UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Environmental Engineering
Course Code: CE701
L-T Scheme: 3-0 **Course Credits: 3**

Introduction: The subject discusses the concept of Environmental Engineering which involves Variations in demand; Factors affecting demand; Design period; Population forecasting Sources of Water Surface water sources; ground water sources Water Quality Impurities in water; Water quality parameters; Standards for potable water Conveyance of water Hydraulic design of pressure pipes.

Objectives:
The students will have a clear understanding of the water treatment and hydraulic design of sewers which involves Aeration, Plain sedimentation, Sedimentation with coagulation, Water Softening, Filtration, Disinfection. Water Distribution Analysis of distribution network; Storage and distribution reservoirs; Capacity of reservoirs Sewage and Drainage Definition of Common Terms, Quantity estimation for sanitary sewage and storm sewage. Partial flow diagrams and Nomograms Wastewater Characteristics Physical, chemical and biological characteristics, DO, BOD and COD Wastewater Treatment Typical flow chart for wastewater treatment; Primary Treatments; Secondary Treatments: Activated Sludge Process, Trickling Filter Process, Septic Tank.

Learning Outcomes:
Knowledge:
The students will develop a clear understanding of the following topics:
Variations in demand; Factors affecting demand; Design period; Population forecasting Sources of Water Surface water sources; ground water sources Water Quality Impurities in water; Water quality parameters; Standards for potable water Conveyance of water Hydraulic design of pressure pipes. Aeration, Plain sedimentation, Sedimentation with coagulation, Water Softening, Filtration, Disinfection. Water Distribution Analysis of distribution network; Storage and distribution reservoirs; Capacity of reservoirs Sewage and Drainage Definition of Common Terms, Quantity estimation for sanitary sewage and storm sewage. Partial flow diagrams and Nomograms Wastewater Characteristics Physical, chemical and biological characteristics, DO, BOD and COD Wastewater Treatment Typical flow chart for wastewater treatment; Primary Treatments; Secondary Treatments: Activated Sludge Process, Trickling Filter Process, Septic Tank

Course Contents:
Unit 1: **Water Demand; Per capita demand**; Variations in demand; Factors affecting demand; Design period; Population forecasting Sources of Water Surface water sources; ground water sources Water Quality Impurities in water; Water quality parameters; Standards for potable water Conveyance of water Hydraulic design of pressurepipes.

Unit 2: Water Treatment Typical flow chart for surface and ground water treatments; Aeration, Plain sedimentation, Sedimentation with coagulation, Water Softening, Filtration, Disinfection. Water Distribution Analysis of distribution network; Storage and distribution reservoirs; Capacity of reservoirs Sewage andDrainageDefinition of Common Terms, Quantity estimation forsanitary sewage and storm sewage.

Unit 3: Sewer Design Hydraulic design of sewers, Partial flow diagrams andNomograms Wastewater Characteristics Physical, chemical and biological characteristics, DO, BOD and COD Wastewater Treatment Typical flow chart for wastewater treatment; Primary Treatments; Secondary Treatments: Activated Sludge Process, Trickling Filter Process, Septic Tank

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Text Books

1. Environmental Engineering, S.K .Garg, Khanna Publishers.
2. Water Supply, Waste Disposal and Environmental Pollution Engineering, A.K.Chatterjee Khanna Publishers.
3. Environmental Engineering, Vol. II , P. N. Modi.
4. Environmental Modelling, Rajagopalan Oxford University Press.
5. Environmental Engineering P. V. Rowe TMH.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Water Resource Engineering
Course Code: CE 702
L-T Scheme: 3-0 **Course Credits: 3**

Introduction: This subject explores the concept of water resources engineering which broadly involves the following concepts:Causes, effects and prevention of waterlogging. Typeof drains-open drains and closed drains (introduction only), Discharge and spacing of closed drains. Examples. Lining of Irrigation Canals: Objectives, advantages and disadvantages of canal lining, economics and requirements of canal lining, Design of lined CanalsexamplesIntroduction to ground water flow, Darcy law; Wells: Definition, Types-open wellor Dug well, Tube well, open well-shallow open well, deep open well, cavity formation in open wells, construction of open wells, Yield of an open well –Equilibrium pumping test, Recuperating test, examples, Tube wells – Strainer type, cavity type, slotted type. Examples.

Objectives:
The student will have a clear understanding of the various concepts of water resources engineering. The student will understand the stream flow measurement which involves the following concepts:Direct and indirect methods, Examples. Stage discharge relationships Hydrographs; characteristics: Base flow separation. Unit Hydrographs. Derivation of unit hydrographs, S-curve, flood routing. Types of Irrigation systems, methods of irrigation: Water requirements of crops: Crop period or Base period, Duty & Delta of a crop, relation between Duty &Delta, Duty at various places, flow Duty & quantity Duty, factors affecting Duty, measures for improving Duty of water, crop seasons. The student will also develop understanding of canal irrigation which involves Introduction, classification of irrigation canals, efficient section, certain important definitions, Time factor, Capacity factor, full supply coefficient, Nominal duty, Channel losses, Examples. Design of unlined alluvial channels by silt Theories: Introduction, Kennedy's theory, procedure for design of channel by Kennedy's method, Lacey's theory, concept of True regime Initial regime and final regime, design procedure using Lacey's theory, examples.

