines.
4. Illustrate the role of AI in solving real-world scientific challenges in physics, chemistry, mathematics, and earth sciences.
5. Analyze ethical, environmental, and societal impacts of AI-driven scientific applications.

Unit 1. Infrastructure and Platforms for Building Applications using AI

Hardware used in building AI applications: Processors - CPU, GPU, TPU, NPU, Memory - RAM, VRAM, Storage - HDD, SSD

Platforms for building applications using AI: Online platforms (Example - Google AutoML, H2O.ai, Teachable Machine or similar platforms - for practice only); Desktop (No-code/Low-code) platforms (Orange Data Mining, KNIME, Weka, Rapid Miner or similar tools - for practice only).

Edge AI: Concept; Applications in daily life in devices like Refrigerators, Led Bulbs, Surveillance Cameras, Micro Ovens, Smart Cars/Scooters; Edge AI in smart Appliances

Unit 2: Foundations of Data - Types, Ethics and Utility in Building Applications using AI
Importance of data in building AI applications: Data as the fuel for AI, Role of big data in training AI models.

Conceptual Foundations of Data: Data vs. Information vs. Knowledge.

Structure of Data: Structured, Semi-Structured, and Unstructured Data.

Modalities of Data: Text, Image, Audio, Video, Tabular, Time-Series, and Spatial Data.

Formats of Data: Text Formats (CSV, JSON, XML), Image Formats (JPEG, GIF, PNG), Audio/Video (MP3, WAV, MP4, AVI).

Data Repositories: Definition of public Datasets; Definition of private Datasets; Importance of Public Datasets, Popular Public Dataset Repositories (Example - Kaggle,

Hugging Face Datasets, UCI Machine Learning Repository, Google Dataset Search or similar ones - for demonstration only), Dataset licensing and usage rights.

Ethics, Privacy in Data Usage: Privacy concerns related to data usage; Regulations governing data usage - GDPR, HIPAA (Overview), Ethical use of data, Responsible AI data practices.

Unit 3. The AI Data Pipeline: From Collection to Model Readiness

The AI Data Pipeline: Stages and Components: Key Stages (Data Collection, Annotation, Preprocessing, Splitting, Feeding into AI Models)

Core Components: Ingestion, Storage, Processing, Validation, Delivery

Data Collection Methods for AI: Manual Input (Surveys, forms, human-curated entries), Sensors & IoT Devices (Real-time data from physical environments), System Logs & Transactions, Web Scraping (Automated extraction from websites), APIs (Structured data access from external platforms)

Data Annotation and Labelling: Definition & Importance; Annotation Methods: Manual Annotation, Automated Annotation; Types of Annotation: Classification, Bounding Boxes, Segmentation, Transcription, Named Entity Recognition (NER)

Data Cleaning and Preprocessing: Importance of data cleaning; Understanding “Dirty” Data: Missing Values, Duplicates, Incorrect Formats, Outliers, Noise; Steps in Data Cleaning: Identify Issues, Handle Errors (Imputation, Removal), Validate Cleaned Data

Data Splitting: Splitting data into training set and test set.

Data Transformation Techniques: Normalization, Transformation, Feature Engineering (Conceptual)

Unit 4: AI in Physical Sciences (Physics & Chemistry Applications)

AI in Physics: AI for analyzing astronomical images (identifying galaxies, stars, exoplanets), CERN Datasets for Particle Physics.

AI in material science: discovering new superconductors and quantum materials
AI in energy: predicting power grid loads, optimizing solar and wind energy systems

AI in Chemistry:

Protein structure prediction (Alpha Fold).

AI in drug discovery - virtual screening of compounds.

AI in chemistry - reaction outcome & material property prediction. **Unit 5: AI in Mathematics and Earth Sciences**

AI in Mathematics:

Pattern recognition in large datasets (fractals, chaos systems, number theory) Automated theorem proving and symbolic mathematics

AI in optimization problems (transport, logistics, resource allocation)

(Explore the Wolfram Alpha Tool:

<https://www.wolframalpha.com/examples/mathematics>)

AI in Earth Sciences

Climate modeling: AI predicting weather patterns, cyclones, and long-term climate change
Remote sensing: AI analyzing satellite images for deforestation, urbanization, and natural resource mapping

Earthquake and natural disaster prediction using sensor networks

AI in geology: identifying mineral deposits, oil, and groundwater reserves

Suggested Lab Practicals (No Coding)**Lab 1 - Exploring Public Datasets (Orange Data Mining)**

- Visit a public repository (Kaggle, UCI, data.gov.in)
- Download a dataset (e.g., rainfall data, literacy rates, or traffic accident statistics)
- **Procedure:**
 1. Open Orange → Add *File* widget → Load a CSV (e.g., Titanic dataset).
 2. Connect to *Data Table* → View rows/columns.
 3. Connect to *Data Info* → Check attributes, data types.
 4. View in *Data Table* and *Distributions* widget.
- **Observation:** Note numeric, categorical, missing values.
- **Outcome:** Students understand structured data format in CSV.

Lab 2 - Exploring Scientific Datasets Dataset: Earth datasets, Physics Particle Dataset **Tool:** Orange Data Mining.

Activity:

- Load a CSV (e.g., earthquake dataset: <https://www.kaggle.com/datasets/warcoder/earthquake-dataset> Physics particle dataset: <https://www.kaggle.com/datasets/dsfelix/physics-particles>)
- Use **Data Table + Distributions** to view features.
- Compare categorical vs numerical attributes.
- **Outcome:** Students understand how scientific datasets are structured and visualized.

Lab 3 - Understanding Dataset Metadata and Formats

- Take two datasets in different formats (CSV, JSON)
- View metadata (description, features, size, license)
- Compare domain-specific datasets (e.g., medical vs. finance)

Lab 4 - Data Annotation Exercise

- Use **MakeSense.ai** or **VGG Image Annotator (VIA)**
- Annotate 10 sample images (traffic signs, fruits, or medical scans)
- Export annotations in XML or YOLO format
- Discuss annotation errors and challenges

Lab 5 - Data Cleaning and Visualization (Orange Data Mining)

- **Aim:** To clean dirty data and visualize categorical and numeric attributes.
- **Procedure:**
 1. Load dataset.
 2. Connect *File* → *Edit Domain* (to change types) and *Impute* (to fill missing values).
 3. Compare cleaned vs. original in *Data Table*.
 4. *Distributions* widget.
 5. Check various features distribution.
(Optional: Create simple bar charts/line charts to visualize trends using Google Looker Studio)
- **Observation:** Missing values filled with mean/median., Graphical representation of data.
- **Outcome:** Learn importance of data cleaning., Students learn importance of visualization in preprocessing.

Lab 6: Train/Test Split in Orange

- **Aim:** To split dataset for AI training/testing.
- **Procedure:**
 1. Load Titanic dataset.

2. Connect File → Data Sampler (70% train, 30% test).
 3. Connect outputs to Data Table widgets to view.
- **Observation:** Students see two different subsets.
 - **Outcome:** Concept of model validation using split data.

Lab 7 – Material Science Data Exploration (Chemistry + Physics)

Dataset: Materials Project Database (<https://next-gen.materialsproject.org/>) OR Kaggle chemistry datasets (<https://www.kaggle.com/competitions/tagIds=7402-Chemistry>)

Tool: Orange Data Mining.

Activity:

Load material/compound dataset (e.g., band gap, conductivity). Visualize trends (scatter plots, bar charts). Identify correlations between features.

Outcome: Students see how AI identifies new material properties.

Lab 8 – Earthquake Prediction Data Analysis (Earth Sciences) Dataset: USGS Earthquake Dataset (public):

<https://www.kaggle.com/datasets/rupindersinghrana/usgs-earthquakes-2024>

Tool:

Orange Data Mining

Activity:

- Load earthquake data (time, magnitude, depth).
- Plot frequency over time & regions.
- Perform simple clustering (e.g., k-means in Orange).

Outcome: Understand how AI detects seismic patterns.

Lab 9– Climate Data Visualization (Earth Sciences)

Dataset: NASA GISS climate dataset (<https://data.giss.nasa.gov/gistemp/>) / FAO rainfall data (<https://www.fao.org/aquastat/en/geospatial-information/climate-information>) .

Tool: Google Looker Studio (free dashboard tool). **Activity:**

- Import CSV of temperature/rainfall data.
- Build trend graphs and heat maps.

Outcome: Learn visualization of climate patterns & anomalies.

Lab 10 – Chemical Compound Classification (Chemistry) Prerequisite: Discuss conceptually about Clustering

Dataset: PubChem / ChEMBL chemical datasets. (<https://pubchem.ncbi.nlm.nih.gov/source/ChEMBL>)

Tool: ChemMine Tools (free web-based). (<https://chemminetools.ucr.edu/>)

Activity:

- Input chemical structures or SMILES notations.
- Predict chemical similarity clusters.
- Analyze “drug-likeness” properties.

Outcome: Understanding AI in drug discovery & reaction prediction.

Lab 11 – Symbolic Mathematics Solver (Mathematics) Dataset: Wolfram Alpha examples / OpenMath datasets.

Tool: MathPix (OCR) + Symbolab / WolframAlpha (free tier)-
<https://www.wolframalpha.com/>

Activity:

- Input handwritten/scanned math problems using MathPix.
- Use Wolfram Alpha to see symbolic solving.

- Compare AI vs manual solution steps.

Outcome: Understand automated theorem proving and symbolic AI.

Lab 11 – Explore the Mathematical AI tool

Tool: WolframAlpha (free tier)- <https://www.wolframalpha.com/>

Activity:

- Solve specific math problems or find information on Mathematical subjects and topics.

Outcome: Understand deep computational power of AI tools in solving Math Problems.

Lab 12 – Explore various Remote Sensing Datasets Tool:

<https://developers.google.com/earth-engine/datasets/>

Activity:

- Explore any Three Satellite Sensor Datasets
- Identify the Significance and the Period of Availability
- Study various bands available in the data

Outcome: Understand various Remote Sensing Datasets.

Note: The Tools suggested above are tentative. Teacher/Student is free to choose any other similar tool to execute the said lab experiments.

Books/References

1. **Data Science for Beginners**, Andrew Park
(Introductory concepts of data types, collection, cleaning, and visualization without coding)
2. **AI Basics for Non-Programmers**, Tom Taulli
(Clear explanations of AI data lifecycle and real-world use cases)
3. **Data Preparation for Machine Learning**, Jason Brownlee
(Conceptual understanding of dataset quality, preprocessing, and pipelines)
4. **Hands-On Data Science for Non-Programmers**, David Meerman Scott
(Spreadsheet-based data exploration and visualization)
5. You Look Like a Thing and I Love You – Janelle Shane
6. AI in Astronomy:
<https://www.bornctoengineer.com/how-is-artificial-intelligence-is-helping-us-learn-about-the-universe>
<https://primo.ai/index.php/Astronomy>
7. CERN datasets for Particle Physics: <https://opendata.cern.ch/>
8. AI in Material Science:
<https://deepmind.google/discover/blog/millions-of-new-materials-discovered-with-deep-learning/>
<https://www.temasek.com.sg/content/dam/temasek-corporate/news-and-views/resources/reports/ai-meets-materials.pdf>
9. AI in Energy: <https://www.xenonstack.com/blog/ai-renewable-energy-production>
<https://www.sandtech.com/insight/how-ai-is-transforming-the-future-in-energy-management/>
10. AI in Chemistry: <https://chemintelligence.com/ai-for-chemistry>
<https://deepmind.google/science/alphafold/>
<https://aimagazine.com/articles/alphafold-2-the-ai-system-that-won-google-a-nobel-prize> <https://blog.google/technology/ai/google-deepmind-isomorphic-alphafold-3-ai-model/#life-molecules>
11. AI in Drug Discovery:

<https://www.ddw-online.com/the-promise-of-ai-advancing-drug-discovery-with-ultra-large-library-processing-29063-202403/>

<https://www.medchemexpress.com/ai-driven-drug-screening.html?srsltid=AfmBOoqhDeVNqW9S5vn1m4FZargNAKEFdOKaPvwsnOIzenQEEJoWkz8J>

12. AI in Optimization Problems:

<https://throughput.world/blog/ai-in-transportation-and-logistics/>

<https://codewave.com/insights/ai-transforming-transportation-logistics/>

13. AI in Remote Sensing: <https://www.satimagingcorp.com/applications/artificial-intelligence-ai/>

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

IKS - Indian Knowledge System : 1 - INDIAN KNOWLEDGE SYSTEM - I
INDIAN INTELLECTUAL HERITAGE

First Year		Semester - II	
No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2	
No. of Credits Theory : -	No. of Credits Practical : -	Total No. of Credits : -	
Internal Assessment : -	End Examination : -	Total Marks : -	
	Practical Component : -	Exam Hours : -	

Course Objective:

1. To introduce to the students the overall organization of IKS
2. To develop an appreciation among the students about the role and importance of Veda, Vedāṅgas, Itihāsas, Science in India, Indian Law, Governance and Health Systems
3. To show case the multi-dimensional nature of IKS and their importance in the contemporary society
4. To motivate the students to take up a detailed study of some of these topics and explore their application potential

Learning Outcome:

1. Appreciate the importance of ancient knowledge to a society
2. The student will have the introductory level understanding of the key components of the Indian Knowledge Systems
3. The students will be able to demonstrate the ability to address some of the existential questions of the life using some of the concepts contained in Indian Knowledge systems.
4. Will be able to apply the knowledge as a tool for their future research

SYLLABUS

1. **Unit 1 (10 hours)**
Understanding Indianness (Bhāratīyata) and IKS
2. **Unit 2 (10 hours)**
Foundational Concepts in IKS for Science, Engineering & Technology
3. **Unit 3 (15 hours)**
Science, Engineering & Technology in IKS
4. **Unit 4 (15 hours)**
Humanities & Social Sciences in IKS
5. **Unit 5 (10 hours)**
Introduction to Indian Knowledge Systems

References/ Learning Resources:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi. (Textbook for the course)
2. Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
3. Sampad and Vijay (2011). "The Wonder that is Sanskrit", Sri Aurobindo Society, Puducherry.

