

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

ES301	Energy & Environmental Engineering	3L-1T-0P	4 Credits
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The objective of this Course is to provide *an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.*

Module 1: Introduction to Energy Science:

- Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

Module2: Ecosystems

- Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3: Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module 4: Environmental Pollution

- Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

Module 5: Social Issues and the Environment

- From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies
Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention

and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Module 6: Field work

- Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai,
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
7. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaia

New Scheme Based On AICTE Flexible Curricula

Fire Technology & Safety Engineering, III-Semester

FT302 Town Planning & Safety in Construction

COURSE OBJECTIVE:

1. To understand the basic concept of planning surveys, Types of roads & types of housing units.
2. Basic concept of Structural soundness, Accident, Hazard their causes and effect.
3. To understand the basic concept of Safety in construction operation.
4. To understand the basic concept of Safety in demolition operation.
5. To perform the safe working at heights with relevant code of practice.

COURSE CONTENT:

TOWN PLANNING

Principles of Town Planning, Site for an Ideal Town, Cost of Town Planning, Surveys, Types of Surveys, Use of Surveys, Zoning, Principles of Zoning, Advantages & Importance of Zoning, Housing, Requirements and Classification Residential Buildings, Rural Housing, Parks and Playgrounds, Classification of Parks, Park Systems and Design, Industries, Classification and Requirement of Industry, Measures to Control location of Industry, Industrial Township, Classification of Urban Roads, Types of Street Systems, Outer and Inner Ring Roads.

BASIC PHILOSOPHY

Building Bye laws for Residential Area, Cinemas, Theatres, Multiplex, Auditorium etc., Drive-in-Cinemas, Gasoline Filling Station, Basic Philosophy and parameters governing in construction such as site planning and layout, safe access and good housekeeping, safety in use of construction machinery, structural soundness, structural safety, accident causes and its effect.

SAFETY IN CONSTRUCTION OPERATIONS

Underground works: - Excavation, drilling & blasting, trenching, strutting, piling & safety in using and operation machinery and equipment relating to above components. Above ground works, Scaffolding, Centering, Frame work, Ladders, Concreting wall and floor openings, staircases and railings. Structural steel work including welding, cutting erection, Safety in use of related machinery equipments, Under water operations, River draining, well sinking, Caissons, under water concreting, Cofferdams & special operation connected with irrigation works, Use of related machinery and equipments, Movement of Materials & personnel, Heavy/Long items, Railway wagons, Motor trucks, Vehicles and Hazardous materials, High rise building, bridges, roads, railways, asphaltting, pneumatic caissons, electrical, installations & lifts, safety in prevention and protection at work site including collapsing of structures.

SAFETY IN DEMOLITION OPERATIONS

Planning & permit, Precautions prior to demolition, Protection of public, Precautions during demolition. Sequence of demolition operations from safety point of view, Safety measures with respect to building materials including cement, lime, timber, steel, glass, paints, varnishes, and petroleum products.

WORKING AT HEIGHT

Fall protection in construction, OSHA 3146, Requirement for working at height, Work permit system, Height pass, Salient Features of safety and health in the Building & other Construction Workers (Regulation of employment and conditions of service) Act. 1996 and Central Rules 1998 IS & NB codes)

COURSE OUTCOME

1. Student will be able to demonstrate various components of Town Planning Including planning surveys, topography, water supply & types of roads

2. Student will be able to apply the basics of architectural aesthetics and layout of housing with site orientation.
3. Student will be able to develop the basic philosophy of Safety in construction operation Including above Ground and Underwater operations
4. Student will be able to develop safety culture towards Occupational hazard & diseases related to construction industries
5. Student will be able to explain n maintain the importance of Construction worker acts and rule between workers n employers.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

REFERENCES

Accident prevention manual for Industrial operations, NSC, Chicago, 1982.

Fulman, J.B., Construction Safety, Security & Loss Prevention, John Wiley and Sons, 1979.

The Building and other construction workers (Regulation of Employment & conditions of service)Act 1996 and central rules 1998.

