SYLLABUS FOR
BE IV/IV, I-SEMESTER
(AUTONOMOUS)

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

DESIGN OF STEEL STRUCTURES – II
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3 + 1 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4010
Credits	:	3	Sessional Marks	:	30	Duration of Sem. End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Design the plate girder for heavy loads and long spans. 2. Design gantry girder for industrial work shops 3. Design the deck type plate girder railway bridge and through type truss girder bridge for broad gauge railway loadings 4. Design the rocker and roller bearings for railway bridges.	1. Design a welded plate girder by limit state method. 2. Design a gantry girder by limit state method 3. Design bearings for steel bridges 4. Design deck type riveted plate girder railway bridge, and through type riveted truss girder railway bridge

UNIT-I

Design of Plate girders: (Limit state design**)** Design of welded plate girder for static loads as per IS:800-2007 – Economical Depth, Design of Cross Section, Flange curtailment, intermediate and bearing stiffeners, Design of connections. Sketch showing the details of longitudinal section and cross section.

UNIT-II

Design of Gantry girders: **(**Limit state design**)** Basic principles, Loads, Codal provisions, Design of Cross section and design of welded connection as per IS: 800-2007. Sketch showing general layout and cross section of gantry girder.

Introduction to Railway Bridges and Design of bearings: Bridges - Deck type and through type bridges – Economical span – Indian standard railway broad gauge train loadings – permissible stresses.

Bearings: Types and general description of different types of bearings, detailed design of Rocker and roller bearings for railway bridges. Sketch showing the details of bearing.

UNIT-III

Design of Deck type riveted plate girder railway bridge: Economical depth, detailed design of Cross section, connections, intermediate and bearing stiffeners for broad gauge main line loading, Wind effects – Design of Cross frames. Sketch showing the details of longitudinal section and cross section.

Design of Through type riveted truss girder railway bridge: Truss configurations, Detailed design of stringer beams, Cross girders and Truss girders for broad gauge main line loading; Wind effects - Design of top lateral and bottom Lateral bracing, Portal and sway bracings. Sketch showing the details of longitudinal section and cross section.

Suggested Books:

1. Duggal S.K "Limit State Design of Steel Structures" McGraw Hill Education (India), 2014
2. Purnima B.C Ashok Kumar Join and Arun Kumar Join, "Design of Steel Structures" Laxmi publication Pvt. Ltd, 2015.
3. Ramchandra and Virendra Gehlot "Design of Steel Structures - II",Scientific Publishers (India) 2008.

Reference Books:

1. Bhavikatti S.S. "Design of Steel Structures", IK International Publishing House Pvt.Ltd, 2014.
2. Arya A.S, Awadhesh Kumar and Ajmani J.L. " Design of Steel Structures" Nem Chand & Bros, 2014.
3. Subramanian N "Design of Steel Structures, Limit State Method", Oxford University Press, 2015
4. Gambhir M.L. "Fundamentals of structural Steel Design" Tata Mc.Graw Hill Education Pvt.Ltd., 2013
5. Shah V.L. And Veena Gore " Limit State Design of Steel Structures" Structures Publications, 2009
6. Chaterjee, S "The design of Modern Steel Bridges" BSP Professional Books, 1991
7. IS: 800 – 2007: Code of Practice for General Construction in Steel, Bureau of Indian Standards, New Delhi.
8. IS: 875-1987: Code of Practice for Design loads for buildings and structures, Bureau of Indian Standards, New Delhi.
9. Bridge Rules – 1982, specifications for Indian Railway Loadings
10. ISI Handbook No. 1 Bureau of Indian Standards, New Delhi
11. IS: 1915 – 1961 – The Indian Standard Code of Practice for design of steel bridges Bureau of Indian Standards, New Delhi
12. Bhavikatti S.S. & Prasad K.V. "Steel Tables with Plastic Modules of I.S.Section" I.K International Publishing House Pvt. Ltd, 2016

Online Courses:

1. http://nptel.ac.in/courses/105103094/
2. www.steel-insdag.org

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ESTIMATION AND SPECIFICATIONS
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3 + 1 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4020
Credits	:	3	Sessional Marks	:	30	Duration of Sem. End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Understand the concept of quantity Estimation and prepare estimates and bar bending schedules for various RCC works 2. Learn to prepare rate analysis for various item of works in construction. 3. Acquire knowledge on various types of specifications used in construction 4. Interpret case studies on Public-Private Partnerships with an emphasis on the construction industry, like BOT, BOOT, DPR, etc.	1. Estimate the quantities of materials used in various construction works. 2. Compute and prepare bar bending schedules. 3. Prepare rate analysis for various quantities 4. List the various types of specifications used in construction. 5. Interpret case studies on Public-Private Partnerships with an emphasis on the construction industry.

UNIT – I

Detailed Estimates: Working out the detailed estimate for Flat roof building -load bearing, RCC & Steel framed structure, Bituminous and C.C Road work including earthwork and Irrigation canal work including earthwork.

UNIT – II

Estimation of steel quantities: Estimation of steel quantities for Slabs, Beams and Columns, Footings – Rectangular, Isolated and combined, Stair Case and Overhead rectangular water tank.

UNIT – III

Rate Analysis: Preparation of analysis of rates and theoretical requirements of materials as per the standard data for Major items of works of a building and all items of work for bituminous and concrete road works.

UNIT – IV

Specifications: General and detailed specification of works, Departmental procedure for construction works, Types of estimates and Earnest Money, Security Deposit, Measurement Book and muster roll.

UNIT – V

Project Delivery Methods: Project Delivery Methods - Design Build (DB), Design Bid Build (DBB), Detailed Project Report (DPR), Concept of Public Private Partnership (PPP) - Build Operate Transfer (BOT), Build Own Operate Transfer (BOOT), Recent developments - case studies.