4. Balasubramanian, R. (2000). "Introduction". In Chattopadhyana (Ed.). History of Science, Philosophy and Culture in Indian Civilisation. Delhi: Centre for Studies in Civilisations.
6. Hiriyanna, M. (1994). Outlines of Indian Philosophy, Motilal Banarsidass, New Delhi.
7. Rajagopalachari, C. (2018). Ramayana, Bharatiya Vidya Bhavan, Mumbai.
8. Rajagopalachari, C. (2019). Mahabharata, Bharatiya Vidya Bhavan, Mumbai.
9. Bag, A.K. (1979). Mathematics in Ancient and Medieval India, Chaukhamba Orientalia, New Delhi.
10. Bhaduri, S. (1975). "Studies in Nyāya – Vaiśeṣika Metaphysics", Bhandarkar Oriental Research Institute, Pune.
11. Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
12. Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205–221.
13. Subbarayappa, B.V. and Sarma, K.V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
14. Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
15. Acarya, P.K. (1996). Indian Architecture, Munshiram Manoharlal Publishers, New Delhi.
16. Rangarajan, L.N. (2000). The Arthashastra, Penguin Random House, Haryana, India.
17. Dominik, W. (2001). "The Roots of Ayurveda", Penguin Classics, Haryana, India. ISBN:9780140436808.
18. Adhia, H., Nagendra, H.R. and Mahadevan, B. (2010). "Impact of Adoption of Yoga Way of Life on the Reduction of Job Burnout of Managers", Vikalpa. 35(2), pp. 21–33.
19. Banerjea, P. (1916). Public Administration in Ancient India, Macmillan, London.
20. Kapoor Kapil, Singh Avadhesh (2021). "Indian Knowledge Systems Vol – I & II", Indian Institute of Advanced Study, Shimla, H.P.

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 3 - ADVANCED FIRE TECHNOLOGY

First Year

Semester - II

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This program will equip students with essential skills in advanced fire prevention, risk assessment, emergency response, and industrial safety management, preparing them for careers in various sectors, including manufacturing, oil & gas, construction, and emergency services

Learning Outcomes

1. Understand Fundamental of Fire Engineering
2. Apply Fire Safety techniques and Regulations
3. Conduct first Aid procedure
4. Evaluate Portable and Fixed Fire Fighting Systems
5. Understand Fire prevention protocols and codes

Unit-I:

Fundamentals of Fire Engineering, Chemistry of Heat & Fire Mechanism, Modes & Media of Fire Extinction, Fire Triangle and Fire Tetrahedron

Unit-II:

Classification of Fire, Fire Prevention Techniques, Safe Guards against Fire Risk, Fire Detection and Control equipment

Unit-III:

Electrical Fires & their control, First Aid for Burns, Personal Protective Equipments, Storage, Handling & Transportation of Flammable & Explosive Chemicals,

Unit-IV:

Portable Fire Fighting apparatus, Fixed Fire Fighting Systems, Hose and Hose fittings, pumps & primers, Multiple fire fighting system, National and international codes on fire protection.

Unit V

Fundamentals of Advanced Fire Fighting, Automatic fire detection and alarm system, Automatic fire suppression system, FM-200 fire extinguishers, Drone firefighting, The role of science and technology in fire and industrial safety.

Student Activities

1. Understand Classification of Fire, Fire Prevention Techniques (**PPT Presentation**)
2. First Aide and other Emergency Procedures(**Demonstration and Group activity**)
3. Identify hazardous and flammable materials (**Preparation of checklists**)
4. Advanced Fire Fighting (**AV presentation**)
5. The role of science and technology in fire and industrial safety(**Essay competition**)
6. Mock drill on Fire Emergency of your location/ building
7. Industrial Visits
8. Field Visits
9. Assignments

List of References

1. Fire and explosion Hazards Handbook of Industrial Chemicals Publication: Jaico Publishing House Author: Tatyana A. Devletshina& Nicholas P. Cheremisinoff, Ph. D.
2. Industrial Fire Protection Hand Book – Publication: CRC Press, Boca Raton, FL. Author: Schroll, R. C, 2002.
3. Fire Protection Hand Book – Publication: National Fire Protection Association USA Author: Quincy – Massachusetts
4. Electrical Safety, Fire Safety Engineering and Safety Management – Rao. S

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 4 - SAFETY ENGINEERING -2

First Year

Semester - II

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This program will equip students with understanding of workplace hazards (Extreme heat, Noise, Vibration and hazardous chemicals) and their prevention. This course highlights various safety operations in agro industry, textile industry, automobile industry, Docks, Boiler, Pharmaceuticals and manufacture units.

Learning Outcomes

1. Understand the effects of extreme temperature at worksite
2. Identify various Noise levels generated in site operations
3. Explain the effect of Vibration on human body
4. Monitor and handling of chemicals to avoid chemical exposure

Unit-I

Types of workplace hazards, Ventilation & Heat Control, Heat stress & control of heat exposures; control of radiant heat; dilution ventilation.

Unit- II

Effects of noise on man; measurement and evaluation of noise; occupational health hazards due to extreme noise and vibration

Unit- III

Chemical Safety- Hazards/Risks, Safety measures, Material Safety Data Sheet (MSDS), Hazard communication. Confined Space – Hazards/Risks, Safety measures

Unit- IV

Hazards and their control measures in agro industry, textile industry, automobile industry and IT.

Safety in Docks, Boiler, Pharmaceuticals and manufacture units

Unit V

Safety Engineering, Industrial Best Practices to promote workplace safety, safety and health regulations of OSHA, ILO, ISO and BIS,

Student Activities

1. Classification various hazards in work place (**PPT Presentation**)
2. Safety Measures at extreme temperature in hot permit area (**Preparation of check-lists**)
3. Measuring and Recording various Noise levels (**On site Group activity**)
4. Identify abnormal health symptoms due to vibration (**Observation Skill**)
5. Safety measures at confined space (**AV presentation**)
6. Identify unsafe act/unsafe condition in various industries(Case studies and site visits)
7. Mock drill on Fire Emergency in a chemical unit
8. Assignments

List of References

1. Introduction Ergonomics, WHO by Singleton
2. Industrial Safety hand Book, Mc Graw Hill by Handley
3. Principle of exhaust ventilation by HMSO

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Community Service Project : 1 - COMMUNITY SERVICE PROJECT
(MINIMUM OF 80 HOURS)

First Year

Semester - II

No. of Hours/Week Theory: 0	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 0
No. of Credits Theory : 0	No. of Credits Practical : -	Total No. of Credits : 1
Internal Assessment : 0	End Examination : 0	Total Marks : 0
	Practical Component : -	Exam Hours :

CONTENTS

1. Introduction
2. Objectives
3. Implementation of Community Service Project
4. Procedure
5. Expected outcomes
6. Time frame for the community service project
7. Assessment methodology for community service project
8. Model of the project report
9. Suggestive list of programmes under community service project
10. Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups.

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Creative Writing / Business: 3 - ENGLISH- ENGLISH BRIDGE-III: GLOBAL FUTURE Writing in English

Second Year

Semester - III

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

Learning Objectives

1. To enhance students' ability to understand and appreciate poetry, prose, and drama.
2. To develop effective writing, speaking, and interpersonal communication skills.
3. To enable students to express themselves confidently in interviews and professional scenarios.
4. To promote critical thinking, emotional intelligence, and self-awareness through soft skills.

Course Outcomes

1. Students will be able to interpret and respond to literary texts.
2. Students will demonstrate proficiency in writing formal and informal letters, CVs, and emails.
3. Students will be capable of participating in interviews and group discussions.
4. Students will reflect on personal and professional strengths through SWOC analysis and EI.

Unit I

1. Poem: 'Where I live?' – Arundhati Subramaniam
2. Barriers to listening & Strategies for effective listening
3. E-mail Writing

Unit II

1. Short Story: The First Day- Edward.P.Jones
2. Greetings and Introduction
3. Resume and Cover Letter

Unit III

1. Prose: The Best Investment I Ever Made-A.J.Cronin
2. Asking and Giving Information
3. Interview Skills{Types of interviews, do's and do not's of interviews and stages of interviews}

Unit IV

1. Prose: Principles of Good Writing – L.A. Hills
2. Paragraph Writing (Guided writing)
3. Principles of Translation (Translation from English to Telugu 150 words)

Unit V

1. Time Management
2. Attitude

3. Social Consciousness
4. Emotional Intelligence

Suggested Classroom Activity:

Unit-1

1. Listening comprehension
2. Writing emails.

Unit-II

1. Self and introducing others
2. Resume writing

Unit-III

1. Mock Interviews
2. Practice session for procuring information

Unit-IV

1. Review of a film in a paragraph
2. Translation of English news

Unit-V

1. Role play
2. Monologue

References

1. Ghosh, B.N. (2010). 'Managing Soft Skills for Personality Development'. Tata McGraw Hill.
2. Kaul, Asha. (2005). 'Effective Business Communication'. Prentice Hall India.
3. Doff, Adrian & Jones, Christopher. (2014). 'Language in Use – Intermediate'. Cambridge University Press.
4. Kumar, Sanjay & Lata, Pushp. (2018). 'Communication Skills'. Oxford University Press.
5. Carnegie, Dale. (1936). 'How to Win Friends and Influence People'. Simon & Schuster.
6. Covey, Stephen R. (1989). 'The 7 Habits of Highly Effective People'. Free Press.
7. Driscoll, Donna. (2021). 'English for Job Seekers'. Cambridge India.
8. Selected newspaper articles, TED Talks, official websites, and YouTube channels used for classroom activities.

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Telugu : 3 - TELUGU – (SRUJANAATHMAKA RACHANA)

Second Year

Semester - III

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Hindi : 3 - HINDI – (MODERN POETRY, HISTORY OF HINDI LITERATURE AND ESSAY)

Second Year

Semester - III

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Sanskrit : 3 - SANSKRIT – (DRAMA, UPANISHAD, ALANKARAS AND HISTORY OF SANSKRIT LITERATURE)

Second Year

Semester - III

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

AECC – Tamil : 3 - TAMIL –

Second Year

Semester - III

No. of Hours/Week Theory: 4	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 4
No. of Credits Theory : 4	No. of Credits Practical : -	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : -	Exam Hours : 3hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 2 - INTRODUCTION TO PUBLIC ADMINISTRATION

Second Year

Semester - III

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 2 - PRINCIPLES OF MANAGEMENT

Second Year

Semester - III

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 2 - PRINCIPLES OF ACCOUNTING

Second Year

Semester - III

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 2 - BASIC ELECTRONICS

Second Year

Semester - III

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 2 - HEALTH AND HYGINE

Second Year

Semester - III

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 2 - BASIC MATHEMATICS

Second Year

Semester - III

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

SEC - Skill Enhancement Course : 3 - DESIGN THINKING / PROBLEM SOLVING

Second Year

Semester - III

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 5 - INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH

Second Year

Semester - III

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable the students to know basic knowledge on industrial hygiene and occupational health. The learner will enable to understand various physical, chemical, biological and, ergonomic disorders. To understand the concept of work physiology, prevention measures and first aid

Learning Outcomes

1. Understand the concept of occupational health
2. To monitor best practices of industrial hygiene
3. Understand the importance of First Aid and CPR
4. Use of Effective safety measures to control occupational diseases

Unit-I

Introduction to Occupational Health, Fundamentals of Occupational Health, Objectives of Occupational Health, Personal Protective equipment for occupational health

Unit-II

Need of Occupational Health & Industrial Health Monitoring, Guidelines to Improve Occupational Health, Importance of House Keeping – 5S Concept

Unit-III

Common occupational diseases at work site, Physical, chemical hazards and biological hazards - route of entry to human system, Diseases due to various dust particles and control measures.

Unit-IV

Legal and medical surveillance to control occupation diseases, engineering control of occupation hazards and diseases, compensation and rehabilitation, Fundamentals of first aid and Cardio Pulmonary Resuscitation (CPR)

Unit-IV

Third Schedule (List of Notifiable Diseases) of the Factories Act, 1948. Monitoring of Occupational diseases and disorders

Student Activities

1. Identification of various occupational hazards in work place (**Group activity**)
2. Explain the role of management to promote occupational health (**PPT Presentation**)
3. Identify occupational skin diseases (**On site Group activity**)
4. Identify abnormal health symptoms due to chemical exposure (**Observation Skill**)
5. List of Notifiable Diseases of the Factories Act, 1948 (**Quiz context**)
6. Safety measures and PPE (**Site visits**)
7. Assignments

List of References

1. Industrial Safety Health and Environmental Management system
Publication: Khanna Publishers Authors: R.K Jain and Sunil S. Rao.
2. Safety, Security and Risk Management – Singh U. K.
3. ABC of Industrial Safety Remember ABC Publication: MEEDS Author: V P M Mani.
4. DiberardinsL.J., 1998. Handbook of occupational safety and health, John Wiley, New York

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(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 6 - SAFETY IN CONSTRUCTION INDUSTRY

Second Year

Semester - III

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will equip the learner with fundamental and applied aspects of safety in construction industry including statutory and safety regulations

Learning Outcomes

1. Understand the basic requirements and safety measures in construction safety
2. Monitor and safe handling of construction material
3. Understand specific safety measures and statutory regulations to promote construction safety

UNIT-I

Introduction to construction safety, Site planning and housekeeping, Types of scaffoldings, Scaffold erection & Dismantling, Scaffolding inspection, Safety in Scaffolding, Accident prevention, Hazard and risk assessment in construction industry.