Learning Outcomes:
Knowledge:
The students will develop a clear understanding of the following concepts:
Measurement of rainfall – Rain gauges, Estimation of missing rainfall data, checking of consistency, Optimum number of Rain gauges. Calculation of average rainfall over area – different methods, Frequency analysis of rainfall intensity duration curve. Rainfall mass curve, hyetograph, Examples Evaporation, evapo-transpiration and infiltration: Processes, Factors affecting run off, estimation of run-off, rainfall run off relationship. Direct and indirect methods, Examples. Stage discharge relationships, Hydrographs; characteristics: Base flow separation. Unit Hydrographs. Derivation of unit hydrographs, S-curve, flood routing. Types of Irrigation systems, methods of irrigation: Water requirements of crops: Crop period or Base period, Duty & Delta of a crop, relation between Duty &Delta, Duty at various places, flow Duty & quantity Duty, factors affecting Duty, measures for improving Duty of water, crop seasons. Introduction, classification of irrigation canals, efficient section, certain important definitions, Time factor, Capacity factor, full supply coefficient, Nominal duty, Channel losses, Examples. Design of unlined alluvial channels by silt Theories: Introduction, Kennedy's theory, procedure for design of channel by Kennedy's method, Lacey's theory, concept of True regime Initial regime and final regime, design procedure using Lacey's theory, examples.

Course Contents:
Unit 1: Catchment area and Hydrologic cycle, Measurement of rainfall – Rain gauges, Estimation of missing rainfall data, checking of consistency, Optimum number of Rain gauges. Calculation of average rainfall over area – different methods, Frequency analysis of rainfall intensity duration curve. Rainfall mass

curve, hyetograph, Examples Evaporation, evapo-transpiration and infiltration: Processes, Factors affecting run off, estimation of run-off, rainfall run off relationship.

Unit 2: Stream flow measurement: Direct and indirect methods, Examples. Stage discharge relationships Hydrographs; characteristics: Base flow separation. Unit Hydrographs. Derivation of unit hydrographs, S-curve, flood routing. Types of Irrigation systems, methods of irrigation: Water requirements of crops: Crop period or Base period, Duty & Delta of a crop, relation between Duty &Delta, Duty at various places, flow Duty & quantity Duty, factors affecting Duty, measures for improving Duty of water, crop seasons.

Unit 3: Canal Irrigation: Introduction, classification of irrigation canals, efficient section, certain important definitions, Time factor, Capacity factor, full supply coefficient, Nominal duty, Channel losses, Examples.
Design of unlined alluvial channels by silt Theories: Introduction, Kennedy's theory, procedure for design of channel by Kennedy's method, Lacey's theory, concept of True regime Initial regime and final regime, design procedure using Lacey's theory, examples.

Unit 4: Water logging and drainage: Causes, effects and prevention of water logging. Type of drains-open drains and closed drains (introduction only), Discharge and spacing of closed drains. Examples. Lining of Irrigation Canals: Objectives, advantages and disadvantages of canal lining, economics and requirements of canal lining, Design of lined Canal examples

Unit 5: Introduction to ground water flow, Darcy law; Wells: Definition, Types-open wellor Dug well, Tube well, open well-shallow open well, deep open well, cavity formation in open wells, construction of open wells, Yield of an open well –Equilibrium pumping test, Recuperating test, examples, Tube wells – Strainer type, cavity type, slotted type. Examples.

Text Books

1. Engineering Hydrology K. Subramanya Tata McGraw-Hill.
2. A Text Book of Hydrology- P. Jaya Ram Reddy Laxmi Publications-New Delhi.
3. Hydrology & Water Resource Engineering- S.K Garg Khanna Publishers.
4. Hydrology Principles, Analysis and Design H. M. Raghunath.
5. Hydraulics of Groundwater J. Bear McGraw-Hill.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Advanced Foundation Engineering
Course Code: CE703A
L-T Scheme: 3-0 **Course Credits: 3**

Introduction: The students will be exposed to the basic concepts of foundation engineering. The subject explores in details the concept of pile foundation and deep foundation. It also discusses the concept of shallow foundation. The subject also describes the sheet pile structures and retaining walls. The subject also explores in details the concept of design of foundations for vibrations control.

Objectives: The students will have a clear understanding of the different types of foundations like shallow foundation and deep foundation. They will have a clear idea about the geo-physical exploration which involves seismic refraction survey electrical resistivity method. They will develop a clear understanding of the plate load test and beams on elastic foundation. The concept of raft foundation and bearing capacity analysis concept will be discussed in details. The students will also develop the concept of pile load test and the load carrying capacity and the settlement analysis.

Learning Outcomes:
Knowledge:
The students will have a clear understanding of the following concepts:
Planning of soil exploration programme, Field testing, Preparation of bore-log and soil investigation report Geo-physical exploration: Seismic refraction survey electrical resistivity method. Bearing Capacity from SPT and SCPT and Plate load Test data, Proportioning of footing based on settlement criteria. Beams on elastic foundation: Infinite beam, Finite beam, Modulus of sub-grade reaction and effecting parameters. Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950.Pile: Tension piles, Laterally loaded piles: Elastic continuum approach, Ultimate load Analysis, Deflection and maximum moment as per IS 2911, Pile load test Drilled Shaft: Construction procedures, Design Considerations, Load Carrying Capacity and settlement analysis Caissons: Types, Sinking and control. Gravity, cantilever and counter fort retaining walls: Stability checks and design Sheet Pile Structures: Cantilever sheet piling, Anchored sheet piling: Free and fixed earth support methods of Analysis, Braced Excavation Elements of vibration theory, Soil- springs and damping constants, dynamic soil parameters, Types of Machine foundations, General consideration in designing dynamic bases. Foundations on expansive soils: Problems and Remedies.