Suggested Books:

1. Dutta B.N. Estimating and Costing in Civil Engineering (Theory and Practice), UBS Publishers' Distributors Pvt Ltd., 2016.
2. Chakraborty M. Estimating, Costing, Specification & Valuation In Civil Engineering , (Published by Author), 2006.
3. Upadhyay A.K. Civil Estimating & Costing: Including Quality Surveying, Tendering and Valuation, S K Kataria and Sons, 2013.

Reference Books:

1. Patil, B.S. Civil Engineering Contracts and Estimation, Orient Black Swan, 2015.
2. Leonard Holm, John E. Schaufelberger, Dennis Griffin, Thomas Cole Construction Cost Estimating: Process and Practices, Pearson Education, 2017.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

WATER RESOURCES ENGINEERING – II
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3 +1period per week	Sem Exam Marks	:	70	Subject Ref Code	: CE4030
Credits	:	3	Sessional Marks	:	30	Duration of Sem Exam	: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
In this subject the students will	*Upon the completion of this course students will be able to*
1. Learn canal regulation works and other irrigation structures 2. Study construction and design aspects of earth dams 3. Acquire knowledge on different components of water power engineering	1. Express canal regulation works, canal falls, cross drainage works and outlets 2. Explain Bligh's theory and Khosla's theory for diversion head works 3. Assess the effects of water logging and design suitable lining for canals 4. Understand the crieteria for design and construction of earth dams 5. Evaluate the factors leading to the assessment of water power potential and layout of a hydel plant

UNIT-I

Regulation works: Canal falls, types, design principles of trapezoidal notch fall, functions of cross regulator and head regulator, Cross drainage works, types, selection and design principles, types of outlets, flexibility, sensitivity and proportionality of outlets.

UNIT-II

Diversion head works: Components, causes of failures, difference between weir and barrage, Bligh's creep theory, exit gradient Khosla's theory and method of independent variables, design principles of vertical drop weir.

UNIT-III

Water logging and canal lining: water logging - effects, causes, remedial measures, lining of irrigation canals, types of lining, design of lined canals, economics of canal lining, salt problems in irrigated soils.

UNIT-IV

Earth dams: Types, Methods of construction, causes of Failures of Earth dams & Design criteria, Seepage analysis for homogenous and Zoned embankment dams, seepage control devices, design to suit available materials and foundation conditions, determination of phreatic line for horizontal drainage filter

UNIT-V

Water Power Engineering: History, demand and generation, different heads, load factor, capacity factor and utilization factor, assessment of water power potential, primary power secondary power, flow duration curve, components and types of Hydel Plants, Penstocks & Surge Tanks, power house layout and components-their functions

Suggested Books:

1. Modi P.N., "Irrigation & Water Resources and Water Power", Standard Book House, New Delhi, 2008.
2. Garg S.K., "Irrigation Engineering & Hydraulic Structures", Khanna Publishers, 2009.

Reference Books:

1. Dandekar & Sarma, Water power Engineering, Vikas Publishers, 2009.
2. Patra K.C., "Hydrology and Water Resources Engineering", Narosa Publishers, 2008.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

CONSTRUCTION MANAGEMENT AND ADMINISTRATION
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4040
Credits	:	3	Sessional Marks	:	30	Duration of Sem.End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Learn the concept of construction management along with functions and objectives. 2. Understand the various techniques used for construction planning such as bar charts, CPM, PERT and crashing of networks 3. Acquire knowledge on various types of construction contracts, tenders and acts related to construction and construction safety 4. Understand the concept of Linear Programming in Construction along with application of Graphical and Simplex methods.	1. Identify and report the importance and necessity of construction management. 2. Employ bar charts, networks to determine the critical path and alter the construction schedules accordingly. 3. Interpret the terms related to costs and time, and there by solve problems on crashing of networks. 4. Categorize various construction contracts, acts and examine various documents related to construction. 5. Interpret the concept of Linear Programming in Construction, and solve problems on Graphical and Simplex methods.

Unit-I

Significance of Construction Management: Objectives and functions of construction management, construction management team, principles of organization and types of organisation.

Unit-II

Construction Planning: Construction planning, bar charts, network techniques in construction management - CPM and PERT.

Unit-III

Time Estimate: Expected likely, pessimistic and optimistic time, normal distribution curve and network problems.

Time Cost Analysis: Cost time analysis in network planning, updating, simple problems of civil engineering works.

Unit-IV

Contracts: Introduction, types of construction contracts and their advantages and disadvantages, conditions of contracts, Introduction to Indian contract act.

Tender: Tender form, Tender Documents, Tender Notice, Work Order.

Safety in construction: Safety measures, workmen compensation act, construction labour act. Demolition of buildings – safety measures.

Unit – V

Linear programming and optimization in construction: Introduction to optimization – Linear programming, Importance of optimization in construction, Simple problems on formulation of LP, Graphical method, Simplex method.

Suggested Books:

1. Srinath L.S., PERT and CPM: Principles and Application, East-West Press, 1975.
2. Peret, F, Construction Project Management an Integrated approach, Taylor and Francis, Taylor and Francis Group, London & New York, 2009
3. Punmia B.C., and Khandelwal, PERT and CPM, Laxmi Publications, 1990.

Reference Books:

1. Gahloj. P.S. and Dhiv. B.M., Construction Planning and Management, Wiley Eastern Ltd., 1992.
2. Kumar Neeraj Jha., Construction Project Management: Theory and Practice, Pearson Education
3. India, 2011.
4. Seetharaman S., Construction Engineering and Management, Umesh Publications, 2012.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

TRANSPORTATION ENGINEERING – II
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3+1 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4050
Credits	:	3	Sessional Marks	:	30	Duration of Sem.End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Impart knowledge on the basics of railway with respect to alignment, components, geometric design, construction and maintenance of track. 2. Introduce principles of airport engineering with respect to planning and geometric design	1. Describe the requirements of alignment and its surveys and explain the permanent way components with its functions 2. Design the elements of railway track 3. Present the techniques for construction and maintenance of railway track 4. Elucidate the requirements of airport layout and explain aircraft characteristics 5. Draw wind rose diagrams and determine the corrected runway length

Unit I

Introduction to Railway Engineering: Classification of railway lines in India, Different gauges on Indian Railways, Railway alignment – Requirements of an Ideal alignment , surveys for railway alignment - Traffic, Reconnaissance, Preliminary and Final location surveys.