UNIT-II

Safety in construction operations, road work and pipeline operations, underground works, demolition operations, safety in excavation, trenching and shoring. Storage, stocking and safe handling of construction materials,

UNIT-III

Hazards and risk in construction industry, Ladders, safety nets and fall protection systems, Occupational health hazards and their prevention.

UNIT-IV

Safety operations at construction works, Usage of various personal protection equipment and safety devices, safety measures in civil engineering works, Fire and electrical safety in construction site.

UNIT-V

Statutory compliance, regulations and legislative acts for safety in construction, The Building and Other Construction Workers Act, 1996, the Factories Act, 1948, and the Occupational Safety, Health, and Working Conditions Code, 2020.

Student Activities

1. Conduct safe organization and handling of machinery works (Onsite training)
2. Explain various hazards and risk assessment in construction (**PPT Presentation**)
3. Identify occupational diseases/disorders of construction workers (**On site Group activity**)
4. Reporting accidents and their preventive measures (**Project work**)
5. **Mock drill** on fire explosion and emergency preparedness at construction site
6. Assignments
7. Industrial visits
8. Case studies

List of References

1. "Construction Management: Principles and Practice" by Alan Griffith and Paul Watson
2. "Construction Safety Management" by Kumar Neeraj Jha, Dilip A. Patel, Amarjit Singh
3. "Safety Management in Construction: Principles and Practice" by S.K. Bhattacharjee
4. **"Handbook on Building Construction Practices"** Published by the Bureau of Indian Standards

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 7 - ACCIDENTS AND PREVENTION

Second Year

Semester - III

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable the students to understand the factors contributing to various accidents, preventive action and safety policy on accidents, and Legal and Regulatory Framework, and basic life supporting skills.

Learning Outcomes

1. Understand the basic safety requirements to avoid accidents
2. Identify unsafe acts and unsafe conditions at workplace
3. Understand safety policy and legal requirements
4. Monitor and safe handling of machines through work permit system

UNIT -I

Definition and classification of accidents- Types, causes and consequences of Accidents, Important Terminologies - Accident, Incident, Fatal and Non-fatal accident etc

UNIT -II

Hazard Analysis Techniques, Risk Assessment, On-site & off-site, Emergency Control Plan – Safety Policy. Accident Investigation reports Preventive actions. Work permits systems

UNIT-III

Accident Theories and Models, Heinrich's theory, Frank Bird theory, Hepburn's Theory, 5Es for accident prevention, Preventing Unsafe Act and Unsafe Condition

UNIT -IV

Proper usage & maintenance of tools, Industrial psychology, Safety management system to control road traffic accidents, fire explosion, short-circuits, chemical spills and other industrial accidents

UNIT -V

Strategies for Accident Prevention, Legal and Regulatory Framework requirements- The workmen's compensation Act, 1923. Personal protective equipment (PPE), Safety awareness and education campaigns, Emergency Preparedness and Response First aid

Student Activities

1. Understand the causes and consequences of various accidents (**Case studies**)
2. Differentiate Unsafe act and Unsafe condition contributing to accidents (**site observation**)
3. List out hazard identification techniques and prepare a model for root analysis (**Group activity**)
4. Reporting accidents and their preventive measures (**Project work**)
5. Prepare a model/design of accident theory (**Class room activity**)
6. Conduct safety audit (On the job training)
7. Assignments
8. Industrial visits
9. Case studies

List of References

1. Industrial Safety Health and Environmental Management system Publication: Khanna Publishers, Authors: R.K Jain and Sunil S. Rao
2. Industrial Safety Management Publication: Tata Mc Graw-Hill Publishing Company Ltd. Author: L. M. Deshmukh
3. ABC of Industrial Safety Remember ABC Publication: MEEDS Author: V P M Mani.
4. Fire and explosion Hazards Handbook of Industrial Chemicals Publication: Jaico Publishing House Author: Tatyana A. Devletshina& Nicholas P. Cheremisinoff, Ph. D.
5. DiberardinsL.J.,1998.Handbookofoccupationalafetyandhealth,John

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Minor - Core : 1 - INDUSTRIALIZATION AND ENVIRONMENTAL POLLUTION

Second Year

Semester - III

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives: The primary objective of this course is to provide students with a comprehensive understanding of environmental systems and the impacts of various forms of pollution on human health, ecosystems, and climate.

Learning outcomes

1. Understand fundamentals of environment and its components
2. Identify and classify different types of pollution
3. Analyze the causes, sources, and effects of pollution
4. Foster awareness and responsibility regarding environmental protection

Unit I

Definition and concepts of industrialization, Environmental impacts of industrial activity, the concept of Globalization and sustainable development, Green industrialization and future trends, types of natural resources: renewable and non-renewable

Unit II

Air Pollution: natural and anthropogenic factors, Major air pollutants, Effects on health, environment, Control measures and technologies to reduce air pollution, Water Pollution: Eutrophication, biomagnifications, Water treatment processes

Unit III

Soil Pollution, industrial waste, Soil remediation techniques, Noise Pollution, Thermal and Radioactive Pollution, Control measures and technologies of soil, noise, and radioactive pollution

Unit IV

Global warming and greenhouse effect and mitigation. Climate change: causes, effects, and solutions. Ozone layer depletion and acid rain, Carbon footprint and carbon trading, Environmental Impact Assessment (EIA), ISO 14001 Environmental Management system

Unit V

Environmental Laws and Policies, Major international and national conventions (Kyoto Protocol, Paris Agreement), Role of Central and State Pollution Control Boards, Role of NGOs and citizen involvement,

List of References

1. Environmental Pollution Control Engineering" – C.S. Rao
2. Industrial Pollution Control Handbook" – H.C. Dubey
3. Environmental Law and Policy in India" – Shyam Divan & Armin Rosencranz
4. Sustainable Development and Environmental Ethics" – B. S. Chauhan

Student Activities

1. Field Survey and Observation Reports
2. Visit a local water body, industrial site, landfill, or forest area.
3. Observe pollution indicators (e.g., water turbidity, air quality, waste accumulation).
4. Prepare a report with findings, photographs, and possible mitigation suggestions.
5. Waste Audit and Management Exercise
6. Classify waste into biodegradable, recyclable, and hazardous.
7. Poster Making on Effects of air pollution, Ways to reduce carbon footprint, Water conservation methods

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 3 - FUNDAMENTALS OF ECONOMICS

Second Year

Semester - IV

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : -	End Examination : 50	Total Marks : 50
30	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 3 - INDIAN PHILOSOPHY

Second Year

Semester - IV

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : -	End Examination : 50	Total Marks : 50
30	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 3 - PERFORMING ARTS

Second Year

Semester - IV

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : -	End Examination : 50	Total Marks : 50
30	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 3 - INTRODUCTION TO GEOGRAPHY

Second Year

Semester - IV

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : -	End Examination : 50	Total Marks : 50
30	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 3 - BASIC STATISTICS

Second Year

Semester - IV

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : -	End Examination : 50	Total Marks : 50
30	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Multidisciplinary Course : 3 - INTRODUCTION TO NANOTECHNOLOGY

Second Year

Semester - IV

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : -	End Examination : 50	Total Marks : 50
30	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

SEC - Skill Enhancement Course : 4 - DESIGN THINKING / PROBLEM SOLVING

Second Year

Semester - IV

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 8 - ENVIRONMENTAL CHEMISTRY

Second Year

Semester - IV

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will equip the learner with fundamental and applied aspects of environmental chemistry including conservation of ecosystem and biodiversity.

Learning Outcomes:

- 1) Understand the environment functions and human activities.
- 2) Acquire knowledge to ensure sustainable use of Ecosystem's services.
- 3) Engage in simple and advanced analytical tools to measure environmental pollution.
- 4) Analyze key ethical challenges concerning biodiversity and its conservation

UNIT-I

Definition – Concept of Environmental chemistry-Scope and importance of environment , Effects of human activities on environment, Natural resources

UNIT-II

Air pollution, Ambient air quality standards, Global warming, Acid rains, Photochemical smog, Green house effect, Bhopal gas disaster, Monitor and Control methods of air pollution.

UNIT-III

Water quality standards and parameters: Turbidity, pH, Dissolved Oxygen, BOD, COD, eutrophication and its effects, Industrial waste water treatment.

UNIT-IV

Toxic chemicals in the environment, effects of toxic chemicals – cyanide and its toxic effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium- Solid waste management.

UNIT-V

Concepts–structure–Functions and types of ecosystem– Abiotic and biotic components, biogeochemical cycles (carbon, nitrogen and phosphorus), the effect of industrialization on human and environment

Students Activities:

- 1) Training of students by related industrial experts.
- 2) Assignments, Seminars, Group discussions, Debates and Quiz (on related topics).
- 3) Visits to laboratories, firms, research organizations etc.
- 4) Invited lectures and presentations on related topics by field/industrial experts.
- 5) Preparation of videos on tools, techniques on selected topics.

List of References

1. Fundamentals of ecology by M.C.Dash
2. Fundamentals of Environmental Chemistry, Manahan, Stanley. E
3. A Textbook of Environmental chemistry by W.Moore and F.A.Moore
4. Environmental Chemistry, Anil Kumar De, Wiley Eastern ltd.
5. Applications of Environmental Chemistry, Eugene R. Wiener

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 9 - SAFETY IN CHEMICAL & PETROCHEMICAL INDUSTRY

Second Year

Semester - IV

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable to understand the properties and hazards of chemicals, petrochemicals, fertilizers, pesticides, handling, storage, transportation and processing of chemicals.

Learning Outcomes:

1. Understand various hazards associated with chemicals and petrochemicals
2. Examine various Processes & Operations in chemical industry
3. Understand the purpose of Material Safety Data Sheets (MSDS)
4. Identify various threats to Environmental due to chemical spills

Unit-I

Safety in Chemical industry, Hazard in Unit Processes & Operations specific safety measures for chemical industries like Fertilizer, Explosives and Polymer plants. Prevention of fire explosion.

Unit-II

Storing and handling of chemicals; Chemicals Compatibility, Safety Precautions for transporting hazardous / toxic / flammable / explosive/ radio-active substance

Unit-III

Transfer of chemicals by pipelines within and outside installations. Inspection techniques for plants, reaction vessels, check list for routine inspection, checklist for specific maintenance, Safety Precautions for working on pipelines

Unit-IV

Color coding identification of contents, Safe procedures of start up and shut down procedures; Emergency maintenance operations; preparation of Material Safety Data Sheets (MSDS)

Unit-V

Environmental Protection & Spill Prevention, Emergency Preparedness, Process **Safety Management (PSM)**-Addresses the specific safety requirements of chemical processes, Enforcement of Standards and regulations for chemical safety

Students Activities

1. classify chemicals and hazardous material (**observation skill**)
2. Apply MSDS to check safety measures in chemical (**On-the job- training**)
3. Perform the safe handling of chemical operations (**Skill**)
4. Participate in mock drills and Emergency Preparedness (**site activity**)
5. Discuss various threats to Environment due to chemical spills and their prevention (**PPT presentation/Oral Talk/ Group discussion**)
6. Industrial Visits
7. Field Visits
8. Assignments on Chemical hazards and prevention
9. Case studies on chemical, petrochemical and pharmacy accidents
10. Audio video presentation on chemical spills and their impact on environment

Reference

1. Chemical Reaction Hazards – A guide to Safety by John Barton.
2. The Chemical Industry – Mc Graw Hill by C.A. Heaton.
3. Pressure Vessels for Industry – Mc Graw Hill by Larry M. Soring
4. Techniques of Safety Management-Mc Graw Hill by D. Peterson

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 10 - SAFETY IN ELECTRICAL INDUSTRY

Second Year

Semester - IV

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable to understand the electrical hazards, first aid, lighting, safety in operation and maintenance of various equipments and devices.

Learning Outcomes:

1. Understand the concept of safety in electrical industry
2. Examine various safety Processes & Operations in thermal power plants
3. Understand the purpose of basic first aid and CPR for electrical shock
4. Understand the procedure of **Electrical Safety Inspections and Audits**

Unit-I

Introduction to electricity, Electrical fires, danger sign for some wiring, cables, safety valve, First Aid, some precautions to avoid electrical accidents. Overload and short circuit protection

Unit-II

Selection of materials, Lighting, unavoidable electrical heat, and Thermal power plants, safety in thermal power plants, turbine, generator, and hydrogen plant, first -aid fire extinguishers

Unit-III

Electrical Injury, Basic first aid in case of electrical emergency, Prevention of electrical fires, Electrical wiring and handling of electrical equipment.

Unit-IV

Earth fault protection, Protection against over voltage, Portable electrical apparatus, Flame proof Electrical equipment, Controlling Electrical hazards and safe work practices

Unit-V

Safety Management of Electrical Systems, Protective Measures and Safety Practices, Electrical Safety Inspections and Audits:

Students Activities

1. Analyze common root causes for electrical hazards (**Observation skill, group activity**)
2. Explain first Aid and CPR procedure (**On-the job- training**)
3. Presentation on Electrical hazards and first aid (**PPT/AV presentation**)
4. Perform the safe handling of electrical operations (**Skill**)
5. Examine safety devises and PPE for electrical safety (**site activity**)
6. Industrial Visits
7. Field Visits
8. Assignments on Electrical hazards and prevention
9. Mock drill and Emergency operations
10. Case studies on Electrical Hazards
11. Conduct CPR (Demonstration-group activity)

List of References

- 1) Electrical Safety Handbook (Hardcover - 2005/09/30) by John Cadick (Author), Mary Capelli-Schellpfeffer (Author), Dennis K. Neitzel (Author).]
- 2) ABC of Industrial Safety remember ABC publication: Meeds Author: V P M Mani.
- 3) Industrial Accident Prevention – Publication: MC Graw-Hill – Author: Herbert William Heinrich.
- 4) Industrial Safety Health and Environmental Management System Publication: Khanna. publishers, authors: R.K Jain and Sunil S. Rao.

