# MAHRASHSI DAYANAND UNIVERSITY, ROHTAK
## SCHEME OF STUDIES AND EXAMINATIONS
## B.Tech 2nd YEAR (FIRE TECHNOLOGY AND SAFETY)
## 3rd SEMESTER

**Proposed 'F' Scheme w.e.f 2012-13**

| Course | Course Title | Teaching Schedule | | | | Marks for class work | Marks for Examination | | Total Marks | Duration of Exam |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| MAT 201F OR HUM 201 F | Mathematics-III or Engineering Economics | 3 or 3 | 2 or | - - | 5 or 4 | 50 50 | 100 | - | 150 | 3 |
| HUM 203F | Fundamentals of Management | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 201 F | Town Planning and Safety in Construction Industry | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 203 F | Fire Engineering | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 205 F | First Aid and Emergency Procedures | 3 | 1 | 4 | 4 | 50 | 100 | - | 150 | 3 |
| FT 207 F | Heavy Vehicle Automobile Engineering and Safety | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 209 F | Machine Drawing and Design | 1 | - | 3 | 4 | 50 | - | 50 | 100 | 3 |
| FT 211 F | Heavy Vehicle Automobile Engineering and Safety Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 213 F | Fire Protection Workshop | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 215 F | Fire Fighting and Field Training - I | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| | **Total** | **19** | **6/7** | **9** | **34/35** | **425** | **600** | **125** | **1150** | |

# MAT-201-F    MATHEMATICS-III
### (Common to CSE, ME, ECE, BME, EE, EEE, E&I, I&C, IT, CE)

L  T  P

3  2  -

Class Work : 50 Marks

Theory : 100 Marks

Total : 150 Marks

Duration of Exam. : 3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.
Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

## Section-B

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability a n d Analyticity
Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula

## Section-C

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series.Zeroes and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).
Probability Distributions and Hypothesis Testing: Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions

## Section-D

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit.
Linear Programming: Linear programming problems formulation, solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

**TEXT BOOKS:**
1. Engineering Mathematics by Babu Ram (Pearson media Publication)
2. Advanced Engg. Mathematics: F Kreyszig.
3. Higher Engg. Mathematics: B.S. Grewal.
**REFERENCE BOOKS:**
1. Advance Engg. Mathematics: R.K. Jain, S.R.K.Iyenger.
2. Advanced Engg. Mathematics: Michael D. Greenberg.
3. Operation Research: H.A. Taha.
4. Probability and statistics for Engineers: Johnson. PHI.

## HUM-201-F  ENGINEERING ECONOMICS
### (Common to CSE, ME, ECE, BME, EE, EEE, E&I, I&C, IT, CE, TT, FAE, TC)

L   T   P
3   1   -

Class Work        : 50 Marks
Theory            : 100 Marks
Total             : 150 Marks
Duration of Exam. :  3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1.  This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks).  Students have to attempt 5 questions in total at least one question from each section.

### Section-A
Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature.  Relation between Science, Engineering, Technology and Economics.

Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

### Section-B
Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

### Section-C
Various concepts of cost - Fixed cost, variable cost, average  cost, marginal cost, money cost, real  cost opportunity cost.  Shape of average cost, marginal cost, total cost etc. in short run and long run.
Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

### Section-D
Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

**TEXT BOOKS:**
1.      Principles of Economics: P.N. Chopra (Kalyani Publishers).
2.      Modern Economic Theory – K.K. Dewett (S.Chand)
**REFERENCE BOOKS:**

1.      A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2.      Micro Economic Theory – M.L. Jhingan (S.Chand)
3.      Micro Economic Theory - H.L. Ahuja (S.Chand)
4.      Modern Micro Economics  :   S.K. Mishra (Pragati Publications)
5.      Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6.      Indian Economy:  Rudar Dutt & K.P.M. Sundhram

## HUM-203-F   FUNDAMENTALS OF MANAGEMENT
### (Common to CSE, ME, ECE, BME, EE, EEE, E&I, I&C, IT, CE)

L  T  P
3  1  -

Class Work       : 50 Marks
Theory           : 100 Marks
Total            : 150 Marks
Duration of Exam.  : 3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A
Meaning of management, Definitions of Management, Characteristics of management, Management vs. Administration. Management-Art, Science and Profession.  Importance of Management.  Development of Management thoughts.

Principles of Management.  The Management Functions, Inter-relationship of Managerial functions. Nature  and Significance of staffing, Personnel management, Functions  of  personnel management, Manpower   planning, Process   of   manpower   planning,   Recruitment, Selection; Promotion - Seniority Vs. Merit.  Training - objectives and types of training.

### Section-B
Production Management : Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control.  Brief introduction to the concepts of material management, inventory control; its importance and various methods**.**

### Section-C
Marketing Management - Definition of marketing, marketing concept, objectives & Functions of marketing.
Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

### Section-D
Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management.  Brief Introduction to the concept of capital structure and various sources of finance.

### TEXT BOOKS:
1.    Principles and Practice of Management - R.S. Gupta, B.D.Sharma,  N.S. Bhalla.
       (Kalyani Publishers)
2.    Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)

### REFERENCE BOOKS:
1.    Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
2.    Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).
3.    Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
4.    Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
5.    Management - James A.F. Stoner & R.Edward Freeman, PHI.

## FT 201 F TOWN PLANING AND SAFETY IN CONSTRUCTION INDUSTRY

| L | T | P | | | |
|---|---|---|---|---|---|
| 3 | 1 | - | Class Work | : | 50 Marks |
| | | | Theory | : | 100 Marks |
| | | | Total | : | 150 Marks |
| | | | Duration of Exam. | : | 3 Hrs. |

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A

**Town Planning:** Planning surveys, selection of site for urban development, consideration cliats, Topography, Drainage and water supply etch-, Types of roads in urban areas communication system and it relationship to the cities. Multi story flats, Group Housing, Group Ware Housing, Commercial complexes, Detached and Semidetached houses in relation to fire risk-, types of housing units, Layout of Housing areas with consideration of site orientation, views and architectural aesthetics.

### Section-B

**Basic Philosophy:** Structural Soundness, Accident and Hazards – their causes & effect. Accident investigation and reporting. Monitoring of safety performance. Treatment of injuries and rehabilitation. Safety Budget, organization, training, implementation. Safety officers. Safety committee.

### Section-C

**Safety in Construction Operations**

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

### Section-D

**Safety in Demolition Operations:** Planning & permit, Precautions prior to demolition; Protection of public; Precautions during demolition; Sequence of demolition operations from safety point. Safety measures with respect to building materials including comment, lime, timber, steel, glass, paints, varnishes, and petroleum products.

HEALTH AND WELFARE: Personal protective equipments; Health, Welfare measures; First aid facilities, Salient Features of safety and Health in The Building and other Construction Workers (Regulation of employment and conditions of service ) Act 1996 and central rules 1998 (IS & NB codes).

**References:**

1. Accident prevention manual for Industrial operations, NSC, Chicago, 1982.
2. Fulman, J.B., Construction Safety, Security & Loss Prevention, John Wiley and Sons, 1979
3. The Building and other construction workers (Regulation of Employment & conditions of service) Act 1996 and central rules 1998.

## FT 203-F FIRE ENGINEERING

L  T  P  
3  1  -

Class Work     : 50 Marks  
Theory         : 100 Marks  
Total          : 150 Marks  
Duration of Exam.  : 3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A

Process of emergency evacuation - special features of personnel movement, Parameter characteristics of the movement of people-practical methods of designing evacuation passages and exists. Evacuation exits and routes - stages of evacuation; Exit Requirements- Planning of evacuation routes and exits - Seating arrangement - Passages and corridors; Smoke control during building design; Mechanical Ventilation; Compartment fires and tactical ventilation.

### Section-B

Classification of building based on occupancy; Fire zone; classification of type of construction according to fire resistance; General fire safety requirements applicable to all individual occupancies. Sitting of detectors as per relevant standards (ISI); Selection and planning of alarm system as per relevant standards (ISI). General requirements and guidelines for the installation of fire detection and alarm system in buildings of different occupancy classification.

### Section-C

General exit requirements as per NBC; Internal staircases; Pressurisation of stair staircases; horizontal exits; fire tower; ramps; fire lifts; external fire escape ladders; Planning of location and calculation of capacity, number and width of exit as per NBC for different occupancy classification.

### Section-D

Selection and distribution of portable extinguishers (for class A and B fires) and other fire rotection equipments and systems for different occupancy classification as per NBC; Planning of fixed fire fighting installation for different occupancy classification- sprinkler system; total flooding system; $CO_2$ system; foam system; Fire training  and education- Arson - Fire safety audits - Risk assessment -Fire insurance. Fire Investigation

Text Books

1. Roytman M.Ya."Principles of Fire Safety Standards for Building Construction", Amerind Publishing Co. Pvt. Ltd., New Delhi, 1975
2. E.Gorden Butcher E.G. and Parnell A.C, Designing of fire safety, John Wiley and Sons Ltd., New York, U.S.A., 1983.
3.  BIS, "NBC Part 4- Fire and Life safety", Bureau of Indian Standards, New Delhi, 2005.

**Reference Books**
1.  Marchant E.W, A Complete Guide to Fire and Building
2.  Adam and Charles Black, Fire safety in Buildings

## FT-205-F   FIRST AID AND EMERGENCY PROCEDURES

L   T   P                                          Class Work       : 50 Marks
3   1   -                                          Theory           : 100 Marks
                                                   Total            : 150 Marks
                                                   Duration of Exam. :  3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A
Aims and Objectives. First Aid principles-Role of the first aider-sequence of action on arrival at scene. Vital signs-breathing -pulse. Introduction to the body-basic anatomical terms-body cavities-head-cranium - thorax-abdomen and pelvis. Biomechanics - Structure and functions of musculoskeletal systems, tendons, ligaments, facia, bone, muscles, joints and basic mechanisms. The respiratory system-respiratory failure - asphyxia-abdominal thrust in Heimlich manoeuvre. Chest injuries-types-fractured ribs -pneumothrox-haemothrox.

### Section-B
The nervous system-functions-components-brain - cerebrum - cerebellum - medulla Oblongata-cerebro-spinal fluid-spinal cord-autonomic nervous system. Unconsciousness-causes-level of consciousness-management of unconscious casualty-problems of unconsciousness. Fainting-recognition-management-aftercare. Diabetes -hypoglycemia -hyperglycemia-management. Seizures(epileptic fits, convulsions) features- management, stroke.  Head injuries-fractures of the base-vault and sides of skull

### Section-C
The circulatory system-heat attack-chest compression- CPR Shock-causes-signs and symptoms-management of shock. Eye-eye injuries-foreign body in eye-eye trauma-corrosive chemical in eye-arc eye. Wounds bleeding classification-types of wounds-case of wounds-bleeding from special sites.

### Section-D
Fractures- classification of fractures-principles of immobilization- sprains and dislocation. Broad and narrow fold bandages-hand bandages-slings. The skin.        Burns-rule of nines-pure thermal burns. Electric burns. Chemical burns. Radiation burns. Cold burns. Poisoning.  Physical fitness.  Lifting - casualty handling. Use of stretchers

**References:**
1) Manual of first aid to the injured: St. John Ambulance Association.
2) First aid text book: American National Red Cross
3) Manual of First aid instruction: US Bureau of Mines
4) V.V. Yudenich, Accident First Aid, Mir Publishers, Moscow

# FT 207 F HEAVY VEHICLE AUTOMOBILE ENGINEERING AND SAFETY

| L | T | P | | |
|---|---|---|---|---|
| 3 | 1 | - | Class Work | : 50 Marks |
| | | | Theory | : 100 Marks |
| | | | Total | : 150 Marks |
| | | | Duration of Exam. | : 3 Hrs. |

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A
**ENGINES:** Engine Classification, construction, details of Engine Components. Combustion in S.I. Engines, Combustion in C.I. Engines, Study of fuel system components, Function of carburetors, construction details, Type of Study of diesel fuel feed systems-, Carburetion and mass distribution of mixture, supercharging, fuel injection and injection sections, Clutch, Types, Construction, Operation and Fault finding of clutches. Transmission assembly, Types of Gear box, Functions of gear box, operation and maintenance of gear box.

## Section-B
**Differential:** Necessity, Construction of differential systems, Axles, Types and Application-, Brakes, Types, Construction and Operation of Hydraulic, Pneumatic Brake Systems, Maintenance of Brakes. Suspension, Necessity, Types, Construction and operation, Shock absorber, Coil springs, Independent suspension, Steering, Systems, Constructional details, types of steering gear box, steering geometry, caster, camber, king pin inclination, Effect of steering geometry on directional stability, Power steering

## Section-C
**Electrical System:** Ignition Systems, Magnet ignition, Battery Ignition, Electronic Ignition, Merits and Demerits, Working, Self Starter, Dynamo voltage regulator, Battery construction, operation and maintenance; pollution, Air-pollution, Euro norms, Pollution Control techniques.