Course Contents:
Unit 1: **Soil Exploration and Site Investigation** Planning of soil exploration programme, Field testing, Preparation of bore-log and soil investigation report Geo-physical exploration: Seismic refraction survey electrical resistively method.

Unit 2: Shallow Foundations Bearing Capacity from SPT and SCPT and Plate load Test data, Proportioning of footing based on settlement criteria. Beams on elastic foundation: Infinite beam, Finite beam, Modulus of sub-grade reaction and effecting parameters. Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950.

Unit 3: Deep Foundations Pile: Tension piles, Laterally loaded piles: Elastic continuum approach, Ultimate load Analysis, Deflection and maximum moment as per IS 2911, Pile load test Drilled Shaft: Construction procedures, Design Considerations, Load Carrying Capacity and settlement analysis Caissons: Types, Sinking and control.

Unit 4: Retaining walls and sheet pile structures Gravity, cantilever and counter fort retaining walls: Stability checks and design Sheet Pile Structures: Cantilever sheet piling, Anchored sheet piling: Free and fixed earth support methods of Analysis, Braced Excavation.

Unit 5: Design of foundation for vibration control Elements of vibration theory, Soil- springs and damping constants, dynamic soil parameters, Types of Machine foundations, General consideration in designing dynamic bases. **Foundations on expansive soils**: Problems and Remedies.

Text Books

1. Foundation Analysis & Design J.E. Bowels McGraw Hill.
2. Principles of Foundation Engineering B.M. Das Thomson Book.
3. Foundation Design Manual N. V. NayakDhanpatRai Publication Pvt. Ltd.

References

1. Foundations for Machines: Analysis and design ShamsherPrakash, Vijay K Puri Wiley Series in Geotechnical Engineering.
2. Advance Foundation Engineering N. Som& S. C. Das.
3. Hand Book of Machine Foundation P. Sirinivashalu& C.V. VaiddyanathanTata McGraw Hill.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Soil Stabilization and Ground Improvement
Course Code: CE703B
L-T Scheme: 3-1 **Course Credits: 3**

Introduction:

:

- To understand fundamentals of soil stabilization.
- It helps students understand different compaction methods for granular and cohesive soil.
- This course covers grouting of soil, use of geotextiles.
- This course equips students with problem solving regarding reinforced earth, dewatering and other stabilization problems.

Objectives:
On completion of this course the student should be in a position to select a suitable soil stabilization method for the site.

Learning Outcomes:
Knowledge:
1. The course aims to acquaint the student with the concept of ―soils with granular skeleton and without granular skeleton.
2. We will cover common nomenclature of stabilized soil systems and stabilization methods.
3. Become aware of the Insitu densification of cohesion less and cohesive soils
4. Know the problems in the design of sand drains, stone columns, reinforced earth etc.

Application:
1. To decide a suitable stabilization system.
2. To use geotextiles in stabilization.
3. To select suitable grouting method.

Course Contents:

Unit 1: Soil Stabilization: Introduction, Stabilization of soil with granular skeleton and soil without granular skeleton, common nomenclature of stabilized soil systems and stabilization methods, specific methods of soil stabilization: Stabilization with cement, lime fly-ash
Book: *Soil Mechanics and Foundation Engineering* by Dr. K.R Arora (Chapter 15)

Unit 2: Insitu densification: Introduction, Compaction: methods and controls Densification of granular soil: Vibration at ground surface, Impact at ground surface, Vibration at depth (Vibroflotation), Impact at depth. Densification of Cohesive Soils: Preloading and dewatering, Design of Sand drains and Stone columns, Electrical and thermal methods
Book: *Soil Mechanics and Foundation Engineering*by Dr. K.R Arora (Chapter 33)

Unit 3: Geo-textiles: Over view: Geotextiles as separators, reinforcement. Geotextiles in filtration and drainage, geotextiles in erosion control.

Book:*Soil Mechanics and Foundation Engineering* by Dr. K.R Arora (Chapter 15)
Advanced Foundation Engineering by V.N.S Murthy (Chapter 16)

Unit 4: Grouting: Over view: Suspension and Solution grout, Grouting equipment and methods, Grout design and layout, Grout monitoring schemes
Book: *Soil Mechanics and Foundation Engineering*by Dr. K.R Arora (Chapter 33)

Unit 5: Soil stability: Reinforced earth fundamentals, Soil nailing, Soil and Rock Anchors, Underpinning
Book: *Soil Mechanics and Foundation Engineering* by Dr. K.R Arora (Chapter 15)
Advanced Foundation Engineering by V.N.S Murthy (Chapter 16)

Text Books
1.*Soil Mechanics and Foundation Engineering* by Dr. K.R Arora
2.*Advanced Foundation Engineering* by V.N.S Murthy

References
1. Designing with Geosynthetics R M Koerner Prentice Hall

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Advanced Highway & Transportation Engineering
Course Code: CE 703C
L-T Scheme: 3-0 **Course Credits: 3**

Introduction: The course will explore the advanced topics of highway and transportation engineering. The concept of traffic engineering and transportation planning will be discussed in details. The topics which will be covered in this subject includes: Traffic Engineering, Transportation Planning, Railway Engineering and Airport Engineering.

