R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – III
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E. Common	**Engineering Mathematics- III**	**BE – 3011**	**3L-1T-0P**	**4**

Courses outcome:-

1. Analyse the behaviour of infinite series.
2. Solve problems based on linear algebra.
3. Acquire knowledge of Complex Functions.
4. Understand methods to solve first order and higher order differential equations.
5. Apply the concepts of differential equations to solve practical problems.

Unit I

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi ,Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

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

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge- Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability: Probability: Binomial, Poisson's, Continuous Distribution: Normal Distribution,

Testing of Hypothesis |: Students t-test, Fisher's z-test, Chi-Square Method

Reference:

(i)   Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
(ii)   Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
(iii)   Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
(iv)   Numerical Methods using Matlab by Yang,Wiley India
(v)   Pobability and Statistics by Ravichandran ,Wiley India
(vi)   Mathematical Statistics by George R., Springer

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – III
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Transportation - Bridges and Tunnels**	CE- 3021	**4L-0T-0P**	4

Course Outcome:-
After learning the course the students should be able to:

1. Know about railway track components, their materials, size, function and importance
2. Carry out geometric design of railway track
3. Know about various components in diverging, merging and crossings of railway tracks, stations, yards, signaling, interlocking and control systems.
4. Know about requirements of railway track for high speed trains, safety aspects and maintenance.
5. Understand about different types of bridges, their components, loads/stresses acting on bridges, requirement and function of the components, hydrological design, methods of erection, maintenance of bridges.
6. Understand about importance, types, methods of construction, mucking, ventilation, lining and lighting in Tunnels.

Unit I

Introduction, Tractive resistances & Permanent way: Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations, Route surveys and alignment, railway track, development and gauges, Hauling capacity and tractiveeffort.

i)   Rails: types, welding of rails, wear and tear of rails, rail creep.
ii)   Sleepers: types and comparison, requirement of a good sleeper, sleeper density.
iii)   Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails.
iv)   Ballast: Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track

Unit II

Geometric Design; Station & Yards; Points and Crossings & Signaling and interlocking:Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipments, layouts, marshalling yards,
Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and inter-locking.

Unit-III

Bridge Site Investigation and Planning; Loading Standards &Component parts: Selection of site, alignment, collection of bridge design data: essential surveys, hydraulic design, scour, depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges. :
Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges, Bridge super structure and sub-structures, abutments, piers, wing walls, return walls,

approaches, floors & flooring system, choice of super structure.

Unit-IV
Bridge Foundations, Construction, Testing and Strengthening of Bridges : Differenttypes of foundation: piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and plants. inspection and Data collection,
strengthening of bridges, Bridge failure.

Unit-V
Tunnels: 1. Selection of route, Engineering surveys, alignment, shape and size of tunnel,bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts 2,Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining,
Mucking operation, Drainage and ventilation, Examples of existing important tunnels in Indiaand abroad.

References
1. Chakraborty and Das; Principles of transportation engineering; PHI
2. Rangwala SC; Railway Engineering; Charotar Publication House, Anand
3. Rangwala SC; Bridge Engineering; Charotar Publication House, Anand
4. Ponnuswamy; Bridge Engineering; TMH
5. Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons
6. Railway Track by K.F. Antia
7. Principles and Practice of Bridge Engineering S.P. Bindra - Dhanpat Rai & Sons
8. Bridge Engineering - J.S. Alagia - Charotar Publication House, Anand
9. Railway, Bridges & Tunnels by Dr. S.C. Saxena

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – III
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Strength of Materials**	**CE- 3031**	**3L-1T-2P**	**6**

Courses Outcomes:-

1. Apply the linear laws of elasticity as related to stress and strain.

2. Understand the concept of a complex stress system.

3. Understand of the behavior of columns and struts under axial
loading.

4. Analyses the bending stress on different types of sections.

5. Determine the effect of combined axial and bending stress.

6. Demonstrate the use of critical thinking and problem solving technique as applied to mechanical and structural systems.

Unit I
Simple Stress and Strains: Concept of Elastic body, stress and Strain, Hooke's law, various types of stress and strains, Elastic constants, Stresses in ompound bars, composite and tapering bars, Temperature stresses. Complex Stress and Strains: Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and strains, Mohr's circle of stresses, Combined Bending and Torsion, Theories of failure
.

Unit II
Bending & Deflection: Theory of simple bending: Concept of pure bending and bendingstress, Equation of bending. Neutral axis, Section-Modulus, Determination of bending stressesin simply supported, Cantilever and Overhanging beams subjected to point load and uniformlydistributed loading. Bending & shear stress distribution across a section in Beams. Deflection of
beams: Double Integration Method. Conjugate Beam Method, Macaulay's Method Area Moment Method.

Unit III
Torsion of Shafts: Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow shafts, Open and closed coil springs, Leaf Spring, Spiral Spring, Pressure Vessels: Thin and Thick walled cylinders and spheres. Stress due to internal pressure, Change in diameter and volume, Compound cylinders and shrink fittings.

Unit IV
Unsymmetrical Bending: Principal moment of Inertia, Product of Inertia, Bending of a beam in a plane which is not a plane of, symmetry. Shear center; Curved beams: Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis.

Unit V

Columns and Struts: Euler's buckling load for uniform section, various end conditions, slenderness Ratio, Stress in columns, Rankine formulae, Eccentric loading on columns.

Reference
1. Nash; Strength of Materials (Schaum), TMH.
2. Rattan SS; strength of Materials; TMH
3. Negi; Strength of materials; TMH
4. Sadhu Singh; Strength of Materials, ,
5. Ramamrutham; Strength of Materials, ,
6. Subramaniam; Strength of Materials; R; Oxford
7. National Building Code of India, Part-IV

List of Experiments

The experimental work to cover tension, compression, bending and impact test etc. on steel, cast iron, RCC and timber, Fire Resistant Test of Structures and Combustibility of Building Materials Test as per I.S.I. and other experiments based on the syllabus.

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Building Design & Drawing**	**CE- 3041**	**3L-1T-2P**	**6**

Courses Outcomes:-
1. Visualize science in the form of technical graphics.
2. Read and draft orthographic projections of points, lines, planes and solids as per the BIS codes.
3. Understand and visualize section of solid, intersection and development of surfaces.
4. Draw and read isometric and orthographic projections of geometric objects
5. Imparting the knowledge of vastu for Home and other Commercial & Industrial Vastu applications

Unit I

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.

Unit II

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.

Unit III

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.

Unit IV

Home Vastu

Introduction of Vastu Science : Effect of cosmic energy and its centralization. Vastu Purusuh, directions and use of magnetic compass
Home Vastu Analysis : The source of water, storage of water, exit of water, Boundary wall, Doors, Windows and Ventilators, Stairs, Garage, Room of Master Room of House, Bedroom, Study Room,

Dining Room, Drawing Room, Guest Room, Worship Room, Kitchen, Toilets, Bath Rooms, Store, Verandah, Basement, the Brahmasthan.

Home Vastu Decoration : The Vastu of colors, Auspicious Articles of Vastu, Vastu of flowers, climbers and pictures etc.

Unit V

Commercial & Industrial Vastu

Commercial Vastu Analysis : Analysis of Direction of Shop or Office, Directions of door, Cabin of Chief, Reception, Direction of Sales Manager, Direction of Customer, The Worship Room, Room of Employees, Workshop, Store, Seminar Room, Guest Room, Cash Room, Kitchen, Toilets etc.

Industrial Vastu : Selection of land, Inspection of Plot and Surroundings, The Main Gate, The Security Room, Arrangement of Industrial Complex, Roads, Place of worship, Trees and Plants, Environment, Water Supplies, Arrangement of Utilities and Power Supplies, Pollution Control, Workshop, Store, Godown, Tank Areas, Boilers, Laboratory, Canteen , Employees Rest Rooms, Toilets, Bathrooms.

Specific Vastu Analysis : Vastu analysis of Hotel, Restaurant, Hospital, School, Ashram, Temple, Cities etc..

References
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

List of Experiments (Expandable)

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).

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – III
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	VALUE EDUCATION	CE- 3051	4L-0T-2P	6

Course Outcomes: After studying this course, students will be able to

CO1-Students will understand the importance of value based living.
CO2-Students will gain deeper understanding about the purpose of their life.
CO3-Students will understand and start applying the essential steps to become good leaders
CO4-Students will emerge as responsible citizens with clear conviction to practice values and ethics in life

Chapter 1:

Value Education   Concepts of Values-Definition and Types of values –The need for Education in values- Challenges for Value adoption-Character development-Vision of a better world

Chapter 2:

Inculcation of values Classification of values- Personal Values-Family Values-Social Values-Spiritual values- Benefits of value adoption

Chapter3:

Values for Professional excellence   Definition-Purpose-implementation-situations to adopt-reflection questions-quotable quotes of Active listening-Decision making-Determination-Perseverance-Discipline- Responsibility

Chapter 4:

Business ethics : Ethics and Entrepreneurship- Professional Ethics –Ethical choices- Resolving Ethical Dilemmas-Leadership and Social Responsibility- Corporate Social Responsibility

Chapter 5:

Quality of Life : Dealing with change-Trends, Organizations and the Individual-Self and the world-Quality from within-Relating to others-The dynamics of personal powers

Chapter 6:

Exploring the self : True Identity-Anatomy of the self-The cyclic processes within the self-States of

the awareness-Innate and Acquired qualities-Empowering the self

Chapter 7:

Understanding Self-Esteem: Know self-esteem-Understanding the self-Components of self-esteem- **Association with self-esteem-Levels of self-esteem-Reflection exercises**

Chapter 8:

Principles of living : Be introspective-Be an observer-Being optimistic-Appreciate differences-Don't compare yourself with others-Live at present

Chapter 9:

Practical Meditation : Why meditate?-Soul consciousness-The supreme-Karma-Timeless dimension-The eight powers

Chapter 10:

 Exercises for Practice

Quiet reflection- Practice introversion-Being an observer-Stand back and observe -Self awareness (Soul consciousness)-Experiencing Body free stage-Reflect on original qualities-Visualize the Divine-Think attributes of the Supreme-Developing a living relationship-Surrender to God-Create Good wishes for all-Visualization in Meditation: Orbs of Light- The forest-The Balloon

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Computer Programming Lab**	**CE- 3061**	**0L-0T-2P**	**2**

Courses Outcomes:-
1. Get knowledge of Computer System, Window explorer, Control panel and Command prompt.
2. Work on Microsoft Word, Excel, PowerPoint and Mail Merging.
3. Use concepts of C++ JAVA, JAVA virtual machine types, basic terminologies, operators, expressions, control structures.
4. Implement programs using functions, arrays and strings.
5. Understand the concept of OOP's, use of classes and objects and basics of file handling.

UNIT-I
Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II
Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector.Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III
Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT–IV
Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

UNIT–V

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:
1.   Deitel & Deitel, "JAVA, How to Program"; PHI, Pearson.
2.   E. Balaguruswamy, "Programming In Java"; TMH Publications
3.   The Complete Reference: Herbert Schildt, TMH

List of Program to be perform (Expandable)
1.   Installation of J2SDK
2.   Write a program to show Concept of CLASS in JAVA
3.   Write a program to show Type Casting in JAVA
4.   Write a program to show How Exception Handling is in JAVA
5.   Write a Program to show Inheritance
6.   Write a program to show Polymorphism

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E. Common	**Environmental Engineering**	**BE - 4011**	**4L-0T-0P**	**4**

Course Outcomes: After studying this course, students will be able to,

CO1-Convey a clear idea of the interdisciplinary nature of environmental and health risk assessment.
CO2-The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk.
CO3-Ability to understand environmental laws and regulations to develop guidelines, procedures and processes for health and safety issues.
CO4-Understand what are professional ethics and how do ethics affect the outcomes of environmental laws and regulations.

Unit –I
Energy- Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

Unit –II
Ecosystem – Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation,

Unit –III
Air Pollution & Sound Pollution - Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

Unit –IV
Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent.
Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

Unit –V
Society, Ethics & Human values– Impact of waste on society. Solid waste management (Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

References:-

1.Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.