## Section-D
**Lubricating System:** Types, Components, Lubricating oil, Cooling System, Detail of Components, Study of Systems, Types, Miscellaneous, Special Gadgets and accessories for Fire Fighting vehicles, Automobile Accidents, CMV Rules regarding safety devices for Drivers, Passengers, Fire fighting vehicles & Appliances. Construction & operation of fire fighting vehicles & appliances, Construction & Operation of Fire boats & other Water borne applications, Rules & regulations of RTO; Laboratory testing of vehicles; Road testing of vehicles. Automobile safety devices

**REFERENCE BOOKS:**
1.      Automobile chassis and body construction, Operation and Maintenance by Wills H. Crouse.
2.      Automobile Machines – Principles and Operations by W.H. Crouse.
3.      Modern Petrol Engine by Arther V. Judge
4.      Ergonomics of Automation by A.T. Watford H.M.S.O.
5.      Practical Automobile Engineering Illustrated by S.Adhey, Asia Publishing House, Bormh.
6.      Automobile Engine overhaul by A.W. Judge and Sir Issac Pitman.
7.      Automobile Electrical Maintenances by A.W. Judge and Sir Issac Pitman.
8.      Fire Risks in Motor Vehicle Servicing by F.P.A. London.
9.      Maintenance of Diesel Engine by H.M.S.O.
10.      Automobile Engineering by G.B.S. Narrang.
11.      Automobile Engineering by R.B. Gupta
12.      A Course in Automobile "Engineering by R.P. Sharma
13.     Heavy Vehicle Automobile Engg. & Safety

# FT 209 F  MACHINE DESIGN AND DRAWING

L   T   P
3   1   -

Class Work    : 50 Marks
Practical     : 50 Marks
Total         : 100 Marks

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A

Introduction graphic language classification of drawing, principal of drawing, IS codes for machine drawing, lines, scales, section dimensioning, standard abbreviation, – Limits ,  fits and Tolerance ( Dimensional and Geometrical tolerance ) , Surface finish, Gears : Gear terminology, I.S. convention representation of assembly of  spur gears, helical gears, bevel gears , worm  and worm wheel.

## Section B

Orthographic projections:  principle of first and third angle projection, orthographic views from isometric views of machine parts / components.   Drawing of sectional views:- Coupling, Crankshaft, Pulley, Piston and Connecting rod, Cotter and  Knuckle joint. Riveted Joint and Welded Joint. Free hand sketching: Need for free hand sketching of standard parts and simple machines components.

## Section C

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing

## Section D

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies Steam stop valve, Stuffing box, Drill jigs and Milling fixture.

**Text Books:**
1.   Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.
2.   A Text Book of Machine Drawing - P S Gill Pub.:  S K Kataria & Sons.
3.   Engineering  Graphics with Auto CAD 2002 –James D.Bethune,  Pearson Education.

**Reference Books:**
1. A Text Book of Machine Drawing Laxmi Narayana and Mathur, M/s. Jain Brothers, New Delhi.
2.  Machine drawing by N Sidheshwar, Kannaieh, V S  Sastry, TMH, New Delhi.

# FT-211 F  AUTOMOBILE ENGINEERING LAB

|  | | | | |
|---|---|---|---|---|
| | | | Sessional | : 25 Marks |
| L | T | P | Practical | : 25 Marks |
| - | - | 2 | Total | : 50Marks |
| | | | Duration of Exam : 3 Hrs. | |

1.   To study working principles and operation of the following Automotive Engine Systems & Sub Systems.
      (a) Multi-cylinder: Diesel and Petrol Engines. (b)  Engine cooling & lubricating Systems.
      (c)  Engine starting Systems. (d)  Contact Point & Electronic Ignition Systems.
2.   To study working principles and operation of the following Fuels supply systems:
      (a) Diesel Fuel Injection Systems (b) Gasoline Fuel Injection Systems.
3.   To study of working principles and operation of the following Automotive Clutches.
      (a)  Coil-Spring Clutch (b)  Diaphragm – Spring Clutch. (c)  Double Disk Clutch.
4.   To study of  working principles and operation of the   following Automotive Transmission systems.
      (a)  Synchromesh – Four speed Range. (b)  Transaxle with Dual Speed Range.
      (c)  Four Wheel Drive and Transfer Case (d)  Steering Column and Floor – Shift levers.
5.    To study of  working  principles  and  operation  of  the  following  Automotive  Drive Lines & Differentials.
      (a)  Rear Wheel Drive Line      (b)  Front Wheel Drive Line.
      (c)  Differentials, Drive Axles and Four Wheel Drive Line.
6.   To study of working principles and operation of the following Automotive Suspension Systems.
      (a)  Front Suspension System     (b)  Rear Suspension System.
7.   To study of working principles and operation of the following Automotive Steering Systems.
      (a)  Manual Steering Systems, e.g. Pitman –arm steering, Rack & Pinion steering.
      (b)  Power steering Systems, e.g. Rack and Pinion Power Steering System.
      (c)  Steering Wheels and Columns e.g. Tilt & Telescopic steering Wheels, Collapsible Steering
      Columns.
8.   To study of working principles and operation of the following Automotive Tyres & wheels.
      (a)  Various Types of Bias & Radial Tyres. (b)  Various Types of wheels.
9.   To study of  working principles and operation of the Automotive Brake systems.
      (a)  Hydraulic & Pneumatic Brake systems (b)  Drum Brake System.
      (c)  Disk Brake System (d)  Antilock Brake System.
      (e)  System Packing & Other Brakes.
10. To   study of working   principles   and   operation   of Automotive Emission / Pollution control systems.


NOTE :

1.  At least ten experiments are to be  performed in the Semester.
2.  At least seven experiments should be performed from   the above list. Remaining three experiments may either be performed from   the above list or as designed & set   by    the concerned institution as per the scope of the  syllabus.

**FT 213 F FIRE PROTECTION WORKSHOP**

|       |   |   |                   |            |
|-------|---|---|-------------------|------------|
|       |   |   | Sessional         | : 25 Marks |
| L     | T | P | Practical         | : 25 Marks |
| -     | - | 2 | Total             | : 50Marks  |
|       |   |   | Duration of Exam :| 3 hrs      |

1. Study of elements of fire and their use
2. Study and use of different extinguishing Hand Appliances - water, foam, dry powder, ABC Powder, CO2, Halon.
3. Study of basic fire protection equipments.
4. Study of Modular Automatic Fire Extinguishers, Trolley Mounted fire extinguishers.
5. Study of Fire Protection systems, Fire Alarm System, Manual, Electric, & Automatic Fire Detection System
6. Study of Water sprays system.
7. Study of Mobile fire fighting Equipments Mobile Monitors, Trailor, Pumps, Fire

# FT 215 F FIRE FIGHTING TRAINING

|   |   |   | Sessional | : 25 Marks |
|---|---|---|-----------|------------|
| L | T | P | Practical | : 25 Marks |
| - | - | 2 | Total | : 50Marks |
|   |   |   | Duration of Exam | : 3 hrs |

This is a field training based on following

1. Hose Drills General movements to be noted for handling delivery hose, hydrant Drill (3-Men) Hydrant Drill (4-Men).
2. Pump Drills Trailer Pump Drill (Four Men), Trailer Pump Drill (Six Men), Motor Fire Engine (without escape)/Water Tender Drill (Six Men), First Aid Hose reel Drill (Three Men).
3. Ladder Drills: Extension Ladder (Four Men), Hook Ladder Drill, Hook Ladder Drill (One Men), Hook Ladder Drill (Two Men), Hook Ladder Drill (Three Men), Fire escape Ladder Drill (Six Men), getting a Branch to work up on Escape Ladder, getting a Branch to work from an escape Ladder, Turn Table, Ladder Drill (Six Men), Hydraulic Platform. Drill (Six Men).
4. Foam Drill (F.B.-2) Foam Drill with inline inductor (Six Men )

# MAHRASHSI DAYANAND UNIVERSITY, ROHTAK
## SCHEME OF STUDIES AND EXAMINATIONS
### B.Tech. 2nd YEAR (FIRE TECHNOLOGY AND SAFETY)
### 4th SEMESTER

**Proposed 'F' Scheme w.e.f 2012-13**

| Course | Course Title | Teaching Schedule | | | | Marks for class | Marks for Examination | | Total Marks | Duration of Exam |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| MAT 201F or HUM 201 F | Mathematics-III or Engineering Economics | 3 or 3 | 2 or 1 | - | 5 or 4 | 50 | 100 | - | 150 | 3 |
| FT 202F | Safety Engineering and Management | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 204 F | Energy Environment Ethics and Society | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 206 F | Strength of Material | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 208 F | Electrical Fire Safety | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 210 F | Pumping Machinery and Fluid Mechanics | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 212 F | Strength of Material Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 214 F | Electrical Fire Safety Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 216 F | Pumping Machinery and Fluid Mechanics | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 218 F | Fire Fighting and Field Training - II | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| GP 202 F | General Proficiency | - | - | 2 | 2 | 50 | - | - | 50 | - |
| | **Total** | **18** | **6/7** | **9** | **34/35** | **450** | **600** | **100** | **1150** | |

# MAT-201-F    MATHEMATICS-III

L   T   P
3   2   -

Class Work      :  50 Marks
Theory          :  100 Marks
Total           :  150 Marks
Duration of Exam.  :  3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

## Section-B

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit  and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations,  necessary  and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

## Section-C

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues.  Evaluation of real integrals using residues (around unit and semi circle only).

Probability Distributions and Hypothesis Testing: Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

## Section-D

Testing of a  hypothesis, tests  of  significance for  large samples, Student's t-distribution (applications only),  Chi-square test of goodness of fit.

Linear Programming: Linear programming problems formulation, solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

### TEXT BOOKS:
1. Engineering Mathematics by Babu Ram (Pearson media Publication)
2. Advanced Engg. Mathematics: F Kreyszig.
3. Higher Engg. Mathematics: B.S. Grewal.

### REFERENCE BOOKS :
1. Advance Engg. Mathematics: R.K. Jain, S.R.K.Iyenger.
2. Advanced Engg. Mathematics: Michael D. Greenberg.
3. Operation Research: H.A. Taha.
4. Probability and statistics for Engineers: Johnson. PHI.

# HUM-201-F   ENGINEERING ECONOMICS

L   T   P                                          Class Work        :   50 Marks
3   1   -                                          Theory            :   100 Marks
                                                   Total             :   150 Marks
                                                   Duration of Exam. :   3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type.  Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature.   Relation between Science, Engineering, Technology and Economics.

Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility  -  its practical application and importance.

## Section-B

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

## Section-C

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost.  Shape of average cost, marginal cost, total cost etc. in short run and long run.

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

## Section-D

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

### TEXT BOOKS:
1.      Principles of Economics: P.N. Chopra (Kalyani Publishers).
2.      Modern Economic Theory – K.K. Dewett (S.Chand)

### REFERENCE BOOKS:
1.      A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2.      Micro Economic Theory – M.L. Jhingan (S.Chand)
3.      Micro Economic Theory - H.L. Ahuja (S.Chand)
4.      Modern Micro Economics  :   S.K. Mishra (Pragati Publications)
5.      Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6.      Indian Economy:  Rudar Dutt & K.P.M. Sundhram

# FT 202 F SAFETY ENGINEERING AND MANAGEMENT

L   T   P
3   1   -

Class Work  :  50 Marks
Theory  :  100 Marks
Total  :  150 Marks
Duration of Exam.  :  3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A
Introduction-Safety-Goals of safety engineering. Need for safety. Safety and productivity Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. History of safety movement .Theories of accident causation, Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages

## Section-B
Accident prevention Methods- Engineering, Education and Enforcement, Safety Education & Training - Importance, Various training methods, Effectiveness of training, Behaviour oriented training. Communication-purpose, barrier to communication. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

## Section-C
Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate.Cost of accidents-Computation of Costs- Utility of Cost data. Plant safety inspection, types, inspection procedure. Safety sampling techniques. Job safety analysis(JSA), Safety surveys, Safety audits. Safety Inventory Technique.

## Section-D
Accident investigation -Why? When? Where? Who? & How? . Basics- Man- Environment & Systems. Process of Investigation -Tools-Data Collection-Handling witnesses- Case study. Accident analysis - Analytical Techniques-System Safety-Change Analysis-MORT-Multi Events Sequencing-TOR.