Objectives: The students will develop a clear concept of traffic engineering, traffic flow characteristics which involves traffic volume, speed, headway, concentration and delay and traffic surveys and studies. The students will also develop the concept of road intersection which involves basic traffic conflicts and classification of at-grade intersection. The concept of transportation planning at different levels will also be discussed in details. The concept of railway engineering and airport engineering is also discussed which involves location surveys and alignments, gauges and geometric design. In airport engineering the students will develop the concept of runway design and runway orientation together with wind rose diagram.

Learning Outcomes:
Knowledge:
The students will develop a clear understanding of the following concepts:
Road user and vehicle characteristics; Traffic flow characteristics – Traffic Volume, Speed, Headway, Concentration and Delay; Traffic surveys & studies; Traffic estimation; Statistical applications in traffic engineering analysis; Parking; Road intersections –Basic traffic conflicts, classification of at-grade intersections, channelization, rotaries, traffic signals, signs and marking; Road Safety; Traffic System Management. Transportation planning at different levels; Transport Project planning– Planning studies and investigation; Elements of Urban Transportation Planning; Transport Demand Analysis; Preparation of Project Report. Location surveys & alignment, Permanent way components, Gauges, Geometric Design, Points & crossings, Stations & Yards, Signalling, Track Maintenance. Functional areas of airports: Runways, Taxiways, , Aprons, Terminal buildings; Classification of Airports; Airport site selection; Design of Runway, Runway orientation, Wind Rose diagram; Design of Taxiway and Terminal Building.

Course Contents:
Unit 1:**Traffic Engineering** : Road user and vehicle characteristics; Traffic flow characteristics – Traffic Volume, Speed, Headway, Concentration and Delay; Traffic surveys & studies; Traffic estimation; Statistical applications in traffic engineering analysis; Parking; Road intersections –Basic traffic conflicts, classification of at-grade intersections, channelization, rotaries, traffic signals, signs and marking; Road Safety; Traffic System Management.

Unit 2: Transportation planning: Transportation planning at different levels; Transport Project planning– Planning studies and investigation; Elements of Urban Transportation Planning; Transport Demand Analysis; Preparation of Project Report.

Unit 3: Railway Engineering : Location surveys & alignment, Permanent way components, Gauges, Geometric Design, Points & crossings, Stations & Yards, Signalling, Track Maintenance.

Unit 4: Airport Engineering : Functional areas of airports: Runways, Taxiways, , Aprons, Terminal buildings; Classification of Airports; Airport site selection; Design of Runway, Runway orientation, Wind Rose diagram; Design of Taxiway and Terminal Building.

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Course Description

Text Books

1. Transportation Engineering Khisty and Lal PHI.
2. A Text Book of Railway Engineering S.P. Arora& S.C. Saxena.
3. Railway Engineering Satish Chandra Oxford University press.

References

1.Transportation Engineering Vazirani & Chandola.
2. Airport planning and Design S.K.Khanna&M.G.Arora.
3. Airport Transportation Planning &Design-. Virendra Kumar &Satish Chandra Galgotia Publication Pvt. Ltd. New Delhi.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Advanced Structural Analysis
Course Code: CE704A
L-T Scheme: 3-0 **Course Credits: 3**

Introduction: The subject discussed in details the matrix method of analysis of structures which involves flexibility matrices and stiffness matrices. The subject also deals with flexibility method for fixed and continuous beams and stiffness methods for grids. The concept of flexibility method for plane frames and stiffness method for space frames are also discussed in details.

Objectives: The students will develop a clear understanding of the statically indeterminate structures which involves method of consistent deformations and theorem of least work. The students will also develop a clear understanding of the kinematically indeterminate structures. The concept of matrix concepts and matrix analysis of structures are also explained in details. The stiffness and flexibility matrix approaches are also dealt with. The students will develop a clear understanding of the two dimensional problems in Cartesian, polar and curvilinear co-ordinates.

Learning Outcomes:
Knowledge:
The students will develop a clear understanding of the following concepts:
Force methods: Statically indeterminate structures (method of consistent deformations; theorem of least work) Displacement Methods: Kinematically indeterminate structures (slope-deflection method; moment distribution method). Matrix concepts and Matrix analysis of structures: Introduction; coordinate systems; displacement and force transformation matrices; Contra-gradient principle; element and structure stiffness matrices; Element and structure flexibility matrices; equivalent joint loads; stiffness and flexibility approaches. Matrix analysis of structures with axial elements: Plane Truss; Analysis by flexibility method Space trusses: Matrix analysis of beams and grids: Flexibility method for fixed and continuous beams: Stiffness method for grids: Matrix analysis of plane and space frames: Flexibility method for plane frames: Stiffness method for space frames. Three dimensional stress and strain analysis, stress - strain transformation, stress invariants; equilibrium and compatibility equations, boundary conditions; Two dimensional problems in Cartesian, polar and curvilinear co-ordinates, bending of a beam, thick cylinder under pressure, complex variable, harmonic and bi-harmonic functions; Torsion of rectangular bars including hollow sections, bending problems; Energy principles, variational methods and numerical methods.