6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH
9. Miller GT JR; living in the Environment Thomson/cengage
10. Cunninghan WP and MA; principles of Environment Sc; TMH
11. Pandey, S.N. & Mishra, S.P. Environment & Ecology, 2011, Ane Books , Pvt. Ltd, New Delhi
12. Joseph, B. Environmental Studies, 2009 Tata Mcgraw Hill, Edu India Ltd. New Delhi.
13. Gour R.R, Sangal, R &Bagaria, G.P. , Excel Books, A-45, Naraina Phase-I ,New Delhi.- 110028

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Concrete Technology**	**CE- 4021**	**3L-1T-2P**	**6**

Courses Outcomes:-
CO1 Identify Quality Control tests on concrete making materials
CO2 Understand the behavior of fresh and hardened concrete
CO3 Design concrete mixes as per IS and ACI codes
CO4 Understand the durability requirements of concrete
CO5 Understand the need for special concretes

Unit I

Introduction Classification, properties, grades, advantage & disadvantages of concrete, Ingredients of concrete, types of cement, aggregates, water, admixtures, Inspection & testing of
materials as per Indian Standard Specifications.

Unit II

Properties of Fresh and Hardened Concrete : Introduction, Workability, Testing of concrete, Factors affecting, Rheology of concrete, Compressive & Tensile strength, Stress and strain characteristics, Shrinkage and temperature effects. Creep of concrete, Permeability, durability, thermal properties & micro-cracking of concrete.

Unit III

Design of Concrete Mix : Various classical methods of concrete mix design, I.S. code method, basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete, concrete mixes with Surkhi and other Pozzolanic materials, design of plastic concrete mix, computer aided design of concrete mix.

Unit IV

Production and Quality Control of Concrete: Production of crushed stone aggregate, batching equipments for production and concreting, curing at different temperatures, Concreting underwater, hot & cold weather condition, statistical quality control, field control, non-instructive testing, repair technology for concrete structures, Inspection & Testing of Concrete.

Unit V

Special Concretes : Light weight concrete, Ready mix concrete, Vacuum concrete, Ferrocement, Fiber reinforced concrete, Polymer concrete composites, Shotcrete, Guniting, Rubble concrete, Resin concrete, Prestressed concrete, Heat resistant concrete, Mass concrete, Temperature control of mass concrete.

References:
1. Varshney RS; Concrete Technology; Oxfored & IBH publishing co.

2. Gambhir ML; Concrete Technology – TMH
3. Sinha SN; Reinforced Concrete Technology; TMH
4. New Building Materials Published by B.M.T.P.C., New Delhi
5. Hand books on Materials & Technology - Published by BMTPC & HUDCO
6. Mohan Rai & M.P. Jai Singh; Advances in Building Materials & Construction
7. Jackson N; Civil Engineering materials.
8. Properties of Concrete - A.M. Neville - Pearson Education

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Surveying & Geomatics**	CE- 4031	3L-1T-2P	6

Courses Outcomes
- Surveying courses give basis knowledge of field survey work which includes linear and angular measurement
- It offers to under the basic requirement s work specific survey, which involves many parameters such as type of equipment, Precision, Time available, and Money etc. for a particular engineering application.
- It gives hands on practices to use various surveying equipment like chain Compass, Theodolite, Total station, Dump Levels etc., for linear and angular, Various type of leveling operation and Contouring
- Collection field data using various survey equipment leads them to prepare maps of suitable scale
- Apply the concept of Tacheometry in surveying difficult and hilly terrains to obtain the topographical map of area.
- Application and setting of the curves, control surveying and hydrographic surveying
- Application of advances surveying known as geomatics in field

Courses Content

Unit-I
Traversing by theodolite, Field work checks, traverse computations, latitude and departures, adjustments, computations of co-ordinates, plotting & adjusting or traverse, Omitted measurements, Measurement EDM, Trigonometrical leveling, Total Station

Unit-II
Tachometry: Tachometric systems and principles, stadia system, uses of anallatic lens, tangential system, sublense system, instrument constant, field work reduction, direct-reading tacheometers, use of tacheometry for traversing and contouring.

Unit-III
Curves: Classification and use; elements of circular curves, calculations, setting out curves by offsets and by theodolites, compound curves, reverse curves, transition curves, cubic spiral and lemniscate, vertical curves, setting out.

Unit-IV
Control Surveys: Providing frame work of control points, triangulation principle, co naissance, selection and marking of stations, angle measurements and corrections, baseline measurement and corrections, computation of sides, precise traversing.
Hydrographic Surveying: Soundings, methods of observations, computations and plotting.

Unit-V

Geoinformatic (Remote Sensing, GIS and GPS):- Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications. GIS-Definition, components and advantages. Introduction & components of GPS, Space segment, control segment and user segment, Elements of Satellite based surveys-Map datums, GPS receivers, GPS observation methods and their advantages over conventional methods.

Principles of photographic surveying: aerial photography, tilt and height distortions.

Reference

1. T.P. Kanetkar, Surveying & Levelling, Vol. I & II.
2. Duggal; Surveying vol I and II; TMH
3. Basak; Surveying and Leveling; TMH
4. R.E.Devis, Surveying theory & Practice, Mc.Graw Hill, New York
5. David Clark & J Clendinning, Plane & Geodetic surveying Vol. I & II, constable & Co. London.
6. S.K. Roy, Fundamentals of surveying, prentice - Hall of India New Delhi
7. B.C. Punmia, Surveying Vol. I, II, III, Laxmi Publications New Delhi
8. K.R. Arora, Surveyhing Vol. I & II, standard book House, New Delhi
9. Remote Sensing and image interpretation by Lillesand T.M. and Kiefer R.W.
10. R.Agor, Advance Surveying ,Khanna Publisher
11. Introduction to Geographic Information Systems,9th Edition- Kang-tsung Chang

List of Experiments/ Field work (Expandable):
1. Horizontal angle measurement by theodolite using reiteration and repetition method
2. Determination of constants of Tachometer
3. Horizontal distances by stadia tacheometry
4. Height and distances by tangential tacheometry
5. Setting out simple curve by linear methods
6. Setting out simple circular curve by Rankine method of tangential angle
7. Traversing based on tacheometry –closing error
8. Study of modern instruments(Remote sensing, GIS and GPS)
9. Horizontal and vertical distance using Total station
10. Traversing and area calculation using Total station

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Engineering Materials & Construction Techniques**	**CE- 4041**	**4L-0T-2P**	6

Courses Outcomes:-

1. Extend the knowledge about the characteristics, sources and defects in various materials.

2. Design and test the materials either in the laboratory or in the field before their actual use at the site.

3. Attain the knowledge of different components of building, their classification, materials and methods of construction and causes of their failures.

4. Know the various services to be provided and the defects in the buildings along with the remedial measures for proper maintenance of the buildings.

A) Construction Materials:
UNIT-I

Stones : Occurrence, varieties, Characteristics and their testing, uses, quarring and dressing of stones. Timber : Important timbers, their engineering properties and uses, defects in timber, seasoning and treatment, need for wood substitutes, Alternate materials for shuttering doors/windows, Partitions and structural members etc. Brick and Tiles: Manufacturing, characteristics, Classification and uses, Improved brick from inferior soils, Hand molding brick
table, Clay-fly ash brick table, Flooring tiles and other tiles and their characteristics.

UNIT-II

Advance Construction Materials : Use of fly ash in mortars, concrete, Fly ash bricks, stabilized mud blocks, non-erodible mud plinth, D.P.C. materials, Building materials made by Industrial & agricultural waste, clay products P.V.C. materials, advance materials for flooring,doors & windows, facia material, interiors materials for plumbing, sanitation & electrification.

(B) Construction Techniques:
UNIT-III

Foundation: Type of soils, bearing capacity, soil slablisation and improvement of bearing capacity, settlement and safe limits. Spread foundations, wall footings, grillage,foundations well foundation, causes of failure and remedial measures; under reamed piles,foundation on shrinkable soils, black cotton soil, timbering for trenches, dewatering offoundations. Hyperbolic parabolied footing, Brick arch foundation. Simple methods of foundationdesign, Damp proof courses, Repairs Techniques for foundations

UNIT-IV

Masonry and Walls : Brick masonry, Bonds, Jointing, Stone masonry, casting and laying, masonry construction, Brick cavity walls, code provisions regarding load bearing and non load bearing walls. Common defects in construction and their effect on strength and performance of walls, designed Brick masonry, precast stone masonry block, Hollow concrete block, plastering and pointing, white and color washing, distempering, dampness and its protection, Design of hollow block masonry walls. Doors, Windows and Ventilators: Types based on material etc., size location, fittings, construction sunshades, sills and jambs, RCC doors/windows frames. Stairs types, rule of proportionality etc., Repairs techniques for masonry, walls, doors & windows.

UNIT-V

Floors and Roofs : Types, minimum thickness, construction, floor finishes, Flat roofs, RCC jack arch, reinforced brick concrete, solid slab and timber roofs, pitched roofs, false ceiling,roof coverings, Channel unit, cored unit, Waffle unit, Plank and Joist, Brick panel, L-Panel, Ferrocement roofing units, water proofing
.Services : Water supply & Drainage, Electrification, Fire protection, thermal insulation, Air Conditioning, Acoustics & Sound insulation, Repairs to damaged & cracked buildings, techniques and materials for low cost housing., Repairs techniques for floors & roofs.

References:
1.   Mohan Rai & M.P. Jai Singh; Advance in Building Materials & Construction,.
2.   S.C. Rangwala; Engineering Materials
3.   Sushil Kumar; Building Construction,
4.   B.C. Punmia; Building Construction ,.
5.   Building Construction, Metchell
6.   Construction Technology, Chudley R.
7.   Civil Engineering Materials, N. Jackson.
8.   Engineering Materials, Surendra Singh.

List of Experiments:
1.   Tests on Bricks
2.   Tests on Aggregates
3.   Tests on Cement
4.   Determination of compressive strength of concrete with different cement grades.
5.   Determination of workability of concrete by slump test
6.   Determination of workability by compacting factor apparatus.
7.   Determination of workability by Vee Bee consistometer.
8.   Nondestructive testing of concrete by Rebound hammer test
9.   Nondestructive testing of concrete by ultrasonic Method.
10.   Test for the effect of admixtures on the concrete compressive strength
11.   Testing of microconcrete
12.   Design of concrete mix.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Fluid Mechanics-1**	**CE- 4051**	**3L-1T-2P**	**6**

COURSE OUTCOME
• Knowledge of the basic concepts and principles of fluid mechanics.
• Ability to analyze fluid flow problems with the application of momentum and energy equations.
• Ability to distinguish between various types of fluid flow.

COURSE CONTENT

UNIT I
Fundamentals Fluid Properties: Engineering units of measurement, mass, density, specific weight, specific volume, specific gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity,pressure and vapour pressure. Fluid Statics: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure,manometers, Forces on plane and curved surfaces (Problems on Gravity Dams and Tainter Gates), buoyant force, stability of floating and submerged bodies, relative equilibrium.

UNIT II
Kinematics of Flow: Introduction to basic lines - Streamlines, Streaklines, Pathlines. Various types of fluid flow. Velocity potential function, Stream function, Vorticity and Circulation, Flow net and its applications in Civil Engineering.

UNIT III
Dynamics of Flow: Basic equations of fluid flow like Energy equation, continuity equation and momentum equation. Bernoulli's equation and its applications – Venturimeter, Orifice meter, Pitot Tube, etc. Impulse Momentum equation and its application. Introduction of Weir and Barrages.

UNIT IV
Laminar Flow: Boundary layer concept, Thickness: Nominal thickness Energy thickness and Momentum thickness. Introduction to laminar flow, Reynolds experiment & Reynolds number. Velocity distribution, laminar boundary layers and laminar sub layer. Navier Stokes equation, Flow between two parallel plates, Couette's flow, Hagen Poisellui's equation.