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(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Minor - Core : 2 - FUNDAMENTALS OF DISASTER MANAGEMENT

Second Year

Semester - IV

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives: By the end of this course, students will be able to understand the basic concepts and terminology of disaster management, including types of hazards (natural and man-made), vulnerability, risk, and resilience.

Learning Outcomes:

1. Identify different types of disasters, their causes, and impacts
2. Understand the role of key stakeholders in disaster management
3. Demonstrate knowledge of early warning systems,
4. Critically analyze past disasters and case studies
5. Promote a culture of disaster awareness and safety

UNIT I:

Disaster Management- Introduction, the concept of Hazards, Vulnerability, Risk, Resilience. Disaster Management Cycle and stages: Response, Recovery, Mitigation and Preparedness

UNIT II:

Natural disasters: Earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, Wild Fires, Industrial Accidents, Biological Disasters and global climate extremes, Climate Change, Global Warming.

UNIT III:

Man-made Disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires, Early warning system for different hazards, Risk Assessment, Prevention and mitigation strategies, Framework of Disaster Risk Reduction

UNIT IV:

Hazard and vulnerability profile of India, Disaster Management Act 2005, National Disaster Mitigation and Management Guideline, National Policy on Disaster Management 2009, NDMA guidelines on various disasters

UNIT V:

Introduction to State Disaster Management Authorities, Role of Remote Sensing & GIS in Disaster Management and its applications, Role of NDRF, Training of personnel including Firefighters

List of References

1. Disaster Management" – *Harsh K. Gupta*
2. Disaster Management: Future Challenges and Opportunities" – Jagbir Singh
3. Community-Based Disaster Risk Reduction" – Rajib Shaw
4. Disaster Management and Preparedness" – *Thomas D. Schneid & Larry Collins*

Student Activities

1. Field Survey and Observation Reports
2. Role Play or Scenario-Based Learning-- Simulate a situation (e.g., flood evacuation, chemical spill response).
- 3.** Participate in or organize a fire drill, earthquake simulation, or first aid demonstration
4. Prepare a report with findings, photographs, and possible mitigation suggestions.
5. Design posters or social media campaigns on Earthquake safety
6. Poster Making on recent natural and man-made disasters

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 11 - HEALTH SAFETY ENVIRONMENTAL LEGISLATION

Third Year

Semester - V

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable the students to know about history of safety legislation, factories act, employee's welfare, other important legislations, OHSAS, environment related acts & CPCB. He is also made aware of risk, hazards, accidents and illnesses related to common day to day life.

Learning Outcomes

1. Understand the importance of safety organizations
2. Examine various legislations related to safety
3. Identity standard codes and principles of safety
4. Understand the importance of Environmental Protection Act

Unit-I:

Introduction to National Safety Council (NSC); Introduction to ILO Convention and Recommendations in providing safety; health and welfare of workers.

Unit-II:

Factories Act, Chapter – III-Health provisions, Chapter-IV-Safety Provisions, & Chapter-V-Welfare Provisions according to amendment; Case laws and the factories act.

Unit-III:

Workmen Compensation Act and Rules; ESI Act and Rules; Contract Labour Act; Employer's Liability Act; Common Law and Product Safety

Unit-IV:

Electricity Act; Indian Explosive Act; Gas Cylinders; Petroleum Act; Statutory provision on Building and other construction works;

Unit-V:

Environmental Protection Act; The Water (control of pollution) Act; The Air (Control of Pollution) Act; Noise Pollution Act; Chemical Accidents (Emergency Preparedness, planning and response).

Student Activities

By the end of the course, students should be able to:

1. Identify safety initiatives taken by NSC and ILO(**PPT presentation**)
2. Observe the implementation of various safety laws and regulations(**Group activity**)
3. Participate in environmental protection campaign(**Group activity**)
4. Participation in national and international webinars and seminars to promote safety culture
5. Assignments on legislative laws and regulations to promote safety
6. Case studies on accidents due to Gas Cylinders and Petroleum
7. Audio video presentation on Indian Legislative Acts
8. Industrial Visits
9. Field Visits

List of References

- 1) Pressure Vessels for Industry – Mc Graw Hill by Larry M.Soring
- 2) Techniques of Safety Management-Mc Graw Hill by D.Peterson

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 12 - A. QUALITY CONTROL IN HEALTH, SAFETY AND ENVIRONMENT

Third Year

Semester - V

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable the students to know about plant and equipment safety appraisal technique, hazard identification techniques, accident investigation, reporting and analysis, measurement and control of performance, first aid. He is also aware of promoting the same in the industry to come day to day

Learning Outcomes

1. Understand safety appraisal technique
2. Identity Hazard identification techniques
3. Explain the process of Accident Investigation
4. Understand the concept of disablement

Unit-I :

Plant & Equipment safety appraisal technique-Objectives, Plant Safety observations; inspections; safety sampling; safety surveys;

Unit-II :

Job safety analysis, safety inventory system, work permit systems, loss control; damage control & system safety.

Unit-III :

Hazard identification techniques- Ex .HAZOP, HIRA Fault, Tree Analysis; Risk Analysis Techniques; Safety Audit, Evaluation risks in chemical process

Unit-IV :

Accident Investigation, reporting and analysis, Purpose. Identifying the key factors and the causes. Writing reports and report forms; corrective action; purpose of investigation, principles of investigations

Unit-V :

Measurement & control of performance- Lost Time Accident; Disabling injury; Accidents reportable under the Factories Act; Frequency Rate; Severity Rate; Incidence rate and man days lost; temporary, permanent, partial and total disablement.

Student Activities

By the end of the course, students should be able to:

1. Identify the equipment required for plant safety (**onsite –job training**)
2. Conduct industrial survey and sampling analysis (**student's project**)
3. Conduct Job safety analysis(JSA) procedure (**skill on documentation**)
4. Identify various steps involved in safety audit (**Group activity**)
5. Case studies on recent industrial accidents/incidents
6. Assignments on hazard identification and risk assessment
7. Participation in national and international webinars and seminars to promote safety culture
8. Industrial Visits
9. Field Visits

List of References

- 1) Hazard Operability Studies – An Introduction- The guide work approach by National Safety Council, India.
- 2) Guidelines for Hazard Evaluation Procedures by American Institute of Chemical Engineer, New York, USA.
- 3) Techniques of Safety Management-Mc Graw Hill by D.Peterson

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 12 - B. INDUSTRIAL WASTE MANAGEMENT

Third Year			Semester - V	
No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5		
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4		
Internal Assessment : 30	End Examination : 70	Total Marks : 100		
	Practical Component : 50	Exam Hours : 3hr		

Objectives

This course will equip the learner with fundamental and applied aspects of industrial waste management. Learner will experienced the conversion of waste to energy, recycling of industrial wastes, and reduce the impact on environment.

Learning Outcomes

1. Identify the environmental impact of industrial waste.
2. Familiarize with laws and policies related to industrial waste management.
3. Utilize natural resources eco-friendly
4. Participate in Social Responsibility and sustainability initiatives

Unit I

Definition and classification of industrial wastes- Sources and types (organic, inorganic, hazardous, non-hazardous, Biomedical Waste), impact on environment and human health

Unit II:

Solid, liquid, and gaseous wastes- Concepts of cleaner production-Waste auditing and life cycle analysis- Source reduction strategies-Process modification and resource recovery,

Unit III:

General Principles of control and removal of specific pollutants and management-Physical, chemical, and biological treatment methods- Equalization, neutralization, coagulation, sedimentation, Disposal of Biomedical Waste

Unit IV:

Types and classification of hazardous wastes- Storage, transportation, and handling-Thermal treatment (incineration, pyrolysis) and Landfilling, specific waste management strategies

Unit V:

Policy and Regulatory Measures of waste management, Overview of environmental regulations , Hazardous Waste Management Rules, ISO 14001, Environmental Management Systems (EMS), Corporate Social Responsibility (CSR) and sustainability initiatives,

Student Activities

1. Industrial visit of nearest waste management treatment plant
2. Students projects on material recycling, waste water management, and solid waste
3. Industrial tour to visit CPCB(Central Pollution Control Board)
4. Participation in Corporate Social Responsibility (CSR) and sustainability initiatives,

List of References

1. "Industrial Wastewater Treatment" – Nelson Leonard Nemerow
2. "Waste Treatment in the Process Industries" – M.N. Rao & A.K. Dutta
3. "Environmental Engineering" – Howard S. Peavy, Donald R. Rowe, George Tchobanoglous
4. CPCB/USEPA Guidelines and Reports

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 13 - A. SAFETY INSPECTIONS AND RISK MANAGEMENT

Third Year

Semester - V

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objective:

To equip the student with skills and techniques for prevention and control of risks and hazards and mitigation of the same in efficient manner at worksite or location

Learning Outcomes:

1. Understand key concepts and terminology of safety inspection
2. Apply knowledge to conduct Safety Inspections
3. Examine various industrial hazards
4. Understand the risk analysis procedure

Unit I

Introduction- Hazard, Risk and Vulnerability, Risk Concepts, Elements of Risk, Perception of Risk, Acceptable Risk, Requirements in Risk Assessment.

Unit II

Plant Inspection - Methods of plant inspections, Advantages of plant inspection, Safety Inspection checklists, Review of the Inspection

Unit III

Risk Assessment & Reduction. Risk Analysis Techniques- Process of Risk Assessment- Risk Matrix. Risk Prioritization.

Unit IV

Risk control – Hierarchy of Controls, Implementation and Review of controls, ALARP Risk management

Unit V

Safety Inspections and Audits, Conducting Safety Inspections, Understanding the purpose and process of safety audits, Safety Inspection and Audit Reports

Students Activities

1. Conduct risk assessment at worksite (**On-the job- training**)
2. Identify various industrial hazards and risks (**Skill**)
3. Explain Hierarchy of Control and implement the same at worksite (**Attitude**)
4. Conduct safety audits based on previous knowledge
5. Utilize safety check lists and conduct safety audit (**On-the job- training**)
6. Industrial Visits
7. Field Visits
8. Assignments on risk assessment

List of References

1. Industrial Safety Health and Environmental Management system
Publication: Khanna Publishers Authors: R.K Jain and Sunil S. Rao.
2. Safety, Security and Risk Management – Singh U. K.
3. ABC of Industrial Safety Remember ABC Publication: MEEDS Author: V P M Mani.
4. Diberardins L ., 1998. H and book of occupational safety and health, John Willey, New York

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 13 - B. INDUSTRIAL SAFETY MANAGEMENT

Third Year

Semester - V

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives

This course will enable the students to know about safety education and training, employee participation, auditing, safety committee, safety promotion and publicity, cost controlling and emergency planning. He is also aware of promoting the same in the industry as well as his daily activities

Learning Outcomes

1. Understand the importance of Safety Management
2. Explain the purpose of safety policy
3. Design and organize safety plan
4. Identify the role of safety committee

Unit-I

Introduction to Management, Effective Management Principles, The role of Safety Management, Managerial Responsibilities, Principle of Management to promote industrial safety .

Unit-II

Planning for safety, purpose, procedure, variety forms of plans, safety policy, planning for process implementation, the role of communication in promoting industrial safety

Unit-III

Organizing for safety: its need and importance, Nature and principles organization, structure of safety committee, role of safety officer, functions of safety department

Unit-IV

Leadership methods, Motivation to the employees – importance, safety education and training- training methods, assessment or evaluation of training programs

Unit-V

Safety committee-structure and functions, Auditing – types, procedures, key elements of audit, emergency planning – types and importance.

Student Activities

By the end of the course, students should be able to:

1. Explain the principles of safety management (**PPT presentation**).
2. Design and implement safety policy (**Group activity**)
3. Conduct a mock drill on fire fighting (**Group activity**)
4. Participation in national and international webinars and seminars to promote safety culture
5. Dynamic leadership to implement HSE policy (**Mock Assembly**)
6. The role of various Safety organization (**Audio video presentation**)
7. Industrial Visits
8. Field Visits
9. Assignments on various safety policy/schemes initiated by Govt. of India
10. Case studies on industrial accidents and their safety violations

List of References

- 1) ABC of Industrial Safety remember ABC publication: Meeds Author: V P M Mani.
- 2) Industrial Accident Prevention – Publication: MC Graw-Hill – Author: Herbert William Heinrich.
- 3) Industrial Safety Health and Environmental Management System Publication: Khanna. publishers, authors: R.Kjain and Sunil S. Rao.
- 4) Industrial Safety Management Publication: Tata Mc Graw-Hill Publishing Company Ltd. Author: I. M. Deshmukh

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Minor - Core : 3 - OCCUPATIONAL HEALTH SAFETY AND ENVIRONMENT MANAGEMENT

Third Year

Semester - V

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives:

This course will enable the students to know basic knowledge on industrial hygiene and occupational health. To know various physical, chemical, biological and, ergonomic disorders

Learning Outcomes

1. Understand the concept of occupational health
2. To monitor best practices of industrial hygiene
3. Understand the importance of First Aid and CPR
4. Use of Effective safety measures to control occupational diseases

UNIT I

Introduction to OHSE, Importance and benefits of OHSE management, Occupational Health- and Industrial hygiene, Workplace health hazards (chemical, biological, physical, ergonomic, psychosocial),

UNIT II

Occupational Safety, Accident causation theories, Hazard identification and risk assessment (HIRA), Job Safety Analysis (JSA), personal protective equipment (PPE), First Aid and CPR.