Course Contents:
Unit 1: **Review of analysis of indeterminate structures**; Force methods: Statically indeterminate structures (method of consistent deformations; theorem of least work) Displacement Methods: Kinematically indeterminate structures (slope-deflection method; moment distribution method). Matrix concepts and Matrix analysis of structures: Introduction; coordinate systems; displacement and force transformation matrices; Contra-gradient principle; element and structure stiffness matrices; Element and structure flexibility matrices; equivalent joint loads; stiffness and flexibility approaches. Matrix analysis of structures with axial elements: Plane Truss; Analysis by flexibility method Space trusses: Matrix analysis of beams and grids: Flexibility method for fixed and continuous beams: Stiffness method for grids: Matrix analysis of plane and space frames: Flexibility method for plane frames: Stiffness method for space frames.

Unit 2: Theory of Elasticity : Three dimensional stress and strain analysis, stress - strain transformation, stress invariants; equilibrium and compatibility equations, boundary conditions; Two dimensional

problems in Cartesian, polar and curvilinear co-ordinates, bending of a beam, thick cylinder under pressure, complex

variable, harmonic and bi-harmonic functions; Torsion of rectangular bars including hollow sections, bending problems; Energy principles, variational methods and numerical methods.

Text Books

1.Matrix Methods of Structural Analysis M.B. Kanchi.
2.Analysis of Structures T.S. Thandavamoorthy Oxford University Press.

Reference Books

1.Intermediate Structural Analysis C.K. Wang McGraw Hill.
2.Theory of Elasticity Timoshenko &Goodier McGraw-Hill.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Hydraulic Structures
Course Code: CE704B
L-T Scheme: 3-0 **Course Credits: 3**

Introduction:

This course will help to familiarize with the structural design of hydraulic structures. The failure criterions of the hydraulic structures are discussed in course. The course also analyzes the theories behind the stability and failure of the structural components. The Topics to be covered (tentatively) include:

- Diversion Head works
- Theories of seepage and Design of weirs and Barrages
- Hydraulic structures for canals
- Cross-Drainage Works
- Dam
- Gravity dam

Objectives:

In this course we will learn about the various hydraulic structures and their types. We will understand the river regime and the selection criterions of the suitable hydraulic appurtenances. We will be familiarize with forces responsible for stability and failure of the structure.

Learning Outcomes:

Knowledge:

1. To introduce the basics of hydraulic structures.
2. To familiarize the stability and failure mechanism of the hydraulic structures.
3. To enable the students to understand the consequences of these structures on the environment.
4. To familiarize the students with the elements of the hydraulic structures. .

Application:

1. To understand and analyze the forces acting on the hydraulic structures.
2. To familiarize with remedies to prevent failure.
3. To understand the environmental effect of these structures.
4. To familiarize with the planning of these structures on a suitable project site.

Course Contents:

Unit 1: Diversion Head works, Theories of seepage and Design of weirs and Barrages

Unit 2: Hydraulic structures for canals, Cross-Drainage Works

Unit 3: Dam, Gravity dam

Text Books

Santosh Kumar Garg, Irrigation Engineering and hydraulic structures, Khanna Publishers

References:

Dr.P.N.Modi , Irrigation, water Resources and Water Power Engg, Standard Book House, Delhi-6

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UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Engineering Materials
Course Code: CE705A
L-T Scheme: 3-0 **Course Credits: 3**

Introduction:

The course is designed to cover the following subjects: classification of materials, atomic structure, periodic table, molecular structure, bonding in solid materials, structure of crystalline solids, mechanical properties of the materials, phase diagrams, thermal processing of metal alloys, corrosion, properties and introduction to ceramics, glasses and composites

Objectives:

1. To introduce the basic concepts of crystal structure, its different types and defects
2. To enable the student to visualize lattice atomic diffusion
3. To familiarize the students with mechanical behavior of metals, different types of mechanical testing and fracture behavior of metals
4. To enable the students to understand solid and liquid phase reactions and phase diagrams, under equilibrium and none equilibrium conditions
S. To provide an overview of different types of heat treatment processes of ferrous and non-ferrous metals

Learning Outcomes:

At the end of the course, the student will be able to

1. understand the importance of materials for various applications
2. identify and analyze the various crystal structures and defects responsible for change in the material properties
3. understand the processof diffusion, its types and mechanisms
4. relate the properties of the materials with their crystal structure
S. identify different phases in iron-carbon diagram for steels and cast-iron and non equilibrium phases
6. usethe phase diagrams effectively to identify the phase-state of the material for a given temperature condition
7. select.the best heat treatment process based on application
8. identify the composition, properties and application of various ferrous, non-ferrous & composite materials

Application:

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Course Description

1. In this syllabus, students will learn the applications of the about the Phase Diagram ,heat treatment.
2. In the section students will learn about Classification of the materials with their proper composition.
3. In this syllabus students will learn about the all Heat treatment Processes.
4. In this syllabus, students will learn about all the transformation of one phase to another phases.
5. In this syllabus students will learn about nano-particles and theirs details.