Permanent way: Permanent way component parts and its functions. Rails – various types, functions, creep in rails, creep measurement, coning of wheels, Track fittings and fastenings, Sleepers- various types, merits and demerits, ballast, various types and sub grade preparation.

Unit II

Geometric Design: Details of geometric design, Gradients, grade compensation, Circular curves, Super elevation, safe speed on curves, Transition curves, widening of gauge on curves, Vertical curves, Check rails

Points, Crossing, Level Crossing: Important terms, switches, Tongue rails, Crossing, Turnouts, Layout of turnout, Classification of level crossings.

UNIT-III

Track construction – Stages in construction of railway track – earthwork, plate laying and laying of ballast

Maintenance of track: Necessity of maintenance, Maintenance of railway track – Maintenance of surface rails, Maintenance of track alignment, Maintenance of gauge, Maintenance of proper drainage and Maintenance of track components

Unit IV

Airport Planning: Introduction to air transportation, air craft types and its characteristics. Terminal area and airport lay-out- building functions and planning considerations, vehicular circulation and parking area, apron and hangar, typical airport layouts.

Unit V

Runway design: Site selection of an airport as per ICAO, orientation of runway by wind rose diagrams, basic runway length determination including corrections, geometric design.

Suggested Books:

1. Satish Chandra and Agarwal M. M., "Railway Engineering", Oxford Publishers, 2013.
2. Khanna. S.K., Arora, M.G. and Jain. S.S., "Airport Planning and Design" Nem Chand & Bros, Roorkee, India, 2012.
3. Saxena S. C. and Arora S. P., "A Text Book of Railway Engineering", Dhanpat Rai and Sons, 2010.

Reference Books:

1. Mundrey J. S., "Railway Track Engineering", Tata McGraw Hill, 2009.
2. Rangwala, "Railway Engineering" Charotar Publishers, 2015.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – I
FINITE ELEMENT METHOD
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3+1 period per Week	Sem. End Exam	:	70	Subject Reference Code	:	CE 4051
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Understand variational approach and compute stiffness matrices for bars, trusses and beam 2. Formulate stiffness matrix of beam, strain-displacement, stress strain relationships for elastic continuum and understand plane stress and plane strain problems 3. Understand the formulation of finite element method and determine stiffness matrices for CST and 4 noded rectangular elements for plane stress and plane strain problems 4. Understand the concept of isoparametric finite elements and formulate shape functions for Lagrangian and serendipity elements 5. Understand formulation of stiffness matrices for axisymmetric elements	1. Apply variational principles to simple problems and solve problems of bars, trusses and beams 2. Compute stiffness matrix of beam elements and write strain displacement, stress-strain relationship for elastic continuum and write stiffness matrices for plane stress and plane strain problems 3. Compute stiffness matrices for CST and 4 noded rectangular elements for plane stress and plane strain problems. 4. Formulate stiffness matrix for four noded quadrilateral elements and eight noded parabolic elements and write shape functions for Lagrangian and serendipity elements 5. Compute stiffness matrices for three noded ring element and four noded tetrahedral elements

UNIT-I
Introduction to the finite element method: Variational approach, Rayleigh – Ritz, and Galerkin's methods. Stiffness matrix for two noded bar, truss and beam elements, problems with 3 degrees of freedom.

UNIT –II
Stiffness matrix for two noded beam element with 3 degrees for freedom per node. Transformation, generation of stiffness matrix for frames. Strain displacement and stress-strain relationship in an elastic continuum (linear problems). Equations of equilibrium, and boundry conditions. Plane stress and plane strain problems.

UNIT- III
Formulation of finite element method using principle of virtual displacement. Determination of stiffness matrix for three noded triangular element (constant strain triangle) and 4 noded rectangular element for plane stress and plane strain problems. Convergence criteria for selection of displacement models. Discrimination of continuum. Assembly of global stiffness and load matrices. Displacement boundary conditions.

UNIT- IV
Isoparametric finite elements: Direct construction of shape functions for higher order elements using natural co-ordinate system. Shape functions for eight noded parabolic curved isoparametric element. Determination of element stiffness matrix for four noded quadrantal element. Use of Jacobian and Gauss quadrature techniques. Load matrix for eight noded rectangular isoparametric element (for body forces and surface traction)

UNIT - V
Axisymmetric Problems: Strain displacement and stress-strain for axisymmetric problems. Stiffness matrix for three noded ring element. Volume co-ordinates and stiffness matrix for four noded tetrahedron element.

Suggested Books:

1. Zienkiewicz O.C., Taylor R.L. and Zhu J.Z., The Finite Element Method, (Its Basics and fundamentals) Vol. I, McGraw Hill, 2013.
2. Krishna Moorthy C.S., Finite Element Analysis, McGraw Hill, 1991.

Reference Books:

1. Desai C.S. and Abel J.F., Introduction to the Finite Method, Van Nostrand, 2002
2. Chandrupatla T.R., Finite Element Analysis for Engineering and Technology, Universities Press, 2004

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – I
PRE-STRESSED CONCRETE
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3+1 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4120
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Appreciate the importance & use of pre stressed concrete. Which possesses additional advantages compared to conventional RCC. 2. Acquire the knowledge on prestress operations and materials of Prestress 3. Acquire the knowledge on the design of prestressed concrete components.	1. Understand the process of production of Prestressed concrete and the principle involved. 2. Examine the advantage of prestressing in reducing tension in concrete and making the beam more safer 3. Describe how the deflections in beams are reduced in Prestressed compared to RCC 4. Examine the shear distribution in Prestressed concrete sections & the design procedure. 5. Explain how the end blocks of Prestressed concrete beams are strengthened against bursting tension.