UNIT V
Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines, etc.).
EVALUATION: Evaluation will be continuous and integral part of the class followed by final examination.
REFERENCES
1. Modi & Seth , Hydraulics & Fluid Mechanics ,Rajson's Publication Pvt Ltd

2. A K Jain, Fluid Mechanics: Including Hydraulic Machines, Khanna Publisher.
3. Subramanyam,Fluid Mechanics & hydraulic machines - - Tata McGraw-Hill
4. R.J.Garde , Engg Fluid Mechanics , SCITECH Publishers Pvt Ltd
5. Merle C. Potter, David C. Wiggert, Bassam H. Ramadan, Mechanics of Fluid, Cengage Learning.
6. John F. Douglas, J.M. Gasoriek, John Swaffield, Lynne Jack, Fluid Mechanics, Pearson Education.
7. K.R. Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers Distributors..
8. Balchandran, Engg Fluid Mechanics, PHI Learning Pvt Ltd
9. Ojha & Chandramouli , Fluid Mechanics & Machinery , Oxford University Press
10. Fox, Mc Donald, Pritchard Fluid Mechanicas– Wiley India, New Delhi.
11. Narsimhan S Fluid Mechanics –. – University Press, Mumbai.
12. Ratnam Chanamala kothapalli A.V. Fluid Mechanics & Machniery — I.K. International, New Delhi.
13. Flow Through Open Channel -- Tata McGraw-Hill
14. S K Som, G Biswas, Suman Chakraborty, Introduction to Fluid Mechanics and Fluid Machines,
Tata McGraw Hill Education.

LIST OF EXPERIMENTS
1. To Verify Bernoulli's equation.
2. To verify Impulse Momentum Equation
3. Calibration and study of Venturimeter.
4. Determination of Cc, Cv, Cd of Orifices
5. Calibration of Orifice Meter
6. Calibration of Nozzle meter and Mouth Piece
7. Reynolds experiment for demonstration of stream lines & turbulent flow
8. Determination of metacentric height
9. Determination of Friction Factor of a pipe
10. Determination of coefficient of discharge for a broad crested weir & to plot water surface profile over weir

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
SECOND YEAR-Semester – IV
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	Software Lab (AutoCAD)	CE- 4061	0L-0T-2P	2

Course Outcomes: After studying this course, students will be able to

CO1-Ability to create fully constrained solid models that can be quickly modified using standard software tools.

CO2-Ability to use, identify and explain standard features in solid modeling including protrusions, revolutions, cutouts, and patterns

CO3-Ability to use standard software tools to create engineering drawings, or other documents, to fully describe the geometries and dimensions of parts, as well as to document assemblies according to standard practice

CO4-Ability to use standard software tools to create part assemblies and check for clearances.

<div align="center">Introduction to CAD</div>

Introduction to Computer Aided Drafting software for 2D and 3D Modeling, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array.

• Practicing commands under Draw and Dimension Menu

• Practicing commands under Modify Menu.

• Practicing commands under Tool Menu.

• Practicing commands under Format Menu.

• Practicing commands under Express Menu.

Text Book/References Books/ Websites: Nil

List of Experiments:

1. Introduction to CAD, Introduction to AutoCAD, Software and hardware requirements, various input and output devices. Getting started with AutoCAD, Setting drawing limits, Units etc.

2. Learning and practice of Draw commands, Modify commands, utility and other commands.

3. Drawing basic Geometric Shapes, Basic Plotting and Editing Tools, Architectural Views & Drafting Views.

4. 3D modeling with AutoCAD

5. Dimensioning, Annotating in AutoCAD with Text & Hatching, Blocks, drafting symbols and Attributes, Layers, Templates & Design Center, Advanced plotting (Layouts, Viewports)

6. Drawing plan, section and elevation of 1 BHK house.

7. Introduction to STAAD .PRO & Primavera.

8. Designing in STAAD .PRO & Primavera.

9. Structural software for building sysystm in ETABS

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	**Transportation Engineering-I**	**CE.- 5011**	**4L-0T-2P**	**6**

COURSE OUTCOME:
CO 1. Understand concept of Geometric design of roads and various aspects of traffic engineering.
CO 2. Understand various types of bridges and their design aspects.
CO 3. Understand various traffic characteristics and analysis and use the data for road design.
CO 4. Understand various Highway materials and their suitability under different conditions.
CO 5. Understand various aspect of airport planning runway and taxiways. It also covers requirement airport obstruction, lightning and traffic control in airport.

Unit – I
High way planning, Alignment & Geometric Design: Principles of highway planning, road planning in India and financing of roads, classification patterns. Requirements, Engg. Surveys for highway location. Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, numerical problems.
Unit – II
Bituminous & Cement Concrete Payments: Design of flexible pavements, design of mixes and stability, WBM, WMM, BM, IBM, surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints, dowel bars, tie bars. Brief study of recent developments in cement concrete pavement design, fatigue and reliability.
Unit – III
Low Cost Roads, Drainage of Roads, Traffic Engg. & Transportation Planning: Principles of stabilization, mechanical stabilization, requirements, advantages, disadvantages and uses, quality control, macadam roads types, specifications, construction, maintenance and causes of failures. Surface and sub-surface drainage, highway materials: properties and testing etc. Channelized and unchannelised intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip generation, trip distribution, model split, traffic assignment, plan preparation.
Unit – IV
Airport Planning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, windrose diagrams, basic runway length and corrections, classification of airports. Geometrical elements: taxi ways and runways, pattern of runway capacity.
Unit – V
Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surface imaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental lending system, precision approach radar, VOR enroute traffic control.
List of Experiments:
1. Aggregate Crushing Value Test

2. Determination of aggregate impact value
3. Determination of Los Angeles Abrasion value
4. Determination of California Bearing Ratio values
5. Determination of penetration value of Bitumen
6. Determination of Viscosity of Bituminous Material
7. Determination of softening point of bituminous material
8. Determination of ductility of the bitumen
9. Determination of flash point and fire point of bituminous material
10. Determination of Bitumen content by centrifuge extractor
11. Determination of stripping value of road aggregate
12. Determination of Marshall stability value for Bituminous mix
13. Determination of shape tests on aggregate

Reference Books & Study Materials:

1. Highway Engineering by Gurucharan Singh
2. Principles of Pavement Design by E.J. Yoder & M.W. Witzech
3. Highway Engineering by O'Fleherty
4. Highway Engineering by S.K. Khanna & C.E.G. Justo
5. Airport Planning & Design by S.K. Khanna & M. G. arora
6. Foresch, Charles "Airport Planning"
7. Horonjeff Robert "The Planning & Design of Airports"
8. Sharma & Sharma, Principles and Practice of Highway Engg.
9. Haung, Analysis and Design of Pavements

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
THIRD YEAR-Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	**Structure Design Drawing-I(RCC)**	**CE.- 5021**	**3L-1T-2P**	**6**

Courses Outcome
CO 1. To recognize the design philosophies of reinforced concrete structures
CO 2. To apply the principles, procedures and current code requirements to the analysis and design of reinforced concrete beams.
CO 3. To identify the behavior of reinforced concrete members in bond, anchorage, shear and torsion.
CO 4. To identify and design of slab
CO 4. To analyze and design reinforced concrete compression members and the load on the structure such as footings and staircases.

UNIT - I
Basic Principles of Structural Design : Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

UNIT - II
Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

UNIT-III
Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continous slabs, Slabs spanning in two directions, Circular slabs, Waffle slabs, Flat slabs, Yield line theory.

UNIT -IV
Columns & Footings: Effective length of columns, Short and long cloumns- Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

UNIT -V
Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slabless tread-riser staircase.
NOTE :- All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids)
Suggested Books: -
1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Water Resource and Irrigation Engineering	CE.- 5031(A)	4L-0T-0P	4

Course Outcome

CO 1: Demonstrated understanding of physical processes in the context of flood hydrology, including the hydrological cycle in general, and rainfall, loss and groundwater transport mechanisms in particular. It gives understanding of the methods that can be used to measure rainfall and flow, as well as their relative advantages and disadvantages. It gives ability to obtain design rainfall intensities and hyetographs which helps in select appropriate methods of determining design flows and hydrographs in urban and rural areas.

CO 2: Demonstrated ability to solve engineering design problems in the context of flood hydrology and hydrogeology

CO 3: Demonstrated the requirement of water resources planning and management for the various project

CO 4: Creating Plan an Irrigation System which also included analyzing irrigation canals and canal network for design. Creating Plan and design of diversion head works for analyzing design irrigation canal structures. Also included design water wells

UNIT-I

Hydrology : Hydrological cycle, precipitation and its measurement, recording and non-recording rain gauges, estimating missing rainfall data, raingauge networks, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

UNIT-II

Floods and Ground water: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control, confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge necessity and methods of improving ground water storage. Water logging-causes, effects and its Prevention. Salt efflorescence-causes and effects. reclamation of water logged and salt affected lands.

UNIT-III

Water resources planning and management: Planning of water resources projects, data requirements, economic analysis of water resources projects appraisal of multipurpose projects, optimal operation of Projects introduction to linear programming and its application to water Resources projects. Role of water in the environment, rain water harvesting, impact assessment of water resources development and managerial measures.

UNIT – IV

Irrigation water requirement and soil-water-crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils- types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply,

consumptive use and its determination. Irrigation methods surface And subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

UNIT – V

Canal irrigation:

Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lininings-objectives, materials used, economics. Canal falls & cross drainage works, - description and design, head and cross regulators. escapes and outlets, canal transitions.

Well irrigation:

Types of wells, well construction, yield tests, specific capacity level and specific yield, hydraulic design of open wells and tube wells, methods of raising well water, characteristics of pumps and their selection, interference of wells, well losses, advantages and disadvantages of well irrigation.

Suggested Books :-

1. Engg. Hydrology - J.NEMEC - Prentice Hall
2. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
3. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
4. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers

B.E. (CIVIL ENGINEERING)
THIRD YEAR-**Semester – V**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Marine Construction	CE.- 5031(B)	**4L-0T-0P**	**4**

Courses outcome
CO 1:-To understand various national level policies for building and development of marine construction
CO 2:- To understand basic requirement of harbor planning and natural phenomena occurred under marine structure
CO 3:- To understand the basic requirement for design aspect of marine structure which also include Docks and Locks.

UNIT – I
History of water transportation at world level and at national level development and policy, classification of harbours, natural and artificial. Major ports in India, administrative set up. 2.

UNIT – II
Harbour Planning: Harbour components, ship characteristics, characteristics of good harbour and principles of harbour planning, size of harbour, site selection criteria and layout of harbours.
Surveys to be carried out for harbor planning

UNIT – III
Natural Phenomena: Wind, waves, tides formation and currents phenomena, their generation characteristics and effects on marine structures, silting, erosion and littoral drift.

UNIT – IV
Marine Structures: General design aspects, breakwaters -function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories – function, types, suitability, design and construction features.

UNIT – V
Docks and Locks: Tidal basin, wet docks-purpose, design consideration, operation of lock gates and passage, repair docks -graving docks, floating docks.
References books: –
1. A course in docs and harbours: S. P. BINDRA
2. Harbour docs and tunneliing: R. SRINIVASAN
3. Doc and harbour engineering: OZA

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
THIRD YEAR-Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Urban & Town Planning	CE.- 5031(C)	**4L-0T-0P**	**4**

Courses Outcome
CO 1:- To understand the definition, classification and other various aspects of urban planning.
CO 2:- To understand the basing problem encountered in urban plan implementation.
CO 3:- To understand the basic Act and bye-laws of town and country planning.
CO 4:- To understand the basic problem of traffic transportation system in urban areas
CO 5:- To understand the various plan required and implication of these plan is required in urban planning and development.

UNIT-I
Definition and classification of urban areas - Trend of urbanization - Planning process – Various stages of the planning process - Surveys in planning. Plans - Delineation of planning areas. utility of spaces, future growth etc. Role of "Urban Planner "in planning and designing in relation with spatial organization, utility, demand of the area and supply

UNIT-II
Plan implementation- Urban Planning agencies and their functions - Financing- Public, private,Nongovernmental organizations- Public participation in Planning. Development controlregulations. sustainability and rationality in planning, Components of sustainable urban andregional development, Emerging Concepts: Global City, inclusive city, Safe city, etc. City of thefuture, future of the city.

UNIT-III
Town and country planning act- Building bye-laws. Elements of City Planning, Zoning and landuse, Housing. Introduction to landscaping, importance , objectives, principles, elements, UrbanPlanning standards Urban renewal for quality of life and livability.