**Text Books** :
1) N.V. Krishnan, Safety Management in Industry, Jaico Publishing House, 1997
2) Ronald P. Blake, Industrial Safety:, Prentice Hall, New Delhi, 1973
3) David L. Goetsch, Occupational Safety and health, Prentice Hall
4) Ted S. Ferry, Modern Accident Investigation and Analysis, John Wiley & Sons

**Reference :**
1) Willie Hammer, Occupational Safety Management and Engineering, Prentice Hall
2) Alan Waring, Safety Management System, Chapman & Hall
3) John V. Grimaldi and Rollin H.Simonds, Safety Management, All India Traveller Book Seller, Delhi.
4) Accident Prevention Manual for Industrial Operations : National Safety Council, Chicago

# FT 204 F ENERGY ENVIRONMENT ETHICS AND SOCIETY

L  T  P                                                    Class Work      :  50 Marks
3  1  -                                                      Theory          :  100 Marks
                                                                Total           :  150 Marks
                                                                Duration of Exam.  :  3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A
**Energy:** linkage with development, world energy scenario, fossil fuel resource- estimates and duration, India's energy scenario; Finite/ depleting energy resources, coal, oil, gas, nuclear fission, promises and present status of nuclear fusion energy; Renewable energy, solar, hydro, wind, biomass, ocean, tidal, wave and geothermal. Synergy between energy and environment, global environment issues, greenhouse gas emission, global warming, green energy solutions.

## Section-B
**Society and environment:** exponential growth in population, environmentally optimum sustainable population, free access resources and the tragedy of commons; environment problems and impact of P.A.T (Population, Affluence and Technology), environmentally beneficial and harmful technologies environment impact assessment policies and auditing interaction between environment, life support systems and socio-culture system.

## Section-C
**Ecosystem:** definition, concepts, structure, realm of ecology, lithosphere, hydrosphere biosphere, atmosphere-troposphere-stratosphere; energy balance to earth, matter and nutrient recycling in ecosystems; nitrogen, oxygen, carbon and water cycles, food producers, consumers and decomposers, food chains-, biodiversity, threat and conservation of biodiversity. Worldviews ' and environmentally sustainable economic growth, introduction to Design For Environment (DFE), product lifecycle assessment for environment and ISO 14000; triple bottom-line of economic, environment and social performance; environmental ethics, its world impact and challenges.

## Section-D

**Ethics and moral values**, ethical situations, objectives of ethics and its study, role morality and conflicts; values, policies and Organization Culture; Non-professional, quasi- and hard-professionals; preventive, personal, common and professional ethics; different ethical value criteria like utilitarian, virtue, right and duty ethics with discussion on the case of priority for improvement of urban (high traffic) or rural (low traffic) intersections causing equal number of fatalities; codes of ethics and their limitations; Institute of engineers code for corporate member, IEEE and ACM professional-code.

**References:**
1. Miller G. T Jr; Living in the environment; Cengage Publisher.
2. Cunningham W; Principles of Environmental Science: TMH
3. Harris CE, Prichard MS, Rabins MJ, Engineering Ethics; Cengage Pub.
4. Martin; Ethics in Engineering-, TMH
5. Govindrajan, Natrajan, Santikumar; Engineering Ethics; PHI pub.
6. Rana SVS; Essentials of ecology and environment; PHI Pub.
7. Gerard Kiely, Environmental Engineering; TMH
8. Khan BH-, Non Conventional energy resources-, TMH Pub.
9. Raynold G.W. "Ethics in Information Technology; Cengage

## FT-206-F    STRENGTH OF MATERIALS

L  T   P                                                    Sessional        : 50 Marks
3  1   -                                                    Theory            : 100 Marks
                                                           Duration of Exam. :  3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A

Simple Stresses & Strains: Concept & types of Stresses and strains, Poison's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

Compound Stresses & Strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal- planes, Mohr's circle of stresses, Numerical.

### Section-B

Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole  span  or  a part  of  it,  (iii)  combination  of   concentrated  loads  and  uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Torsion Of Circular Members: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

### Section-C

Bending & Shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and  channel sections, composite  beams, shear stresses in  beams with combined bending, torsion & axial loading of beams. Numericals.

Columns & Struts:   Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordom's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short  strut of rectangular & circular sections, Numerical.

### Section-D

Slope & Deflection: Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads     or combination of concentrated and uniformly distributed loads, Numerical.

Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

**TEXT BOOKS:**
1.   Strength of Materials – G.H.Ryder  - Macmillan, India
2.   Strength of Materials– Andrew Pytel  and Fredinand L.Singer, Addison – Wesley

**REFERENCE BOOKS:**
1.   Strength of Materials – Popov, PHI, New Delhi.
2.   Strength of Materials  A Rudimentary Apprach – M.A. Jayaram, Sapna
       Book House, Bangalore

# FT 208 F ELECTRICAL FIRE SAFETY

L  T   P                                    Sessional      : 50 Marks
3  1   -                                    Theory         : 100 Marks
                                            Duration of Exam. :  3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

Generation: - Different types of Generating Stations, their equipments, Possible Faults and safety measures.

## Section-B

Transmission: - Transmission lines, their equipments, Possible Faults and safety measures.

## Section-C

Distribution: - Substation their equipments, Possible Faults and safety measures. Transformer: Their types, Working Principal, Applications, Possible faults & Safety measures.

## Section-D

Electrical Safety Equipments: - Relay Fuses, Circuit Breaker, Insulators – Their types and applications

Earthing: - Their methods and applications.

Insulation: - Their types and applications Static Electricity & its protection

Indian Standards (General reading)

1. I.S. 2206 (Part – 1) - 1962Specifications for flame-proof electric lighting fitting.
2. I.S. 3034 – 1961 Code of Practice for fire safety of industrial buildings Electrical Generating and distribution stations.
3. I.S. 1646 – 1961 Code of Practice for Fire Safety of Buildings (General) Electrical installations.
4. I.S. 2148 – 1968 Specifications for Flame Proof Enclosures of Electrical apparatus.

**TEXT AND REFERENCE BOOKS:**
1.     Electricity Fire Risks – G.S. Hodges
2.     N. F. P.A.
3.     J.P. Handbook.
4.     Estimating & Costing – S.L. Uppal

# FT 210 F PUMPING MACHINERY AND FLUID MECHANICS

L  T   P                                            Sessional        : 50 Marks
3  1   -                                            Theory           : 100 Marks
                                                   Duration of Exam. :  3 Hrs.

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

**Hydraulic Machinery:** Principles, Dynamic Section of Fluid, Dynamic force and torque executed by fluid jet on plain, curved stationary and moving vanes-, Velocity Diagrams, work done by impact, pressure due to deviated flow; Pumps (Positive Displacement Pumps) Reciprocating pumps; Basic theory, types, construction, installation characteristics and operation and accessories.

## Section-B

**Centrifugal pumps and its characteristics:** Other water lifting devices, Ejector pumps, Air-lift pump installation operation.-Parallel —Series, Centrifugal pumps. Pump Section, Maintenance and application.

## Section-C

**HYDRAULICS:** The flow of water through open channels, pipe hose and nozzles. Measures of flow, pressure and pressure drop. KINEMATICS OF FLUIDS; FLOW: Type of flow, path lines and stream lines, equation of continuity, one dimensional method of flow analysis.

## Section-D

**DYNAMICS OF FLUID FLOW:** Energies-potential, pressure and kinetic, Momentum and energy equations for steady flow, Bernoulli's theorem and its applications.

FLUID MEASUREMENT: Pressure measurements, use of piezo-meters and static tubes, velocity measurements, use of pitch-tubes, current meters. Discharge measurement, use of venturi-meter. Orifice -meter.

**TEXT AND REFERENCE BOOKS:**
1. Pump Selection and application: Tyler C. Riches.
2. Pump Operators, Handbook: I.S. University of Science and Technology.
3. Fire Pumps and Hydraulics: I.E. Ditts and T.M. Harris.
4. Hydraulic Mechanics: Dr. J.Lal
5. Pumps and Blowers : Church and Lal
6. Manual of Fireman ship Book No.4
7. Hydraulics Machines : J.Lal
8. Fire-fighting Hydraulics : Purington
9. Hydraulics and Fluid Mechanics : P.N.Modi, Dr. S.M. Seth
10. A text-book of Hydraulics, Fluid Mechanics & Hydraulic Machines: R.S. Khurmi
11. Fluid Mechanics and Systems : S. Nagarathnam
12. Engineering Fluid Mechanics : K.L. Kumar
13. A Text Book on Hydraulics and Fluid Mechanics (Vol. 1): Dr. V.G. Garde, R.M. Advani.

# ME- 214-F STRENGTH OF MATERIAL LAB

| L | T | P | | | |
|---|---|---|---|---|---|
| - | - | 2 | Sessional | : | 25Marks |
| | | | Theory | : | 25 Marks |
| | | | Total | : | 50Marks |
| | | | Duration of Exam | : | 3 hrs |

**List of Experiments:**

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the Erichsen sheet metal testing machine & perform the Erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the sheer test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Gear of Single, Double and Triple start.
13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14. To find Moment of Inertia of a Fly Wheel.

Note:
1. At least ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

# FT 214 F ELECTRICAL WORKSHOP

L T  P                                                      Class Work marks      : 25
0 0  2                                                     Theory marks          : 25
                                                           Total marks           : 50

LIST OF EXPERIMENTS:

1.  Introduction of tools, electrical materials, symbols and abbreviations.

2.   To study stair case wiring.

3.  To study house wiring i.e., batten, cleat, casing-caping and conduit wirings.

4.   To study fluorescent tube light.

5.   Study circuit of a Simple power supply with regulation & filters.

6.  To study Circuit of a SMPS.

7.  To study circuit & working of a U.P.S.

7.  To study Circuit & working of a Home Inverter.

8. To study construction of moving iron, moving coil, electrodynamic & induction type meters.

9. To design & fabricate single phase transformer.

10.  To study fuses MCBs and importance of earthing.

11.  To fabricate a simple PCB using sreen printing or any other technique.

12.  Drilling & mounting of components on above PCB.


NOTE:
Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & setup by the concerned institution.

# FT 210 F PUMPING MACHINERY & FLUID MECHANICS LAB

L T  P                                      Class Work marks      : 25
0  0  2                                      Theory marks          : 25
                                             Total marks           : 50

**List of Experiments:**
1. To study Centrifugal Pump Characteristics
2. To study force balances in a Static System.
3. To study Different Types of Flow.
4. To determine the loss of head in the fittings at the various water flow rates

# FT 218 F FIRE FIGHTING AND FIELD TRAINING-II

| L T P | | Class Work marks | : 25 |
|---|---|---|---|
| 0 0 2 | | Theory marks | : 25 |
| | | Total marks | : 50 |

The field training based on the following is to be performed

Hose Drills General movements to be noted for handling delivery hose, hydrant Drill (3-Men) Hydrant Drill (4-Men).

Pump Drills Trailer Pump Drill (Four Men), Trailer Pump Drill (Six Men), Motor Fire Engine (without escape)/Water Tender Drill (Six Men), First Aid Hose reel Drill (Three Men).

Ladder Drills: Extension Ladder (Four Men), Hook Ladder Drill, Hook Ladder Drill (One Men), Hook Ladder Drill (Two Men), Hook Ladder Drill (Three Men), Fire escape Ladder Drill (Six Men), getting a Branch to work up on Escape Ladder, getting a Branch to work from an escape Ladder, Turn Table, Ladder Drill (Six Men), Hydraulic Platform. Drill (Six Men).
Foam Drill (F.B.-2) Foam Drill with inline inductor (Six Men)

# GP-202-F GENERAL PROFICIENCY
## (Common to CSE,IT,ECE,EE,E&I,I&C,EEE,CE,BM,FT)

L  T  P
 -  -  2

Sessional    : 50 Marks
Total        : 50 Marks
Duration of Exam:  3 Hrs

- Quiz & Aptitude,
- Comprehension,
- Communication for Specifics,
- Let's speak,
- Composition Skills –Formal Letter Writing based on the trends in practice in corporate culture.
- Training on etiquettes & manners should be carried further and be observed during the general classes
- Ethics in Engineering

# MAHRASHSI DAYANAND UNIVERSITY, ROHTAK
## SCHEME OF STUDIES AND EXAMINATIONS
### B.Tech 3rd YEAR (FIRE TECHNOLOGY AND SAFETY)
### 5th SEMESTER

**Proposed 'F' Scheme w.e.f 2012-13**

| Course | Course Title | Teaching schedule | | | | Marks For class work | Marks for Examination | | Total Marks | Duration of Exam |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| FT 301F | Rescue Equipments and Techniques | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 303 F | Building Design and Drawing | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 305 F | Salvage Evaluation of Fire Situation | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 307 F | Environmental Engineering and Management | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 309 F | Fire Prevention and Protection Measures | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 311 F | Nuclear Safety and Radioactive Materials | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 313 F | Environmental Engineering Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 315 F | Field Training in Fire Rescue | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 317 F | AutoCAD and Fire Software Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 319F | Engineering Workshop Practice | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| | Total | 18 | 6 | 8 | 32 | 400 | 600 | 100 | 1100 | |

Note:-

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

2. Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry. According to performance letter grades A, B, C, F are to be awarded. A student who is awarded 'F' grade is required to repeat Practical Training.