Unit-I

Introduction: Basic Concepts, materials, permissible stresses – systems of prestressing. Losses of prestress in pre-tensioned and post-tensioned members.

Unit-II

Design: Analysis of PSC beams for flexure using elastic analysis of simple and composite sections with various cable profiles.

Unit-III

Design of sections for flexure: Design of PSC sections by elastic and limit state methods for flexure.

Design for Shear: Shear and principle stresses, Design of R.C. section for shear, cracked and uncracked sections.

Unit-IV

Deflections: Importance of deflections, factors influencing deflections, codal provisions, short terms and long-term deflections – computation. Cable profiles

Unit-V

End Blocks: Nature of stresses, stress distribution – Magnel and Guyon's Methods – IS code provisions – Design by Guyon's method.

Continuous Beams: Advantages of continuous members – codal provisions – analysis of two span continuous beams – concordant cable profiles.

Suggested Books:

1. Krishna Raju N., Prestressed Concrete, Tata McGraw Hill, 2001.
2. Pandit G.S. and Gupta S.P., Prestressed Concrete, CBS Publications, 1995.
3. Dayaratnam, Prestressed Concrete, Oxford & IBH Publications, 2017

Reference Books:

1. Lin TY. And Bushy, Design of Pre stressed concrete Structures, Wiley India, Pvt, Ltd, 2010
2. IS 1343-2012, Code of Practice for Prestressed concrete, B.I.S Publications.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – I
GEOINFORMATICS
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	3+1 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4130
Credits	:	3	Sessional Marks	:	30	Duration of Sem. End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. To provide fundamental knowledge on geo spatial technologies such as GIS, remote sensing, photogrammetry, and GPS	1. Define common coordinate systems and projections in a map and types of data in GIS 2. Explain the theoretical and practical considerations required for preparing a GIS-database 3. prepare, manipulate, display and analyse spatial data, synthesise and present high quality GIS-based outputs in a report format 4. Apply the principles and techniques of remote sensing and photogrammetry in preparation of map 5. Describe the fundamental theory and concepts of the Global Positioning System

UNIT I

Introduction and scope of Geoinformatics, Branches of Geoinformatics, Geoinformatics technologies and Applications

Cartography

Map, definitions, representations-Point, line, polygon, Geographic coordinate system, Map projections, Map Analysis.

Geographic Information System (GIS) Data: Data types – spatial, non-spatial (attribute data) – data structure, data format – point line vector – Raster – Polygon

UNIT II

Data Input : Keyboard entry, Manual Digitizing, Scanner, Remotely sensed data, Existing Digital data Cartographic database, Digital elevation data

Data Base Management Systems: Functions & components, storage of GIS data

Data Editing: Detection and correction of errors, data reduction, edge matching

UNIT III

Data Analysis and Modelling: Spatial analysis, Vector data analysis, Raster data analysis – Modelling in GIS – Digital elevation model Modelling networks

Presentation of Geo-data and Analysis: Types of output data – Types of errors elimination and accuracies – sampling – Components of data quality

Applications of Geographic Information System (GIS): Soil and water resources, Agriculture, Land use planning, geology and Municipal applications.

UNIT IV

Remote Sensing: Overview, sensors and Platforms, interpretation elements; Geometric and radiometric distortions, Geo-referencing, re-sampling methods; Atmospheric errors and removal;

Photogrammetry: metric and non-metric cameras; Geometry of near vertical and tilted photographs, heights and tilt distortions; Rectification and ortho-photographs; Stereoscopy; Orientation interior, exterior, relative, and absolute.

UNIT V

Global Positioning System (GPS): Overview-signal structure and code modulation Pseudo-range measurements; Accuracy of navigation position: UERE and DOP. Intentional degradation of GPS signals: Selective availability (SA) and Anti-spoofing (AS), Point positioning, Differential Positioning and Relative positioning; Space based augmentation systems and Ground based augmentation systems

Suggested Books:

1. Kang-Tsung Chang, Introduction to GIS, Tata McGraw Hill Edition, 2015.
2. Burrough, P.A., Principles of GIS for land resource assessment, Oxford publication, 1986.
3. Anji Reddy M., Remote Sensing and Geographic Information System, 2012
4.

Reference Books:

1. John R Jensen, Ryan R Jensen, Introduction to Geographic Information System, 2013
2. John A. Richards, Remote sensing Digital Image Analysis, 2012
3. T. Schenk, Introduction to photogrammetry, 2005
4. Leick, A., GPS Satellite Survey, John Wiley: NJ, 2015
5. Hofmann, B., Lichtenegger H. and Collins J., Global Positioning System: Theory and Practice, Springer: Berlin, 2011.
6. Hofmann-Wellenhof, Bernhard, Lichtenegger, Herbert, Wasle, Elmar, GNSS – GPS, GLONASS, Galileo and more, 2013.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

COMPUTER APPLICATIONS-II LABORATORY (GIS)
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	2 period per Week	Semester End Exam	:	50	Subject Reference Code	:	CE 4011
Credits	:	1	Sessional Marks	:	25	Duration of Semr End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. To introduce the platforms of GIS related softwares inorder to apply the knowledge in GIS based projects	1. Generate a GIS base map with data obtained from surveys, scanned map, satellite images, CAD 2. Create thematic maps for various applications in civil engineering 3. Perform spatial analysis with GIS tools

List of experiments:

1. Introduction to ARCGIS – ARCMAP Data view, Table of contents, toolbars, Adding data, Creation of feature classes, importing data from CAD
2. Rectification of satellite images/scanned map
3. Database creation and digitization of spatial datasets and projections.
4. Attribute data integration to the vector data – Creation of tables, fields.
5. Map layout generation with legend, scale, north arrow and grids.
6. Use of spatial analysis tools, querying, joining data.
7. Use of editing tools, buffer and overlay analysis
8. Creation of thematic maps
9. Introduction to QGIS
10. Practice exercises through case studies.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

PROJECT SEMINAR
SYLLABUS FOR B.E. IV/IV - I SEMESTER

Instruction	:	2 periods per Week	Semester End Exam	:	-	Subject Reference Code	:	CE 4021
Credits	:	1	Sessional Marks	:	25	Duration of Sem. End Exam	:	-

Course outcomes:

1. Analyse civil engineering problems in a multi disciplinary domain.
2. Acquire the ability to make effective presentation.
3. Explore the use of research based knowledge.
4. Apply engineering knowledge in the context of society
5. Present the details obtained after mutual discussions with the team members

Instructions to students:

Objective of the project seminar is to actively involve the students in preparation of the final year project with regard to following components:

1. Problem definition and specification.
2. Literature survey, familiarity with research journals.
3. Broad knowledge of available techniques to solve a particular problem.
4. Planning of the work, preparation of bar (activity) charts.
5. Presentation – oral and written.

The department can initiate the project allotment procedure at the end of III year 2nd semester and finalise it in the first two weeks of IV year 1st semester.

First 4 weeks of IV year 1st semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R & D institutions. The objective of these preliminary talks will be to expose the students to real life practical problems and methodology to solve the technical problems.

Seminar schedule will be prepared by the co-ordinator for all the students from 5th week to the last week of the semester which should be strictly adhered to.

Each student will be required to:

1. Submit a one-page synopsis before the seminar for display on notice board.
2. Give a 20 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the talk.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

SYLLABUS FOR
BE IV/IV, II-SEMESTER
(AUTONOMOUS)

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – II
DISASTER MITIGATION AND MANAGEMENT
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Sem. End Exam	:	70	Subject Reference Code	:	CE4531
Credits	:	3	Sessional Marks	:	30	Duration of Sem. End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Know about the state of art of disaster management in world and explore the history of the disasters and comprehend how past events have helped shape the future. 2. Study the various natural and manmade disasters and apply the mitigation measures 3. Expose students to various technologies used for disaster mitigation and management.	1. Attain knowledge on various types, stages, phases in disaster with international & national policies & programmes with reference to the disaster reduction. 2. Understand various types of natural disaster, their occurrence, Effects, Mitigation and Management Systems in India 3. Understand different types of manmade disasters, their occurrence, Effects, Mitigation and Management Systems in India. 4. Explain the utility of geographic information systems (GIS), Remote sensing technology in all phases of disaster mitigation and management. 5. Develop understanding on the concepts of risk, vulnerability, warning and forecasting methods in disaster management.

UNIT-I

Introduction: Hazard, vulnerability and risk, Types of disasters , Disaster management cycle, role of civil engineers in disaster management, Progress of disaster management in world, vulnerability profile of India, Disaster management act, Disaster management in India

UNIT-II

Natural Disasters: Hydro - meteorological based disasters – Tropical cyclones, floods, drought and desertification zones, Geographical based disasters – Earthquake, Tsunamis, Landslides and avalanches – Causes, Types, effects and Mitigation measures, coastal zone management

UNIT-III

Human induced hazards: chemical industrial hazards, major power breakdowns, traffic accidents, etc. Case studies

UNIT-IV

Remote sensing and GIS for Disaster Management: Introduction to remote sensing and GIS, its applications in disaster mitigation and management, case studies

UNIT-V

Disaster Management: Risk assessment and hazard mapping – mitigation and management options – warning and forecasting.

Suggested Books:

1. Rajib, S and Krishna Murthy, R.R. “Disaster Management Global Challenges and Local Solutions”, Universities Press,2012.
2. Navele, P & Raja, C.K. Earth and Atmospheric Disasters Management, Natural and Manmade, B.S. Publications, 2009.

Reference Books:

1. Fearn-Banks, K Crises Computations Approach: A case book approach, Route ledge Publishers, 2011.
2. Battacharya, T. Disaster Science and Management, Tata McGraw Hill Company, 2012.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – II
GROUND IMPROVEMENT TECHNIQUES
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE4532
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of the course are to introduce	*Upon the completion of this course students will be expected to*
1. Need for ground improvement and different mechanical, chemical, static and dynamic techniques of ground improvement 2. Various stabilization techniques for cohesionless and cohesive soils 3. Miscellaneous techniques of ground improvement including geotextiles and reinforced earth.	1. Appreciate the need for ground improvement and different mechanical, chemical, static and dynamic techniques 2. Recognize various chemical stabilization and grouting techniques 3. Understand different ground improvement techniques for cohesionless soils 4. Recognize different ground improvement techniques for cohesive soils 5. Identify miscellaneous techniques of ground improvement

UNIT-I

Introduction: Need for ground improvement, applications, factors affecting, different mechanical, chemical, static and dynamic techniques.

UNIT-II

Chemical Stabilization: Lime, cement, bitumen, factors influencing – Design approach, construction procedure, laboratory testing, additives. Suspension and solution grouts, principles, methods, equipment, applications, compaction grouting, jet grouting, permeation grouting

UNIT-III

Cohesionless Soils: In situ densification, vibro techniques – Mechanisms. Factors affecting, suitability number, compacting piles. Vibro replacement process.

UNIT-IV

Cohesive Soils: In situ densification, pre-loading – dewatering-sand drains. Sandwicks, geodrains, ropedrains, band drains, stone columns, lime piles – thermal and vacuum methods.

UNIT-V

Miscellaneous Techniques: Soil Nailing, Soil Anchoring, Micropiles, Highway Slope Stabilization Techniques-Rip Rap method

Geotextiles: - Woven and non-woven fabrics, types, functions and application – Geo-textiles, geogrids, tests on geo-textiles.