UNIT-IV
Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems. Legal Issues in Planning and Professional Practice, Concepts and contents related to planning provision regarding property rights, Concept of Arbitration, State and Central government to deal with various matters concerning Town and Country Planning. mechanism for preparation of DP: Land Acquisition Rehabilitation and Resettlement Act 2013.

UNIT-V
Types of Development plans: Master Plan, City Development Plan, Structure Plan, housing, land use, Water Supply & sanitation, etc., Planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc).

Reference Books:-
1.Adib Kanafani.(1983). Transportation Demand Analysis. Mc Graw Hill Series in
Transportation, Berkeley.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill
Book Company, New York.
3. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company,
New York.

4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.

5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.

6. Yoder and Witczak, Priniciples of Pavement Design, John Wiley and Sons

7. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.

8. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)

9. W.Ronald Hudson, Ralph Haas and Zeniswki , Modern Pavement Management, Mc Graw Hill and Co Academic Session 2016-17

10. Relevant IRC Codes

11. Bruton M J (1981), "Introduction to transportation planning", Hutchinson of London

12. Dickey J W(1980), "Metropolitan Transportation Planning", Tata McGraw Hill

13. Principles of Transportation Engineering : P. Chakraborty and A. Das

14. Fundamentals of Transportation Engineering: : C.S. Papacoastas

15. Traffic Engineering and Transport Planning: : L.R. Kadyal

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Fluid Mechanics-II	CE.- 5041(A)	**4L-0T-0P**	**4**

Course Outcomes:-
CO 1. Students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
CO 2. They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady conditions.
CO 3. Problems pertain to design, construction as well as efficient working of various types of hydraulics structures and machines is considerably simplified by using dimensional analysis and model studies.
CO 4. Impact of Jet on vanes which is a base for analysis and design of turbo machines.
CO 5. They will have knowledge in hydraulic machines(pumps and turbines)

UNIT I
Laminar and turbulent boundary layers and laminar sublayer, boundary layer concept, aging of pipes. Losses due to sudden expansion and contraction, losses in pipe fittings andvalves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes. Concept of Water Hammer, transmission of power.

UNIT-II
Uniform flow in open channels: Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections.

UNIT-III
Non uniform flow in open channels: Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing.

UNIT-IV
Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and an Aerofoil, development of lift, lifting vanes, Magnus effect.

UNIT-V
Hydraulic Machines:
Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton-wheel turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & setting, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation.
Pumps:
Centrifugal pumps: Various types and their important components, manometric head, total Head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves.
EVALUATION: Evaluation will be continuous and integral part of the class followed by final examination.

REFERENCE

1. Fluid Mechanics – Modi & Seth – Standard Book house, Delhi
2. Open Channel Flow by Rangaraju – Tata Mc Graw – Hill Publishing Comp. Ltd., New Delhi
3. Fluid Mechanics – A.K. Jain – Khanna Publishers, Delhi
4. Fluid Mechanics, Hydraulics & Hydraulic Machanics – K.R. Arora – Standard Publishers Distributors
1705-B, NaiSarak, Delhi-6
5. Hyd. Of open channels by Bakhmetiff B.A. (McGraw Hill, New York)
6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)
7. Engineering Hydraulics by H. Rouse
8. Centrifugal & Axial Flow Pump by Stempanoff A.J. New York

LIST OF EXPERIMENT
1. Study the performances characteristics of Pelton Wheel
2. Study the performances characteristics of Francis Turbine
3 Calibration of multistage (Two) Pump & Study of characteristic of variable speed pump
4. To study the performance & details of operation of Hyd. Ram
5. Determination of coefficient of discharge for a broad crested weir & to plot water surface Profile over weir

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
THIRD YEAR-Semester – V
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Remote Sensing & GIS	CE.- 5041(B)	**4L-0T-0P**	**4**

Course Outcome

CO1: Students should be able to learn the basic principles of remote sensing. Describe the process of data acquisition of satellite images and their characteristics.

CO2 : To Retrieve the information content of remotely sensed data and Analyses the energy interactions in the atmosphere and earth surface features. Interpret the images for preparation of thematic maps

CO3: Students able to explain the concepts and fundamentals of GIS

CO4: Gain knowledge in modern image interpretation and recent analysis techniques.

CO5: Compute knowledge of remote sensing and GIS in different civil engineering applications.
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UNIT-I
Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements ofvisual interpretation techniques.

UNIT-II
Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions(spatial, spectral, radiometric and temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity , Earth Rotation) and non-systematic [random] errors(Altitude, Attitude), Image enhancements(Gray Level Thresholding, level slicing, contrast stretching),image filtering.

UNIT-III
Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones

UNIT-IV
Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion.

UNIT-V
Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services And Its Applications.

Reference Books:-:

1.Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.

2.Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.

3.Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

4.Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
5.Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
6.Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Renewable Energy Sources	CE.- 5041(C)	**4L-0T-0P**	**4**

Courses Outcome

CO 1:- To understand the growing requirement of renewable energy system with the growing requirement of population.

CO 2:- To understand the design requirement of wind energy system

CO 3:- To understand the requirement of solar energy system. How this can be effectively and efficiently. It gives insight of biomass energy system for energy generation and its use.

CO 4 :- To understand how energy from oceans can be used form energy generation.

CO 5 :- To understand to conservation, audit and measurement of electric energy for efficient use of it.

UNIT - I

Renewable Energy Systems Energy Sources, Comparison of Conventional and nonconventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management.

UNIT – II

Wind Energy System Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind- diesel, wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for stand alone systems. Use of electronic load controllers and self excited induction generators. Wave Energy System: System configuration: grid connected and hybrid Systems.

UNIT - III

Solar Radiation Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Phototonic System Solar cell, Solar cell materials, efficiency, Charact eristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels. Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

UNIT - IV

Energy from oceans Ocean temperature difference, Principles of OTEC, plant operations, Geothermal Energy Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern nonconventional energy sources.

UNIT - V

Electric Energy Conservation Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, airconditioning, power plants, process industries, illumination etc. Methods of Energy Audit. Measurements systems; efficiency measurements. energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers.

Reference Books:-:

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.

2. El Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York USA
5. Anna Mani, "Wind Energy Resource Survey in India-Ill", Allied Publishers Ltd., New Delhi,
6. S.P. Sukhatme: Solar Energy, TMH- 4e,
7. Dr. A. Ramachandran, Prof B.V Sreekantan & M F.C. Kohli etc, "TERI Energy Data Directory & Year book 1994-95", Teri Tata Energy Research Institute, New Delhi,
8. Solanki –Renewable Energy Technologies – PHI Learning
9. Sawhnew –Non Conventional Energy Resources – PHI Learning

R.K.D.F. UNIVERSITY, BHOPAL

B.E. **(CIVIL ENGINEERING)**
THIRD YEAR-**Semester – V**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Material Testing Lab	CE.- 5051	0L-0T-2P	2

List of Experiments:
1. To determine the normal consistency of cement.
2. To determine the initial and final setting time of cement .
3. To determine compressive strength of cement.
4. To determine the soundness of cement.
5. To determine the fineness modulus of fine aggregate & course aggregate.
6. Mix design of concrete by IS code Method.
7. Slump test for determining workability of concrete.
8. Compressing strength of concrete cube.
9. To determine the flexure strength of concrete.

R.K.D.F. UNIVERSITY, BHOPAL

B.E. **(CIVIL ENGINEERING)**
THIRD YEAR-**Semester – V**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Non-Destructive Testing	CE.- 5061	0L-0T-2P	2

1. Determine Compressive Strength of concrete by using Manual Rebound Schmidt Hammer.
2. Determine Compressive Strength of concrete by using DIGISCHMIDT 2000 Concrete test hammer.
3. Determine the Pulse Velocity, Crack Depth and Compressive Strength of concrete by using PUNDIT – lab ultrasonic instrument.
4. Determine the concrete ability to resist chloride ion penetration.
5. Determine the Dampness in Building Material by using James Instrument Aquameter.
6. Determine Location of Rebars, measurement of concrete cover and bar diameter by using Rebar detector.
7. Determine the Humidity of Concrete and other structure by using Vaisala Structural Humidity Measurement Kit SHM40.
8. Determine the Rate of Corrosion in concrete structure by using CORMAP II.
9. Determine Resistivity of Concrete by using Resipod.

B.E. (CIVIL ENGINEERING)
THIRD YEAR-Semester – VI
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Environmental Engineering-II	CE.- 6011	4L-0T-2P	6

UNIT – I
Estimation of ground and surface water resources. quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population.

UNIT – II
Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis of water, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps -operation & pumping stations.

UNIT – III
Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

UNIT – IV
Layout and hydraulics of different distribution systems, pipe fittings, valves and appurtenances, analysis of
distribution system. Hardy cross method, leak detection, maintenance of distributionsystems, service reservoir capacity and height of reservoir.

UNIT – V
Rural water supply schemes, financing and management of water supply project, water pollution control act, conservancy & water carriage system, sanitary appliance and their operation, building drainage system of plumbing.

Suggested Books and Reading Materials:-
1. Water Supply Engineering by B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engg. by G.S. Birdi - Laxmi Publications (P) Ltd. New Delhi
3. Water & Waste Water Technology by Mark J.Hammer - Prentice - Hall of India, New Delhi
4. Environmental Engineering - H.S. Peavy & D.R.Rowe - Mc Graw Hill Book Company,New Delhi
5. Water Supply & Sanitary Engg. by S.K. Husain
6. Water & Waste Water Technology - G.M. Fair & J.C. Geyer
7. Relevant IS Codes

List of Experiments:
1. To study the various standards for water
2. To study of sampling techniques for water
3. Measurement of turbidity
4. To determine the coagulant dose required to treat the given turbid water sample
5. To determine the conc. of chlorides in a given water samples
6. Determination of hardness of the given sample
7. Determination of residual chlorine by "Chloroscope"
8. Determination of Alkalinity in a water samples
9. Determination of Acidity in a water samples

10.Determination of Dissolved Oxygen (DO) in the water sample.

THIRD YEAR-**Semester – VI**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Geo Tech Engineering	CE.- 6021	3L-1T-2P	6

Courses outcome
CO 1. To understand the origin of soil and to identify different types of soil.
CO 2. To understand the various physical and engineering characteristics of different types of soil.
CO 3. To understand the concept of slope stability.
CO 4. To appreciate the use of modern technology in the field of geotechnical
engineering

UNIT – I
Basic Definitions & Index Properties: Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behaviour. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

UNIT – II
Soil Water and Consolidation: Soil water, Permeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flownets, uses of a flownet, Effective, neutral and total stresses. Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of preconsolidation pressure, settlement analysis. Calculation of total settlement.

UNIT – III
Stress Distribution in Soils and Shear Strength of Soils: Stress distribution beneath loaded areas by Boussinesq and water gaurd's analysis. Newmark's influence chart. Contact pressure distribution.
Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

UNIT – IV
Stability of Slopes: Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

UNIT – V
Lateral Earth Pressure: Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less and cohesive soils. Effect of surcharge, water table and wallfriction. Arching in soils. Reinforced earth retaining walls.
LABORATORY WORK : Laboratory work will be based on the above course as required for soil investigators of engineering projects.
List of Experiments:
1. Determination of Hygroscopic water content
2. Particle - size analysis
3. Determination of Specific gravity of soil particles
4. Determination of plastic limit
5. Determination of liquid limit

6. Determination of shrinkage limit
7. Permeability tests
8. Direct shear test
9. Consolidation test

Suggested Books: -

1. Soil Mech. & Found. Engg. by Dr. K.R. Arora - Std. Publishers Delhi.
2. Soil Mech. & Found. by Dr. B.C.Punmia- Laxmi Publications, Delhi.
3. Modern Geotech Engg. by Dr.l Aram Singh - IBT Publishers, Delhi.
4. Geotech Engg. by C. Venkatramaiah - New Age International Publishers, Delhi
5. Soil Mech. & Found. Engg. by S.K. Garg- Khanna Publishers, Delhi.
6. Soil Testing for Engg. by T.W. Lambe - John Wiley & Soms. Inc.
7. Relevant I.S. Codes

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Quantity Surveying & Costing	CE.- 6031(A)	4L-0T-0P	4

CO1: To know the importance of preparing the types of estimates under different conditions.
CO2: To apply logical thoughts and prepare the rate analysis and bills.
CO3: To comprehend detailed report on estimation and valuation process
CO4: To analyze and synthesize cost effective approach for civil engineering projects.
CO5: To evaluate the cost of expenditure and prepare a detailed rate analysis report

UNIT – I

Introduction: Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

UNIT – II

Rate Analysis: Task for average artisan, various factors involved in the rate of an item,material and labour requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)

UNIT – III

Detailed Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.