UNIT III

Environmental Management, Environmental impact assessment (EIA), Waste management (solid, liquid, hazardous), Pollution control and prevention, Sustainability practices

UNIT IV

Components of OHSE management systems, Monitoring, auditing, and continuous improvement, Roles and responsibilities, Occupational Safety and Health Act (OSHA),

UNIT V

Promoting safety culture and leadership, Emergency preparedness and response, OHSE Legislation and Standards, Role of ILO, WHO and UNEP, Environmental Protection Acts

List of References

1. Fundamentals of Occupational Safety and Health" – *Mark A. Friend & James P. Kohn*
2. Industrial Safety and Environment" – *A.K. Gupta*
3. Occupational Health and Safety Management: A Practical Approach" – Charles D. Reese
4. Industrial Safety and Health Management" – C. Ray Asfahl & David W. Rieske

Student Activities

1. Identification of various occupational hazards in work place (Group activity)
2. Explain the role of management to promote occupational health (PPT Presentation)
3. Identify occupational skin diseases (On site Group activity)
4. Identify abnormal health symptoms due to chemical exposure (Observation Skill)
5. List of Notifiable Diseases of the Factories Act, 1948 (Quiz context)
6. Safety measures and PPE (Site visits)
7. Assignments

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Minor - Core : 4 - ARTIFICIAL INTELLIGENCE (AI) AND ENVIRONMENTAL MONITORING

Third Year

Semester - V

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives:

This course introduces students to the application of Artificial Intelligence (AI) techniques for environmental data analysis, modeling, and decision-making. It explores how AI tools can be used to monitor environmental parameters, predict environmental changes, and support sustainable development.

Learning Outcomes: By the end of the course, students will be able to:

1. Understand the role of AI in solving environmental challenges.
2. Use sensor and remote sensing data for environmental monitoring.
3. Develop models for forecasting weather, pollution, and climate changes.

Unit I

History and the scope of Artificial Intelligence, Introduction to AI and the Environment, Overview of environmental issues, the role of AI in environmental monitoring and management Case studies

Unit II

Environmental Data and Sources, Types of environmental data: air, water, soil, climate, remote sensing, IoT, and satellite data, Data collection techniques and challenges, Data preprocessing and cleaning

Unit III

AI in Climate and Weather Prediction, Modeling climate change using AI, AI in meteorology and extreme weather prediction, Neural networks for forecasting

Unit IV

AI for Pollution Monitoring, Air and water quality monitoring systems, Predictive models for pollution levels, Remote Sensing and Image Analysis, Satellite and drone imagery

Unit V

Risk assessment and disaster management, Ethical concerns in environmental AI applications, AI for Sustainable Development Goals (SDGs, Environmental policy and AI governance

Student Activities

1. Analyzing real-world environmental datasets (e.g., NASA, NOAA)
2. Building a simple AI model for predicting pollution or temperature
3. Remote sensing image classification project
4. Case studies on contemporary environmental challenges and their monitoring

Suggested Readings & Resources:

1. *"Artificial Intelligence for the Earth"* – World Economic Forum
2. *"Data Science for Environmental Modeling and Sustainability"* by Jong Lee
3. Scientific journals (e.g., *Environmental Modelling & Software*, *Remote Sensing of Environment*)
4. Open datasets: NASA Earth Data, Kaggle Environmental Datasets, EPA Air Quality System

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Environmental Education : 1 - ENVIRONMENTAL EDUCATION

Third Year

Semester - V

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 14 - A. FIRE PREVENTION AND FIRE EXTINGUISHING TECHNIQUES

Third Year

Semester - VI

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives:

On completion of the course, the learner is expected to be familiar with the operation of various fire extinguishers, maintenance and standardization of fire extinguishers

Learning Outcomes

1. Understand the concept of Fire Triangle and Fire Tetrahedron
2. To Describe various types of fire extinguishing agents
3. To Explain the safe operating procedure of fire extinguishers
4. Understand the importance of color code and standards
5. Understand Do's and Don'ts of using extinguishers

Unit 1: Introduction to Fire and Fire Classes

Definition and causes of fire, The Fire Triangle and Fire Tetrahedron, Classification of fires, Fire Prevention methods and Equipment

Unit 2: Overview of Fire Extinguishers

Components and working principle, Classification of extinguishers, PASS technique (Pull, Aim, Squeeze, Sweep), Mode of operation (stored pressure, cartridge type), Color coding and labeling standards, Inspection, testing, and refilling schedule, Do's and Don'ts of using extinguishers

Unit 3: Liquid-Based Fire Extinguishers

Water Extinguishers- Working principle and types, Limitations and hazards
Foam Extinguishers (AFFF)-Composition and mechanism, Applications and limitations

Unit 4: Powder-Based Fire Extinguishers:

ABC Dry Chemical Powder (DCP)-Composition, Advantages and disadvantages,
BC Powder- Composition, Advantages and disadvantages, Class D Powder-
Specialized Powder, Safety precautions and Limitations

Unit 5: Gas-Based Fire Extinguishers

Carbon Dioxide (CO₂) Extinguishers-Storage and release mechanism, Safety handling and discharge risks, Clean Agent Extinguishers:FM-200, Novec 1230, Inergen. Environmental and health considerations, National and international standards

Student activities

By the end of the subject, students should be able to:

1. Live demo of different extinguishers
2. Hands-on practice with training extinguishers
3. Fire response drill simulation
4. Safety gear and personal protection during use
5. Oral or ppt presentation on sops of fire extinguishers
6. Industrial visits
7. Field visits
8. Assignments

List of References

1. **Fire Extinguisher Handbook by Fire Protection Association (UK)**
2. **Fire Extinguishers: A Comprehensive Guide to Fire Safety by Harshit Gaur**
3. Fire Protection Handbook (NFPA) by Arthur E. Cote (editor) et al.
4. Fire Protection and Prevention: The Essential Handbook by Barendra Mohan Sen
5. Fire Protection Engineering in Building Design by Jane I. Lataille

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 14 - B. ERGONOMIC HAZARDS AT WORKPLACE

Third Year

Semester - VI

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives:

On completion of the course, the learner is expected to be familiar with the knowledge of ergonomic hazards and control measures

Learning Outcomes

1. Understand the science of ergonomics
2. To Describe various ergonomic hazards
3. To Explain the root causes of ergonomic hazards at various industries
4. Understand the importance of ergonomic risk assessment
5. Understand the Safely precautions to avoid health hazards

Unit 1: Introduction to Ergonomics

Definition and scope of ergonomics, Importance of ergonomics in the workplace, Relationship between ergonomics and occupational health, Categories of ergonomic hazards, Legal and regulatory framework

Unit 2: Types of Ergonomic Hazards

Physical Ergonomic Hazards (Repetitive motion,, Awkward postures, Forceful exertions, Prolonged static positions and Vibration- whole-body and hand-arm, Cognitive Ergonomics (Mental workload and Stress and fatigue), Organizational Ergonomics: (Work schedules, Work pace and control, Task design and job rotation)

Unit 3: Ergonomic Risk Assessment

Workplace hazard identification, Job/task analysis (JTA), Tools and methods: RULA (Rapid Upper Limb Assessment), REBA (Rapid Entire Body Assessment), Recording and reporting findings

Unit 4: Health Effects of Ergonomic Hazards

Musculoskeletal Disorders (MSDs): Carpal Tunnel Syndrome, Tendonitis, Lower back pain, Neck and shoulder disorders, Early warning signs and symptoms, Long-term health and productivity impacts

Unit 5: Ergonomic Interventions & Control Measures

Building an ergonomic safety culture, Monitoring and continuous improvement, **engineering controls:** Ergonomic workstation design, Equipment modifications, Assistive devices; **Administrative controls:** Job rotation, Work-rest cycles, Training and education; **Personal protective measures:** Ergonomic chairs/supports, Anti-fatigue mats, Wearables (exoskeletons, posture trackers)

Student Activities

By the end of the subject, students should be able to:

1. **Oral or PPT presentation on ergonomic hazards**
2. Identify and mitigate ergonomic hazards at work place (**Group activity/Project**).
3. Understand and apply relevant safety regulations on ergonomic hazards (**Quiz**)
4. Case Studies & Practical Applications
5. Industry-specific ergonomics
6. Group projects on ergonomic assessments
7. Industrial Visits
8. Field Visits
9. Assignments

List of References

1. **"Foundational Principles, Applications, and Technologies"** by Pamela McCauley-Bush **Ergonomics:**
2. **"Occupational Ergonomics: Engineering and Administrative Controls"** by William S. Marras & Waldemar Karwowski
3. **Introduction to Human Factors and Ergonomics for Engineers** by Mark R. Lehto & Steven J. Landry
4. **"Workplace Ergonomics: A Practical Guide"** by Dan MacLeod
5. **"Applied Ergonomics Handbook"** by Michael J. Burke
6. **"Handbook of Human Factors and Ergonomics"** by Gavriel Salvendy

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 15 - A. FIRE SAFETY AND EMERGENCY MANAGEMENT PLAN

Third Year

Semester - VI

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives:

On completion of the course, the learner is expected to be familiar with the operation of fire emergency and Evacuation plan

Learning Outcomes

1. Understand the concept of Fire Emergency
2. To Describe fire emergency and Evacuation plan
3. To Identify the warning system and fire detection system
4. Understand the importance of Incident command system (ICS)
5. Understand Do's and Don'ts of at Fire Emergency

Unit 1: Introduction to Fire Safety

Definition and importance of fire safety, Triangle of fire, Classes and types of fire, Common causes of fire in different industries, Common Fire Protection Equipment and devices

Unit 2: Fire Detection and Prevention

Fire detection systems: Smoke detectors, heat sensors, Fire alarm systems and communication systems, Fire prevention strategies and good housekeeping, Fire load and ignition sources

Unit 3: Fire Protection and Control Systems

Types of fire extinguishers and their use, Sprinkler systems and suppression technologies
Fire hydrants and hose reels, Passive and active fire protection systems

Unit 4: Emergency Management

Phases of emergency management (Mitigation, Preparedness, Response, Recovery), Coordination with local fire departments and authorities, Elements of an effective emergency evacuation plan, Evacuation routes and signage, Assembly points and headcounts

Unit 5: Roles and Responsibilities

Fire fighters, emergency coordinators, first aiders, Employee roles in fire emergencies
Communication chain and command hierarchy, Incident command system (ICS) basics

Student activities

By the end of the subject, students should be able to:

1. Live demo of Fire Emergency
2. Hands-on practice with training extinguishers
3. Preparation and design of Evacuation plan
4. Fire response drill simulation
5. Safety gear and personal protection during use
6. Rescue operations and Mock drill on Incident command system
7. Preparation of fire safety check lists
8. Industrial visits
9. Field visits
10. Assignments

List of References

1. Fire Extinguisher Handbook by Fire Protection Association (UK)
2. Fire Extinguishers: A Comprehensive Guide to Fire Safety by Harshit Gaur
3. Fire Protection Handbook (NFPA) by Arthur E. Cote (editor) et al.
4. Fire Protection and Prevention: The Essential Handbook by Barendra Mohan Sen
5. fire Protection Engineering in Building Design by Jane I. Lataille
6. Fire Engineering and Emergency Planning by R. Barham
7. Disaster Planning & Control by William M. Kramer

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

**Major – Elective : 15 - B. INDUSTRIAL PSYCHOLOGY AND BEHAVIORAL
BASED SAFETY**

Third Year

Semester - VI

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives:

On completion of the course, the learner is expected to be familiar with the operation of various fire extinguishers, maintenance and standardization of fire extinguishers

Learning Outcomes

1. Understand the concept of Industrial Psychology
2. To Describe various Theories of motivation
3. To Explain the strategies for Stress management
4. Understand the importance case studies on BBS
5. Understand the Reinforcement of safe behavior

UNIT 1: Introduction to Industrial Psychology

Definition, scope, and objectives, Role of psychology in industry, Historical development of industrial psychology, Relationship with organizational behaviour, Psychological principles in training

UNIT 2: Motivation and Job Satisfaction

Theories of motivation (Maslow, Herzberg, McGregor, Vroom), Application in workplace settings, Job satisfaction and its determinants, Impact on performance and productivity

UNIT 3: Work Stress and Management

Causes of workplace stress, Psychological and physiological effects, Stress management techniques, Shift work and fatigue management, **Leadership and Supervision**, Role of supervision in industrial settings

UNIT 4 : Introduction to BBS

Definition and principles, History and development of BBS, Difference between traditional safety and BBS, Behavior modification theory (Skinner), Identifying unsafe behaviors

UNIT 5: Designing and Implementing BBS in the Workplace

Setting goals and metrics, Observational tools and checklists., Roles and responsibilities (observers, team leaders), Steps for successful implementation, Training and communication strategies, Overcoming resistance and barriers, Reinforcement of safe behavior

Student activities

By the end of the subject, students should be able to:

1. Case study discussion (Group Activity)
2. Motivational Theories –Role Play
3. Conducting safe behaviour survey
4. Design a BBS campaign
5. Oral or ppt presentation on BBS
6. Industrial visits
7. Field visits
8. Assignments

List of References

1. *Human Behaviour at work* by Davis K. &Newstrom J.W., (Mcgraw Hill International, 1985)
2. *Managing, Organizational Behaviour* by Schermerhorn J.R.Jr., Hunt J.G &Osborn R.N.,
3. *Industrial Psychology*, by Blum M.L. Naylor J.C., Horper& Row, CBS Publisher, 1968
4. *Handbook of Industrial and Organizational Psychology* by Dunnette, M.D.,
5. *Industrial Psychology* by Tiffin, J and McCormic E.J

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Minor - Core : 5 - SUSTAINABLE DEVELOPMENT AND DISASTER MANAGEMENT

Third Year

Semester - VI

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives: The course designed to provide students with a deep understanding of both sustainable development principles and disaster management strategies.