## FT 301 F RESCUE EQUIPMENT AND TECHNIQUES

L T P
3 1 -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A
**Hydraulically and pneumatically operated tools and equipments: -** Hydraulic Jack, Hydraulic Cutter, Hydraulic Expander. Air Lifting Bags, Electric Power Tools: - Electric Cutter, Electric Saw, Chain Saw etc. Small Gears: - Their types, Applications and working principal Ladders:  Constructional features, their types,   Material and applications Ropes: - Their types, material and applications.

### Section-B
**General Introduction-** Emergency Rescue Tender, Water Tender, Foam tender, Multipurpose Tender Hydraulic Platform, Turn Table Ladder, Canteen Van and Ambulance; Fire Extinguishers: - Their types and Applications. Rescue by Ordinary Means

### Section-C
**Different types of Knots & Hitches and their applications in emergency Carries & Drags:** Fireman carry, two men carry, three man carry, four man carry, chair carry, stretcher carry and different types of Drags. Rescue problems and their remedies, Rescue from High rise buildings, Rescue from major disasters Earthquake, Flood, Drought, Tsunami etc. Rescue from Fire incident

### Section-D
**Respiratory Equipments:** Respiratory Physiology, Composition of Air, Breathing, Breathing Rate, Calculation of the capacity & time duration of the B.A.Set. Artificial Respiration and their techniques, Renunciator, B.A. Set: - Their types, Constructional features, Working Principal and Applications, Gas Masks: Their types, Constructional features, Working Principal and Applications.

### TEXT AND REFERENCE BOOKS:

1. The manual of fire ship- 6- A by HMSO
2. Elementary principles of rescue by Got. Of India, ministry of Home Affairs
3. Rescue Service Manual by HMSO
4. Rescue - Civil defense handbook by HMSO
5. Rescue tender for Airfields by ISI
6. Relevant ISI special appliances and equipments
7. Manual of fireman ship book no. 244

# FT 303 F BUILDING DESIGN AND DRAWING

L  T  P
3  1  -

Sessional marks: 50
Theory marks: 100
Total marks: 150
 Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A
**Drawing of Building Elements:** Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

## Section-B
**Building Planning -** Provisions of National Building Code, Building bye-laws, open area, setbacks, FAR terminology, principle of architectural composition (unity, contrast, etc), principles of planning, orientation.

**Building Services:** Introduction of Building Services like water supply and drainage, electrification, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

## Section-C
**Design and Drawing of Building -** Design and preparation of detailed drawings of various types of buildings like residential building, institutional buildings and commercial buildings, detailing of doors, windows, ventilators and staircases etc.

## Section-D
**Perspective Drawing -** Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings.

**TEXT AND REFERENCE BOOKS:**
1. Malik & Meo; Building Design and Drawing By
2. Shah, Kale & Patki; Building Design and Drawing; TMH
3. Gurucharan Singh & Jgdish Singh Building Planning, Design and Scheduling

# FT 305 F SALVAGE EVALUATION OF FIRE

L  T  P           Sessional marks: 50
3  1  -           Theory marks: 100
                 Total marks: 150
                 Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A

Concept of Salvage at planning stage, Salvage Operation and difficulties encountered. Various items of equipment necessary in salvage operation.

### Section-B

Evaluation of fire situation: Fire loss calculation, Flame temp. Measurement, Calculation for heat release rate, Salvage operation in different types of occupancies silk hotel, Hospitals, Departmental Stores and basement god owns etc.

### Section-C

Follow up action and investigation of Fire situation such as structural Fire, Wild Fire and Auto mobile Fire etc.

### Section-D

Case Studies of Salvage Operations in different types of occupancy.

**TEXT AND REFERENCE BOOKS:**
1. Manual of Firemanship, Part 6-A by H.M.S.O.
2. Report and Accounts by Fire Salvage Association of Liverpool limited.
3. The principles and practice of Fire salvage operation by fire salvage association.
4. Loss prevention in process of industries, Vol1, 2 & 3, Frank P. Lees.
5. Power Plant Engineering- Dr. Mahesh Verma.

# FT 307 F ENVIRONMENTAL ENGINEERING AND MANAGEMENT

L  T  P
3  1  -

Sessional marks:     50
Theory marks:     100
Total marks:     150
Duration of exam:     3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A
**Air pollution**:- Sources of air pollution, effects of air pollution, classification of pollutants, Atmospheric transport of pollutants-wind profiles, atmosphere stability, inversion, turbulence, dispersion and diffusion of air pollutants, Gaussian plume dispersion model. Principles and techniques of ambient air and stack emission monitoring; Particulate matter control equipment working principles of gravity settlers , cyclones, wet scrubbers, fabric filters and electrostatic precipitators; Gaseous control methods- an overview of absorption, adsorption and combustion methods; Biological methods for VOC and odour control.

## Section-B
**Waste water**: Physical, chemical and biological characteristic, Effects of pollutants on water quality and aquatic life; Physical unit operations in waste water treatment- flow equalization, sedimentation, and flotation; Biological unit processes- kinetics of microbial growth, Aerobic treatment systems: working principle and design parameters of trickling filter, activated sludge process, and rotating biological contactor; Anaerobic treatment systems: mechanism of anaerobic process, low rate and high rate digesters, working principle and applications of anaerobic filters.

## Section-D
**Solid wastes**: environmental, aesthetic and health risk; Sources, quantities and composition of solid wastes; Storage, collection and transportation of urban solid waste, disposal options- sanitary landfills, composting and its variations, anaerobic digestion, incineration and pyrolysis; Vermi composting; Recovery alternative; Monitoring of solid wastes. Hazardous wastes- definition and classification, health and environmental effects, treatment, disposal and management of hazardous wastes, legal frame work for hazardous waste management in India.

## Section-D
**Environmental management in industries:**- Principles and requirements of ISO 14001 EMS; Environmental auditing and auditing for waste minimization; Environmental impact ,assessment-description of the environmental setting, prediction and assessment of impacts, methods of impact analysis, Indian scenario, public participation in environmental decision making Strategies for pollution prevention - recycle and reuse, cleaner technologies. Life cycle assessment-principle and methodology. The concept of industrial ecology, Clean development mechanism (CDM) - carbon trading.

**Text Books :**
1. C.S. Rao: Environmental Pollution Control Engineering,   New Age International (P) Ltd  Publishers, 1991.
2. M.N. Rao and A.K. Dutta  Wastewater Treatment, Oxford & IBH, Publishing Co. Pvt. Ltd, New Delhi, 1987.

**References :**
1) Pavani, J. L: Handbook of solid waste Disposal and Management
2) Metcalf and Eddy Inc.: Waste Water Engineering: Treatment, Disposal, Reuse
3) Canter. L.W: Environmental Impact Assessment
4) Liu, I (Ed).:  Environmental Engineers Handbook (2$^{nd}$ Ed.)

# FT 309 F FIRE PREVANTION & PROTECTION MEASURES

L  T  P                                                      Sessional marks: 50
3  1  -                                                      Theory marks: 100
                                                             Total marks: 150
                                                             Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

**General principles of fire prevention and protection measures:**  Planning and Construction of the building: Site planning considering the nature of the plant, building, equipment and process from the stand point of safety and fire protection, where corrosive, poisonous, explosive and easily combustible materials are handled and processed. Type Of construction fire wall, barricades etc. Fire separation, fire steps, segregation, isolation.

## Section-B

**Internal planning and combustion of plants and buildings:** Layout of hazardous pipe lines, vessels and equipment, planning of strategic points and selection of fire extinguishing device, Automatic, fire doors, fire, doors, wire glass windows, fire walls, parapeted to prevent spread of fire through roofs, vertical cut offs, Exits, guard & guarding, floor platforms, path roadways, stairs ventilation. Protection and devices for fire due to lightening.

## Section-C

**Fire Protection arrangement**: Fire appliances: Fire warning system (Manual & Automatic) fixed fire-fighting installations: Foam system; Gas/vapor system; Dry powder system; Special safety protection equipment-Explosion detection, venting and suppression system, Inergen clean agent system and F.M. 200.

Different Extinguishing properties & application like water, foam, carbon die oxide, dry chemical powder, halogenated agent and halon alternatives. Lighting: lighting arrangement and minimum light require in domestic, commercial, industrial and public assembly occupancies etc. Emergency lighting system

## Section-D

 **Safety and fire protection organization**: (a) House-keeping and management;  (b) Plant fire brigade and fire fitting facilities, petrol, systems.

Detailed analysis of fire case studies: especially those fires were large number of people have been involved. Interaction and relative value of the components of escape route design, especially smoke movement and control.

**TEXT AND REFERENCE BOOKS:**
1. General fire hazards and fire protection by J.J. Williams
2. Fire prevention Notes for Industrial premises by F.P.A.
3. Fire prevention hand book by Kesteren fire Brigade.
4. Fire prevention standard recommendations by Earnest Beam Ltd
5. Automation- A challenge to fire protection Engineers by Warre J. Baker.
6. Fire Protection- Technical information and Useful general knowledge by Mather and Platt.
7. Hand book of fire protection by N.F.P.A.
8. Fire protection in factory, buildings by H,N,S.O
9. Fire safety in Building by Adam Chalres black.
10. Crosby- Fisky- forster hand book of fire protection.
11. Industrial  fire hazards by Danna and Milne
12. Fire protection for the design professional by Rolf Jansem
13. Introduction by science and fire protection by William K. Bare.

# FT 311 F NUCLEAR SAFETY AND RADIOACTIVE MATERIALS

L T P                                                          Sessional marks: 50
3 1 -                                                          Theory marks: 100
                                                               Total marks: 150
                                                               Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A
Radio Active Material – Basic theory Principles and Techniques of radiation dissymmetry. Techniques of area and air monitoring . Techniques of personnel radiation protection.

### Section-B
Sources and characteristics of radioactive waste and their types and their method of disposal, Handing and prevention of radiation emergencies  and Storage requirements of radioactive materials

### Section-C
Fire fighting and rescue operations in the presence of radiation hazard. Pre plan of Radiation incident.

### Section-D
Radiation Safety in Nuclear Power Stations

## TEXT AND REFERENCE BOOKS:

1. Radioactive Materials , B,m. Rao, Himalaya Publishing House (2001)  (In press)
2. Principles of Radiation Dosimetry, G .W.White ,John Wiley and Sons,New York(1969)
3. Radiation Hygiene Handbook,Henson Blat.2(Ed)McGraw Hill,New York(1959)
4. Radioactive Wastes,their Treatment and disposal ,J.C.Collins,E.F.N Spon Ltd.,London
5. Effects of Nuclear Weapons,S.Glasstone, U.S.Goverment Printing Office, Wastington
6. Environmental Redioactivity ,M.Eisembud,McGraw Hill Book Co.,New York(1963)
7. Industrial Safety, F.A.Patty(Ed.),Prentice Hall,New York(1960)
8. Industrial  Hygience and Toxicology,F.A.Patty (Ed) ,Vols.I and II Interscience,New York(1962)
9. Living with Radiation Problems of the Nuclear age for the Layman Parts-I and II
10. Fire Service Problem,Published by the United States Atomic Energy Commission.
11. Source Book of Atomic Energy S.Glasstone,3$^{rd Ed.,}$  Affiliated East-West Press,New Delhi.

# FT 313 F ENVIRONMENTAL ENGINEERING AND MANAGEMENT LAB

L    T    P                              Sessional marks   :   25
\-    -    2                               Practical marks   :    25
                                           Total marks       :    50
                                           Duration of exam :    3 hrs

## List of Experiments

1. Determination of pH, turbidity, total hardness, total solids and dissolved oxygen of water samples.

2. Determination of BOD and COD of waste water samples.

3. Jar test for determining the optimum coagulant dose for water treatment.

4. Determination of kinetic constants of activated sludge process.

5. Determination of sulphur dioxide, oxides of nitrogen and particulate matter from chimney sources.
6. Determination of particulate matter, chlorine, ammonia, carbon monoxide and sulphur dioxide in ambient air.

7. Analysis of lead and other heavy metals in air using spectroscopy.

8. Study of pollution prevention and control facilities in industries.

9. Preparation of Environmental Impact Statement (EIS) for an industrial project.

10. Preparation of an Environment Audit Report.

Note: Any Eight Experiments should performed from above list and two experiments can be suitably chosen on the contemporary topics

# FT 315 F FIELD TRAINING IN FIRE RESCURE

| L | T | P | | |
|---|---|---|---|---|
| - | - | 2 | Sessional marks : | 25 |
| | | | Practical marks : | 25 |
| | | | Total marks : | 50 |
| | | | Duration of exam : | 3 hrs |

The field training based on the following should be given
   a) Rescue Drill
   b) Rescue from fire.
   c) Rescue from the accidents (Road side, railway accident & Aircraft),
   d) Rescue from electrocution and
   e) Rescues from well.