Course Contents:

Unit 1:

Engineering Materials: Effects of alloying elements in steel. Low alloy steels. Stainless , Magnetic materials for high and low temperature service. Brasses and bronzes; Aluminum base alloys. Bearing Materials. Atomic structure of METALS: Crystal structure, crystal lattice of (i) Body centred cubic (ii) Face centred cubic (iii) Closed packed hexagonal, crystallographic Notation of atomic planes and Directions (Miller Indices), polymorphism and allotropy, Crystal imperfection.

Unit 2:

Plastic Deformation of Metals and Alloys: Mechanism of plastic deformation, role of dislocation; slip and twining. Elementary treatment theory of work hardening, Theories of recrystallation and grain growth. Elementary treatment of creep; Fatigue and fracture

Unit 3:

Phase and Phase Equilibrium: Solidification of alloys, Phase Diagrams, relationship with structure and properties; Eutectic systems. Iron Carbon alloys, Iron-Carbon equilibrium diagram

Unit 4:

. **Heat Treatment of Alloys:** Phase transformation in steel. 'S' Curves Detailed study of various heat treatment Processes- hardening, annealing and tempering, case hardening. Hardenability, Precipification hardening. Heat treatment Furnaces.

Unit 5:

Classification of Metals and Alloys-compositions, general properties and uses, Ferrous alloys, Non-ferrous alloys, Polymers & Elastomers, Ceramic Materials ,Composite materials.

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Course Description

Text Book:

1. Donald RAskeland and Pradeep, P.Phule (2006), The Science
2. Engineering of Materials for Science and Engineering, 5th edition

References

1. MaterialsScienceand Engineeringby W.D.Callisterand adapted byR.Balasubramaniam,Willey India, 2010 Ed.
2. Engineering Materials:propertiesand selectionbyBudinski&Budinski,9thEd.,Prentice HallIndia
3. Engineering Materialsand Metallurgy byR.Srinivasan, 2ndEd.,TataMcGrawHill.
4. Materials&Processes inManufacturing byE.P.Degarmoand adapted byBlack&Kosher, 10thEd.,Wiley India.
5. MaterialsScienceand Engineeringby V.Raghavan, 5thEd.,Prentice HallIndia.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Electrical & Electronic Measurement
Course Code: CE705B
L-T Scheme: 3-0 **Course Credits: 3**

Introduction:

This course gives fundamentals of different measuring techniques, working principle of instrument transformer, concept of CRO, Knowledge of sensors and transducers. The Topics to be covered (tentatively) include:

- Measurement methods
- Analog meters
- Instrument transformer
- Measurement of Power, Energy, resistance
- Potentiometer
- Cathode ray oscilloscope(CRO)
- Sensors &Transducers

Objectives:

The objective of the course is to to introduce the student fundamentals of Electronics Instruments and Measurement, providing an in-depth understanding of analog and digital meters, to learn the role of sensors and transducers in real life applications.

Knowledge:

1. Providing an in-depth understanding of Measurement errors.
1. Learning the necessity of measuring devices and also proper selection of the
2. Effects of the internal impedances of meters while measuring
3. Working principle of different types of analog instruments.
4. Operating principle and practical use of current transformer and potential transformer
5. Knowledge of using bridges to measure inductance capacitance resistances
6. Learning the application of ac and dc potentiometer to measure unknown emf
7. Understand the fundamental concepts of CRO and it's use to measure electrical parameters
8. Knowledge of sensors and transducers and their real time application

Application:

1. Analog and digital meters are used for measuring different electrical quantities.
2. No other instrument in electronic industry is as versatile as a CRO for measuring and recording purpose
3. Transducers are used in electronic communications systems to convert signals of various physical forms to electronic signals, and vice versa.

Course Contents:

Unit 1:

Measurements: Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments.

Analog meters: General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.

Unit 2:

Instrument transformer: Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current & Potential transformer, errors.

Measurement of Power: Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors.

Measurement of resistance:

Measurement of medium, low and high resistances, Megger.

Unit 3:

Measurement of Energy:

Construction, theory and application of AC energy meter, testing of energy meters.

Potentiometer:

Principle of operation and application of Crompton's DC potentiometer, Polar and Co ordinate type AC potentiometer. Application.

ACBridges:

Measurement of Inductance, Capacitance and frequency by AC bridges.

Unit 4:

Cathode ray oscilloscope(CRO):

Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO.

Electronic Instruments:

Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator.

Sensors &Transducers:

Introduction to sensors &Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.

Text Books

1. A.K.Sawhney, A course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and sons

References

1. H.S.Kalsi, Electronic Instrumentation, Tata McGraw hill

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Lab Manual

Title of Course: Environmental Engineering Lab
Course Code: CE 791
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:
1. The students will be able to determine the Bio Chemical Oxygen demand for a given sample of waste water.
2. They will be able to determine the Chemical Oxygen Demand for a given sample of waste water.
3. The students will be able to determine the total solids, suspended solids and dissolved solids in a given sample of water.

Learning Outcomes: The students will be able to develop a clear understanding of the different physical, chemical and physiological tests conducted on water. They will be able to determine the Ph, concentration of chlorides, carbonates, bi-carbonates, hydroxide alkalinity, fluorides, iron and optimum alum dose for a given sample of water. The students will also develop the knowledge of determining the chlorine percentage in a given sample of bleaching powder.

