NAGARJUNA

COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous College under VTU

DEPARTMENT OF CIVIL ENGINEERING

VISION

To transform the students as leaders in Civil Engineering to achieve professional excellence in the challenging future.

MISSION

M1: To provide the Civil Engineering knowledge and skills for students through an excellent academic environment.

M2: Adopting innovative teaching techniques using modern engineering tools for designing,modeling and analyzing the societal and environmental problems.

M3: Developing Communication skill, leadership qualities through team work and skills for continuing education among the students.

M4: To inculcate moral, ethical and professional values among students to serve the society.

M5: Validate engineering knowledge through innovative research projects to enhance their employability and entrepreneurship skills.

V to VIII Semesters

Scheme and Syllabus
With effect from Academic Year 2019-20

Fifth Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	17CVI51	Transportation Engineering (IC)	CV	3:0:2:0	4	100
2	17CVT52	Structural Analysis-II	CV	3:0:0:0	3	100
3	17CVI53	Design of RCC Structural Elements (IC)	CV	3:0:2:0	4	100
4	17CVT54X	Foundation Elective-IV	CV	3:0:0:0	3	100
5	17CVT55X	Foundation Elective-V	CV	3:0:0:0	3	100
6	17CVT56X	Engineering Elective-VI / PBL	CV	3:0:0:0	3	100
7	17CVL57	Fluid Mechanics Lab	CV	1:0:2:0	2	100
8	17CVL58	Analysis and Design Lab-I	CV	1:0:2:0	2	100
9	17CVH59	General Aptitude	CV/BS&H	2:0:0:0	2	100
Total				**22:0:8:0**	**26**	**900**

Foundation Elective – IV

Sl. No.	Course Code	Course
1	17CVT541	Construction Industry Practice-I
2	17CVT542	Advanced Fluid Mechanics
3	17CVT543	Traffic Engineering

Foundation Elective – V

Sl. No.	Course Code	Course
1	17CVT551	Advanced Surveying
2	17CVT552	Construction Management and Engineering Economics
3	17CVT553	Online Certification courses from IITs / IISc / SWAYAM / EDX

Engineering Elective – VI / PBL

Sl. No.	Course Code	Course
1	17CVT561	Green Buildings
2	17CVT562	Building Services
3	17CVT563	Hydrology and Irrigation Engineering

Sixth Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	17CVI61	Design of Steel Structures (IC)	CV	3:0:2:0	4	100
2	17CVT62	Geotechnical Engineering-I	CV	3:0:0:0	3	100
3	17CVI63	Environmental Engineering (IC)	CV	3:0:2:0	4	100
4	17CVT64X	Foundation Elective-VII	CV	3:0:0:0	3	100
5	17CVT65X	Engineering Elective-VIII / PBL	CV	3:0:0:0	3	100
6	17HOE66X	Open Elective-IX	CV/BS&H	2:0:0:4	3	100
7	17CVL67	Detailing of Structural Elements Lab	CV	1:0:2:0	2	100
8	17CVL68	Extensive Survey Camp	CV	1:0:2:0	2	100
9	17CVH69	Technical Aptitude and GD	CV/BS&H	2:0:0:0	2	100
Total				**21:0:8:4**	**26**	**900**

Foundation Elective – VII

Sl. No.	Course Code	Course
1	17CVT641	Construction Industry Practice-II
2	17CVT642	Advanced Transportation Engineering
3	17CVT643	Earthquake Resistant Design of Structures

Engineering Elective – VIII / PBL

Sl. No.	Course Code	Course
1	17CVT651	Pollution Control and Management
2	17CVT652	Water Resources Engineering
3	17CVT653	Pavement Materials and Construction

Open Elective – IX

Sl. No.	Course Code	Course
1	17HOE661	Lab View – Level 1
2	17HOE662	Yoga and Meditation
3	17HOE663	Martial Arts
4	17HOE664	Music (Carnatic Vocal / Instrumental)
5	17HOE665	Dance
6	17HOE666	Sports
7	17HOE667	Online Certification Courses from IITs / IISc / SWAYAM / EDX

Seventh Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	17CVT71	Geotechnical Engineering-II (IC)	CV	3:0:2:0	4	100
2	17CVT72	Estimation and Valuation (IC)	CV	3:0:2:0	4	100
3	17CVT73X	Foundation Elective-X	CV	3:0:0:0	3	100
4	17CVT74X	Engineering Elective-XI / PBL	CV	3:0:0:0	3	100
5	17HOE75X	Open Elective-XII	CV/BS&H/ME	2:0:0:4	3	100
6	17HOE76X	Open Elective-XIII	CV/BS&H	2:0:0:4	3	100
7	17CVL77	Project Management Lab	CV	0-0-2-0	1	100
8	17CVL78	Analysis and Design Lab-II	CV	1:0:2:0	2	100
9	17CVP79	Project Phase-I	CV	1-0-4-0	3	100
Total				**18-0-12-8**	**26**	**900**