Reinforced earth: Concept of reinforced earth, reinforcing materials, applications of reinforced earth structures

Suggested Books:

1. Purushothama Raj P. , Ground Improvement Techniques, Laxmi Publications, 2016
2. Hausmann R., “Engineering principles of Ground Modification”, McGraw Hill Publishing Co, 1990.

Reference Books:

1. Moseley, M.P., “Ground Improvement”, Blackie, Academic & professional, 1993
2. Fang-Hsai – Yang, “Foundation Engineering Hand Book”, CBS Publication, New Delhi, 1990.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – II
ADVANCED ENVIRONMENTAL ENGINEERING
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4533
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Understand the characteristics and effects of industrial wastes on land and human health. 2. Describe the waste water characteristics and treatment from various industries 3. Explain various effects of air pollution and perform quantitative analysis on various samples for air pollution. 4. Interpret the working and control of equipments pertaining to air pollution 5. State the objectives of EIA, legal provisions and preparation of EIA documents	1. Classify various types of industrial wastes 2. Assess the treatment procedure for waste water from different industries. 3. Analyse air quality parameters, effects of air pollution. 4. Design the control equipments of air pollution. 5. Understand the need for EIA and preparation of EIA reports

UNIT-I

Industrial Waste Management: Types of industries, characteristics of industrial wastes, effects of industrial effluents on streams, land and human health. Environmental legislation related to industrial effluents and hazardous wastes. Streeter phelps equation.

UNIT-II

Industrial Waste Water Treatment: Manufacturing process, waste water characteristics and effluent of the following industries – Leather tanning, dairy, pulp and paper, pharmaceutical, textiles, steel plants, thermal power plants, fertilizer, cement, sugar and distilleries.

UNIT-III

Air Pollution: Sources, classification and effects of air pollutants, Meteorology of air pollution, wind rose diagrams, lapse rates, atmospheric stability and dispersion of air pollutants, stack height calculation, ambient air quality monitoring, stack sampling, analysis of air pollutants.

UNIT-IV

Air Pollution Control: Air quality standards, methods of air pollution control-zoning, source correction, control of suspended parciulate matter by equipment (gravitation, centrifugation, filtration, scrubbing, electrostatic precipitation), selection of proper equipment, gaseous pollutant control by absorption, condensation, combustion.

UNIT-V

Environmental Impact Assessment: Need for environmental impact assessment (EIA), objectives of EIA. EIA capabilities and limitations. Legal provisions of EIA. Methods of EIA, base line data collection required for EIA, evaluation of impacts, prediction of impacts. Preparation of Environmental Management Plan, preparation of EIAs of road project, Industry, and dam. Issues related to rehabilitation of affected people, Preparation of Environmental impact statement and Environment management plan.

Suggested Books:

1. Rao M.N. and Dutt, Waste Water Treatment, Oxford and IBM Publications Ltd, 2008.
2. Eckenfelder, Industrial Water Pollution Control, McGraw Hill Book Co, 1999.
3. Rao C.S., Environmental Pollution Control Engineering, WileyEastern Ltd., 2006.

Reference Books:

1. Rao M.N., Rao H.V.N., Air Pollution Control, Tata McGraw Hill, 2001.
2. Peavy and Rowe, Environmental Engineering, McGraw Hill Publications, 2013.
3. Keiley, Environmental Engineering, McGraw Hill Publishers, 2003.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – II
ADVANCED REINFORCED CONCRETE DESIGN
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE 4534
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Obtain the knowledge of design principles for the design of certain complicated structures. 2. Obtain the design principles for the design of building elements used in modern buildings. 3. Gain knowledge on the advanced type of foundation design.	1. Design the beams of curved shape and beams of very large depth. 2. Design the building frames being used in the modern concrete construction 3. Understand the methods of analysis and design of flat slabs. 4. Design the piles foundations in weak soils. 5. Design the raft or mat foundations to control the uneven settlements which occur in different pockets of soils at a particulars site.

UNIT-I

Beams curved in plan: Introduction - design principles - structural design of beams curved in plan of circular and semicircular types.

Deep beams: Introduction – flexural and shear stresses in deep beams. I.S. Code provisions – Design of deep beams.

UNIT-II

Building frames: Design of rectangular portal frames for vertical loading including hinges at the base – Detailing of Reinforcement.

Multi storied Frames: Analysis by substitute frame methods for different loading cases.

UNIT-III

Flat slabs: Introduction, Components – I.S. Code provisions – Design methods, Design for flexure and shear.

Foundations: Structural design of piles and pile caps. Raft foundations – Different types – analysis and design

Suggested Books:

1. Krishna Raju N., *Advanced Reinforced Concrete Design*, CBS Publishers, 2016
2. Shah H.J., *Reinforced Concrete*, Volume II, Charotar Publishers, 2014

Reference Books:

1. Varghese P.C., *Advanced Reinforced Concrete Design*, PHI, 2005.
2. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, *R.C.C. Designs (Reinforced Concrete Designs)*, Laxmi Publications, 2015.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – III
ADVANCED TRANSPORTATION ENGINEERING
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Sem. End Exam	:	70	Subject Reference Code	:	CE4541
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Impart knowledge on advanced transportation concepts in the field of urban transportation planning, ITS, pavement management, economic analysis and transportation system management	1. Estimate urban travel demand 2. Know the concepts of ITS 3. Evaluate the pavement with respect to structure, function and safety 4. Perform economic analysis using highway economic evaluation methods and check the feasibility of highway projects 5. Propose right TSM strategy for solving traffic problems

UNIT-I

Urban Transportation Planning: Introduction to travel demand estimation , Study area delineation, zoning, Planning surveys, OD matrix generation, Four stage travel demand modelling – Trip generation, trip distribution, modal split, trip assignment and their methods.