Course Contents:
Practicals that must be done in this course are listed below:

1. Determination of turbidity for a given sample of water.
2. Determination of colour for a given sample of water
3. Determination of solids in a given sample of water: Total Solids, Suspended Solids and Dissolved Solids.
4. Determination of pH for a given sample of water.
5. Determination of concentration of Chlorides in a given sample of water.
6. Determination of carbonate, bi-carbonate and hydroxide alkalinity for a given sample of water.
7. Determination of hardness for a given sample of water.
8. Determination of concentration of Fluorides in a given sample of water.
9. Determination of concentration of Iron in a given sample of water.
10. Determination of the Optimum Alum Dose for a given sample of water through Jar Test.
11. Determination of the Residual Chlorine in a given sample of water.
12. Determination of the Chlorine Demand for a given sample of water.
13. Determination of the Available Chlorine Percentage in a given sample of bleaching powder
14. Determination of amount of Dissolved Oxygen (DO) in a given sample of water.
15. Determination of the Biochemical Oxygen Demand (BOD) for a given sample of wastewater.
16. Determination of the Chemical Oxygen Demand (COD) for a given sample of wastewater.
17. Determination of bacteriological quality of water: presumptive test, confirmative test.

Text Book:
1. Environmental Engineering And Solid Waste Management By S.K.Garg.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

Title of Course: Manufacturing Technology Lab **Course Code: CE795A**
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:

1. The objective of the laboratory is learning. The experiments are designed to illustrate phenomena in different areas of Workshop and to expose you to uses of instruments.
2. To provide an understanding of the design aspects of machines.
3. To provide an efficient understanding of the equipments and their functioning.

Learning Outcomes: The students will have a detailed knowledge of the concepts of process of workshop equipments and their use in various areas of mechanical engineering. Upon the completion of practical course, the student will be able to:

- **Understand** and implement basic services and functionalities of the machines using tools and equipments.
- **Use** modern manufacturing technology to understand outlined process of production.
- **Understand** the benefits of newly manufactured parts and designs.
- **Analyze** the dimensions of job and measurements to be taken in account.
- **Implement** the manufacturing processes in competition of different jobs.
- **Understand** the concepts of different operations conducted on milling, shaper andworking in smithy and forging.

Course Contents:

Exercises that must be done in this course are listed below:

Exercise No.1: Smithy & Forging operation
Exercise No. 2: Operation on Shaper machine
Exercise No. 3: Operation on Drilling machine
Exercise No. 4: Operation on grinding machine
Exercise No. 5: Machining spur gear

Text Book:

1. Hazra Choudhary, Media Promoters & Publishers Pvt Ltd.
2. Ashish Dutt Sharma, S. Chand

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Course Description

Title of Course: Electrical & Electronic Measurement Lab
Course Code: CE795B
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:
1. To introduce the student fundamentals of Electronics Instruments and Measurement
2. To understand how measuring instruments work for measurement of electrical and non electrical quantity.
3. Providing practical ideas and an in-depth understanding of Measurement procedures.

Learning Outcomes: The students will have a detailed knowledge of the concepts of different measuring methods and the devices that has to be used for the purpose. Upon the completion of Operating Systems practical course, the student will be able to:

- **Understand** necessity of measuring devices and also proper selection of the devices
- **Use** proper instruments for measuring electrical and non electrical quantities**.**
- **Understand** effects of the internal impedances of meteres while measuring.
- **Analyze** General features of analog meteres
- **Learn** the application of ac and dc potentiometer to measure unknown emf
- **Understand** the fundamental concepts of CRO and it's use to measure electrical parameters

Course Contents:
Exercises that must be done in this course are listed below:
Exercise No. 1: Measure a resistance using Kelvin's Double Bridge
Exercise No. 2: Measure unknown capacitance using Schering Bridge
Exercise No. 3: Measure self inductance using Anderson's Bridge.
Exercise No. 4: Measure unknown value of capacitance using De Sauty Bridge
Exercise No. 5: Measure Unknown frequency using Wein's Bridge
Exercise No. 6: Measure three phase power and power factor
Exercise No. 7: Study the operation of CRO

Text Book:
1. A.K. Sawhney, A course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and sons

Recommended Systems/Apparatus Requirements:
1. Laboratory Kits, Multimeters, CRO, Connecting wires.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

Title of Course: Seminar on Industrial Training **Course Code: CE781**
L-T –P Scheme: 0-0-3 **Course Credits: 2**

Course Description & Objectives:

1. **Understand** the history of medical research and bioethics related to the HeLa cells. Understand the diverse social and economic, racial and gender contexts within which Henrietta Lacks lived and died. Understand the themes of this seminar. Appreciate the legacy and implications of these medical, ethical and social understandings on today's society.

2. **Identify**, understand and discuss current, real-world issues.

3. **Distinguish** and **integrate** differing forms of knowledge and academic disciplinary approaches (e.g., humanities and sciences) with that of the student's own academic discipline (e.g., in agriculture, architecture, art, business, economics, education, engineering, natural resources, etc.). And apply a **multidisciplinary strategy** to address current, real-world **issues**.