# FT 317 F AUTO CAD AND FIRE SOFTWARE LAB

L     T     P

-     -     2

Sessional marks  :  25

Practical marks   :  25

Total marks      :  50

Duration of exam :  3 hrs

**List of experiments/ programs/designs**

Experiments and Problem solving on Auto-Cad and fire software.

# FT 319 F ENGINEERING WORKSHOP PRACTICE

|    |    |    |
|----|----|----|
| L  | T  | P  |
| -  | -  | 2  |

Sessional marks : 25
Practical marks : 25
Total marks : 50
Duration of exam : 3 hrs

## List of Experiments

1. Following jobs to made
   a) Forging of chisel
   b) Forging of C-Ring
   c) Forging of Pan Hook (S-shaped)
   d) Forging of screw drive
   e) Forging of hexagonal nut etc.

2. Preparation of job piece by making use of filling, sawing and chipping operation.
3. Job having combined practice for drilling and tapping.
4. Study of Equipment used for brazing, soldering and gas arc welding.
5. Study Equipment used for Branzing, Soldering and gas Arc welding
6. Study of tools and equipments, Safety precautions
7. Study of sheet metal and make a tray of sheet metal

# MAHRASHSI DAYANAND UNIVERSITY, ROHTAK

## SCHEME OF STUDIES AND EXAMINATIONS
### B.Tech 3rd YEAR (FIRE TECHNOLOGY AND SAFETY)
### 6th SEMESTER

**Proposed 'F' Scheme w.e.f 2012-13**

| Course | Course Title | Teaching schedule | | | | Marks For class work | Marks for Examination | | Total Marks | Duration of Exam |
|--------|--------------|---|---|---|-------|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| FT 302F | Legal Aspect of Safety, Health and Environment | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 304F | Fire Safety Codes and Standardization | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 306F | Fire Fighting & Safety Equipments | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 308F | Identification and Risk Assesmant | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 310F | Applied Numerical Technique and Computing | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 312F | Heat Transfer, Combustion and Explosives | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 314F | Field Training Rescue (Chemical Hazards) | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 316F | Applied Numerical Technique and Computing Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 318F | Heat Transfer, Combustion and Explosives Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 320 F | Industrial Hygiene Lab | - | - | 2 | 2 | 25 | - | 25 | 50 | 3 |
| FT 322F | General Proficiency | - | - | 2 | 2 | 50 | - | - | 50 | - |
| | Total | 18 | 6 | 10 | 34 | 450 | 600 | 100 | 1150 | |

Note:-

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of Calculator will not be permitted in the examination.
2. Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the VII semester

# FT 302 F LEGAL ASPECTS OF SAFETY, HEALTH AND ENVIRONMENT

L T P                                           Sessional marks: 50
3 - -                                           Theory marks: 100
                                                Total marks: 150
                                                Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A
**Factories Act**- Definitions, Preliminary, Inspecting staff, Health, Safety, Provisions relating to hazardous processes, Welfare, Working hours of adults, Employment of young persons Special provisions. Dock workers (Safety, Health and Welfare) Act and Regulations-Definitions Powers of Inspectors, Power of Govt. to direct Inquiry, Obligation of dock workers. Duties of Safety Officers, Reporting of accidents, Emergency Action Plan, Safety Committee.

## Section-B
**Workmen's Compensation Act**: Definitions, Employer's liability for compensation, Calculation of amount of compensation. ESI Act and Rules: Applicability to Construction, Definitions and Benefits as per the Act & the Rules Public Liability Insurance Act and Rules-Definitions, Calculation of amount of relief Environmental Relief Fund, Advisory Committee, Powers of        District Collector, Extent of Liability, Contribution to Relief Fund.

## Section-C
**Explosives Act and Rules:** Definitions, Categories of Explosives, General Safety Provisions, Use of Explosives Grant of license, Notice of Accidents, Inquiry into ordinary and more serious accidents, Extension of definition to other explosive substances.
Petroleum Act & Rules - Definitions, Control over Petroleum import, transport, storage, production, refining and blending, Need for license, exemption, Notice of Accidents and Inquiries.

## Section-D
Water Act- Definitions, Powers and Functions of  Boards, Provisions regarding prevention and control of water pollution, Power to make rules, Rules on Consent for Establishment and Operation. Air Act - Definitions, Power & Functions of Boards, Prevention & Control of Air Pollution, Consent as per Air Pollution Rules. Environment (Protection) Act and Rules- Definitions, general powers of central government, prevention, control and abatement of environmental pollution, standards for emission, prohibition and restrictions on siting and operation of industries. MSIHC Rules Definitions, Duties of Authorities, Notification of Major Accidents Safety Reports, Safety audit, MSDS, On-site & Off-site Emergency Plan, Giving safety information to public.

**References**
1. Factories Act, 1948 with amendments of 1976 & 1987.
2. Dock Workers (SHW) Act, 1986; Rules, 1990 & Regulations, 1990.
3. Explosives Act and Rules.
4. Petroleum Act and Rules.
5. Environmental Acts & Rules as above.

# FT 304 F FIRE SAFETY CODE AND STANDARDISATION

L  T  P                                                     Sessional marks: 50
3  1  -                                                     Theory marks: 100
                                                            Total marks: 150
                                                            Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section-A
**Specification of Rescue and Fire**: Fighting equipment and appliances viz., TP, Water Tender C. F. T. and I.S. Standard ( IS 948, IS 950 IS 6067, IS 10460 ,IS 4989 (PART-1)  IS -4989(PART-3),IS -949,IS 951,IS 944 , IS 2930,IS-947 IS 6070, IS 957 ,IS-946 ,942 , IS-8090, IS-2190 ,IS-903 IS-636

### Section-B
Salvage Tender Emergency Tender, Rescue tender, DCP Tender IS-10993, IS-949,

### Section-C
Code concerning construction and design of buildings. NBC -1983

### Section-D
Code of practice for construction of temporary  structures and pandals IS -8758 Codes relating to fire ratings of materials used.
Municipal Bye-  Laws in relating to fire prevention , industrial fire Prevention and Protection enforcement.

### References

 1. National Buildings  code by Indian Standard institution
2. All relevant  INDIAN  Standard  Specification and code of  practices
3. Related N. F. P.A. Codes ,Standard and recommended  Practice.
4.DGMS (Indian ) Director  General of Mine  Safety Mines regulations.
5. U.L. Standard , Specification
6. Factory Act.

# FT 306 F FIRE FIGHTING AND SAFETY EQUIPMENT

L T P                                                          Sessional marks: 50
3 1 -                                                          Theory marks: 100
                                                               Total marks: 150
                                                               Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A
**Hose and Hose Fitting:** Details study of hoses, coupling, branches, branch holders , Monitors, Nozzles , Stand Pipes, collecting Head, Suction hose fittings Breaching, Adopters and Ramps.

## Section-B
**Portable Fire Extinguishers:** Constructional features ,Specifications and applications, Extinguishers using water, mech, Foam, co2 dry power Extinguishers and Light Water,

## Section-C
**Foam and foam Making Equipment**: Types of foam, Foam making equipment, properties and characteristics of good foam, practical Consideration, care and maintenance.

## Section-D
**Personnel Protective Equipments**: complete Head to Toe protection
Head Protection – Helmets their types material of construction and reliability
Face protection- Face Shields, their types, material of construction and reliability
Body protection- Aprons, their types material of construction and reliability
Hand protection- Hand Gloves, their types material of construction and reliability
Leg protection- Shoes, Gum Boots their types material of construction and reliability
Fall Protection – Safety Belts, their types, material of construction and reliability

**References**
1.N.F.P.A . Codes
2. H.M.S.O. London manuals

# FT 308 F IDENTIFICATION AND RISK ASSESSMENT

L T P
3 1 -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

Hazard and risk, Types of hazards - fire, explosion and toxic gas release, Structure of hazard identification and risk assessment. Identification of hazards : Inventory analysis, Fire and explosion hazard rating of process plants -The Dow Fire and Explosion Hazard Index, The Mond Index, Plant layout and unit hazard rating, Preliminary hazard analysis, Hazard and Operability study (HAZOP), What If analysis, Case studies.

## Section-B

Plant availability and process reliability: ways of improving plant availability, MTBF and MTTF, the reliability function, failure rate, bathtub curve, probability relationships, simple reliability estimation. Estimation of frequency of occurrence of a hazard : The logic tree approach, set theory and Boolean algebra, application to probability, Boolean manipulation. Fault tree analysis - logic symbols, minimal cut set, logic gates, fault tree quantification. Event tree analysis-notation, event tree construction, advantages and disadvantages of ETA. Failure mode and Effect Analysis (FMEA) - methodology, criticality analysis, corrective action and follow-up.

## Section-C

Consequence modelling : Source models - discharge rate models, flash and evaporation, dispersion models. Explosions and fires - vapour cloud explosions, flash fires, physical explosions, BLEVE and fire ball, confined explosions, pool fires, jet fires. Effect models-dose-response functions, probit functions, toxic gas effects, thermal effects, explosion effects - Software application for effect and damage calculations.

## Section-D

Quantification of risk : QRA, Vulnerability analysis, accepted and imposed risk, perception of risk, risk indices, individual risk and societal risk, acceptance criteria for risk, ALARP, Presentation of measures of risk - risk contour, F-N curve. Calculation of individual risk and societal risk. Human reliability analysis (HRA) : factors leading to human error, aracteristics f HRA techniques, Technique for Human Error Rate Prediction (THERP), Accident Sequence Evaluation Program (ASEP), Techniques using expert judgment, Operator Action tree (OAT).

**Text Books**

1. AIChE/CCPS, Guidelines for Hazard Evaluation Procedures second edition. Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York, 1992.

2. AIChE/CCPS, Guidelines for Chemical Process Quantitative Risk Analysis second edition. Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York, 2000.

**References**

1. Lees F.P. Loss Prevention in the Process Industries second edition. Butterworths, London, 1996.

# FT 310 F APPLIED NUMERICAL TECHNIQUES AND COMPUTING

L T P
3  1 -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
**ERRORS IN NUMERICAL CALCULATIONS**: Introduction, Numbers and their accuracy, Absolute, relative and percentage errors and their analysis, General error formula. INTERPOLATION AND CURVE FITTING Taylor series and calculation of functions, Introduction to interpolation, Lagrange approximation, Newton Polynomials, Chebyshev Polynomials, Least squares line, curve fitting, Interpolation by spline functions.

## Section B
**NUMERICAL DIFFERENTIATION AND INTEGRATION:** approximating the derivative, Numerical differentiation formulas, Introduction to Numerical quadrature, Newton-Cotes formula, Gaussion Quadrature. SOLUTION OF NONLINEAR EQUATIONS Bracketing methods for locating a root, Initial approximations and convergence criteria, Newton- Raphson and Secant methods, Solution of problems through a structural programming language such as C or Pascal.

## Section C
**SOLUTION OF LINEAR SYSTEMS** Direct Methods, Gaussian elimination and pivoting, Matrix inversion, UV factorization, Iterative methods for linear systems, Solution of problems through a structured programming language such as C or Pascal. EIGEN VALUE PROBLEMS Jacobi, Given's and Householder's methods for symmetric matrices, Rutishauser method for general matrices, Power and inverse power methods.

## Section D
**SOLUTION OF DIFFERENTIAL EQUATIONS** Introduction to differential equations, Initial value problems, Euler's methods, Heun's method, Runge-Kutta methods, Taylor series method, Predictor-Corrector methods, Systems of differential equations, Boundary valve problems, Finite-difference method, Solution of problems through a structured programming language such as C or Pascal.
PARTIAL DIFFERENTIAL EQUATIONS, EIGENVALUES AND EIGENVECTORS Solution of hyperbolic, parabolic and elliptic equations, The eigenvalue problem, The power method and the Jacobi's method for eigen value problems, Solution of problems through a structural programming language such as C or Pascal.

**Text Books:**
1. Numerical Methods for Mathematics, Science and Engineering by John H.Mathews, PHI New Delhi.
2. Applied Numerical Methods – Carnahan, B.H., Luther, H.A. and Wilkes, J.O., Pub. - J. Wiley, New York

**Reference Books:**
1. Numerical Solution of Differential Equations, by M.K. Jain, Published by Wiley Eastern, New York.
2. Introductory Methods of Numerical Analysis by S.D. Sastry, Published by Prentice Hall of India.
3. Numerical Methods – Hornbeck, R.W. , Pub.- Prentice Hall, Englewood Cliffs, N.J.