UNIT – IV

Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building. Preparation of DPR. Contracts: Different types notices inviting tenders, contract documents, security deposit and earnest money, conditions of contract, arbitration.

UNIT – V

Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.
Suggested Books:
1. Quantity Surveying & Costing – B.N. Datta
2. Estimating & Costing for Civil Engg. – G.S. Birdi
3. Quantity surveying & costing – Chakraborty
4. Estimating & Costing – S.C. Rangawala
Practical & Sessional Works:
1. Preparation of detailed estimate.
2. Detailed estimate for services of plumbing and water supply or Electrification work.
3. Detailed estimate for earth work for the road construction or arched culvert.
4. Rate analysis for at least 8 items of construction.
5. Preparation of DPR of Civil Engineering Project

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	**Entrepreneurship Development and Management**	**CE.- 6031(B)**	**4L-0T-0P**	**4**

Course Objective

CO(1) :-Understanding basic concepts in the area of entrepreneurship,
CO(2):-Understanding the role and importance of entrepreneurship for economic development, developing personal creativity and entrepreneurial initiative, adopting of the key steps in the elaboration of business idea.
Co(3):-Understanding the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.

UNIT-I
Introduction to Entrepreneurship: Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, agencies in entrepreneurship management and future of entrepreneurship.
 The Entrepreneur: Meaning of entrepreneur, the skills required to be an entrepreneur, the entrepreneurial decision process, and role models, mentors and support system.

UNIT-II
Business Opportunity Identification: Business ideas, methods of generating ideas, and opportunity recognition Preparing a Business Plan: Meaning and significance of a business plan, components of a business plan, and feasibility study

UNIT-III
Financing the New Venture: Importance of new venture financing, types of ownership securities, venture capital, types of debt securities, determining ideal debt-equity mix, and financial institutions and banks
 Launching the New Venture: Choosing the legal form of new venture, protection of intellectual property, and marketing the new venture

UNIT-IV
Managing Growth in New Venture: Characteristics of high growth new ventures, strategies for growth, and building the new venture capital

UNIT-V
Harvesting Rewards: Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy
 REFERENCES :

• 	Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
• 	Donald F Kuratko, " Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.
• 	Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
• 	Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition

Dream tech, 2005.
- Rajeev Roy, 'Entrepreneurship' 2nd Edition, Oxford University Press, 2011.
- EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
THIRD YEAR-**Semester – VI**

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	**Cost-Effective & Eco-Friendly Construction**	**CE.- 6031(C)**	**4L-0T-0P**	**4**

Courses outcome

CO1:- It gives the proper understand of utilization of concepts of energy efficient and environment friendly materials and techniques.

CO2:- There are various applications of cost effective techniques in construction such as building, sanitation and low cost road.

C03:- Cost analysis and comparison with conversional construction material and techniques is made.

UNIT-I

Concepts of energy efficient & environment friendly materials and techniques: Cost effective materials: Soil, Fly ash, Ferro-cement, Lime, Fibers, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer.

Energy Efficient & Environment friendly building material products: Walls - Stabilized and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferro cement partitions. Roofs – Pre-cast R.C. Plank & Joists roof, Pre-cast channel roof, Pre-cast L-panel roof, Pre-cast Funicular shells, Ferro cement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

Green Materials, Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials.

UNIT-II

Cost effective construction techniques and equipments:-

(a) Techniques: Rat trap bond construction, Energy Efficient roofings, Ferro cement technique, Mud Technology.

(b) Equipments: Brick moulding machine, Stabilized soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferro cement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

UNIT-III

Cost effective sanitation:

(a) Waste water disposal system

(b) Cost effective sanitation for rural and urban areas

(c) Ferrocement Drains

UNIT-IV

Low Cost Road Construction:

Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

UNIT-V

Cost analysis and comparison: (a)All experimental materials (b)All experimental techniques Green Building rating systems

Reference books:

1. Alternative Building Materials and Technologies – K S Jagadeesh, B V Venkatta Rama Reddy &

K S NanjundaRao – New Age International Publishers

2. Integrated Life Cycle Design of Structures – AskoSarja –CRC Press

3. Non-conventional Energy Resources –D S Chauhan and S K Sreevasthava – New Age International Publishers

4. Buildings How to Reduce Cost – Laurie Backer - Cost Ford

5. Lynne Elizabeth, Cassandra Adams Alternative Construction : Contemporary Natural BuildingMethods ", Softcover, Wiley & Sons Australia, Limited, John,2005

6. Givoni, "Man, Climate, Architecture, Van Nostrand, New York, 1976.

7. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery,John Wiley & Sons,2005.

8. Eugene Eccli- Low Cost, Energy efficient shelter for owner & builder, Rodale Press, 1976

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
THIRD YEAR-**Semester – VI**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Environmental Impact Assessment (EIA)	CE.- 6041(A)	4L-0T-0P	4

COURSE OUTCOMES:

CO1: The student will develop of major problems in Environmental impact and control, regulations.
CO2: The students will be able to familiar with regulations pertinent to environmental problems.
CO3: The students will be able to describe general environmental impact problems, meteorological definitions.
CO4: The students will be able to present the results as a report in the record notebook.
CO5: The students will develop the ability to learn from the mistakes ethically and increase the quality of design.

UNIT-I

INTRODUCTION Impact of development projects under Civil Engineering on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA.

UNIT-II

METHODOLOGIES
Methods of EIA –Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives – Case studies.

UNIT-III

PREDICTION AND ASSESSMENT
Assessment of Impact on land, water and air, noise, social, cultural flora and fauna; Mathematical models; public participation – Rapid EIA.

UNIT-IV

ENVIRONMENTAL MANAGEMENT PLAN
Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People – ISO 14000

UNIT-V

CASE STUDIES
EIA for infrastructure projects – Bridges – Stadium – Highways – Dams – Multi-storey Buildings – Water Supply and Drainage Projects

TEXT BOOKS
1. Canter,L., Environmental Impact Assessment, McGraw-Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis",
Common Wealth Publishers, New Delhi, 1992.

REFERENCES
1. John G. Rau and David C Hooten (Ed)., Environmental Impact Analysis Handbook, McGraw-Hill Book Company, New York, 1990.
2. Environmental Assessment Source book, Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith petts, handbook of environmental impact assessment vol. i & ii, blackwell science, 1999.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
THIRD YEAR-**Semester – VI**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Structural Design & Drawing-II (R.C.C)	CE.- 6031(B)	4L-0T-0P	4

Courses Outcome

CO 1:- To understand basic requirement for design of multistory building

CO 2:- To understand the design requirement of Earth retaining structures

CO 3:- To understand the design requirement of overhead water tanks

CO 4:- To understand the design requirement of storage such as silos and bunkers.

CO 5:- To understand the design required T-beams and slab bridges. It also includes Prestressing concept and other requirement.

UNIT – I

Design of Multistory Buildings – Sway and nonsway buildings, Shear walls and other bracing elements.

UNIT II

Earth Retaining Structures: Cantilever and counter fort type's retaining walls.

UNIT – III

Water Tanks: Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks.

UNIT – IV

Silos and Bunkers

UNIT – V

T-beam & Slab bridges- for highway loading (IRC Loads). Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

Suggested Books: -

1. R.C.C. by O.P. Jain Vol. II
2. R.C.C. by B.C. Punmia
3. Essentials of Bridge engineering – D.J. Victor
4. Bridge Engineering – Ponnuswamy
5. Advanced R.C.C. Design by N.K. RAJU
6. N.Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill, New Delhi.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
THIRD YEAR-**Semester – VI**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Operational Research	CE.- 6041(C)	4L-0T-0P	4

Courses outcome

CO 1.Operational research given knowledge of various tool and techniques for optimization of various aspect of work.

CO 2. Linear models help to identify the co-relationship between various parameters.

CO 3. Transportation model helps to identify optimization of cost of distribution and network model (CPM & PERT) helps to optimization of route.

CO 4. An inventory model helps to maintain the inventory for required project.

CO 5. Queueing models helps to analysis and check on entire process carried.

CO 6. Decision models help in making decision by various input given at various stages of work.

UNIT-I

Linear Models: The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT-II

Transportation Models And Network Models: Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT-III

Inventory Models: Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT-IV

Queueing Models: Queueing models – Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT -V

Decision Models: Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variable search technique – Dynamic Programming – Simple Problem.

Books Recommended
Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
THIRD YEAR-**Semester – VI**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.E.(Civil)	Quantity Surveying and Cost Lab	CE.- 6051	0L-0T-2P	2

List of Experiments:
1.. Preparation of detailed estimate.
2. Detailed estimate for services of plumbing and water supply or Electrification work.
3. Detailed estimate for earth work for the road construction or arched culvert.
4. Rate analysis for at least 8 items of construction.
5. Preparation of DPR of Civil Engineering Project.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. (CIVIL ENGINEERING)
THIRD YEAR-**Semester – VI**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours	Total Credits

				per Week	
B.E.(Civil)	**Prestressed Concrete Structure Lab**	**CE.- 6061**		**0L-0T-2P**	**2**

List of Tutorials:

Based on Syllabus students shall perform following.
1. Fabrication, casting and testing of simply supported prestressed concrete beam/slab (pres-tensioned or post-tensioned) for strength and deflection behaviour.
2. Fabrication, casting and testing of beam/slab (pres-tensioned or post-tensioned) with different layout of cables for strength and deflection behaviour
3. Fabrication, casting and testing of various prestressed structures as per contents given in the syllabus
4. Minimum 15 problems from above topics along with cross checking using any opensource / professional software.
5. Modeling and analysis of at least one real-life structure using open-source/ professional software

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Advanced Structural Design (Steel)**	**CE- 7011**	**3L-1T-2P**	**6**

Course objectives:
• To introduce steel structures and its basic components and structural steel fasteners like welding and bolting
• To design tension members, compression members, beams and beam-columns
• To design column splices and bases.
• Able to understand properties of steel under loading conditions.
• Able to determine the ultimate bending moment capacity of steel members considering both yielding and lateral buckling.
• Ability to analyze railway bridge, footbridge, water tanks and Chimneys.

Course Content:-

UNIT – I

Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, Design of structural connections -Bolted, Rivetted and Welded connections. Design of compression members, Tension members

UNIT – II

Design of simple beams, Built-up beams, Plate girders and gantry girders.

UNIT-III

Effective length of columns, Design of columns-simple and compound, Lacings & battens. Design of footings for steel structures, Grillage foundation

UNIT – IV

Plate girder bridges (Riveted and welded).
Trussed girder bridges for railways and highways (IRC & IRS holding).

UNIT – V

Chimneys: Guyed and self supporting steel stacks.

Course outcomes:
• Learn the basic elements of a steel structure
• Learn the fundamentals of structural steel fasteners
• Able to design basic elements of steel structure like tension members, compression members, beams and beam-columns
• Able to design column splices and bases.

Reference Books :-
i) Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
ii) Design of steel structures by P.Dayaratnam
iii) Design of steel structures Vol. I & II by Ramchandra
iv) Design of steel structures by L.S. Negi
v) Design of steel structures by Ramammutham
vi) Design of steel structures by PunmiaCE-4005 Structural Analysis-I

Vii) Design of steel structures by Punmia

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Computation Methods in Structure Engineering**	**CE- 7021(A)**	**3L-1T-0P**	**4**

Courses objective:-
To give deep knowledge of computer based Matrix methods in order to solve complex engineering structure.