P.S. Rangwala, Town Planning, Charotar Publishing Housing Pvt. Ltd., 2008

New Scheme Based On AICTE Flexible Curricula

Fire Technology & Safety Engineering, III-Semester

FT303 Nuclear Safety and Radioactive Materials

COURSE OBJECTIVE:

1. To teach basic concept and fundamentals of Radioactivity and its effect.
2. To learn about the special nuclear materials and their fire extinguishing guide lines.
3. To teach different types of reactors and their Engineered Safety Features in Nuclear Power Plant.
4. To learn the Radioactivity dispersion and its absorption with remedial plans.
5. To study the major nuclear power plant accident in past.

COURSE CONTENT:

Radiation Terms- Radioactivity, Alpha, Beta, Gamma Rays, Ionizing Effect, Radiation Exposure, Biological Effects, Radiation Protection Factors, Radioactive Placard and Label Requirement, Fixed site Storage Vessels for Medical Isotopes, Radiation Monitoring Equipment- Geiger- Muller (GM) Counter, Pocket Chamber Dosimeters, Survey meters, Radiation Detection, Devices.

Special Nuclear Materials, Radioactive Pyrophoric Metals- Uranium, Plutonium, Thorium with Fire Extinguishing guide lines, Radioactive material Emergency Response- Hazard Identification, Action Plan, Zoning, Managing the Incident, Assistance and Termination.

Nuclear Power Plant Safety- Overview and brief description of Pressurized Water Reactor (PWR), Boiling Water Reactor (BWR) and Pressurized Heavy Water Reactor (PHWR-CANDU), Components and Equipments, Engineered Safety Features in each Reactors. Nuclear Power Plant Operating States and Accident Classification as per code of federal regulation, Large break LOCA typical sequence in Nuclear Power Plant.

Dispersion of Radioactivity Releases from Nuclear Power Plant, Phenomena of Releases, Diffusion of Radioactive Plume at different heights and temperature condition. Simple Evaluation Techniques, Special Case of Radioactive Iodine release, Biological Absorption and Remedial Plans.

Major Nuclear Power Plant Accidents: Case Studies, Causes and sequence of events, Consequences & follow up actions in Three Mile Island unit-2 Accident, Chernobyl Accident, Fukushima Station Accident and Davis Basse Accident.

COURSE OUTCOME

1. Students will be able to explain Radioactivity and its effect on human body.
2. Students will be able to evaluate various techniques concerning to Radioactivity dispersion and its absorption.
3. Students will be able to demonstrate the types of reactors and their engineered safety features in Nuclear Power Plant.

LABORATORY

Experiments as suggested by the course coordinator.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

REFERENCES

J. Misumi, B. Wilpert and R. Miller, Nuclear Safety: A Human Factors Perspective, Taylor & Francis.
Gianni Petrangeli, Nuclear Safety, Elsevier-2006

John C. Lee and Morman J. McCormick, Risk and Safety Analysis of Nuclear Systems, Wiley- 2011
Joe Varela, Hazardous Materials Handbook for Emergency Response, International Thomson Publishing.

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Fire Technology & Safety Engineering, III-Semester

FT304 Industrial Hygiene & Occupational Health

COURSE OBJECTIVE:

1. To have the knowledge of types of storage & handling process of hazardous material.
2. To learn about the understanding of impact of noise during working hours..
3. To have the knowledge to develop confidence for training & workers regarding occupational diseases.
4. To learn about stress related to work hazard.
5. To learn about various communicate risk factor in handling hazardous material.

COURSE CONTENT:

Introduction to chemical hazards. Dangerous properties of chemicals, dust, gases, fumes, mists, vapors and smoke. Exposure evaluation and air sampling, There sold limit values. Chlorine Exposure effects. Personal monitoring. Introduction to chemical processes and safety. Storage, Transport and handling of hazardous chemicals. Industrial ventilation. Natural ventilation. Opening in work area.

Physical hazards. Improper illumination, Thermal radiation, ultra violet radiation, ionizing and non ionizing radiation. Preventive and control measures. Noise-Measurement, Noise-control techniques – Noise Survey, vibration. Thermal stress, heat balance, heat-stress, heat disorders, control measures.

Work Physiology – classification of workload. Work capacity and man- Job alignment. Fatigue, Physiological tests – diet and exercise for work stress control. Ergonomics, Application of ergonomics in safety and health management, methods of reducing postural strain.