# FT 312 F HEAT TRANSFER, COMBUSTION AND EXPLOSIVE

L   T   P                                                    Sessional   : 50 Marks
3   1   -                                                     Theory      : 100 Marks
                                                             Total       : 150 Marks
                                                    Duration of Exam   : 3 Hrs.

Note:
1.  Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

2. The paper setter will be r e q u i r e d  to mention in the n o t e  of question paper that the use of Steam tables, Charts, Graphical plots is permitted.

## Section A
Basics and Laws: Definition of Heat Transfer, Reversible and  irreversible processes,  Modes of heat flow, Combined  heat transfer system and law of energy  conservation.

Steady State Heat Conduction:  Introduction, I-D heat  conduction  through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and  spherical co-ordinate systems, Numericals.

## Section B
Steady State Conduction with Heat Generation: Introduction, 1 – D heat conduction  with heat sources, Extended surfaces  ( fins), Fin effectiveness  2-D heat conduction ,  Numericals.
Transient Heat Conduction:   Systems with negligible internal resistance, Transient heat  conduction in plane walls,  cylinders, spheres with convective  boundary conditions, Chart solution, Relaxation Method, Numericals.

## Section C
Convection: Forced convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and  energy equations, Some results for flow over a flat  plate and  flow through tube, Fluid friction and heat transfer ( Colburn analogy ), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal o\planes & cylinders, Numericals.
Thermal Radiation:  The Stephen-Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between non black bodies, Electrical network for radiative exchange in an enclosure of two or three gray bodies, Radiation shields, Numericals.
## Section D
Heat Exchangers:  Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness, Numericals.
Heat Transfer with Change of Phase: Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling, Numericals.

**Text Books :**
1.   Heat Transfer – J.P. Holman, John Wiley & Sons, New York.
2.   Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York.
3.   Heat Transfer-Principles & Applications-Binay K. Dutta, PHI, New Delhi
**Reference Books :**
1.   Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press.
2.   Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
3.   Compact  Heat Exchangers – W.M. Keys & A.L. Landon, Mc. Graw Hill.
4.   Thermal  Radiation Heat Transfer – Siegel, R. and J.R. Howell, Mc. Graw Hill.
5.   Heat Transmission – W.M., Mc.Adams , Mc Graw Hill.

# FT 314 F FIELD TRAINING RESCUE (CHEMICAL HAZARDS)

| L | T | P | | Sessional marks | : | 25 |
|---|---|---|---|---|---|---|
| - | - | 2 | | Practical marks | : | 25 |
| | | | | Total marks | : | 50 |
| | | | | Duration of exam | : | 3 hrs |

RESCUE DRILL has to be performed based on the following

a) Rescue from Chemical hazards.
b) Rescue from toxic and poisonous gas leak.
c) Rescue from high rise buildings and sewage

# FT 316 F APPLIED NUMERICAL TECHNIQUES AND COMPUTING LAB.

L      T      P                                      Sessional marks  :  25
-      -      2                                        Practical marks   :  25
                                                    Total marks      :  50
                                                    Duration of exam :  3 hrs

The students will be required to carry out the following exercises, that are based on the theory course ME-311 Numerical Methods and Computing, with the help of MATLAB software / Pascal / C / C++ on personal computer.

1. Solution of Non-linear equation in single variable using the method of successive bisection.

2. Solution of Non-Linear equation in single variable using the Newton Raphson, Secant, Bi – Section and Modified Eualer's, method.

3. Solution of a system of simultaneous algebraic equations using the Gaussian elimination procedure.

4. Solution of a system of simultaneous algebraic equations using the Gauss-Seidel iterative method.

5. Solution of a system of simultaneous algebraic equations using the Gauss-Seidel iterative method employing the technique of successive relaxation.

6. Numerical solution of an ordinary differential equation using the Euler's method.

7. Numerical solution of an ordinary differential equation using the Runge - Kutta $4^{th}$ order method.

8. Numerical solution of an ordinary differential equation using the Predictor – corrector method.

9. Numerical solution of a system of two ordinary differential equation using Numerical intergration.

10. Numerical solution of an elleptic boundary value problem using the method of Finite Differences.

# FT 318 F    HEAT TRANSFER, COMBUSTIO AND EXPLOSIVE LAB

L     T      P
-     -      2

Sessional      : 25 Marks
Practical      : 25 Marks
Total          : 50 Marks
Duration of Exam: 3Hrs.

**List of Experiments**:

1.  To determine the thermal conductivity of a metallic rod.

2.  To determine the thermal conductivity of an insulating power.

3.  To determine the thermal conductivity of a solid by the guarded hot plate method.

4.   To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.

5.   To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.

6.   To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.

7.   To determine average heat transfer coefficient for an externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.

8.   To measure the emmisivity of the gray body (plate) at different temperature and plot the variation of emmisivity with surface temperature.

9.    To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.

10.   To verify the Stefen-Boltzmann constant for thermal radiation.

11.    To demonstrate the super thermal conducting heat pipe and compare its working with that of the best conductor i.e. copper pipe.

12.   To study the two phases heat transfer unit.

13.   To determine the water side overall heat transfer coefficient on a cross-flow heat exchanger.


Note:
1.   At least ten experiments are to be performed in the semester.
2.   At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

**FT 320 F INDUSTRIAL HYGIENE LAB**

| L | T | P |
|---|---|---|
| - | - | 3 |

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks
Duration of Exam: 3Hrs.

1. Demonstration and calibration of Air sampling equipment.
2. Sampling and estimation of gases in work environment by calorimetric method.
3. Sampling and estimation of solvent vapours in work environment
4. Sampling and estimation of dust-gravimetric method
5. Noise level measurement - Sound level meter, Octave filter set
   a) Measurement of sound pressure level in db A and db linear
   b) Frequency analysis of noise
6. Measurement of illumination level
7. Study  of lungs models
8. Study of occupational diseases with photographic models
9. Demonstration of medical laboratory equipments
10. Thermal stress analysis.

# MAHRASHSI DAYANAND UNIVERSITY, ROHTAK

**SCHEME OF STUDIES & EXAMINATIONS**
**B.Tech 4<sup>th</sup> YEAR FIRE TECHNOLOGY & SAFETY,**
**7<sup>th</sup> SEMESTER**

### Proposed 'F' Scheme w.e.f 2012-13

| Course | Course Title | Teaching schedule | | | | Marks For class work | Marks for Examination | | Total Marks | Duration of Exam |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| FT 401 F | Safety and Risk Management | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 403 F | Industrial Engineering | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 405 F | Operational Research | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 407 F | Disaster Management | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 409 F | Fire Fighting Installation and Automation | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| -------- | Dept. Elective | 3 | 1 | - | 4 | 50 | 100 | - | 150 | 3 |
| FT 411 F | Fire Fighting Installation and Automation Lab | - | - | 2 | 2 | 50 | - | 50 | 100 | 3 |
| FT 413 F | Squad Drill | - | - | 2 | 2 | 50 | - | 50 | 100 | 3 |
| | Total | 18 | 6 | 4 | 28 | 400 | 600 | 100 | 1100 | - |

**Dept. Elective:**

1. FT 417 F    Process Instrumentation and Control Engineering
2. FT 419 F    Automobile Engineering and Safety.
3. FT 421 F    Advanced Safety Engineering and Management.
4. FT 423 F    Environmental Protection and Waste Management.
5. FT 425 F    Human Factor Engineering.
6. FT 427 F    Simulation and Process Modeling
7. FT 429 F    Total Quality management
8. FT 431 F    Safety in Health Care waste Management
9. FT 433 F    Safety in Construction

# FT 401 F SAFETY AND RISK MANAGEMENT

|       |   |   | Sessional | : 50 Marks |
|-------|---|---|-----------|------------|
| L     | T |   | Theory    | : 100 Marks |
| 3     | 1 | - | Total     | : 150 Marks |
|       |   |   | Duration of Examination: 3 Hrs | |

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section-A

**Concept of Risk:** Definition, Accepted and imposed risk, perception and qualification of risk, ALARP, COST benefit analysis.

## Section-B

**Basic quantitative risk Assessment** (QRA) The logic tree approach, Principal of QRA, Fault tree analysis, probability theory, Combination of Frequencies, Event tree analysis

Safety in Design and operation: Safety assurance in design, safety in operation, maintenance, organizing for safety, Accident investigation and reporting,

## Section-C

HAZOP: Introduction to HAZOP, conducting a HAZOP study , computerized reporting systems, HAZOP ,of batch process, Extensions of HAZOP Failure mode and effect analysis Methodology of FMEA, CRITICALITY analysis corrective action and follow up.

## Section-D

**Consequence Modeling**; Gas dispersion , Toxicity , Explosions and fires, Human factors the role of the operator , control room design human Error assessment method , application of Hazop to human reliability ,date on operator reliability

**TEXT AND REFERENCE BOOKS:**

1. Process safety analysis: An introduction by Bob Skelton.
2. An introduction to Risk Analysis by Robert E, Megill.
3. Risk Assessments  Questions and answered a practical approach by pat perry,
4. Safety sharing the experience  B P process Safety  series
5. Fire Safety Risk Assessment HM government.

# FT 403  F   INDUSTRIAL ENGINEERING

|  |  | Sessional | : 50 Marks |
|---|---|---|---|
| L | T | Theory | : 100 Marks |
| 3 | 1  - | Total | : 150 Marks |
|  |  | Duration of Examination: 3 Hrs | |

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
Definition of  Industrial Engineering: Objectives, Method study, Principle of  motion economy, Techniques of method study - Various  charts,  THERBLIGS,  Work measurement - various methods, time  study PMTS, determining time, Work sampling, Numericals. Productivity  & Workforce  Management :Productivity - Definition,  Various methods  of measurement, Factors effecting  productivity,  Strategies  for  improving productivity,  Various  methods of Job evaluation &  merit rating, Various  incentive payment  schemes,  Behavioural aspects, Financial incentives.

## Section B
Manufacturing Cost Analysis: Fixed &  variable  costs,  Direct,  indirect & overhead costs, & Job costing, Recovery of overheads, Standard costing, Cost control, Cost variance  Analysis - Labour, material, overhead in volume, rate & efficiency, Break even Analysis, Marginal costing & contribution, Numericals. Materials Management : Strategic importance of materials in  manufacturing industries, Relevant costs, Inventory control models  - Economic order quantity (EOQ), Economic batch quantity (EBQ) with & without shortage, Purchase discounts,  Sensitivity  analysis, Inventory control systems  - P,Q,Ss Systems,  Service level, Stock out risk,  determination  of order  point & safety stock, Selective inventory control  - ABC, FSN, SDE, VED and three dimensional, Numericals.

## Section C
Quality  Management:  Definition of  quality,  Various approaches, Concept of quality assurance systems, Costs of quality,  Statistical quality Control (SQC),  Variables  & Attributes, X, R, P & C - charts, Acceptance sampling, OC - curve,  Concept of AOQL, Sampling plan - Single,  Double & sequential, Introduction to TQM & ISO - 9000. Production  Planning  &  Control (PPC) :  Introduction to Forecasting - Simple & Weighted moving average  methods, Objectives  & variables of PPC, Aggregate planning -  Basic Concept, its relations with other decision areas,  Decision options  - Basic & mixed strategies, Master  production schedule (MPS), Scheduling Operations Various methods  for line & intermittent production systems, Gantt  chart, Sequencing - Johnson algorithm for n-Jobs-2 machines, n- Jobs-3  machines, 2 Jobs n-machines, n-Jobs m-machines Various means  of measuring effectiveness  of  PPC, Introduction to JIT, Numericals.

## Section D
Management Information Systems (MIS) :  What  is MIS ? Importance  of  MIS, Organizational & information system structure,  Role  of MIS in decision making,  Data  flow diagram,  Introduction to  systems  analysis  & design, Organizing information systems. Product Design and Development: Various Approaches, Product life cycle, Role 3S's – Standardization, Simplification, Specialization, Introduction to value engineering and analysis, Role of Ergonomics in Product Design.

**Text Books:**  1. Production and Operations Management - Chary, TMH, New Delhi.
             2. Management Information Systems - Sadagopan, PHI  New Delhi.
             3.  Modern Production Management – S.S. Buffa, Pub. - John Wiley.
**Ref.Books:**  1. Operations Management - Schroeder, McGraw Hill ISE.
             2. Operation Management - Monks, McGraw Hill ISE.
             3.  Production & Operations Management -  Martinich,  John Wiely SE.
             4. Industrial and Systems Engineering - Turner, MIZE, CHASE, Prentice Hall Pub.

# ME- 405-F   OPERATIONS RESEARCH

| L | T | P | | Sessional | : 50 Marks |
|---|---|---|---|---|---|
| 3 | 1 | - | | Theory | : 100 Marks |
| | | | | Total | : 150 Marks |
| | | | | Duration of Exam | : 3 Hrs. |

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section A

Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on O.R. model building –Types & methods. Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex Gauss-Jordan reduction process in simplex methods, BIG-M methods computational, problems.