UNIT - I
Matrix formulation for the principle of virtual work and energy principles, principle of contragradience, stiffness and flexibility matrices, Degree of Freedom. Axial, bending, shear and torsional deformations. Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beam column, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions. nonprismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

UNIT - II
Basics of the Direct Stiffness method - Analysis of pinjointed frames, rigid jointed structures,plane grids and composite structures for different loads including temperature, shrinkage,prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Nonsway)

UNIT - III
Concepts of Bandwidth, various storage schemes & equation solvers; Reduction in order of stiffness matrix – use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Method

UNIT - IV
Analysis of continuum structures - Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalised element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

UNIT - V
Two Dimensional Iso parametric elements, shape functions for Simplex. Lagrangian and Serendipidity family elements in natural coordinates, computation of stiffness matrix for isoparametric elements, degrading of elements, plate bending elements.

Courses outcome
- Understood different computational methods and their applicability for the solution of engineering problems.
- Learned different differentiation and integration techniques used in numerical methods.
- Learned different interpolation techniques and their application.
- Capable in selection and use of computational techniques for modelling of various engineering problems.

Reference Books :-
1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach, Chapman and Hall, New York.
2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishers and Distributors, New Delhi.
3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.
4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.
5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.

6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact	Total

			Hours per Week	Credits
CE	**Design of Hydraulic Structure**	**CE- 7021(B)**	**3L-1T-0P**	**4**

Course content
The course covers the basics in hydraulics of Gravity, Earth and rock fill dams, hydraulic design of energy dissipation structures, spillways and outlets, surge tanks, hydraulic steel works, valves, gates and Hydropower Plants details.

UNIT – I
Gravity dams: Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

UNIT – II
Earth Dams: Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.
Rock fill dams: Types, merits and demerits, conditions favourable for their adoption.

UNIT – III
Spillways : Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.

UNIT – IV
Energy dissipations and gates: Principles of energy dissipation Energy dissipaters based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles and details. Design of canal regulating structures, Detailed design of Sarda Falls, design of cross drainage works, sphypon aquaduct.

UNIT – V
Hydropower Plants: Introduction of Hydropower development, assessment of power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft tubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details

Courses Outcome
The course provides basic knowledge of equations for calculations of water flow in rivers around hydraulic structures. The students shall be able to plan and design hydraulic structures and waterways of a hydropower plant based on the content of the course.

- Knowledge about various type of hydraulic structures and their function
- Knowledge about Design principles of gravity and earth dams
- Knowledge about Components of diversion head work and their How do the energy balance is associated with a hydraulic jump
- Energy balance. What does critical flow and the specific energy concept mean

- How the flow pattern change under different influences
- How is the flow downstream a spillway and through an opening
- How the river develops various water lines
- Which pipeline is best for the given hydraulic condition.

Reference Books: -
1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. by Punmia & Pandey
5. Water Power Engineering by Dandekar

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Structural Dynamics**	**CE- 7021(C)**	**3L-1T-0P**	**4**

Course Objective

The objective of the course is to understand the behavior of structure to various dynamic loads.

Course Outcome

The students will learn the effect of dynamic loading on the structure and its analysis. Evaluation: Evaluation will be continuous and integral part of the class followed by final examination.

Course Contents

UNIT-I

Undamped Single Degree of Freedom System Degree of freedom, undamped system, Force displacement relation, damping force, Equation of motion, mass-spring damper system, D'Alembert's Principle, Solution of differential equation of motion, frequency, period and amplitude of motion.

UNIT-II

Damped Single Degree of Freedom System Viscous damping, equation of motion, critically damped systems, over and under damped systems, logarithmic decrement.

UNIT-III

Response to harmonic and periodic vibrations Harmonic vibration of undamped and viscously damped systems, natural frequency and damping, force transmission and vibration isolation, Fourier series representation, response to periodic force.

UNIT-IV

Response to Arbitrary, Step, and Pulse Excitation Response to unit impulse, arbitrary force, Duhamel's Integral, step force, rectangular pulse force,half cycle sinusoidal pulse force, triangular pulse force.

UNIT-V

Multi Degree of Freedom System:Matrix formulation, stiffness and flexibility influence coefficients, eigen value problem, normal modes and their properties. Matrix iteration technique for eigen value, and eigen vectors, Free andforced vibration by modal analysis.

Reference Books:

1. Chopra A. K., Dynamics of Structures, Prentice Hall of India, NewDelhi,
2. Clough R.W., Penzien J., Dynamics of structures, McGraw-Hill
3. Biggs J M, Introduction to Structural Dynamics
4. Mario Paz, Structural Dynamics, CBS publishers New Delhi

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Environmental Engineering-III**	**CE- 7021(D)**	**3L-1T-0P**	**4**

Courses Objective:-
To give the knowledge of sewerage schemes and it's their importance characteristics. It also impart the knowledge of unit operations and design

UNIT –I
Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.
Characteristics and analysis of waste wate, rcycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Th OD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

UNIT –II
Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment, Sewage filtration theory& design.

UNIT –III
Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & imhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

UNIT – IV
Advanced Waste Water treatment - Diatomaceous earth filters, ultra filtration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, and Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil

UNIT – V
Solid Waste Management: Quantity, Composition and characteristics of solid waste, Methods of solid waste collection, conveyance, treatment and disposal.

Outcomes of course:
1. The students will get a diverse knowledge of environmental engineering practices applied to real life problems.
2. The students will learn to understand the theoretical and practical aspects of environmental engineering along with the design and management applications
3. Students understood Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water
4. Students understood industrial waste water quantity and quality for achieving better sanitation in society

Suggested Books and Reading Materials:-

Reference Books:
1. A.P. Sincero and G.A. Sincero, Environmental Engineering, Prentice Hall of India,New Delhi.
2. G. Tchabanoglous, Solid Waste Treatment and Disposal, McGraw Hill Pub.
3. G.S. Birdie and J.S. Birdie, Water Supply and Sanitary Engineering, Dhanpat RaiPublishing Co. New Delhi.
4. H.S. Peavy, D.R. Rowe and G. Tchbanoglous, Environmental Engineering,McGraw Hill International

Editions
5. J.A. Salvato, Environmental Sanitation, Wiley Interscience.
6. M.L. Davis and D.A. Cornwell, Introduction to Environmental Engineering,
7. S.K.Garg ,Water Supply Engineering by Khanna Publisher
8. Metcalf and Eddy,(Revised by G. Tchobanoglous) Wastewater Engineering & Treatment, disposal
Reuse, Tata-McGraw Hill, New Delhi

B. Web Material
1. http://www.epa.gov
2. http://www.indiaenvironmentportal.org.in
3. http://nptel.iitm.ac.in
4. http://www.filtersource.com
5. https://dgserver.dgsnd.gov.in

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Internet of Things**	**CE- 7031(A)**	**4L-0T-0P**	**4**

Course Objectives :
The course provides basic knowledge of how to connect various devices through Internet and control them remotely. It will provide methods for different types of networking and data storage. The course aims at providing communication overview and protocols for safe and secure data access and transfer and maintain confidentiality and integrity.

Course Outcomes (COs):
After completion of the course the students should be able to
1. Understand in depth about Internet of things.
2. Establish secure communication for his network for his devices connected in IOT.
3. Store his data securely on cloud and access it when required
4. Design web based application using various internet protocols and services
5. Use sensor technology and RFID and wireless networking for maintaining privacy and security concern in smart city and housing environmental considerations.

UNIT-I
Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.

UNIT-II
Machine-to-machine (M2M), SDN (software defined networking) and NFV(network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

UNIT-III
Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, MQTT, CoAP, SOAP, REST, HTTP Restful and Web Sockets.
Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.

UNIT-IV
Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology.

UNIT-V
IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view. IOT Privacy and security solutions, Raspberry Pi &arduino devices.IOT Case studies: smart city streetlights control & monitoring.

Reference Book:
1. Rajkamal, ”Internet of Things”, Tata McGraw Hill publication
2. Vijay Madisetti and Arsh deep Bahga, "Internet of things(A-Hand-on-Approach)" 1st Edition ,Universal Press
3. Charless Bell "MySQL for the Internet of things", A press publicatons.
4. Francis dacosta "Rethinking the Internet of things: A scalable Approach to connecting everything", 1st edition, A press publications .
5. Hakima Chaouchi "The Internet of Things: Connecting Objects", Wiley publication.
6. Donald Norris "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black", McGraw Hill publication.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-Semester – VII
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Construction Planning and Management**	**CE- 7031(B)**	**4L-0T-0P**	**4**

Courses objective:-
Understand the different activities in software project development i.e, planning, design and management.
Courses Outcome:-
1. Understanding the evolution and improvement of software economics according to the basic parameters and transition to the modern software management.
2. Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process.
3. Gaining knowledge about the various artifacts, workflows and checkpoints of the software management process and exploring the design concept using model based architecture from technical and management perspective.
4. Develop an understanding of project planning, organization, responsibilities, automation and control of the processes to achieve the desirable results.

Course Contents

UNIT –I
Preliminary and detailed investigation methods: Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

UNIT –II
Construction equipments: Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

UNIT –III
Contracts: Different types of controls, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

. UNIT –IV
Specifications & Public Works Accounts: Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill

UNIT-V
Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with

waiting line method.

Reference Books :-
1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Integrated Waste Management**	**CE- 7031(C)**	**4L-0T-0P**	**4**

Course Objectives:
CO1: To Aware about the problems associated with Municipal solid waste(MSW) and their effective management.
CO2: To understand the components of Integrated solid waste management system.
CO3: To learn about recycling, reuse and reduce, recover of solid wastes and Transfer station.
CO4: To examine the operation of a resource recovery facility, waste-to-energy strategies.
CO5: To study the design and operation of a municipal solid waste composting and land-filling.

UNIT I:
INTRODUCTION OF SOLID WASTES:-Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes: Physical, chemical and biological characteristics-Problems occur due to improper disposal of solid wastes.

UNIT II:
INTEGRATED SOLID WASTE MANAGEMENT:-Definition- Reduction, reuse, recycling and recovery principles of waste management- Functional elements of integrated solid Waste management-Waste generation and handling at Source-Collection of solid wastes- Collection methods and services-guidelines for collection route layout.

UNIT III:
INTRODUCTION OF TRANSFER STATION:-Transfer Station-Processing and segregation of the solid waste- various methods of material segregation. Importance of Transfer Stations. Site selection of transfer stations.

UNIT IV:
PROCESSING AND TRANSFORMATION OF SOLID WASTES:-Composting: definition-methods of composting-advantages of composting, Incineration: definition methods of incineration-advantages and disadvantages of incineration.

UNIT V:
DISPOSAL OF SOLID WASTE:-Volume reduction, Open dumping, land filling techniques. Landfills: Classification-Design and Operation of landfills, Land Farming, Deep well injection.

Course Outcomes:
After studying this course, students will be able to:
CO1: Review the components of solid waste management system as per need of particular locality, town or city.
CO2: Be aware of the significance of recycling, reuse and reduction and recovery of solid wastes.
CO3: Develop an insight into the collection, transfer, and transport of municipal solid waste.
CO4: Understand the importance and operation of a resource recovery facilities like waste-to-energy Technologies-Biochemical and thermochemical.
CO5: Understand the design and operation of a municipal solid waste composting and landfilling.

Text Books:
1. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, Integrated Solid Waste management, Tata McGraw Hill
2. Ramachandra T.V., Management of Municipal Solid Waste, 2009; by The Energy and Resource Institute, TERI
3. Sasikumar, K, Gopi Krishna, Sanoop, Solid Waste Management; 2009, PHI.

Reference Books:

1. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
2. MSW Management Rules 2016, Govt. of India, available online at CPCB website

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R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

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Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Geology**	**CE- 7031(D)**	**4L-0T-0P**	**4**

Courses Objective :-
The objective of the courses is to study the physical, mineralogy & Crystallography and petrology of the various rock . structural and applied geology gives various application to structure of various rocks.
Courses Outcome:-
- Understand the concepts of various geological materials and weathering processes.
- Understand the properties, behaviour and engineering significance of different type of rocks and minerals.
- Learned the interpretation skills of geological maps having different type of geological features.
- Learned consideration and importance of geological aspects in civil engineering related infrastructure projects.

UNIT-I
Introduction and Physical Geology: Objects and scope of geology.The crust and the interior of the earth, origin and age of the earth, Sub-aerial and sub-terrain weathering,denudation and deposition, wind, river, glacial and marine erosion, volcanoes , soil formation, soil profile, geological classification of soil and concept of earthquake Plate- tectonics.