Learning Outcomes:

1. Understand the concepts of sustainable development and disaster management.
2. Explore global frameworks and policies
3. Assess and design disaster management plans
4. Promote the importance of community engagement and participatory approaches

UNIT I

The concept of sustainable development, Its historical context (e.g., the Brundtland Report, UN Summits), The MDGs (Millennium Development Goals) and SDGs (Sustainable Development Goals), Importance of sustainable development, Disaster Management in India.

UNIT II

Introduces basic ecological principles, including types of ecosystems, interrelationships, and factors affecting their sustainability. Natural Resources and management. Environmental Impact Assessment

UNIT III

Environmental Regulations: key environmental laws and policies (e.g., Environment Protection Act, Water Act, Air Act). The concept of Economic Sustainability and Green Economy and Low-Carbon Economy

UNIT IV

Renewable Energy: solar, wind, hydro and their potential. Green Technology: technologies that can contribute to sustainability (e.g., green buildings), water treatment technologies, Sustainable Urbanization

UNIT V

Environmental Ethics, Framework Sustainable Development Goals (SDGs), Corporate Social Responsibility (CSR), Concept of Disaster Management Cycle , Disaster Management Act 2005, National Policy on Disaster Management 2009

List of References

1. Sustainable Development: Principles, Frameworks, and Case Studies" – *Anupam Saraph*
2. Our Common Future" (The Brundtland Report) – *World Commission on Environment and Development (WCED)*
3. Introduction to International Disaster Management" – *Damon P. Coppola*
4. Natural Disaster Management: An Overview" – *Coppola & Malhotra*

Student Activities

1. Field Survey and Observation Reports
2. Design and PPT presentation on The MDGs (Millennium Development Goals)
3. Design posters on SDGs (Sustainable Development Goals),
4. Role Play or Scenario-Based Learning-- Simulate a situation (e.g., flood evacuation, chemical spill response).
5. Participate in or organize a fire drill, earthquake simulation, or first aid demonstration
6. Prepare a report with findings, photographs, and possible mitigation suggestions.
7. Design posters or social media campaigns on Earthquake safety
8. Poster Making on recent natural and man-made disasters

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Minor - Core : 6 - ENVIRONMENTAL IMPACT OF FIRE DISASTERS

Third Year

Semester - VI

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives: This course focuses on fire disasters both natural and human-induced and their short- and long-term impacts on the environment. The course integrates real-world case studies and environmental policies related to fire risk reduction.

Learning Outcomes: : By the end of the course, students will be able to:

1. Understand the types, causes, and dynamics of fire disasters.
2. Evaluate fire risk factors, vulnerability, and climate-fire interactions.
3. Explore fire disaster management strategies, technologies, and policies.
4. Study case-based evidence of major fire disasters globally and locally.

Unit I

Definition and classification of fire disasters, Natural vs anthropogenic fires, Global and regional fire disaster trends, Historical overview of major fire disasters

Unit II

Causes and Characteristics of Fire Disasters, Natural causes: lightning, drought, heatwaves, Human-induced causes: land clearing, negligence, industrial accidents, Urban vs wildland fires, Fire disaster behavior and spread dynamics

UNIT III

Environmental Impacts of Fire Disasters, Air pollution and Greenhouse Gas Emissions, Soil erosion, Soil fertility loss, microbial disruption, contamination of water systems, Loss of Biodiversity, habitat fragmentation, and ecosystem degradation

Unit IV

Socio-Economic and Health Impacts, Displacement and loss of livelihood, Health effects: respiratory diseases, burns, trauma, Economic costs of fire damage and recovery, Vulnerability of communities and risk perception

Unit V

Fire risk assessment and mapping, Early warning systems and fire detection (remote sensing, IoT, drones), Firefighting strategies and technologies, Role of local governments, NGOs, and communities, Recovery, rehabilitation, and sustainable land management as per National disaster management policies, Case studies on fire hazards: forest fires, wild fires

Student Activities

- Audio-Visual Presentations on Fire hazards
- Photo exhibition on Impact of Fire hazards on society and Ecosystem
- Case study presentations on fire disasters
- Remote sensing analysis of burned areas
- Fire risk mapping using GIS
- Simulation exercise: Fire Disaster Response Planning

Suggested Readings & Resources:

1. Fire: Fundamentals and Control by Walter M. Haessler
2. SFPE Handbook of Fire Protection Engineering (6th Edition)
3. Fundamentals of Fire Safety in Building Design by Than Singh Sharma
4. Essentials of Fire Fighting (7th Edition) by IFSTA
5. Principles of Fire Safety Engineering by Akhil Kumar Das
6. *“Fire, Environment, and Society”* – Charles E. Van Wagner
7. *“Introduction to Wildland Fire”* – Stephen Pyne
8. Handbook on Fire Technology by IFE (India)
9. Reports from NDMA

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Semester Internship : 2 - SEMESTER INTERNSHIP
(MINIMUM OF 180 HOURS WITH 3 CREDITS)

Third Year

Semester - VI

No. of Hours/Week Theory: -	No. of Hours / Week Practical: -	Total No. of Hours (T+P): -
No. of Credits Theory : -	No. of Credits Practical : -	Total No. of Credits : 3
Internal Assessment : -	End Examination : -	Total Marks : -
	Practical Component : -	Exam Hours : -

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 16 - CONFINED SPACE AND EMERGENCY RESCUE OPERATIONS

Fourth Year

Semester - VII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives:

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

1. Identify and classify confined spaces.
2. Understand the hazards associated with confined space entry.
3. Implement control measures and permit systems.
4. Use PPE and monitoring equipment effectively.
5. Develop and execute confined space emergency rescue procedures.

UNIT I:

Types of confined spaces, Hazards in Confined Spaces, Atmospheric hazards (oxygen deficiency, toxic gases, flammable vapors), Physical and mechanical hazards, Biological hazards, Psychological and ergonomic risks

UNIT II:

Confined Space Risk Assessment, Hazard Identification and Risk Assessment (HIRA), Job Safety Analysis (JSA), Entry Permit System, Lockout/Tagout (LOTO), Permit-to-Work (PTW) process, Ventilation and atmospheric testing, Communication methods inside confined spaces, Use of checklists and documentation

UNIT III:

PPE and Equipment, Respiratory Protective Equipment (RPE), Tripods, harnesses, and, retrieval systems, Gas detectors and monitors, intrinsically safe lighting and communication tools

UNIT IV:

Emergency Response Planning, Developing an emergency response plan (ERP), Rescue hierarchy: Self-rescue, Non-entry rescue, Entry rescue, First aid and CPR overview, Coordination with external emergency services

UNIT V:

Rescue Operations and Techniques, Roles and responsibilities of the rescue team, Use of breathing apparatus (SCBA), Non-entry and entry rescue methods, Rope access and retrieval techniques, Rescue drills and timing

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 17 - HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Fourth Year

Semester - VII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Course Objectives:

By the end of the course, participants will be able to:

1. Understand the principles and importance of HIRA.
2. Identify different types of workplace hazards.
3. Analyze risks using qualitative and quantitative methods.
4. Apply HIRA techniques to control and minimize risks.
5. Integrate HIRA into workplace safety management systems

UNIT I:

Introduction to HIRA, Definition and purpose of HIRA, Legal and regulatory requirements (OSHA, ISO 45001, etc.), Relationship between HIRA and overall risk management, Benefits of implementing effective HIRA systems

UNIT II:

Types of Hazards, Classification of hazards: Physical, Chemical, Biological, Ergonomic, Psychosocial, Mechanical / Electrical, Real-life examples and case studies

UNIT III:

Risk Assessment Fundamentals, Concepts of risk, hazard, severity, likelihood, Risk Matrix: 3x3, 5x5, or customized formats, Qualitative, semi-quantitative, and quantitative methods, ALARP (As Low As Reasonably Practicable) principle

UNIT IV:

HIRA Process Step-by-Step, Step 1: Hazard identification, Step 2: Risk analysis and evaluation, Step 3: Risk control (Hierarchy of Controls), Step 4: Documentation and monitoring, Step 5: Review and continuous improvement

UNIT V:

HIRA Tools and Techniques, Job Safety Analysis (JSA), Failure Mode and Effect Analysis (FMEA), What-If Analysis, Hazard and Operability Study (HAZOP), Bowtie Method, Risk Register / Hazard Log

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 18 - SAFETY IN MINING INDUSTRIES

Fourth Year

Semester - VII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Course Objectives

By the end of this course, participants will be able to:

1. Understand the unique safety challenges in mining operations.
2. Identify and mitigate mining-specific hazards.
3. Comply with applicable mining safety regulations and standards.
4. Implement effective safety management systems in mining environments.
5. Respond appropriately to mining emergencies and incidents.

UNIT I

Introduction to Mining Safety, Overview of mining operations (surface & underground), Importance of health and safety in mining, Historical mining disasters, Regulatory bodies (DGMS, OSHA, MSHA, etc.),

UNIT II

Mining Hazards and Risk Factors, Physical hazards: rockfalls, collapses, machinery, noise
Chemical hazards: dust, gases (methane, CO, etc.), chemicals, Biological hazards, Ergonomic and psychosocial risks, Environmental factors: heat, humidity, confined spaces

UNIT III

Mining Safety Regulations and Standards, Directorate General of Mines Safety (DGMS) guidelines, Indian Mines Act, 1952, Environmental laws impacting mine safety, Hazard Identification and Risk Assessment (HIRA) in Mining

UNIT IV

Mine Safety Equipment and PPE, Respiratory protection (including for gas and dust), Hearing protection, helmets, boots, and eye protection, High-visibility clothing, Specialized PPE for underground and blasting operations, Inspection and maintenance of PPE

UNIT V

Safe Operating Procedures in Mines, Drilling and blasting safety, Haulage and transportation safety, Working at heights and in confined spaces, Slope stability and bench management, Isolation, LOTO, and electrical safety in mines, Ventilation and Gas Monitoring, Fire and Explosion Prevention in Mines, Emergency planning and communication

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(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 19 - A. SAFETY IN PHARMACEUTICAL INDUSTRY

Fourth Year

Semester - VII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives:

- To understand hazards of pharmaceutical operations
- To understand safe handling of Hazardous chemicals
- To identify components of MSDS
- To understand Emergency Preparedness at fire hazards
- To understand proper usages of PPE

Research based Concepts:

UNIT I: Introduction to Industrial Safety and Hazards

- Understanding industrial safety, hazard, and risk in the context of pharmaceutical operations.
- Industrial disasters (e.g., Bhopal Gas Disaster), Overview of key safety regulations and guidelines from bodies - the Occupational Safety and Health Administration (OSHA), Factory Acts, and relevant environmental protection agencies.
- Types of Hazards in the Pharmaceutical Industry: Chemical Hazards: Properties of hazardous chemicals (toxic, flammable, reactive). Routes of exposure (inhalation, ingestion, skin absorption) and types of toxicity (acute vs. chronic). Management of chemical exposure, including Threshold Limit Values (TLV). Material Safety Data Sheets (MSDS) and proper chemical labeling and storage.

UNIT II: Fire and Physical Hazards

- **Fire and Explosion Hazards:** Sources of ignition and combustible materials.
- Fire prevention systems, types of fire extinguishers, and fire fighting protocols.
- Mechanical and chemical explosion potentials and preventive measures (ventilation, relief systems).
- Physical and Mechanical Hazards: Safety around equipment and machinery (e.g., mixers, compression machines). Electrical hazards, wiring faults, and safe work practices for electrical systems. Ergonomics and general workplace safety (slips, trips, falls).

UNIT III: Biological & Environmental Hazards

- **Biological Hazards:** Hazards related to handling microorganisms, cell cultures, and biological products (less prominent than chemical hazards but relevant in biotech pharma).
- **Environmental Hazards:** Industrial pollution concerns and waste management procedures (e.g., EHS systems, effluent treatment).

- Good Manufacturing Practices (GMP) and Safety: Integrating safety protocols within GMP environments.

UNIT IV: Hazard and Risk Management

- Risk Assessment: Methodologies and tools for identifying, analyzing, and evaluating risks (e.g., Hazard and Operability Study - Hazop).
- Risk Control and Mitigation: Implementing protective measures and control systems to minimize identified risks.
- Quality Risk Management (QRM): Application of ICH Q9 guidelines in safety management.
- Accident Prevention: Fundamentals of accident investigation, root cause analysis (RCA), and corrective and preventive actions (CAPA)

UNIT V. Safety Management Systems and Procedures

- Safety Programs: Elements of a comprehensive safety program and safety management plan.
- Personal Protective Equipment (PPE): Selection, use, and maintenance of appropriate PPE.
- Emergency Preparedness and Response: Developing and implementing emergency action plans for spills, fires, and other incidents.
- Safety Culture and Training: Fostering a culture of safety through ongoing training, communication, and employee involvement.
- Auditing and Compliance: Conducting internal and external safety audits to ensure compliance with regulations and standards.

References

1. *Safety in the Chemical Laboratory and Industry: A Practical Guide* by Muhammad Raza Shah et al.
2. *Handbook for Laboratory Safety* by Benjamin R. Sveinbjornsson.

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 19 - B. A STUDY ON MACHINE GUARDING AND ITS TYPES

Fourth Year

Semester - VII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives:

- To understand Principles of machine guarding
- To understand various types of machine guards
- To identify safe guard devices and their proper utilization
- To understand Risk Assessment and Emergency Preparedness

Research based Concepts:

UNIT I: Introduction to Machine Guarding

- Understanding the necessity of machine guarding to prevent severe injuries such as amputations, lacerations, burns, and crushing injuries.
- Relevant Standards and Regulations: Overview of key regulatory requirements, such as OSHA standards (e.g., 29 CFR 1910.212) and national/international standards (e.g., ANSI B11 series, National Building Code provisions).
- Causes of Machine Accidents: Common scenarios leading to accidents, such as reaching into equipment, failure to use lockout/tagout (LOTO) procedures, or missing guards.
- Hazard Recognition: Identifying mechanical hazards associated with machinery, including point-of-operation, power transmission apparatus (flywheels, pulleys, belts, chains, gears), and in-running nip points

UNIT II. Principles and Requirements of Safeguards

- Hierarchy of Controls: Understanding that engineering controls (guards and safety devices) are preferred over administrative controls and personal protective equipment (PPE).
- Minimum Requirements for Safeguards: Prevent contact with hazardous parts. Protect from falling objects. Not interfere with the job, allowing for comfortable and efficient operation. Allow for safe lubrication and maintenance, if possible, without removing the guard.