### Section B

Deterministic Model:  Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimal, Stepperg stone method, MODI methods, degeneracy, assignment, traveling salesman, problems. Advanced Topic Of LP:   Duality, PRIMAL-DUAL relations-its solution,  shadow price,  economic interpretation, dual-simplex, post-optimality & sensitivity analysis, problems.

### Section C

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems. Project Line Models:  Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources leveling in project, problems.

### Section D

Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems. Decision Theory:   Decision process, SIMON model types of decision making environment- certainty, risk, uncertainty, decision making with utilities, problems.

**Text Books:**
1. Operation Research – TAHA, PHI, New Delhi.
**2.** Principle of Operations Research – Ackoff, Churchaman, arnoff, Oxford IBH, Delhi.

**Reference Books :**
1. Operation Research- Gupta & Sharma, National Publishers, New Delhi.
2. Quantitative Techniques- Vohra, TMH, New Delhi
3. Principles of operation Research (with Applications to Managerial Decisions) by H.M.Wagher, Prentice Hall of India, New Delhi.
4. Operation Research – Sharma, Gupta, Wiley Eastern, New Delhi.
5. Operation Research – Philips, Revindran, Solgeberg, Wiley ISE.

# FT 407 F DISASTER MANAGEMENT

L T P
3 1 -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
Importance of disaster management for chemical industry - Types of emergencies - major industrial disasters - causes and consequences of major industrial disasters like Flixborough, Seveso and Bhopal. Components of a major hazard control system - identification of major hazard control installations - purpose and procedures - safe operation of major hazard installations- mitigation of consequences - reporting to authorities. Implementation of major hazard control systems- group of experts - training - checklists - inspection - evaluation of major hazards - information to the public- manpower requirements - sources of Information

## Section B
Emergency planning - on-site and off-site emergency plan - need of plan-possible approach objectives of emergency plan On-site emergency planning- formulation of the plan and emergency services- Identification of resources - actions and duties-emergency procedure-mock drills. Off-site emergency planning-bjectives and elements of off-site plan-role of administrative machinery-role of major hazard works management-role of the local authority. Emergency preparedness at local level-Awareness and preparedness for emergencies at local level (APELL)-The process and its partners.

## Section C
Requirements of emergency plan as per Indian legislations like Factories Act, Manufacture, Storage and Import of Hazardous Chemicals Rules, Chemical Accidents (Emergency planning, Preparedness and Response) Rules. Emergency planning and preparedness in international standards like ISO 14001, OHSAS 18001 and OSHA's Process Safety Management System, Emergency Planning in Seve so II directive - elements of emergency planning in ISO: 18001-Hazardous Materials/Spills Emergencies –contingency plans for road transportation of hazardous chemicals –contingency plans for. Oil spills in marine environment.

## Section D
Natural Hazards- potentially hazardous natural phenomena-earthquakes-landslides-flooding cyclones - hazards in arid and semi-arid areas - nature of the hazard - hazard management activities -disaster mitigation - natural hazard prediction - emergency preparedness - disaster, rescue and relief - post disaster rehabilitation and reconstruction - education and training activities - vulnerable elements to be considered in the development planning for natural hazard management - applications of remote sensing and GIS in disaster management.

**REFERENCES:**
1. ILO, Geneva: Major Hazard Control - a Practical Manual.
2. UNEP, Paris: APELL-A Process for responding to technological accidents, A Handbook, Industry & Environment Office., 1998
3. Accident Prevention Manual for Business and Industry, Vol. I-National Safety Council, USA.
4. Oil spill Response: The National Contingency Plan - Institute of Petroleum, London
5. Petak, W.J and Atkisson, A.A.: Natural Hazard Risk Assessment and Public Policy: Anticipating the Unexpected
6. U.R. Rao: Space Technology for Sustainable Development

# FT 409 F FIRE FIGHTING INSTALLATION AND AUTOMATION

L  T  P
3  1  -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
Grouping of Fixed-Fire-fighting Installations, Provisions of First Aid Fire- Fighting Arrangements, External Hydrants, Ring- Mains.

Rising Mains: Down Corner, Dry- rises, Wet- rises and specification of each types, their relevant code of practices.

## Section B
Water Supply & Hydrants System: Grading, Requirement of water supply. Total requirement of water for different hazards pressure tanks water supply, designing of Fire Hydrant Sustem for different occupancies; designing of HVWSS/MVWSS/Sprinklers System: Types of Sprinklers system and its specification New Standard for the installation of Sprinklers and Hazard classification. Multiple et-Drenchers, Rules for spacing Sprinklers and drencher's heads.

## Section C
Mechanical Foam installation: Determination of foam compound for fire-fighting in oil tanks, Methods of application. Top application Base injection, Sub-surface Injection. Foam inlets and Risk for which foam is used. Premix foams, Installation characteristics of foam. Different types of foam, Low expansion, Medium expansion and High expansion foam, their special application, advantage and disadvantage of various types and the storage of foam concentrates.

## Section D
Installations Involving Carbon-di-oxide and Dry powder: Their special features, characteristics, designing, arrangements, operation, extinguishing act5ion, risk an specification

Fire Alarm & Detection System: Designing, Calculations, Testing and Maintenance, Working principle of smoke detectors, heat detectors, Flame detectors & optical beam type detectors.

**REFERENCES:**
1. Standard Installation of sprinklers system by NFPA.
2. A study of Performance of Automatic sprinklers system by NFPA.
3. National Fire Code of sprinklers by NFPA.
4. Care and Maintenance of sprinklers system by NFPA.
5. Fire and Fire by UNISEF Publication.
6. Relevant Indian Standard and Code of Practices.

# FT 411 F FIRE FIGHTING INSTALLATION ANDAUTOMATION LAB

| L | T | P | | Sessional marks | : | 50 |
|---|---|---|---|---|---|---|
| - | - | 2 | | Practical marks | : | 50 |
| | | | | Total marks | : | 100 |
| | | | | Duration of exam | : | 3 hrs |

**List of Experiments**

1. To study the General Requirements of Different type of Occupancy as per NFPA 101-Life Safety Code.
2. To study the fixed DCP Installation as per NFPA Code 17.
3. To study the Fire Fighting Properties of Foam Concentrate
   a. Fuel Tolerance
   b. burn back resistance
   c. Induction Ratio
   d. Fluidity
   e. Film Formation
4. To study the $CO_2$ Total flooding System as per IS Specification

# FT 413 F SQUAD DRILL

| L | T | P | | Sessional marks | : | 50 |
|---|---|---|---|---|---|---|
| - | - | 2 | | Practical marks | : | 50 |
| | | | | Total marks | : | 100 |
| | | | | Duration of exam : | | 3 hrs |

DRILL WILL CONDUCTED BY FINAL YEAR STUDENT TO PLAY A ROLE OF INSTRUCTOR

1. Squad Drill: Aim of squad drill- Principles of good instruction- sequence of teaching- words of command technique of instruction.
2. Attention- stand- easy- stand at ease-Turning and including-Forming up in three ranks – Numbering – Proving – Open and close order March Dismiss ion and Falling out- sixing getting on Parade- length of Pace and time of marching. Halting- side- space paces forwarded and to the Rear –Wheeling-changing step in quick and slow time- turning on marching-saluting at the halts and on the marching.
3. Marching Marking time and halting in Double time-braking into slow, quick and Double time marching in line in slow time.
4. Report salute and salute with Message-Changing Direction- Forming of squad at halt march-wheeling in file-marching off in single file-reforming three on March and at the halt.

# FT 417 F PROCESS INSTRUMENTATION AND CONTROL ENGINEERING

L  T  P                                                         Sessional marks: 50
3  1  -                                                         Theory marks: 100
                                                                Total marks: 150
                                                                Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
Elements of measurement - Fundamental standards, Quality of measurement, Meaning of measurement, Errors in measuring instruments, Precision and accuracy, Calibration principle, Static and dynamic characteristics of measuring instruments. Measurement of temperature-Bimetallic and pressure thermometers, Thermocouples, Resistance thermometers, Pyrometry, Calibration. Pressure and vacuum measurement -Manometers, Measuring element, Absolute pressure measurement, Static accuracy of pressure gauges.

## Section B
Flow measurement-Orifice installation, Pitot tube, Area flow meters, Open channel meters. Level measurement - Direct method, Measurement of level in open and pressure vessels. Measurement of pH and humidity. Recording Instruments, Indicating and signaling instruments, Signal transmission, and codes.

## Section C
Open loop and close loop systems - Transfer function modeling- block diagram representation of mechanical, thermal and liquid level systems. Transient response analysis - Time response of first and second order system for impulse and step inputs-Effect of damping factors on transient response - Characteristics of proportional, integral, derivative, PI, PD and PID controllers. Frequency response method of analysis - polar plot-Bode Plot.

## Section D
Introduction to stability - Definition via impulse response function - Routh-Hurwitz stability criterion - Nyquist stability criterion. Control system components - error detectors - modulators and demodulators - Hydraulic controllers - Pneumatic controllers - PLC. Introduction to computer control in chemical process industry. Comparison between discrete data, digital and analogue control systems. Introduction to digital signal processing.

**Text Books**
1. D Patranabis, Principles of Industrial Instrumentation, Second Edition, Tata Mc-Graw-Hill Publishing Company Ltd, New Delhi, 1996.
2. George Stephanopolous, Chemical Process Control: An Introduction to Theory and Practice, Prentice Hall of India Pvt. Ltd, 1990.

**References**
1. Eckman D P, Industrial Instrumentation, Wiley Eastern Ltd, New Delhi, 1990
2. Ogata, K., Modern Control Engineering, Prentice Hall, 1995
3. Benjamin C. Kuo., Digital Control Systems, Oxford University Press, 1992
4. Stefani R.T, Shahian B, Savant J.C and Hostetter G. H, Design of Feedback Control Systems, Oxford University Press, 2002.

# FT 419 F    AUTOMOBILE ENGINEERING & SAFETY

L T P             Sessional marks: 50
3 1 -             Theory marks: 100
               Total marks: 150
               Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A

Types of automobiles.  Limiting Dimensions as per Central Motor Vehicles Rules. Engines - Classification, Construction, Materials of engine components.  Prototype Testing as per Central Motor Vehicles Rules. Fuel  System - Fuel tank, Fuel filter, Types of Fuel system.  Carburetor - Simple and Modern, Fuel injection System.  Emission Standards as per CMV Rules.

## Section B

Electrical System - Storage Battery Operations and Maintenance. Ignition System- Coil and Magneto Ignition System.   Starting System, Lighting System, Horn System - Wind Shield Wiper Motors, Fans, Heaters, Traficators. Automobile air conditioning.   Central Motor Vehicles Rules regarding Lighting, Windshields, Wipers.

## Section C

Transmission System-Clutches-operation and fault finding of clutches, Fluid Flywheel, Gear Box-types, Steering Systems, Chassis Springs, Suspension. Differential, Dead and Live axles, Rims, Tyre etc. Brakes - Types, construction and fault finding.  CMV Rules - Brakes, Steering & Tyre.

## Section D

Lubrication Systems - Types, Components, Lubricating oil, Cooling system - Details of components, Study of Systems, Types.  Miscellaneous - Special gadgets and accessories for fire fighting vehicles. Automobile accidents. CMV Rules regarding Safety devices for drivers, passengers.

**REFERENCES:**

1) William H.Crouse,Automobile Chassis and Body Construction, Operation and Maintenance.
2) William H. Crouse, Automobile Machines -Principles& Operations.
3) GBS Narang, Automobile Engineering
4)  Kirpal Singh, Automobile Engineering
5)  Joseph Heitner, Automotive Mechanics-Principles & Practices
6)  P. L. Kohli, Automotive Electrical Equipments.
7)  The Central Motor Vehicles Rules, 1989

**FT 421 F ADVANCED   SAFETY ENGINEERING AND MANAGEMENT**

L  T  P
3  1  -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section A
Domino incident investigation - technique, logic diagram, input requirements, output, example. Unavailability analysis of protective systems- technique, logic diagram, input requirements, example. Reliability analysis of automatic control systems -   PES safety system development logic diagram , system analysis,  calculation of fractional dead time, application, strengths and weaknesses. Introduction to MORT analysis,   IFAL analysis, Markov processes and application of Markov modeling to safety instrumented systems, Sneak analysis.

### Section B
Environmental risk assessment-Human health risk assessment (HHRA), Ecological risk assessment (EcRA),   Receptor, stressor and exposure. Steps in EcRA - identification of potential sites, identification and characterization of stressors, identifying receptors, identification of potential ecological effects, selection of assessment and measurement end points, developing a conceptual model and risk hypotheses,  approach for risk assessment.