UNIT-II
Mineralogy and Crystallography: Fundamentals of mineralogy, study of common rock forming minerals,ores & minerals of economic importance to civil engineering., elements of crystallography and introduction to crystal systems.

UNIT-III
Petrology: Composition of earth's crust, study of igneous, sedimentary and metamorphic rocks and their formation, characteristics classification, Rocks of civil engineering importance.
Geology of India: Physical features of India, Brief geological history of India, occurrence of important ores and minerals in India.

UNIT-IV
Structural Geology: Structures related to rocks,Dip,Strike and outcrops,Classification and detailed studies of geological structures i.e. folds,Faults,Joints,Un-conformity and their importance in Civil Engineering.

UNIT-V
Applied Geology: Introduction to applied geology and its use in civil engg.,properties of rocks, selection of sites for roads, bridges,dams, reservoirs and tunnels.Prevention of engineering structures from seismic shocks, stability of hill sides,water bearing strata, artesian wells, Use of remote-sensing techniques in selection of above sites.

REFERENCE READINGS:-
1. Prabin Singh – "Engineering and General Geology"

2. Gulati , Geotechnical Engineering; TMH
3. P.K. Mukerjee – " A text Book of Geology"
4. S.K. Garg – " A text Book of Physical and Engineering Geology"

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Advances Surveying Lab**	**CE- 7041**	**0L-0T-2P**	**2**

COURSE LAYOUT
1. Introduction to EDM
2. Setting and working with Total station
3. Layout drawing of Land Surveying and topology mapping using Total station
4. Introduction to Global Positioning System (GPS)
5. Introduction to Differential Global Positioning System (DGPS)
6. Drawing layout with DGPS(include mission planning and data processing)
7. Working with Google earth
8. Introduction to Remote sensing
9. Introduction to GIS
10. Working with open sources software like QGIS (DIGITAL LAND SURVEYING AND MAPPING (DLS)

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	IOT Lab	CE- 7051	0L-0T-2P	2

List of Experiments

LAB INDEX Design, Developed and implement following using Arduino, Raspberry Pi compiler and Python language in Linux/Windows environment.

1. Study and Install IDE of Arduino and different types of Arduino.

2. Write program using Arduino IDE for Blink LED.

3. Write Program for RGB LED using Arduino.

4. Study the Temperature sensor and Write Program foe monitor temperature using Arduino.

5. Study and Implement RFID, NFC using Arduino.

6. Study and Configure Raspberry Pi.

7. WAP for LED blink using Raspberry Pi.

8. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.

9 . Study and implement MQTT protocol using Arduino.

10. Study and implement CoAP protocol using Arduino.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Theory of Structure**	**CE- 8011**	**3L-1T-2P**	**6**

COURSE OBJECTIVE
- To understand the concept and analyses of determinate and indeterminate structures.

To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems. The course runs through a number of techniques which are used for the analysis of civil engineering structures.

COURSE OUTCOME
- Ability to distinguish between determinate and indeterminate structures. Ability to analyze determinate and indeterminate structures. Ability to use influence line diagrams as a valid tool for structural analysis

COURSE CONTENT
UNIT I
Virtual work and Energy Principles: Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.
Indeterminate Structures-I : Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by theorem of three moments, Effect of sinking and rotation of supports, Moment distribution method (without sway)
UNIT II
Indeterminate Structures - II: Analysis of beams and frames by slope Deflection method, Column Analogy method.
Arches and Suspension Cables: Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches - Rib shortening and Temperature effects.
UNIT III
Rolling loads and Influence Lines: Maximum SF and BM curves for various types of rolling loads, focal length, EUDL, Influence Lines for Determinate Structures- Beams, Three Hinged Arches. Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method
UNIT IV
Plastic analysis of beams and frames. Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.
UNIT V
Matrix method of structural analysis: force method and displacement method. Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam-Columns.
.
Reference Books:
1. Ghali A & Neville M., Structural Analysis - A Unified classical and matrix Approach, Chapman and Hall, New York.
2. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
3. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
4. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.

5. Norris C.H., Wilbur J.B. and Utkys. Elementry Structural Analysis, McGraw Hill International, Tokyo
6. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
7. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
8. Reddy C.S., Basic Stgructural Analysis, Tata McGraw Hill Publishing Company, New Delhi.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Traffic Engineering**	**CE- 8021(A)**	**3L-1T-0P**	**4**

Courses objective:-
The objective of traffic engineering is to give a deep knowledge of growing required of city in terms for Traffic Characteristics, Traffic studies, Traffic Operations and Control, Street light and Accident Studies & Mass Transportation

Courses Outcome:-
- To analyses of spot speed and delay studies.
- To enable various types of traffic capacity studies e.g. volume and density relationships
- To enable analyse and identify accident studies and characteristics.
- To understand the various traffic management and their technique.

UNIT -I
Traffic Characteristics :
(i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory.
(ii) Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

UNIT -II
Traffic Studies :
(i) Spot Speed Studies and Volume Studies.
(ii) Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies.
(iii) Origin and Destination Studies (O & D) : Various methods, collection and interpretation of data, planning and sampling.
(iv) Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service.
(v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

UNIT -III
Traffic Operations and Control :
1. Traffic regulations and various means of control.
2. One way streets- advantages and limitations.
3. Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

UNIT -IV
Street Lighting :
1. Methods of light distribution.
2. Design of street lighting system.
3. Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors.
4. Different types of light sources used for street lighting.

5. Fundamental factors of night vision.

UNIT -V

Accident Studies & Mass Transportation:

1. Accident Studies: Causes of accidents, accident studies and records, condition and collision diagram, preventive measures.

2. Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

Reference Books :-

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by Matson, W.S.Smith & F.W. Hurd
3. G.J. Pingnataro, Principles of Traffic Engineering
4. D.R.Drew, Traffic Flaw Theory

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Foundation Engineering**	**CE- 8021(B)**	**3L-1T-0P**	**4**

Courses Outcomes

- To determine the selection of foundation and sub-soil exploration on various types of soil
- To determine various methods of analysis the bearing capacity of shallow foundation.
- To determine the selection and mechanics of pile foundation
- To determine the important of foundations on problematic soil & Introduction to Geosynthetics
- To determine the lateral earth pressure on the retaining wall

Courses Content

UNIT-I

Selection of foundation and Sub-soil exploration/investigation: Types of foundation, Factors affecting the selection of type of foundations, Steps in choosing types of foundation based on soil condition. Objectives and planning of exploration program, methods of exploration-wash boring and rotary drilling-depth of boring, Soil samples and soil samplers-representative and undisturbed sampling, Field penetration tests: SPT, SCPT, DCPT. Introduction to geophysical methods, Bore log, report writing.

UNIT-II

Shallow Foundation: Introduction, significant depth, design criteria, modes of shear failures. Detail study of bearing capacity theories (Prandtl, Rankine, Terzaghi, Skempton, Meyerhof), Bearing capacity determination using IS Code. Settlement, components of settlement & its estimation, permissible settlement, Proportioning of footing for equal settlement, allowable bearing pressure. Bearing capacity from in-situ tests (SPT, SCPT, PLATE LOAD), Factors affecting bearing capacity, Contact pressure under rigid and flexible footings. Floating foundation.

UNIT-III

Pile foundations: Introduction, Load transfer mechanism, Types of piles and their function, Factors influencing selection of pile, their method of installation and their load carrying characteristics for cohesive and granular soils, Piles subjected to vertical loads- pile load carrying capacity from static formula, dynamic formulae (ENR and Hiley), Pile load test, Pile group: carrying capacity, efficiency and settlement. Negative skin friction.

UNIT-IV

Foundations on problematic soil & Introduction to Geosynthetics: Significant characteristics of expansive and collapsible soils, footing on such soils, Problems and preventive measures. Underreamed pile foundation-its concept, design & field installation. Introduction to geosynthetics-materials, types, functions and uses.

UNIT-V

LATERAL EARTH PRESSURE: Active, Passive and Earth pressure at rest. Rankine's theory of earth pressure, Earth pressures in layered soils, Coulomb's earth pressure theory, Culmann's graphical method. RETAININGWALLS: Types of retaining walls- stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill. Reinforced earth retaining walls.

Reference Book:
1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers DistributionLtd.,NewDelhi.2014.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi,7thEdition,2017(Reprint).
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition

2017.

4. Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition, 28th August 2015.
5. Shamsher Prakash et al, "Analysis, Design of foundations and Retaining Structures" Sarita Prakashan.
6. Murthy, V.N.S., "Advanced Foundation Engineering", CBS Publishers and Distributors
7. Coduto D.P., Foundation design; principles and practices, Pearson Publication

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Bridge Engineering**	**CE- 8021(C)**	**3L-1T-0P**	**4**

Courses outcome

To design various types of bridge super structures such as R.C and steel bridge. It also involves design of Pier, Abutment ,Wing Walls , Foundation and Bearings.

Courses content

UNIT-I

Types of Bridge Super Structures

Introduction and types, temporary bridge superstructures, military bridges, other temporary bridges, permanent bridges, R.C.C. bridges, Pre-stressed concrete bridges, steel bridges, movable steel bridge. Consideration of loads and stresses in road bridges: Introduction, loads, forces and stress, dead loads, bridge loading as per relevant IRC and IRS specifications traffic lanes, foot way, kerbs, railing and parapet loading, impact, wind load, longitudinal forces, Temperature effect of live load on back fill and on the abutment.

UNIT-II

Design of R.C. Bridge

Slab culvert, pipe culvert, T-beam, box culvert bridge super structure, Courbon's theory for load distribution, balanced cantilever bridges, design examples.

UNIT-III

Design of Steel Bridges

Types of steel superstructure, plate girder bridge, truss bridge, wind forces of lattice girder bridge, bracings, arch and bowstring girder bridge, design example.

UNIT-IV

Pier, Abutment and Wing Walls

Types of piers and abutments, stability analysis of piers and abutments, design of piers, Forces on piers, stability, abutment, bridge code provision for abutments, wing walls, design examples.

UNIT-V

Foundations and Bearings

Types of bridge foundations and general design criteria, shallow foundations, deep foundations, piles, wells and pneumatic caissons, river training works.

Bearings: functions and types of bearings, necessity of bearings, design of elastomeric bearings, expansion joints, necessity and types of expansion joints, design considerations.

References Books:

1. Victor, D.J., Essential of Bridge Engineering , Oxford & IBH Publishing Co., New Delhi.
2. Rowe, R.E., Concrete Bridge Design , C.R. Books Ltd., London
3. Krishna Raju N, Design of Bridges, Oxford & IBH Publishing Co., New Delhi.
4. Bakht. B and Jaeger, L.C., Bridge Analysis Simplified, McGraw Hill Book Co. Inc.
5. Ponnuswamy, S., Bridge Engineering, Tata McGraw Hill, New Delhi.
6. Bakht, B. and Jaeger, L.G., Bridge Deck Analysis Simplified, McGraw Hill International Edition, Singapore
7. Aswani M.G., Vazirani V.N. and Ratwani M.M., Design of Concrete Bridges, Khannapublishers, New Delhi.
8. Hambly E.C., Bridge Deck Behaviour.

9. Sastry V. V., Design of Bridges, Dhanpat Rai & Co
10. Raina.V.K., Concrete Bridge Design and Practice, Tata McGraw Hill, New Delhi.
11. Jagadeesh .T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013
12. Indian Standard Codes and IRC codes related to bridges

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Earthquake Resistant Design of Structures**	**CE- 8021(D)**	**3L-1T-0P**	**4**

Courses Objective
- To under the behavior of Earthquake and its characteristics
- To determine the response spectrum in multi-storeyed building
- To determine the earthquake intensity and effect by earth quake modelling

UNIT I
Engineering Seismology: Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, Earthquake measurement parameters, Characteristics of earthquake and its quantification- Magnitude and Intensity scales, Seismic instruments. Seismic zoning map of India.

UNIT II
Response Spectrum: Response history and strong motion characteristics. Response Spectrum elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design .Computation of seismic forces in multi-storeyed buildings - using procedures as per codal provisions.

UNIT III
Aseismic Structural Modelling: Structural configuration for earthquake resistant design,Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls,

UNIT IV
Design of structure for earthquake resistance: Seismic design philosophy,Load combinations, Ductility and energy absorption in buildings. confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Lateral load resisting structural systems.