UNIT III: Types of Machine Guards

- Fixed Guards (Permanent Barrier Guards):
- Interlocking Guards:

- Adjustable Guards:
- Self-Adjusting Guards:
- Safe handling of Machine Guards
- Applications and Limitations Of Guards

UNIT IV: Safeguarding Methods and Devices

- Presence-Sensing Devices:
 - Photoelectric Devices (Light Curtains):
 - Pressure-Sensitive Devices: .
- Safety Controls:
- Automatic Feeding and Ejection Methods:
- Safeguarding by Location/Distance:
- Awareness Barriers/Devices:
- Miscellaneous Aids: Hand-feeding tools and protective shields (for flying chips/sparks)

UNIT V: Risk Assessment and Management

- Risk Assessment: Methodologies to identify hazards and determine appropriate safeguarding solutions.
- Training and Responsibilities: Training requirements for operators and maintenance staff on hazard recognition, safe operation, LOTO procedures, and guard maintenance.
- Inspection and Maintenance: Protocols for regular inspection, maintenance, and replacement of damaged guards.
- Lockout/Tagout (LOTO): Integration of machine guarding with energy control procedures during maintenance and repair

References:

1. *Machine Guarding Handbook: A Practical Guide to OSHA Compliance and Injury Prevention* by Frank R. Spellman and Nancy E. Whiting.
2. **National Fire Protection Association (NFPA) 70E**

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 20 - A. SAFETY IN HANDLING AND STORAGE OF COMPRESSED GAS CYLINDERS

Fourth Year

Semester - VII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives

- Identify the various physical and chemical hazards associated with compressed gases.
- Understand relevant safety regulations and standards (e.g., OSHA, NFPA, CGA guidelines).
- Implement safe procedures for the storage, handling, transportation, and use of gas cylinders.
- Use appropriate personal protective equipment (PPE) and engineering controls.
- Respond effectively to emergencies involving compressed gas cylinders.

Research based Concepts:

UNIT I: Introduction to Compressed Gases and Associated Hazards

- Types: Compressed, liquefied, and dissolved gases (e.g., Acetylene).
- Physical Hazards: High pressure, explosion/rupture potential if heated.
- Chemical Hazards and Classification: Flammable: (Acetylene, hydrogen, propane), Oxidizing : (Oxygen, nitrous oxide), Toxic / Poisonous: (Chlorine, ammonia), Corrosive: (Hydrogen chloride), Inert / Asphyxiant: (Nitrogen, argon, helium), Pyrophoric: (silane).
- Health Effects: Acute vs. chronic exposure, signs, and symptoms. Regulations and Standards: Overview of regulatory bodies and key rules

UNIT II: Cylinder Identification and Inspection

- Labeling Requirements: Importance of clear, legible labels and stamped information.
- The "Always Read the Label" Rule: Emphasizing that color-coding is not a reliable identification method due to variations between suppliers.
- Cylinder Condition: Inspecting for damage, corrosion, dents, or signs of heat exposure.
- Status Tagging: Systems for marking cylinders as "Full," "In Use," or "Empty."

UNIT III: Safe Handling and Transportation

- Manual Handling: Proper lifting techniques for smaller cylinders; never lifting cylinders by the valve cap or stem.

- Mechanical Aids: Mandatory use of a cylinder cart or hand truck designed with straps or chains for securing the cylinder during transport.
- Transport Procedures: Safe handling

UNIT IV: Safe Storage Requirements

- Securing Cylinders with safe handling
- Segregation of Incompatibles: Storing corrosive, toxic, and highly toxic gases in approved exhausted enclosures (gas cabinets or fume hoods).
- Environmental Conditions: away from heat sources, direct sunlight, and ignition sources.
- Storing in a cool, dry, well-ventilated area Protecting cylinders from dampness to prevent rust and corrosion.
- Inventory Management: Storing full and empty cylinders separately and using a "first-in, first-out" system to prevent prolonged storage

UNIT V Emergency Preparedness

- Leak Detection: Using a soap solution; never using an open flame.
- Emergency Response: Procedures for handling leaks (evacuation, contacting emergency services, isolating the area).
- Incident Investigation: Reporting all incidents and near misses to improve safety procedures.

References

1. *Handbook of Compressed Gases* by the Compressed Gas Association, Inc.
2. **OSHA Standards (Code of Federal Regulations 29 CFR 1910)**: Specific sections, particularly 1910.101 (Compressed gases, general requirements) and 1910.253 (Oxygen-fuel gas welding and cutting), outline mandatory safety rules.
3. **NFPA 400 (Hazardous Materials Code) and NFPA 55 (Compressed Gases and Cryogenic Fluids Code)**:

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

**Major – Elective : 20 - B. SAFETY IN ELECTRICAL SYSTEMS –
OPERATIONS, MAINTENANCE AND
INSTALLATION**

Fourth Year

Semester - VII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives

- Identify common electrical hazards in industrial and residential settings.
- Understand and comply with major electrical safety codes and regulations (e.g., NFPA 70E, OSHA, National Electrical Code).
- Implement safe work practices for installation, maintenance, and operation of electrical systems.
- Develop and apply emergency response procedures for electrical incidents
- Select and use appropriate Personal Protective Equipment (PPE) and safety grounding techniques.

Research based Concepts:

UNIT I: Fundamentals of Electrical Safety and Hazards

- Basic Electrical Principles: Voltage, current, resistance, AC vs. DC systems.
- Types of Electrical Hazards: Electric Shock: Mechanism of injury, physiological effects of current on the human body (ventricular fibrillation, muscle contraction). Arc Flash / Arc Blast: Causes, extreme temperatures, pressure waves, sound blast, and resulting burn injuries.
- Fires and Explosions: Electrical causes of ignition in hazardous environments.
- Secondary Hazards: Falls due to shock or blast reaction.
- Regulatory Framework: Overview of OSHA standards, NFPA 70, NFPA 70E

UNIT II. Electrical Safety in Installation and Design

- Wiring Design and Protection: Proper grounding and bonding principles. Circuit breakers and fuses: Selection, function, and limitations.
- Ground Fault Circuit Interrupters (GFCIs), Arc-Fault Circuit Interrupters (AFCIs).
- Equipment Selection and Approval, Clearance and Guarding: Maintaining safe working clearances around electrical panels and equipment; proper guarding of live parts.
- Hazardous Locations: Requirements for electrical installations in areas with flammable gases, liquids, or combustible dusts.

UNIT III: Electrical Safety in Operations and Maintenance (O&M)

- Lockout/Tagout (LOTO) Procedures: The "Zero Energy State" concept.

- Detailed steps: Preparation, shutdown, isolation, lockout/tagout application, stored energy checks, verification of isolation (the "test for absence of voltage" rule).
- Procedures for complex systems and group LOTO.
- Energized Electrical Work Permits: When energized work is permitted, required documentation, and approval processes.
- Safe Work Practices: Using adequately insulated tools and test equipment. Prohibited practices (e.g., working on wet surfaces, using damaged equipment, removing grounding prongs)

UNIT IV: Personal Protective Equipment (PPE) and Tools

- Shock Protection: Insulating gloves, sleeves, blankets, and matting.
- Arc Flash Protection: Understanding the Arc Thermal Performance Value (ATPV) ratings.
- Selection and Use: Proper selection, inspection, maintenance, and storage of flame-resistant (FR) clothing, face shields, hard hats, and safety glasses.
- Insulated Tools: Requirements for VDE/ASTM F1505 certified tools.
- Safety Barriers and Signage: Use of barricades, covers, and warning signs to delineate restricted approach boundaries (RAB) and arc flash boundaries (AFB)

UNIT V: Emergency Response and Procedures

- First Aid for Electric Shock Victims: Recognizing symptoms, basic life support, and CPR fundamentals.
- Safe Rescue Techniques: De-energizing the source if possible; using non-conductive materials to separate the victim from the circuit.
- Fire Extinguishers: Selection and correct use for electrical fires (Class C fires).
- Emergency Action Plans (EAPs) & Root cause analysis (RCA) of electrical incidents.

References:

1. NFPA 70E: *Standard for Electrical Safety in the Workplace*
2. OSHA Standards (29 CFR 1910 Subpart S and 29 CFR 1926 Subpart K)
Electrical Safety Handbook by John Cadick et

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OOTC : 1 - MOOCS / SWAYAM

Fourth Year

Semester - VII

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

IKS - Indian Knowledge System : 1 - INDIAN KNOWLEDGE SYSTEM - I

Fourth Year

Semester - VII

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 0	No. of Credits Practical : -	Total No. of Credits : 0
Internal Assessment : 0	End Examination : 0	Total Marks : 0
	Practical Component : -	Exam Hours : -

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 21 - SAFETY AUDITS AND INSPECTIONS

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Objectives:

By the end of the course, participants will be able to:

- Understand the principles and importance of safety audits and inspections.
- Plan and conduct effective audits and inspections.
- Identify non-conformities and hazards in the workplace.
- Recommend corrective and preventive actions (CAPA).

UNIT I:

Introduction to Safety Audits and Inspections, Objectives and scope, Benefits of proactive safety evaluations, Legal and regulatory framework (OSHA, ISO 45001, local laws), Types of audits (internal, external, compliance, process, behavior-based)

UNIT II:

Legal and Regulatory Requirements, Relevant legislation and standards (e.g. OSHA, ISO 45001, IS 14489), Employer and employee responsibilities, Audit as a tool for legal compliance, Documentation and records required by law

UNIT III:

Planning and Preparing for an Audit or Inspection, Determining audit scope, criteria, and objectives, Preparing audit checklists and inspection forms, Selecting audit team members, Pre-audit communication and documentation review, Tools and equipment required

UNIT IV:

Conducting safety Inspections Types: Routine, periodic, planned, unannounced, Areas of focus: Machinery, electrical, fire safety, PPE, housekeeping, ergonomics, Observation techniques and hazard identification, Safety behavior observations, Use of mobile tools/apps for inspections

UNIT V:

Conducting safety Audits, Opening meetings, Interviewing staff and verifying evidence, Reviewing documents and records, Identifying non-conformities and root causes, Objective reporting and professional conduct, Reporting and Documentation, Follow-up audits and inspections

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 22 - LABOUR SAFETY AND WELFARE – FACTORIES ACT 1948

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Course Objectives:

By the end of this course, participants will:

- Understand the key provisions of the Factories Act, 1948.
- Identify statutory responsibilities related to worker safety and welfare.
- Interpret legal compliance requirements for factories.
- Promote a safe and healthy working environment.
- Ensure implementation of welfare measures for workers.

UNIT I

Introduction to the Factories Act, 1948, Historical background and need for the Act, Objectives of the Act, Scope and applicability, Key definitions: Factory, Worker, Occupier, Manufacturing Process

UNIT II

Health Provisions (Chapter III), Cleanliness and hygiene, Disposal of waste and effluents, Ventilation and temperature control, Dust and fume control, Artificial humidification, Overcrowding, Lighting, drinking water, latrines, and urinals, Spittoons

UNIT III

Safety Provisions (Chapter IV), Fencing of machinery, Work on or near machinery in motion, Employment of young persons on dangerous machines, Striking gear and devices for cutting off power, Self-acting machines, Casing of new machinery, Pressure plants and revolving machinery, Floors, stairs, and means of access, Pits, sumps, and openings in floors, Precautions against fire

UNIT IV

Welfare Provisions (Chapter V), Washing facilities, Storing and drying clothing, Sitting arrangements, First-aid appliances (number and type required), Canteens (threshold and rules), Shelters, restrooms, and lunchrooms, Crèches for children, Welfare officers (appointment and duties)

UNIT V

Working Hours and Employment of Workers, Annual leave with wages, Duties of occupier and factory manager, Rights and duties of workers, Appointment and powers of Inspectors, Safety Committees and their roles, Worker participation in safety and welfare, Legal Compliance and Penalties

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major - Core : 23 - OCCUPATIONAL SAFETY AND HEALTH EDUCATION

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Course Objectives

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

- Understand the fundamentals of occupational safety and health.
- Recognize workplace hazards and assess associated risks.
- Apply safety principles to reduce accidents and occupational illnesses.
- Promote health and safety culture through education and training.
- Understand regulatory frameworks governing workplace safety.

UNIT I:

Introduction to Occupational Safety and Health, Definitions: Safety, Health, Environment, and Welfare, Importance of OSH in the workplace, History and evolution of OSH, OSH as part of sustainable development, Role of ILO, WHO, and national bodies (e.g., DGMS, DGFASLI)

UNIT II:

Occupational Health and Industrial Hygiene, Principles of industrial hygiene, Occupational diseases (e.g., silicosis, asbestosis, dermatitis), Exposure limits and monitoring (e.g., TLV, STEL, PEL), Ventilation, noise control, and ergonomics, Role of health surveillance and medical check-ups

UNIT III:

Components of a Safety Management System (SMS), Safety policies, objectives, Incident/Accident investigation (root cause analysis), Safety committees and employee participation, Promoting positive safety culture and behavior-based safety (BBS),

UNIT IV:

Importance of OSH training and education, Designing training programs (induction, job-specific, refresher), Adult learning principles in OSH education, Toolbox talks, posters, safety campaigns, Communication barriers and solutions

UNIT V:

Psychological and Ergonomic Aspects of OSH, Mental health and stress in the workplace, Psychosocial risks (harassment, bullying, workload), Workplace ergonomics: design, posture, repetitive strain, Fatigue and shift work management, Continual improvement through PDCA cycle

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 24 - A. SAFETY AND HEALTH IN DOCK WORK

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives:

- To understand dock work hazards
- To understand safe handling of cargoes
- To identify components of Traffic Management
- Emergency Preparedness and Training

Research based Concepts

UNIT I: DOCK WORK HAZARDS AND PPE

Understanding the environment, types of hazards, Physical Hazards, fall from height, Struck-by and caught-in hazards, Electrical hazards, Noise and vibration, Chemical Hazards, Confined spaces, Ergonomic and Environmental Hazards. Control Methods, Personal Protection Equipment. Safety measures: Guardrails, safety nets, fall protection systems, and secure ladders. Good housekeeping, proper drainage, anti-slip flooring, and sufficient lighting.

