

COURSE OBJECTIVE- The objective of this course is to fulfill the needs of Engineers to understand the Applications of Fourier Series, Different Transforms, Complex Analysis & numerical methods in order to enable young technocrats to acquire Mathematical thinking of Formulating, Analyzing and Solving a wide range of Practical Problems Appearing in Science & Engineering.

Course Contents

Fourier Series: Fourier Series for Continuous & Discontinuous Functions, Expansion of odd and even periodic functions, Half-range Fourier series, Complex form of Fourier Series,

Integral Transforms:

Fourier Transform-Complex Fourier Transform, Fourier Sine and Cosine Transforms, Applications of Fourier Transform in Solving the Ordinary Differential Equation. **Laplace Transform-** Introduction of Laplace Transform, Laplace Transform of elementary Functions, Properties of Laplace Transform, Change of Scale Property, First and Second Shifting Properties, Laplace Transform of Derivatives and Integrals. Inverse Laplace Transform & its Properties, Convolution theorem, Applications of Laplace Transform in solving the Ordinary Differential Equations.

Functions of Complex Variables: Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integrals.

Numerical Solution of Ordinary Differential equations: Picard's Method, Taylor's Series, Euler's Method, Modified Euler's Method, Runge-Kutta methods, Milne's and Adam's Bashforth Methods.

COURSE OUTCOMES- The curriculum of the Department is designed to satisfy the diverse needs of students. Coursework is designed to provide students the opportunity to learn key concepts of Fourier Series, Different Transforms, Complex Analysis & Numerical Methods for Solving Ordinary Differential Equations of First Order.

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

References:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley India.
2. H C Taneja: Advanced Engineering Mathematics, I.K. International Publishing House Pvt. Ltd.
3. B.S. Grewal: Higher Engineering Mathematics , Khanna Publication.
4. S S Sastri: Engineering Mathematics, PHI
5. Ramana: Advance Engg. Mathematics, TMH New Delhi
6. Engineering Mathematics By Samnta Pal and Bhutia, Oxford Publication

COURSE OBJECTIVE:

1. To develop the ability to perceive and measure spatial relationships
2. To draw geometric and organic shapes in space.
3. To understand the contrast in tone and texture.
4. To understand how light describes form and space.
5. To become familiar with the visual elements of drawing (line, shape, value, texture, scale, space, etc.)
6. To understand the importance of composition, organization, placement and positive and negative space.
7. To understand the importance of Fire safe Building Concept

COURSE CONTENT:

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.

Building Planning: Provisions of National Building Code, Building bye-laws, open area, set backs, FAR terminology, principle of architectural composition (i.e. 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.

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.

Perspective Drawing: Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings.

COURSE OUTCOME

1. Graduate will be having basic knowledge various components of building construction that relate to the fire service & safety Engineering
2. Graduate will be able specifically focus on elements of construction and the design of structures that are shown to be key factors when inspecting buildings, pre-planning fire operations and emergency operations at fires.
3. Graduate will be able to calculate fire and smoke growth for masonry, steel, and concrete construction, and fire resistance wood construction.
4. Graduate will be able to manage required relationship between building types and Urban Search & Rescue Team capacity and Urban Interface building requirements

LABORATORY

1. Sketches of various building components.
2. One drawing sheet of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.
3. One drawing sheet each for services and interiors of buildings.
4. One drawing sheet containing detailed planning of one/two bed room residential building (common to all student)
5. One drawing sheet each of residential and institutional building (Each student perform different drawing).
6. Use of AutoCAD for preparation of drawings.

EVALUATION

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

REFERENCES

Malik & Meo; Building Design and Drawing By
Shah, Kale & Patki; Building Design and Drawing; TMH
Gurucharan Singh & Jgdish Singh Building Planning, Design and Scheduling

Fire Technology & Safety Engineering, III-Semester

FT-3003 STRENGTH OF MATERIALS

COURSE OBJECTIVE:

To familiarize the students with the fundamentals of deformation, stresses, strains in structural elements.

COURSE CONTENT:

Stress and strain: stresses in members of a structure, axial loading, normal stress, shear stress, analysis of simple structures, stepped rods, members in series and parallel: stress strain diagram, Hooke's law, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, fiber reinforced composite materials, strain energy under axial loads and stresses due to impact of falling weights. Transformation of stress and strain, principal stresses, normal and shear stress, Mohr's circle and its application to two and three dimensional analysis .

Bending: pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, shear force and BM diagram, relationship among load, shear and BM, shear stresses in beams, strain energy in bending, deflection of beams, equation of elastic curve, Macaulay's method and Area moment method for deflection of beams.

Torsion in shafts: Tensional stresses in a shafts, deformation in circular shaft, angle of twist, stepped and hollow transmission shafts .

Theories of failures: maximum normal stress & shear stress theory; maximum normal and shear strain energy theory; maximum distortion energy theory; application of theories to different materials and loading conditions .

Columns & struts: stability of structures, Euler's formula for columns with different end conditions, Rankine's formula.

OUTCOMES :

At the completion of this course, students should be able to

1. Know the concepts of stress and strain.
2. Analyze the beam of different cross sections for shear force, bending moment, slope and deflection.
3. Understand the concepts necessary to design the structural elements and pressure vessels.