UNIT-II

Introduction to Intelligent Transportation Systems (ITS): Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection. ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS)

UNIT-III

Pavement Management Systems: Introduction to PMS, Components of PMS, Introduction to project level and network level management systems, Importance of pavement evaluation in PMS, Functional condition evaluation techniques, Structural condition evaluation techniques – BBD and FWD, Safety evaluation

UNIT-IV

Highway Economic Evaluation: Economic Analysis; Basic Concepts of Economic Analysis, Principles of Economic Analysis; Cash flow diagrams; Time value of Money; Development of cash flow Diagrams; Methods of Economic Evaluation - Equivalent Uniform Annual Cost Method; Present worth of cost method; Equivalent uniform annual net return method; Net present value method; Benefit cost ratio method. Applications of these methods to highway projects.

UNIT-V

Transportation System Management: TSM actions – Objectives and Philosophy; Relevance of TSM actions to Indian Urban Context, TSM actions – Measures to improve vehicular flow, preferential treatment of High occupancy vehicles, Reduced Peak period travel, Promotion of High occupancy and Non vehicular travel modes, Parking management, Transit and para transit service improvements, Transit management efficiency measures.

Suggested Books:

1. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers, 2011
2. Hass, R. and Hudson, W. R., Pavement Asset Management, McGraw Hill Company, Inc, 2015
3. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.

Reference Books:

1. Winfrey, Economic analysis for Highways, International Textbook Company, Pennsylvania, 1969
2. Transportation System management Notes: S.R.Chari, REC Warangal.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – III
GROUND WATER HYDROLOGY
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE4542
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Grasp the properties of Ground water and solve for problems on steady flows. 2. Explain the various methods used to calculate parameters of unsteady flow. 3. Describe various geophysical exploration methods and selection of sites 4. Interpret the various artificial methods of ground water recharge, sea water intrusion and its control. 5. Explain conjunctive use of ground water, different ground water analog models.	1. Assess the ground water parameters and flow characteristics, equations 2. Interpret various equations for unsteady radial flow to a well. 3. Understand different methods of geophysical explorations 4. Evaluate the methods of artificial recharge of ground water. 5. Analyse various ground water analog models and hydrologic balance equations

UNIT-I

Introduction: Ground water in the hydrologic cycle, vertical distribution of ground water. Types of aquifers – unconfined, confined and leaky aquifers, porosity, void ratio, storage coefficient, permeability, transmissivity, specific yield, safe yield. General equation of ground water flow, steady undirectional flow, steady radial flow to a well in unconfined and confined aquifers. Steady flow with uniform recharge.

UNIT-II

Unsteady Radial Flow to a well: Non equilibrium equation for pumping tests, Theis method of solution, Cooper Jacob method, Chow's methods of solution, law of times, well flow near acquifer boundaries. Image wells, multiple well systems, partially penetrating wells, steady radial flow in leaky artersion aquifer. Well completion and well development.

UNIT-III

Geophysical Exploration: Surface investigations of ground water – Electrical Resistivity method, seismic refraction method, gravity and magnetic methods, geologic methods, Dowsing. Subsurface Investigations – Test Drilling, resistivity logging, potential logging, Interpretation of logs and selection of site as a well.

UNIT-IV

Artificial Recharge of Ground Water: Methods of recharge, water spreading, sewage discharge, Recharge through pits and shafts, Recharge through well, Induced recharge. Sea water intrusion in coastal aquifers; occurrence, Ghyben-Herzberg relation, space of fresh – salt water interface, length of the intruded sea water wedge, prevention and control of sea water intrusion.

UNIT-V

Ground Water Basin Management: Conjuctive use of surface and ground waters, Hydrologic balance equation. Ground water analog models-sand models, electric analog models, viscuous flow models.

Suggested Books:

1. Todd D.K., Ground Water Hydrology, John Wiley & Sons, Inc., 2011.
2. Ragunath H.M., Ground Water, Wiley Eastern Limited, 2006.
3. Karnath K.P., Ground Water Ananment, Development and Management, Tata McGraw Hill Publishing Company, 1987.

Reference Books:

1. Walton, Ground Water Resource Evaluation, McGraw Hill, 1970.
2. Bouwer, Ground Water Hydrology, McGraw Hill, 1978.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – III
ELEMENTS OF EARTHQUAKE ENGINEERING
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE4543
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to	*Upon the completion of this course the students will be expected to*
1. Obtain the concepts of engineering seismology, related terms. 2. Study of different, dynamic system like single degree & multiple degrees of freedom. 3. Evaluate the Earthquake forces necessary for seismic resistant design. 4. Describe the various case studies of major earthquakes, damage patterns, principles of earthquake resistant design; Retrofitting strategies.	1. Understand the basics of Engineering seismology 2. Gain the knowledge on the concepts of theory of vibrations and response spectrum analysis 3. Follow the seismic design philosophy for the Earthquake forces on various buildings. 4. Estimate the seismic performance of building with respect to damage patterns 5. Understand the concepts of earthquake resistant design as per codal provisions and retrofitting strategies.

UNIT-I

Engineering Seismology: Causes of earthquakes – Seismic waves – Magnitudes, intensity and energy release – characteristics of strong earthquakes, ground motions, soils effects and liquefaction.

UNIT-II

Theory of Vibrations: Introduction, long and short period structure; single, two and multi-degree of freedom systems, damped and undamped variations, concepts of damped and undamped vibrations, response spectrum – Response spectrum analysis.

UNIT-III

Seismic Design Philosophy: Concept of Seismic resistant design, reduction factors – Over strength, Ductility and Redundancy – Determination of earthquake forces on structures. Seismic Design and detailing of Masonry, Reinforced Concrete, and Steel Buildings.

UNIT-IV

Seismic Performance of Buildings: Case Studies of few serious earthquakes in the country in the past, damages to buildings – Damage Patterns – Performance of Non-Engineered Buildings, Rural houses during the Earthquakes.