Occupational Health: Common occupational diseases such as silicosis, asbestosis, and toxicity related to lead, nickel, chromium, and manganese. Causation of diseases and its effects. Methods of prevention. Compensation of occupational diseases. Occupational dermatitis, occupational cancers, Medical examination of workers, occupational health center, health records, fundamentals of first aid.

Personal Protective Equipments: Non respiratory personal protective devices: Head protection , Ear protection. Face and Eye protection. Head protection. Feet protection. Body protection. Supply, use, care maintenance of personal protective equipments. Requirements under safety laws. Respiratory personal protective devices: classification of hazards. Selection of respirators. Instructions in use of breathing apparatus. Supply, Training for use, care & maintenance of breathing apparatus.

COURSE OUTCOME

1. Student will able to demonstrate the knowledge of types of storage & handling process of hazardous material.
2. Students will show the understanding of impact of noise during working hours..
3. Students will develop confidence for training & workers regarding occupational diseases.
4. Students will able to handle stress related to work.
5. Students will able to communicate risk factor in handling hazardous material.

LABORATORY

Experiments as suggested by the course coordinator.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

REFERENCES

Occupational Health & Safety in manufacturing Industries – M K Potty.

Diseases of occupation – D. Hunter.

Code of Practice for Hazardous goods by NFPA

Dangerous properties of Industrial materials by Irvin Sex.

Handbook of occupation Health & Safety NSC Chicago 1982

Encyclopedia of occupational Health & Safety Vol I & II I.L.O. Geneva 1985.

Human Factors in Engineering & Design Tata McGraw-Hill 1982

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Fire Technology & Safety Engineering, III-Semester

FT305 Safety Engineering & Its Industrial Application

COURSE OBJECTIVE:

To understand the fundamental of safety engineering in material handling, operation at different levels with major industrial hazards and their application in emergency planning of an organization..

COURSE CONTENT:

MATERIAL HANDLING AND MECHANICAL HAZARDS: Principles of Material handling, Material characteristics, Major equipments categories- Positioning equipment, Conveyors and Automatic Guided vehicles, Mechanical injuries- Safe guards and their requirement, Point of operation for guards and devices. Sensing devices for guards- mechanical limit switches and non mechanical actuation, Guard locking systems and devices, Sensor for motion detection, Presence sensing devices- Trip devices, Mechanical trip switches, Trip wires, Pressure sensing mats, Edge detections, Opto electronic presence detector, Light curtains, Control devices for safety.

HAZARDS AND CONTROL AT DIFFERENT LEVEL: Causes and kind of falls, Walking and slipping, Impact and acceleration hazards, Lifting and standing hazards, Forklift safety. Lockout- tagout, log-in procedure, Loto hardware, Energy isolation release from lockout or tagout, Special procedure. Confined space entry- Identification and hazards, Confined space entry procedure and permits, Duties and responsibilities of entrants, Attendants and rescue team, Hot work procedure and permits. Behavior based Safety.

PRESSURE HAZARDS AND VESSEL TESTING: Pressure hazard sources, Boilers and pressure hazard, High temperature water hazard, Hazard of unfired pressure vessels, Measurement and reduction of pressure hazards. Pressure vessels definition, Classification and grading, Examination intervals and principles, Defect and failure, Pressure testing, Types of pressure test, Safety precaution in pressure and hydraulic testing, Leak testing and detection, Leak location methods and leak rate.

EMERGNECY PLANNING: Safety in industries involving hazardous processes- types of hazards in chemical industries, Introduction, Onsite Emergency planning, Developing Emergency plan, Essential function and Nominated personnel, Off-site Emergency planning, Emergency Incidents and emergency Scenarios – case studies.

INDUSTRIAL HAZARDS AND CONTROL : Hazards and their control in the manufacture of articles from refractory materials, hazards in solvent extraction plants and their control, safety in industries, manufacturing rayon by viscose process, hazards and their control in fertilizer industries, hazards and their control in LPG bottling plant.