4. Improve oral and written **communication** skills.

5. Explore an appreciation of the **self** in relation to its larger diverse social and academic contexts.

6. Apply principles of **ethics** and **respect** in interaction with others.

Course Outcomes:

After the completion of this course, the student should be able to:

1. **Learn and integrate.** ***Through independent learning and collaborative study, attain, use, and develop knowledge*** *in the arts, humanities, sciences, and social sciences, with disciplinary specialization and the ability to integrate information across disciplines.*

2. *Use multiple thinking strategies to* ***examine real-world issues****,* ***explore creative avenues of expression****,* ***solve problems, and make consequential decisions***

3. **Learn and integrate.** Communicate**.** *Acquire, articulate, create and convey intended meaning using* ***verbal*** *and* ***non-verbal method of communication*** *that demonstrates respect and understanding in a complex society.*

4. *Use multiple thinking strategies to examine* ***real-world issues****,* ***explore creative avenues of expression****,* ***solve problems, and make consequential decisions.***

5. **Clarify purpose and perspective.** *Explore* ***one's life purpose and meaning*** *through transformational experiences that foster an understanding of****self, relationships****, and* ***diverse global perspectives****.*

6. **ractice citizenship.** *Apply principles of* ***ethical*** *leadership,* ***collaborative engagement****,* ***socially responsible behavior****,* ***respect for diversity*** *in an interdependent world, and a service-oriented commitment to advance and sustain local and* ***global communities****.*

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

Title of Course: Group Discussion **Course Code: CE781**
L-T –P Scheme: 0-0-3 **Course Credits: 2**

A group discussion aims at a structured but informal exchange of knowledge, ideas, and perceptions among the participants on any issue, topic or sub-topic. Contributions are pooled together and examined in terms of their relevance and validity to the discussion objectives. If planned and organized in a structured way and certain essential conditions are met, it can provide a highly enriching and stimulating experience to the participants. Lets us see, the objectives, different steps involved in it and its limitations.

Objectives of a Group Discussion

- Produce a range of options or solutions, addressing a particular problem or an issue.
- Generate a pile of ideas by examining issues in greater depth, looking at different dimensions of these issues.
- Broaden the outlook of the participants through cross-fertilization and exposure to new and different experiences and ideas and enrich their understanding of the issues under discussion.
- Develop their skills in interpersonal communication and in expressing their views in a clear and succinct manner.
- Effective means of changing attitudes through the influence of peers in the group
- Valuable means of obtaining feedback for the training team on verbal skills, motivation level and personal traits of the participants and characteristics of the group

Steps in organizing a Group Discussion

- Setting up the Groups
- Planning a Group Discussion
- Preparation of Group Reports
- Presentation and Consolidation of Group Reports

Limitations

- If the group is large, not all the members may get the opportunity to participate and contribute to the discussion.
- If the task is not clearly defined, the discussion may lack focus and, as a result, it may be unproductive.
- Difficulties can arise if the leader is unskilled in guiding the discussion and/or not familiar with the topic or the issues.
- Some members may dominate and, in a way, hijack the discussion.

- As this is a group task, some members may take it easy and not feel constrained to participate.

Learning outcomes

After studying this course, you should be able to:

- understand the key skills and behaviours required to facilitate a group discussion
- prepare effectively before facilitating a meeting
- consider some of the difficult behaviours that can occur in meetings
- think of some possible strategies for dealing with these.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

Title of Course: Project Part- I **Course Code: CE782**
L-T –P Scheme: 6P **Course Credits: 4**

Project: an activity where the participants have some degree of *choice* in the outcome. The result is complete and functional, that is, it has a beginning, middle and end. Usually, it spans multiple lab periods and requires work outside scheduled lab periods. Since there are choices in implementation, *design* is inherently a component of a project. A project is inherently different from an *analysis* or *exercise*, in which the solution has a predictable form. Projects span a wide variety of possibilities: design and build, identify a system, do a forensic analysis, evaluate a product or assess some environmental situation.

Program Objective 1
Graduates shall make their way to the society with proper scientific and technical knowledge in mechanical engineering.

Program Objective 2
Graduates shall work in design and analysis of mechanical systems with strong fundamentals and methods of synthesis.

Program Objective 3
Graduates shall adapt to the rapidly changing environment in the areas of mechanical engineering and scale new heights in their profession through lifelong learning.

Program Objective 4
Graduates shall excel in career by their ability to work and communicate effectively as a team member and/or leader to complete the task with minimal resources, meeting deadlines.

Program Outcomes:

1. Ability to apply knowledge of mathematics, science and mechanical engineering fundamentals for solving problems.
2. Ability to Identify, formulate and analyze mechanical engineering problems arriving at meaningful conclusions involving mathematical inferences.
3. Ability to design and develop mechanical components and processes to meet desired needs considering public health, safety, cultural, social, and environmental aspects.
4. Ability to understand and investigate complex mechanical engineering problems experimentally.
5. Ability to apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations.
6. Ability to understand the effect of mechanical engineering solutions on legal, cultural, social, public health and safety aspects./li>

Course Description

7. Ability to develop sustainable solutions and understand their impact on society and environment.
8. Ability to apply ethical principles to engineering practices and professional responsibilities.
9. Ability to function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10. Ability to comprehend, design documentation, write effective reports, make effective presentations to the engineering community and society at large.
11. Ability to apply knowledge of engineering and management principles to lead teams and manage projects in multidisciplinary environments.
12. Ability to engage in independent and life-long learning in the broad context of technological changes and advancements.