UNIT-V

Seismic Resistant Design: Basic Principles of Earthquake resistance. Concepts of earthquake resistant construction in rural areas. Base isolation and energy dissipation devices. Seismic retrofitting – Repair, rehabilitation and retrofitting, retrofitting strategies – Importance of reanalysis. Case studies

Suggested Books:

1. Chopra A.K., Dynamics of Structures, Theory and Applications to Earthquake Engineering, Pearson Education, 2007.
2. Pankaj Agarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall of India, 2006.
3. Kramer S.L., Geotechnical Earthquake Engineering, Pearson Education, 2004.

Reference Books:

1. Mario Paz, International Handbook of Earthquake Engineering: Codes, Programs and Examples, Springer Verlag, 1995.
2. Prakash Rao D.S., Design Principles and Detailing of Concrete Structures, Tata McGraw-Hill Publishing Company, 1995.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE – III
HEALTH MONITORING & RETROFITTING OF STRCTURES
SYLLABUS FOR B.E. IV/IV - II SEMESTER

Instruction	:	3 period per Week	Semester End Exam	:	70	Subject Reference Code	:	CE4544
Credits	:	3	Sessional Marks	:	30	Duration of Sem End Exam	:	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Identify the importance of structural health monitoring, which gives the knowledge about the safety & stability of structures 2. Assess the present condition and strength of an existing structure by adopting Non destructive testing methods. 3. Conduct condition survey concrete structures by Non destructive evaluation.	1. Explain the importance of structures health monitoring (SHM) and the basic components of SHM. 2. Describe the application of SHM in civil engineering with respect to various types of structures. 3. Describe the various methods of Non – destructive testing of concrete structures to know their health condition. 4. Examine the various Non – destructive testing methods which are suitable for determining the condition of the existing concrete structures. 5. Examine the condition of the existing structures by conducting condition survey to know various defects and to make use NDT methods for evaluation to suggest the methods of rehabilitation.

UNIT–I

Introduction to Structural Health Monitoring (SHM) : Definition & motivation for SHM, SHM – a way for smart materials and structures, SHM and bio mimetic - analogy between the nervous system of a man and a structure with SHM, SHM as a part of system management, Passive and Active SHM, NDE, SHM and NDECS, Basic components of SHM, materials for Sensor design

UNIT–II

Application of SHM in Civil Engineering: Introduction to capacitive methods, capacitive probe for cover concrete, SHM of a bridge, applications for external post tensioned cables, monitoring historical buildings

UNIT–III

Non Destructive Testing of Concrete Structures : Introduction to NDT - Situations and contexts, where NDT is needed, classification of NDT procedures, Visual Inspection, Half- Cell Electrical Potential Methods, Schmidt Rebound Hammer Test, Resistivity Measurement, Electro Magnetic Methods, Radiographic Testing, Ultrasonic Testing, Infra Red Thermography, Ground penetrating Radar, Radio Isotope gauges, Other methods.

UNIT-IV

Condition Survey & NDE of Concrete Structure: Definition and objective of Condition Survey, Stages of Condition Survey (Preliminary, Planning, Inspection and Testing stages), possible defects in concrete structures, Quality control of concrete structures- Definition and need, Quality control applications in concrete structures, NDT as an option for Non-Destructive Evaluation (NDE) of Concrete structures, Case studies of a few NDT procedures on concrete structures

UNIT–V

Rehabilitation and Retrofitting of Concrete Structures: Repair, rehabilitation & retrofitting of structures, damage assessment of concrete structures, materials and methods for repairs and rehabilitation, modelling of repaired composite structure, structural analysis and design – importance of re-analysis, execution of rehabilitation strategy, case studies

Suggested Books:

1. Daniel Balageas, Claus-Peter FritzenamI Alfredo Guemes, “Structural Health Monitoring” published by ISTE Ltd, U.K. 2006.
2. “Guide book on Non-destructive Testing of Concrete Structures, Training Course series no. 17”, International Atomic Energy Agency, Vienna, 2002

Reference Books:

1. Hand book on “Repair and Rehabilitation of RCC Buildings”, published by Director General, CPWD, Govt. of India, 2002.
2. Handbook on Seismic Retrofitting of Buildings, published by CPWD & Indian Building Congress in Association with IIT, Madras, Narosa Publishing House, 2008.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

PROJECT
B.E. IV/IV - II SEMESTER

Instruction	:	18 period per Week	Semester End Exam	:	50	Subject Reference Code	:	CE4521
Credits	:	9	Sessional Marks	:	50	Duration of Sem End Exam	:	-

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Solve a real life societal problem through research based approaches	1. Formulate an analytical model for a civil engineering problem and obtain its solution with necessary tools. 2. Design a civil engineering structure with due consideration for public health and safety. 3. Perform and manage as an individual or as a member of a team with ethical values. 4. Examine the concepts of environment and sustainability 5. Write effective reports and communicate effectively on civil engineering problems. 6. Present the conclusions in a way to benefit the society.

Instructions to Students:

Solving a real life problem should be the focus of under graduate projects. Faculty members should prepare project briefs (giving scope and references) well in advance which should be made available to the students at the departmental library. The project may be classified as hardware / software / modeling / simulation. It may comprise any elements such as analysis, design, synthesis.

The department will appoint a project coordinator who will coordinate the following.

1. Grouping of students (a maximum of 3 in a group)
2. Allotment of projects and project guides
3. Project monitoring at regular intervals.

All projects allotments are to be completed by the 4^{th} week of IV year 1^{st} semester, so that students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through students' presentation. Sessional marks should be based on the grades / marks, awarded by a monitoring committee of faculty members as also marks given by the supervisor.

Efforts be made that some of the projects are carried out in industries with the help of industry coordinators. Problems can also be invited from the industries to be worked out through undergraduate projects.