COURSE OUTCOME:

1. Students will be able to recognize major material handling equipment and design safe guards for mechanical hazards prevention.
2. Students will be able to illustrate hazards during operation at different levels and develop safe operating procedures.
3. Students will be able to visualize the pressure hazards and plan vessel testing for the organization.
4. Students will be able to demonstrate emergency planning of an organization in onsite and offsite situations.
5. Students will be able to identify the major industrial hazards and their control measures.

LABORATORY:

1. To visualize and demonstrate the function of mechanical limit switches in EOT crane with the help of sample working model.
2. To plan the requirement and design the safe guards for a sample working model of bucket elevator.
3. To define and demonstrate trip wire function for emergency lock inside the sample working model of conveyor belt.
4. To schematize the safe operating procedure for confined space entry and demonstrate confined space entry operation within the sample model of confined space entry.
5. To perform the pressure vessel test for a given sample of pressure vessel with the help of ultra sonic thickness tester and hand/electric operated hydraulic pump.
6. To recognize and relate the rated load capacity of a sample working model of EOT cranes and interpret it with safe load capacity.
7. To schematize the safe operating procedure for prevention of chlorine leakage and demonstrate the chlorine leakage and its control with the help of emergency kit and neutralization process.
8. To measure the efficiency of exhaust fan for removal of toxic fumes through exhaust duct in a given sample of “acid spread” model.

EVALUATION:

Evaluation will be continuous an integral part of the class as well through external assessment.

REFERENCES

- Sam Mannan, Lees' Loss Prevention in the Process Industries, Third Edition Volume-2 section-19*
Sam Mannan, Lees' Loss Prevention in the Process Industries, Third Edition Volume-2 section-24
Paul A. Erickson, Practical Guide to Occupational Health and Safety, Academic Press
David L. Goetsch. Occupational Safety and Health for Technologist, Engineers and Manager- Third edition, Prentice- Hall Inc.
Dave Macdonald, Practical Machinery safety, Newnes
Dr. K.U. Mistry, Fundamentals of Industrial safety & health, Siddhart Prakashan.

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New Scheme Based On AICTE Flexible Curricula

Fire Technology & Safety Engineering, III-Semester

FT306 Field Training in Rescue Operations

COURSE OBJECTIVE:

1. To understand the Aim, Principle & Instruction Method of Squad Drill.
2. To perform the position of Attention, Stand at Ease, Stand Easy, Sizing, Right dress, Dismiss, Step forward/backward March and Side step.
3. To understand the tricks of Parade Inspection, how & whom to salute and perform the position of Saluting.

COURSE CONTENT:

INTRODUCTION:

Aim of drill, The Principle of good Instructions, Words of command, Timing and Techniques for Instructions.

POSITION:

Attention, Stand at ease, Stand easy, Turning and Inclining, Dressing, Forming up in Three ranks, Numbering, Open and Close order March, Sizing.

MARCHING:

Length of pace and time of marching, Marching in quick time, Elementary instruction, Regular pace, Halt, Marching in slow time, Position in marching.

CHANGING, BREAKING AND TURNING:

Changing step in slow march, changing step in quick march, Breaking into slow march, Breaking into quick march, Turning and Diagonal march in slow time and quick time.

FORMING:

Forming squad on the march in slow and quick time, Marching of in single file, Reforming in three ranks. Practice for word of command, Correction of Faults, Inspection and Handling a Squad, Application of Instruction Techniques, Organizing Instructional Periods.

COURSE OUTCOME

1. Students will able to conduct Squad Drill of Fire Fighting Crew in an Organization.
2. Students will able to trained Fire Fighting crew in different Squad Drills.

LABORATORY

1. To Study the Aim, Principle, Instruction Method of Drill
2. To perform the position of Attention, Stand at Ease, Stand Easy, Sizing, Right dress, Dismiss, Step forward/backward March and Side step.
3. To perform the position of March and pace, Turning by numbers, Mark Time, The Halt, Marching in squad, Quick March and The Halt (on the move).
4. To perform the position of 'Right (or Left) ---Turn', Changing direction by wheeling and Changing steps on the March, Forming File from Single File and Forming Single File from File.
5. To study the tricks of Parade Inspection, how & whom to salute and perform the position of Saluting.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

REFERENCES

Drill manual for Fire Services of India by Govt. of India.

Fire Fighters Skill drill manual by NFPA