EVALUATION

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

REFERENCES:

Beer FP, Johnson Mechanics of Materials ,Sixth Edition ;Mc Graw Hills
Debabrata Nag & Abhijet Chanda :Strength of Materials : Wiley
Rattan; Strength of materials;Second Edition , Mc Graw Hills
Nash William; Schaum's Outline Series; forth Edition Strength of Materials;Mc Graw Hills
Singh Arbind K; Mechanics of Solids; PHI
Sadhu Singh; Strength of Materials; Khanna Pub.
R Subramannian , Strength of materials OXFORD University Press ,Third Edition .
S Ramamurthum , Strength of materials , Dhanpat Rai

LABORATORY:

1. Standard tensile test on MS and CI test specimen with the help of UTM
2. Direct/ cross Shear test on MS and CI specimen
3. Transverse bending test on wooden beams to obtain modulus of rupture
4. Fatigue test
5. Brinell Hardness tests
6. Vicker hardness test
7. Izod/Charpy test
- 8 Rockwell Hardness test

Fire Technology & Safety Engineering, III-Semester

FT-3004 HEAVY VEHICLES & AUTOMOBILE ENGINEERING & SAFETY

COURSE OBJECTIVE:

1. To understand the basic concept of Engine classification and types gear box
2. To understand the basic concept of differential systems
3. To understand the basic concept of Electrical system of Heavy vehicle.
4. To understand the Lubrication system of heavy vehicle and safety arrangements in automobiles.
5. To study the Indian Motor Vehicle Act and Safety Systems in Automobiles.

COURSE CONTENT:

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 carburettors, construction details, Type of Study of diesel fuel feed systems. Carburation 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, Transfer of gear box, operation and maintenance of gear box.

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, Hotchkiss drive, Torque tube drive. 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 Lubrication systems. Types, classification of systems. Lubricants. Cooling System – Air cooling, components, and working of cooling systems.

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.

Lubricating System: Types, Components, Lubricating oil, Cooling System, Detail of Components, Study of Systems, Types, Miscellaneous, Spacial 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.

Motor Vehicles Act and Safety Systems

Motor Vehicle Act, Driving License, Traffic signs & Light Signals, Driving techniques for Special Situations, Driving in emergency situations, Safety provisions, Active and Passive Safety Measures, Features for minimum injury during crash, State of the art Safety systems,

COURSE OUTCOME

1. Graduate will able to find the basic Faults in the different types of Engines and their operations with Construction of differential system, axles, brakes, gear box, steering system and lubrication system.
2. Graduate will able to identify the electrical faults in vehicle and also will understand the operation and construction of the electrical systems in fire fighting vehicles with applying its pollution control techniques.
3. Graduate will able to apply CMV rules regarding safety devices for drivers, passengers fire fighting vehicles and special type of appliances.
4. Graduate will able to have basic knowledge of operation of fire boats and rules and regulation of RTO. With its testing.

LABORATORY

1. To study Electrical System of a Heavy Vehicle.
2. To Study the Lubrication system of an Automobile
3. To Study the cooling system of an Automobile
4. To study the Suspension System of an Automobile.
5. To study the braking system of an Automobile.
6. To Study the Transmission system of an Automobile
7. To Study the Differential and Drive Axles of an Automobile
8. To study the fuel feed system of a Petrol Engine.

EVALUATION

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

REFERENCES

- Wills H. Crouse, Automobile chassis and body construction, Operation and Maintenance, Tata McGraw Hill 1976
- Dr. D.S. Kumar, Automobile Engineering, S.K. Kataria & Sons 2015
- Arther V. Judge, Modern Petrol Engine 1975
- A.T. Walford, Ergonomies of Automation 1989
- S.Adhey, Bormh Practical Automobile Engineering Illustrated, Asia Publishing House, 1983
- G.B.S. Narrang, Automobile Engineering, Khanna Publisher
- R.B. Gupta, Automobile Engineering, Satya Prakashan 2015
- R.P. Sharma, A Course in Automobile”Engineering, Dhanpat Rai & Sons

Fire Technology & Safety Engineering, III-Semester

FT-3005 TOWN PLANNING & SAFETY IN CONSTRUCTION

COURSE OBJECTIVE:

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

COURSE CONTENT:

TOWN PLANNING

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

BASIC PHILOSOPHY

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

SAFETY IN CONSTRUCTION OPERATIONS

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

SAFETY IN DEMOLITION OPERATIONS

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

WORKING AT HEIGHT

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

COURSE OUTCOME

1. Graduate will be able to demonstrate various components of Town Planning Including planning surveys, topography, water supply & types of roads
2. Graduate will be able to apply the basics of architectural aesthetics and layout of housing with site orientation.
3. Graduate will be able to develop the basic philosophy of Safety in construction operation Including above Ground and Underwater operations
4. Graduate will be able to develop safety culture towards Occupational hazard & diseases related to construction industries
5. Graduate will be able to explain n maintain the importance of Construction worker acts and rule between workers n employers.

EVALUATION

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

REFERENCES

Accident prevention manual for Industrial operations, NSC, Chicago, 1982.
Fulman, J.B., Construction Safety, Security & Loss Prevention, John Wiley and Sons, 1979.
The Building and other construction workers (Regulation of Employment & conditions of service)Act 1996 and central rules 1998.
P.S. Rangwala, Town Planning, Charotar Publishing Housing Pvt. Ltd., 2008

Fire Technology & Safety Engineering, III-Semester

FT-3006 Field Training in Rescue Operations

COURSE OBJECTIVE:

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

COURSE CONTENT:

INTRODUCTION:

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

POSITION:

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

MARCHING:

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

CHANGING, BREAKING AND TURNING:

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

FORMING:

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

COURSE OUTCOME

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

LABORATORY

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

EVALUATION

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

REFERENCES

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

Fire Fighters Skill drill manual by NFPA.

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