UNIT II: CARGO HANDLING SAFETY AND WORK AT HEIGHTS

Cargo types and properties: Safe handling procedures for various cargoes, including containers, bulk materials (grain, coal), heavy lifts, and timber. Specialized cargo: Specific precautions for dangerous goods, chemicals, and other specialized items. Equipment operation: Cranes and lifting gear: Safe operation, load limits, and pre-use inspection of cranes, derricks, and other lifting equipment. Forklifts and vehicles: Safe driving practices, traffic management within the dock area, and proper vehicle maintenance. Fall protection systems: Use of guardrails, safety nets, and scaffolds. Personal fall arrest systems (PFAS), Safe access and egress: Ladders and gangways: Preventing dropped objects:

UNIT III: TRAFFIC MANAGEMENT ON DOCKS

Software and technology, Dock and yard management software: Digitally coordinates truck arrivals and departures, manages time slots, and optimizes ramp usage to prevent congestion and idle times.

Dock management dashboards, Intersection violation systems: Physical and safety measures: Barricades and barriers: Use physical barriers like concrete barriers and pedestrian barricades to create safe zones and separate traffic from people. Clear signage and visibility: Protective guard rails: Traffic flow analysis: Regular maintenance, Communication:

UNIT IV: MANUAL HANDLING & ERGONOMICS

Introduction to manual handling: Define manual handling, including lifting, lowering, pushing, pulling, and carrying loads. Explain the specific risks faced in a dock environment due to uneven surfaces, heavy and unstable loads, and confined spaces. Hazard identification: Identify key risk factors associated with manual handling tasks. Principles of safe manual handling, Risk assessment. Ergonomics in the dock environment

UNIT V: EMERGENCY PREPAREDNESS AND TRAINING

Emergency Response Plan (ERP): Outlines the structure of a dockyard-specific Emergency Response Plan. Incident Command System (ICS): Principles and organizational structure of ICS, including the roles and responsibilities of the Incident Commander, Operations, and Logistics sections. Emergency Control Centre (ECC): the setup and function of a central command location during an emergency. Practical Drills and Post-Incident Management

References:

1. Safety and Health in Ports (Revised Edition) Publisher: International Labour Organization (ILO)
2. Occupational Safety and Health (Dock Work) Convention, 1979 (No. 152) and Recommendation (No. 160)

ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNANAGAR-522 510
(Syllabus with effect from the Academic Year 2025-26 admitted batch)

NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 24 - B. SAFETY IN AVIATION INDUSTRIES

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives:

- To understand principles of Aviation Safety
- To understand Fire prevention and principles
- To identify occupational Hazards
- To design Emergency Preparedness
- To understand incident reporting

Research based Concepts

UNIT I: FOUNDATIONS OF AVIATION AND SAFETY

Foundations of Aviation and Safety, The principles of Aviation Safety and Security including regulations, protocols, and the roles of regulatory bodies like the ICAO and DGCA. Human Factors and Risk Management, Aviation Safety Management Systems (SMS), Air Traffic Management (ATM), Crisis and Emergency Response

UNIT II: FIRE AND EMERGENCY SAFETY

Fire prevention and principles: Understanding the fire triangle, Identifying fire hazards in aviation environments (e.g., electrical, fuel-based), Preventive measures like proper housekeeping and equipment handling, Proper use of various fire extinguishers and other on-board equipment, Aircraft and airport emergency plans, Crew coordination and communication during emergencies, Adapting standard fire and rescue equipment for use on aircraft, Personnel safety and the use of personal protective equipment, Dangerous goods awareness

UNIT III: OCCUPATIONAL HEALTH AND SAFETY (OHS)

Fundamentals of occupational health and safety: hazard anticipation, recognition, evaluation, and control, and the role of OHS in the workplace and surrounding community. Identification of specific risks in aviation environments, such as those related to ground operations, machinery, and equipment. Promoting a safety culture: to prevent injuries, aircraft damage, and to encourage continuous improvement. Procedures: for preventing and controlling the spread of communicable diseases in

aviation workplaces. Implementing public health emergency procedures, particularly in airport environments

UNIT IV: INCIDENT REPORTING & INVESTIGATION

Introduction to aviation safety and incident reporting. An overview of the principles of safety and proactive risk management in the aviation industry. Incident classification and investigation preparation, Organizing the investigation, establishing objectives, and appointing a qualified investigator-in-charge. Establishing the goals of an effective reporting system. Reporting and recommendations

UNIT V: AVIATION SAFETY MANAGEMENT SYSTEM (SMS)

Introduction to safety management, Models for understanding accidents and incidents, including the role of human factors and organizational failures, The core pillars of a functional SMS-Safety Policy and Objectives, Safety Assurance (SA), Safety Risk Management (SRM), and Safety Promotion. Implementing and maintaining an SMS Emergency Response Plan (ERP), Continuous improvement

References

1. Safety Management Systems in Aviation by Alan J. Stolzer, Robert L. Sumwalt, and John J. Goglia
2. Commercial Aviation Safety by Stephen K. Cusick, Antonio I. Cortés, and Clarence C. Rodrigues

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 25 - A. SAFETY IN BIO-PROCESS INDUSTRIES

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Course Objectives:

- Identify, assess, and mitigate various hazards specific to bioprocess operations.
- Understand and apply national and international biosafety guidelines and regulations.
- Design and operate bioprocess equipment with inherent safety features.
- Conduct basic hazard and risk analysis for bioprocess facilities.
- Develop an understanding of the role of AI in modern bioprocess safety management.

Research based Concepts:

UNIT I: BIOLOGICAL HAZARD IDENTIFICATION

- **Biohazardous agents:** Classification, risk assessment, and handling procedures for microorganisms, toxins, and cell cultures.
- **Exposure routes:** Inhalation, ingestion, skin contact, and inoculation.
- **Contamination control:** Sterilization of media and equipment, waste stream sterilization, and HEPA filtration.
- **Waste management:** Handling and disposal of biohazardous waste.

UNIT II: CHEMICAL AND PROCESS SAFETY

- **Fire and explosion hazards:** Fire triangle, flammability limits, and ignition sources in a bioprocess setting.
- **Toxicology:** Dose-response relationships, threshold limit values (TLVs), and Material Safety Data Sheets (MSDS).
- **Chemical reactivity:** Hazard analysis of chemical reactions used in purification and formulation.
- **Pressure and vacuum systems:** Safe design and operation of bioreactors and process vessels.
- **Occupational health and hygiene:** Managing noise, radiation, ergonomics, and confined space entry.

UNIT III: OCCUPATIONAL EXPOSURE AND PPE

- **Concepts of occupational health:** History, principles, and importance in bioprocessing.

- **Regulatory framework:** Overview of national and international regulations (e.g., OSHA, WHO, EU directives) relevant to bioprocessing.
- **Hierarchy of controls:** Understanding the order of control measures: elimination, substitution, engineering controls, administrative controls, and PPE. Matching the PPE to the specific hazard (permeation, degradation, resistance)
- **Roles and responsibilities:** The responsibilities of employers, supervisors, and employees in maintaining a safe work environment.

UNIT IV: WASTE MANAGEMENT

- **Introduction to waste management:** Definitions, types of waste (solid, liquid, gaseous), and the importance of proper management in bioprocessing.
- **Waste management hierarchy:** The 3R principle (Reduce, Reuse, Recycle) and its application in bioprocessing.
- **Waste characterization:** Methods for sampling and analyzing the physical, chemical, and biological properties of waste.
- **Sources and characteristics of bioprocess wastewater:** Sources from upstream (fermentation) and downstream processing, and the composition of spent media, cleaning-in-place (CIP) effluents, and utility water.

UNIT V: EMERGENCY RESPONSE PREPAREDNESS

- **Emergency Response Plan (ERP):** Outlines the structure of specific Emergency Response Plan.
- **Incident Command System (ICS):** Principles and organizational structure of ICS.
- **Fire prevention and principles:** Understanding the fire triangle, Identifying fire hazards in bioprocessing environments.
- **Preventive measures,** housekeeping, and equipment handling.
- **Personnel safety** and the use of personal protective equipment, Dangerous goods awareness

References

1. Biosafety in Microbiological and Biomedical Laboratories (BMBL)- Publisher: Centers for Disease Control and Prevention (CDC) & National Institutes of Health (NIH) (USA).
2. Environmental, Health, and Safety (EHS) Guidelines for Pharmaceuticals and Biotechnology Manufacturing

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

Major – Elective : 25 - B. SAFETY IN AGRICULTURE AND TEXTILE INDUSTRIES

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 3	No. of Hours / Week Practical: 2	Total No. of Hours (T+P): 5
No. of Credits Theory : 3	No. of Credits Practical : 1	Total No. of Credits : 4
Internal Assessment : 30	End Examination : 70	Total Marks : 100
	Practical Component : 50	Exam Hours : 3hr

Learning Objectives:

- To understand safety principles in agro and textile industry
- To understand safe handling of agrochemicals and equipment
- To identify hazardous agro chemicals and prevention of health hazards
- To identify hazards and risks in boilers
- To understand fire emergency and incident preparedness

Research based Concepts:

UNIT I: HAZARDS IN AGRO INDUSTRY

- Physical and Mechanical Hazards: Machinery and equipment accidents, Pesticides and herbicides, Fertilizers and other chemicals. Biological Hazards-Zoonotic infections, Organic dusts and molds, Insects and pests.
- Ergonomic Hazards-Repetitive motions (e.g., harvesting, milking), heavy lifting, awkward postures, and prolonged physical exertion - musculoskeletal disorders
- Environmental Hazards: Extreme weather: Working outdoors exposes individuals to heat-related illnesses (heatstroke, heat exhaustion) and cold-related conditions (frostbite, hypothermia)

UNIT II: HANDLING OF AGROCHEMICALS AND EQUIPMENT

- Understanding Chemical Information: Product Labels, including signal words and safety pictograms. Safety Data Sheets, safe handling, first aid, and emergency procedures.
- Exposure Routes: inhalation, skin contact/dermal, ingestion/oral, eye contact and the associated health effects (acute and chronic).
- Disposal Procedures: Proper disposal of empty containers (rinsing, puncturing), obsolete chemicals, and hazardous waste.
- Personal Protective Equipment (PPE): Identification and correct use of necessary protective clothing (coveralls, gloves, masks, goggles, boots, respirators).

UNIT III: CHEMICAL SAFETY AT TEXTILE INDUSTRIES

- The scope of the industry, including design, production, and distribution of yarn, cloth, and clothing. Identifying typical chemicals used in each process, such as sizing agents (e.g., PVA, CMC), bleaching agents (e.g., peroxides, chlorine), and finishing agents (e.g., resins).
- Understanding the types of chemical hazards, including corrosives, irritants, sensitizers, carcinogens, mutagens, and reactive substances.
- Hazard Communication: Proper labeling of chemicals, provision of Safety Data Sheets (SDS), and clear communication of risks to employees.

UNIT IV: SAFETY AT BOILER AND STEAM SYSTEMS

- Boiler systems: Understanding the components of the feed water, steam, and fuel systems.
- Key equipment: Safety valves, pressure gauges, water level gauges, economizers, and air pre-heaters.
- General safety and emergency preparedness: Boiler house safety, Personal Protective Equipment (PPE), Emergency response, Fire safety and First Aid. Safety devices and controls
- Safety valves- Operation and importance of pressure relief valves for over-pressurization.
- Control systems: Understanding high and low pressure, high and low temperature, and flame failure cutouts.

UNIT V: FIRE HAZARDS AND EMERGENCY PREPAREDNESS

- Fundamentals of Fire Science: the fire triangle and tetrahedron, combustion, flash point, fire point, and auto-ignition temperature.
- Fire Prevention: Methods and strategies to prevent fires, including hazard identification in common areas like storage, electrical systems, and heating.
- Fire Risk Assessment: Evaluating the likelihood and severity of potential fires.
- Fire Protection Systems: The design, installation, and maintenance of fire alarms, sprinklers, and other suppression systems. Emergency Preparedness

References

1. Agricultural Safety by Keith E. Barenklau
2. Safety and Health in the Textile Industry (International Labour Organisation - ILO)

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NAME OF THE COURSE : B.Sc. HONOURS IN FIRE AND INDUSTRIAL SAFETY

OOTC : 1 - MOOCS / SWAYAM

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 2	No. of Credits Practical : -	Total No. of Credits : 2
Internal Assessment : 0	End Examination : 50	Total Marks : 50
	Practical Component : -	Exam Hours : 1½ hr

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IKS - Indian Knowledge System : 1 - INDIAN KNOWLEDGE SYSTEM - I

Fourth Year

Semester - VIII

No. of Hours/Week Theory: 2	No. of Hours / Week Practical: -	Total No. of Hours (T+P): 2
No. of Credits Theory : 0	No. of Credits Practical : -	Total No. of Credits : 0
Internal Assessment : 0	End Examination : 0	Total Marks : 0
	Practical Component : -	Exam Hours : -