### Section C
Security for chemical process industries- Assessments and regulatory environment, methods for assessing security vulnerability, emerging security regulations,   government development and industry activities that relate to security for process facilities.   Strategies and counter measures - prevention of  intentional  releases  and  theft  of  chemical  releases  at  process  facilities. Site security for process industries - Essential elements - threat analysis, security counter measures, mitigation and emergency response.   Specific security measures - information security,   cyber security, physical security, policies and procedures, training, mitigation and response, inherently safer processes.  Case study

### Section D
Safety Management Systems: SHEMS, OHSAS 18001 and OSHA's PSM - Policy, planning, training, implementation, management control and review. Layer of Protection Analysis  (LOPA)-   Overview of relevant standards and guidelines, risk tolerance criteria. Preparation of LOPA-LOPA methodology,   the  LOPA  team.  Scenario  development -components,  inherently  safe considerations. Initiating causes/ effects- dentification, estimation of frequencies. Independent protection layers- IPL criteria, allocation of IPL credit- basic process control systems, operator response, pressure relief device, safety instrumented system, safety instrumented function. Safety integrity level (SIL) assignment, Interpreting LOPA results and making recommendations.

**Text Books and References**
1. Centre for Chemical Process Safety, AIChE :   Guidelines for Chemical Process Quantitative Risk Analysis, second edition, 2000.
2.   ACC: Site Security Guidelines for the U.S Chemical Industry, American Chemistry Council, Washington DC, 2001.
3 Jo Treweek Ecological impact assessments, Blackwell Science, 1999.

# FT 423 F ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT

L T P
3 1 -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
Air Pollution Management, Air Pollution Measurement, Air quality monitoring, Air Pollution modeling, Air Pollution control Technology & method, Equipment Selection, Equipment design, Particulate emission control, Sources corrective methods, Air quality Management concept.

## Section B
Water pollution Management concepts of water pollution, characteristics of waste water, standards of pollution parameters methodology of waste water treatment, Water Treatment process, Sedimentation, Coagulation and flocculation, Filtration, Advanced water Treatment processes, industrial water pollution Management.

## Section C
Solid and hazardous waste Management & risk analysis; sources, Classification and composition of MSW (Municipal Solid Waste), Waste Minimization of MSW, Thermal treatment (Combustion) of MSW, Hazardous Waste Transport & Treatment facilities, Treatment system for hazardous waste & handling of treatment plant residues.

## Section D
Environmental Management in industries, Principals and requirements of ISO 14001 EMS, Environmental auditing & Auditing of waste minimization. Environment Impact Assessment, Environmental Management Plan. EIA, EMP and Environmental Auditing Environmental Impacts, Evaluation of Impact.

## Text Books and References
1. Environmental Management Handbook by Marcel Dekker.
2. Environmental Management Handbook for Hydrocarbon Processing Indus; James B. Well
3. Environmental Safety and Health Engineering by Gayle wood side and Dianna Koeurek
4. Waste Management by Rajiv K. Sinha
5. Hazardous Waste Management by J.M. Goel
6. Perspectives in Nuclear Toxic and Hazardous Waste by Kadambari Sharma.
7. Water Pollution, Cases Effects and Control by P.K. Goel
8. A to Z of Environmental Audit, A. Mehrotra
9. Elements of Biotechnology- P.K. Gupta.
10. A text book on Biotechnology by  H. D. Kumar

# FT 425 F HUMAN FACTORS ENGINEERING

L  T  P                                                          Sessional marks: 50
3  1  -                                                          Theory marks: 100
                                                                 Total marks: 150
                                                                 Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### Section A
Human factors - objectives and approach. Systems thinking - human -machine systems, characteristics of systems, system reliability. Human beings as information processors- information theory, displaying information, coding of information, characteristics of good coding system, compatibility, types of compatibility, perception, memory, decision making, attention, age and information processing, mental workload and its measurement.

### Section B
Process of seeing, visual capabilities, accommodation, visual acuity, contrast sensitivity, factors affecting visual acuity and contrast sensitivity, adaptation, colour discrimination, perception. Design of hard copy and VDT screens. Graphic representations - symbols, objectives and criteria for selection, perceptual principles of symbolic design. Codes - dimension, colour. Design of dynamic information displays, uses of dynamic information, design, of quantitative visual ,displays, design of qualitative visual displays, design of signal and warning lights, recommendations regarding signal and warning lights, representational displays, head-up displays.

### Section C
Physical work - muscle physiology, work physiology, measures of physiological strain, physical work load, work efficiency, energy consumption, grades of work, factors affecting energy consumption, controlling energy expenditure, strength and endurance, measurement of strength, factors affecting strength. Manual materials handling - lifting tasks, carrying tasks, pushing tasks, limits of MMH tasks, reducing risks of MMH overexertion. Motor skills, biomechanics of human motion, types of body movements, range of movements, classes of motor movements, Speed of movements- reaction time, movement time, accuracy of movements. Human control of systems- compatibility, spatial compatibility, movement compatibility. Supervisory control. Controls devices- functions of control, factors in control design. Principles of hand tool and device design.

### Section D
Workplace design- anthropometry, static dimensions, dynamic dimensions, principles in the application of anthropometric data. Work spaces- work-space envelopes for sitting and standing personnel, out-of-reach and clearance requirements. Design of work surfaces. Science of seating-general principles of seat design. VDT workstations. Arrangement of components within a physical space      - principles of arranging components, methodologies for arranging components, types and uses of various data, link diagrams, general location of various controls and displays within work space, specific arrangements of controls and displays within work space, spacing of control devices. General guidelines in designing individual workplaces.

### TEXT AND REFERENCE BOOK
1. Sanders, M.M. and McCormick, E.J,      Human Factors in Engineering & Design 7th ed. McGraw-Hill International Edition, 1993
2. Martin Helander, A Guide to Ergonomics of Manufacturing, TMH, 1996

# FT 427 F SIMULATION AND PROCESS MODELING

L  T  P  
3  1  -

Sessional marks: 50  
Theory marks: 100  
Total marks: 150  
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A

Introduction to modeling and simulation: Modeling and simulation methodology system modeling, concept of simulation; gaming; static, continuous and discrete event simulation.

## Section B

Basic concept of probability, generation and characteristics of random variable, continuous and discrete variable and their distributions; mapping uniform random variables to other variable distributions; linear, nonlinear and stochastic models.

## Section C

Introduction to Queuing Theory: characteristics of queuing system, Poisson's formula, birth-death system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models N/M/c Application of queuing theory in manufacturing and computer system.

## Section D

System Dynamics modeling: Identification of problem situation, preparation of casual loop diagrams and flow diagrams, equation writing, level a rate relationship, Simulation of system dynamics models.

Verification and validation: Design of simulation experiments, validation of experimental models, testing and analysis. Simulation languages comparison and selection, study of simulation software – Arena, Pro-model, SIMULA, DYNAMO, STELLA, POWERSIM.

## TEXT AND REFERENCE BOOK

1. Law AM and Kelton WD; Simulation Modeling and Analysis; TMH
2. Gordon G., System simulation, PHI Learning.
3. Banks J; hand book of Simulation; John Wiley.
4. Taha H, Operations Research; PHI.
5. Hillier FS, Liberman GJ; Introduction to OR; OMH.
6. Deo N; System Simulation with Digitial Computer; PHI Learning.
7. Harrell C, Ghosh B, Bowden R; Simulation Using Promodel; MG Hill.
8. Seila, Ceric and Tadikmalla; Applied Simulation Modeling, Cengage.
9. Payer T., Introduction to system simulation, McGraw Hill.
10. Sushil, System Dynamics, Wiley Eastern Ltd.
11. Spriet JA; Computer Aided Modeling and Simulation, Academic Press INC; USA

# FT 429 F TOTAL QUALITY MANAGEMENT

L  T  P
3  1  -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership - Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

## Section B

TQM Principles - Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement- Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle,35S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy,Performance Measure.

## Section C

Statistical quality control - The seven tools of quality, Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

## Section D

TQM tools-Benchmarking-Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs. Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing

## TEXT BOOK
1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education, Inc.     2003. (Indian reprint 2004). ISBN 81-297-0260-6.

## REFERENCES BOOKS
1. James R.Evans & William M.Lidsay, "The Management and Control of Quality", (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Narayana V. and Sreenivasan, N.S. "Quality Management - Concepts and Tasks", New Age International 1996.
3. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers, 1991.

# FT 431 F SAFETY IN HEALTH CARE WASTE MANAGEMENT

L  T  P                                                    Sessional marks: 50
3  1  -                                                    Theory marks: 100
                                                           Total marks: 150
                                                           Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
Definition & characterization of health-care waste - sources and generation of waste, Physico chemical characteristics. Hazards of health-care waste, public health impacts of health care waste. Health- care waste management planning    - waste  management plan for health care establishments, management of health-car waste from scattered small sources, waste minimization, recycling and reuse.

## Section B
Handling, storage and transportation of health-care waste-waste segregation and packaging, onsite collection, transport and storageof waste, offsite transportation of waste. Treatment and disposal of health care waste - Incineration   chemical disinfection; wet and dry thermal treatment, Microwave irradiation, land disposal, Inertization.

## Section C
Treatment and disposal methods - Infectious waste and sharps, pharmaceutical waste, cytotoxic waste, chemical waste, wastes with high heavy - metal content, pressurized containers - radioactive waste. Collection and disposal of waste water - hazards of  waste  water from  health care establishments - waste water management. Workers' protection, cytotoxic safety, Emergency response.

## Section D
Epidemiology  of  noso comical infections and prevention. Training for health care personnel and waste management operators. Minimal programmes for health care waste management - waste segregation, safe recycling, treatment & disposal, management of hazards health - care waste by waste categories.

## TEXT AND REFERENCE BOOK
1.  A Pruss,E.Giroult P.Rushbrook (Ed.):   Safe Management of Waste from health care activities. World Health Organization, Geneva

# FT 433 F SAFETY IN CONSTRUCTION

L T P
3 1 -

Sessional marks: 50
Theory marks: 100
Total marks: 150
Duration of exam: 3 hrs

**NOTE:** Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

## Section A
Introduction to Construction Industry- Safety issues in construction- Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry. Framing Contract conditions on safety, and related matters. Relevance of ergonomics in construction safety.

## Section B
Safety in various construction operations- Excavation- under- water works- under-pinning & shoring Ladders and Scaffolds- Tunneling- Blasting- Demolition- Pneumatic caissons- confined SpaceTemporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety.

## Section C
Safety in material handling and equipments- Safety in storage & stacking of construction materials. Safety in the use of construction equipments- Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Mixers, Conveyors, Pneumatic and hydraulic tools in construction. Temporary power supply

## Section D
Contract Labour(R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Building & Other Construction Workers (RE & CS) Act, 1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Welfare provisions, Penalties.

## TEXT AND REFERENCE BOOK
1. K.N. Vaid, Construction Safety Management.
2. V.J. Davies and K. Tomasin, Construction Safety Handbook.
3. James B. Fullman, Construction Safety, Security & Loss Prevention
4. Linger L, Modern Methods of Material Handling
5. R.T. Ratay, Handbook of Temporary Structures in Construction.
6. National Building Code of India
7. Relevant Indian Standards published by BIS
8. Contract Labour Act and Central Rules
9. Building and Other Construction Workers (RE &CS) Act, 1996 and Central Rules.

# MAHRASHSI DAYANAND UNIVERSITY, ROHTAK
## SCHEME OF STUDIES & EXAMINATIONS
### B.Tech 4th YEAR FIRE TECHNOLOGY & SAFETY,
### 8th SEMESTER

**Proposed 'F' Scheme w.e.f 2012-13**

| Sl. No. | Course No. | Subject | Internal Marks | External Marks | Total Marks |
|---------|-----------|---------|----------------|----------------|-------------|
| 1. | **FT- 402-F** | Industrial Training/Institutional Project Work | 150 | 150 | 300 |

**Note:**

The students are required to undergo Industrial Training or Institutional Project Work of duration not less than 4 months in a reputed organization or concerned institute. The students who wish to undergo industrial training, the industry chosen for undergoing the training should be at least a private limited company. The students shall submit and present the mid-term progress report at the Institute. The presentation will be attended by a committee. Alternately, the teacher may visit the Industry to get the feedback of the students.

The final viva-voce of the Industrial Training or Institutional Project Work will be conducted by an external examiner and one internal examiner appointed by the Institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the Board of Studies in Engineering and Technology. Assessment of Industrial Training or Institutional Project Work will be based on seminar, viva-voce, report and certificate of Industrial Training or Institutional Project Work obtained by the student from the industry or Institute.

**The internal marks distributions for the students who have undergone Industrial Training consist of 50 marks from the industry concern and 100 marks by the committee members consisting of faculty members of concerned department of the parent institute.**

The teachers engaged for Institutional Project work shall have a workload of 2 hours per group (at least 4 students) per week.