UNIT V
Seismic control of structures: Introduction, concept and types of seismic control systems as active, passive and semi-active systems. Requirements of efficient earthquake resistant structural system, damping devices, base isolation systems. Retrofitting of structures.

Reference Books:
1. Chopra Anil Kumar, Dynamics of Structures - Theory and Application to Earthquake Engineering, Pearson Education.
2. Hosur Vinod, Earthquake Resistant Design of Building Structures, Wiley (India).
3. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press.
4. Agarwal Pankaj, Shrikande Manish, Earthquake Resistant Design of Structures, Prentice Hall of India, New Delhi India.
5. Pauley & Priestly, Seismic Design of Reinforced Concrete and Masonry Buildings, John Wiley & Sons.
6. Stratta J. L, Manual of Seismic Design, Prentice-Hall India Pvt Ltd.
7. Kramer S. L., Geotechnical Earthquake Engineering, Prentice-Hall India Pvt Ltd.
8. All relevant IS codes:
 IS 1893: Criteria for earthquake resistant design of structures, Bureau of Indian Standards, New Delhi.
IS 4326: Code of practice for earthquake resistant design and construction of buildings, Bureau of Indian Standards, New Delhi.

IS 13920: Ductility detailing of reinforced concrete structures subjected to seismic forces, Bureau of Indian Standards, New Delhi.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

![RKDF University Logo]	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Pavement Design**	**CE- 8031(A)**	**4L-0T-0P**	**4**

Course Objectives:
• To introduce highway pavements, design concepts and material properties,
• To understand and enable students to carry out design of bituminous mixes, analyse and design flexible and rigid highway pavements
• To introduce the concepts of pavement evaluation and rehabilitation.

Course Outcome:
The students will be able to
i. identify the pavement components and design bituminous mixes,
ii. analyze and design flexible and rigid pavements
iii. evaluate structural condition of pavement.

UNIT -I
Equivalent Single Wheel Load (ESWL) : Definition, calculation of ESWL, repetition of loads and their effects on the pavement structures.

UNIT -II
Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

UNIT -III
Rigid Pavements : Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

UNIT -IV
Rigid pavement design : IRC method, Fatigue analysis, PCA chart method, joints, design and construction & types, AASHTO Method, Reliability analysis.

UNIT -V
Evaluation and Strengthening of Existing Pavements : Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Reference Books :--
1. Principles of pavement design by E.J.Yoder & M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

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R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

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Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Air quality Monitoring and Control**	**CE- 8031(B)**	**4L-0T-0P**	**4**

Course objectives

1. The course objectives has three components i.e., sources of air pollution, pathways (air pollutants transformation and transport) and receptors.
2. Students would get an insight into the dispersion of air pollution in the atmosphere
3. This life cycle of air pollution will enable the student to first identify the pollutants and their sources and then the transport mechanisms of the pollutants followed by the affected population and there control mechanisms.

Courses outcomes
1. After attending the course the students shall have acquired knowledge and understanding to evaluate air quality management and analyze the causes and effects of air pollution.
2. Students would be able to understand the type and nature of air pollutants, the behavior of plumes and relevant meteorological determinants influencing the dispersion of air pollutants.

The basic understanding of methods available for controlling point, line and area sources and first-hand experience of using most widely used air quality models such as AERMOD

UNIT – I
Air pollution problem: Economics and social aspects, historical episodes of air pollution. Sources of Air pollution, effects of air pollution on health, animal, plants and materials

UNIT – II
Role of meteorological condition, properties of typical air pollutants, air diffusion and concentration pollutants. general diseases caused by air pollutants. toxicity of various pollutants. Plums patterns and height of chimneys.

UNIT – III
Atmospheric chemistry, formation of secondary pollutants – PNN, PBN, Photolytic cycles, general diseases and toxicity of pollutants

UNIT – IV
Sampling and Analyzing of Air Pollutants: Instruments pollution survey, standards of air pollution.Principle of air pollution control, site selection and zoning, various control methods, process and equipment changes, design and operation of various air pollution control equipments.

UNIT – V
Air pollution control legislation, public education pollution standards, status of air pollution control in various countries.
Industrial Hygiene: Concept and importance, factory Involved in environmental hazards, industrial ventilation occupational diseases, control methods

3. **.Reference Books** :--

1. "Air Pollution" - Faith W.L, John Wiley & Sons
2. "Air Pollution" - Mc Cabe L.C., Mc. Graw Hill, International
3. Air Pollution - Stern A.C., Academic Press N. York
4. Fundamentals of Air Pollutions - Raju BSN Oxford & IBH Publishing Co. Pvt. Ltd.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Finite Element Method**	**CE- 8031(C)**	**4L-0T-0P**	**4**

Course Objectives:
1. To learn basic principles of finite element analysis procedure .
2. To learn the theory and characteristics of finite elements that represent engineering structures.
3. To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses.

Course outcomes:
Upon successful completion of this course you should be able to:
1. Understand the concepts behind formulation methods in FEM.
2. Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
3. Develop element characteristic equation and generation of global equation.
4. Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced.

UNIT I
Introduction to Finite Element Method : General description of the finite element method. Engineering applications of finite element method. Boundary conditions: homogeneous and nonhomogeneous for structural, heat transfer and fluid flow problems. Potential energy method, Rayleigh Ritz method, Galerkin's method, Displacement method of finite element formulation. Convergence criteria, Discretisation process, Types of elements: 1D, 2D and 3D, Node numbering, Location of nodes. Strain displacement relations, Stress strain relations, Plain stress and Plain strain conditions, temperature effects. Interpolation models: Simplex, complex and multiplex elements, Linear interpolation polynomials in terms of global coordinates 1D, 2D, 3D Simplex Elements.

UNIT II
One-Dimensional Elements-Analysis of Bars and Trusses,
Linear interpolation polynomials in terms of local coordinate's for 1D, 2D elements. Higher order interpolation functions for 1D quadratic and cubic elements in natural coordinates, , ,Constant strain triangle, Four-Nodded Tetrahedral Element (TET 4), Eight-Nodded Hexahedral Element (HEXA 8), 2D isoparametric element, Lagrange interpolation functions, Numerical integration: Gaussian quadrature one point, two point formulae, 2D integrals.Fore terms: Body force, traction force and point loads,
Numerical Problems: Solution for displacement, stress and strain in 1D straight bars, stepped bars and tapered bars using elimination approach and penalty approach, Analysis of trusses.

UNIT-III
Beams and Shafts: Boundary conditions, Load vector, Hermite shape functions, Beam stiffness matrix based on Euler-Bernoulli beam theory, Examples on cantilever beams, propped cantilever beams, Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and uniformly distributed load.
Torsion of Shafts: Finite element formulation of shafts, determination of stress and twists in circular shafts.

UNIT-IV
Heat Transfer: Basic equations of heat transfer: Energy balance equation, Rate equation: conduction, convection, radiation, energy generated in solid, energy stored in solid, 1D finite element formulation using vibrational method, Problems with temperature gradient and heat fluxes, heat transfer in composite

sections, straight fins.

Fluid Flow: Flow through a porous medium, Flow through pipes of uniform and stepped sections.

UNIT- V

Axi-symmetric Solid Elements: Derivation of stiffness matrix of axisymmetric bodies with triangular elements, Numerical solution of axisymmetric triangular element(s) subjected to point loads.

Dynamic Considerations: Formulation for point mass, Consistent element mass matrix of one dimensional bar element, truss element, Lumped mass matrix of bar element, truss element.

Text Books:

1. Logan, D. L., A first course in the finite element method,6th Edition, Cengage Learning, 2016.
2. Rao, S. S., Finite element method in engineering, 5th Edition, Pergaman Int. Library of Science, 2010.
3. Chandrupatla T. R., Finite Elements in engineering, 2nd Edition, PHI, 2013.

Reference Books:

1. J.N.Reddy, "Finite Element Method"- McGraw -Hill International Edition.Bathe K. J. Finite Elements Procedures, PHI.
2. Cook R. D., et al. "Concepts and Application of Finite Elements Analysis"- 4th Edition, Wiley & Sons, 2003.

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Artificial Intelligence**	**CE- 8031(D)**	**4L-0T-0P**	**4**

Course Objectives

After studying this course, students will be able to

1. learn about importance of AI techniques. Adoption of Artificial Intelligence (AI) technologies is widely expanding in our society. Applications of AI include: self-driving cars, personal assistants, surveillance systems, robotic manufacturing, machine translation, financial services, cyber security, web search, video games, code analysis and product recommendations.

2. Know the exact application of AI Techniques. Such applications use AI techniques to interpret information from a wide variety of sources and use it to enable intelligent, goal-directed behavior.

3. understand the working of Modern AI based systems. It often involves self-learning systems that are trained on massive amounts of data, and/or interacting intelligent agents that perform distributed reasoning and computation.

4. Know about sensors used in AI based systems.AI connects sensors with algorithms and human computer interfaces, and extends itself into large networks of smart devices.

5. Know the opportunities after having knowledge of AI techniques. The knowledge of Artificial Intelligence opens career opportunities in companies that are building the next generation of

intelligence and language understanding for their products: for example intelligent personal assistants opinion mining systems, customer support system, biomedical applications, computer games, smart adaptive devices, robots, smart planning systems.

Courses Content

Unit 1: Introduction to Artificial Intelligencel: Main components and characteristics of AI (Feature Engineering, ANN, Deep Learning),Applications of AI, Advantages and disadvantages of AI, Goals of AI, Comparision of Programming of a System with AI and without AI,Challenges in AI, Programming languges preferably used in AI,Techniques/Algorithms used inAI,AI Software plaforms,Future of AI

Unit 2: Various types of production systems and search techniques: Types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies.

Unit 3: Knowledge Representation and Probabilistic Reasoning: Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and nonmonotonic reasoning. Probabilistic reasoning, Baye's theorem, semantic networks, scripts, schemas, frames, conceptual dependency, fuzzy logic, forward and backward reasoning.

Unit 4: Game playing techniques: Minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.

Unit 5: Introduction to learning ,ANN: Various techniques used in learning, introduction to Artificial neural networks, common sense, reasoning, Convolution Neural Network,Feedforward Neural Network, Recurrent Neural Network, Multilayer perceptron, Architecture / Three Layers in Artificial Neural Networks, Implementation of ANN, Applications of ANN in images,signals and languagesome example of expert systems.

References:-

1.Rich E and Knight K, "Artificial Intelligence", TMH, New Delhi.
2.Nelsson N.J., "Principles of Artificial Intelligence", Springer Verlag, Berlin.
3. Stuart Russell , Artificial Intelligence: A Modern Approach , 3rd Edition), Peter Norvig, PHI, ISBN13:

978-0136042594, ISBN-10: 0136042597
4. B. Yegnanarayana , Artificial Neural Networks ,PHI
5.Schalkoff, Artificial Neural Networks . Mc Graw HILL Education
Evaluation. Evaluation will be continuous and integral part of the class as well as through external assessment

R.K.D.F. UNIVERSITY, BHOPAL
B.E. **(CIVIL ENGINEERING)**
FOURTH YEAR-**Semester – VIII**
Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
CE	**Earthquake Resistant Lab**	**CE- 8041**	**0L-0T-2P**	**2**

1 Lump mass with equal height:- To understand effect of frequency and present travel on structure having equal height

2 Lump mass with variable height :- To understand effect of frequency and present travel on structure having variable height

3 Lump mass with different material :-To understand effect of frequency and present travel on structure having different material

4 Lump mass with different thickness:- To understand effect of frequency and present travel on structure having different thickness

5 Single degree freedom system :-To understand behavior of multi degree of freedom system under lateral load

6 Multi degree freedom system :-To understand behavior of single degree of freedom system under lateral load

7 Building without structural control system:- To understand behavior of Uncontrolled structure under earthquake

8 Building with X-Bracing:-To understand behavior of building having X- Bracing under earthquake

9 Building with Shear wall:- To understand behavior of building having shear wall under earthquake

10 Pounding Effect:- To understand pounding effect of structure

11 Liquefaction of Soil:-To understand liquefaction of soil under dynamic loading