Foundation Elective – X

Sl. No.	Course Code	Course
1	17CVT731	Construction Industry Practice-III
2	17CVT732	Pre-Stressed Concrete Structures
3	17CVT733	Pavement Design

Engineering Elective – XI / PBL

Sl. No.	Course Code	Course
1	17CVT741	Fire safety and management
2	17CVT742	Fundamentals of Energy, Environment and climate change
3	17CVT743	Industrial Waste Water treatment

Open Elective – XII

Sl. No.	Course Code	Course
1	17HOE751	Tax Management
2	17HOE752	Assessment of Building Energy Performance (Offered by ASHRAE)
3	17HOE753	Natural Disaster Mitigation and Management
4	17HOE754	Online Certification courses from IITs / IISc / SWAYAM / EDX

Open Elective – XIII

Sl. No.	Course Code	Course
1	17HOE761	Small and Medium Enterprise Management
2	17HOE762	Occupational Safety and Health Administration
3	17HOE763	Animation and Multimedia Engineering
4	17HOE764	Online Certification courses from IITs / IISc / SWAYAM / EDX

Eighth Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	Total Credits	Marks
1	17CVP81	Project Phase-II	CV	4	100
2	17CVP82	Project Phase-III	CV	4	100
3	17CVP83	Evaluation and Viva voce (External)	CV	10	100
		Total		**18**	**300**

IC – Integrated Course **L – Lecture** **T-Tutorials**
P-Practical **S – Self Study**

Fifth Semester B.E. – Syllabus

Transportation Engineering (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVI51	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the importance and characteristics of road transport and various committee.
- Understand the recommendations, various road patterns and road development programmes in India.
- Analyze requirements of Ideal alignment and various geometrical design factors.
- Gain knowledge on Pavement materials and its properties.
- Gain knowledge on Pavement design as per IRC and details of pavement.
- Get the importance of Highway Drainage system and Highway Economics.

Syllabus

Module – I

Principles of Transportation Engineering: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport, Jayakar committee recommendations and implementation – Central Road Fund, Indian Roads Congress.

Highway Development and Planning: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, Present scenario of road development in India (NHDP and PMGSY) and in Karnataka (KSHIP andKRDCL), Road development plan - vision 2021.

08 Hours

Module – II

Highway Alignment and Surveys: Ideal Alignment, Factors affecting the alignment, Engineering surveys- Map study, Reconnaissance, Preliminary and Final location and detailed survey, Reports and drawings for new and re-aligned projects.

Highway Geometric Design-I: Importance, Terrain classification, Design speed, Factors affecting geometric design, Cross sectional elements; Camber- width of pavement-Shoulders, Width of formation- Right of way, Typical cross-sections.

08 Hours

Module – III

Highway Geometric Design-II: Sight Distance-Restrictions to sight distance- Stopping sight distance-Overtaking sight distance- overtaking zones- Examples on SSD and OSD- Sight distance at intersections, Horizontal alignment-Radius of Curve- Super elevation – Extra widening-Transition curve and its length, setback distance – Examples, Vertical alignment-Gradient-summit and valley curves with examples.

08 Hours

Module – IV

Pavement Materials and Design Sub grade soil: Desirable properties - HRB soil classification-determination of CBR and modulus of sub grade reaction - Examples on CBR and Modulus of sub grade reaction, **Aggregates-** Desirable properties and list of tests, **Bituminous materials**- Explanation on Tar, bitumen, List of tests on bituminous materials. Pavement types, component parts of flexible and rigid pavements and their functions, design factors, ESWL and its determination - Examples, Flexible pavement-Design of flexible pavements as per IRC:37-2001 - Examples, Rigid pavement- Westergaard's equations for load and temperature stresses - Examples.

08 Hours

Module – V

Highway Drainage: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials.

Highway Economics: Highway user benefits, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods- Examples. **08 Hours**

List of Highway Material Testing Lab Experiments

Sl. No.	Name of the Experiment
	Test on Aggregates
1	Aggregate crushing value
2	Aggregate abrasion value (Los Angels Abrasion Test)
3	Aggregate Impact value
4	Shape tests on aggregates (Flaky, elongation)
	Test on bituminous materials and mixes
5	Specific gravity of bitumen
6	Penetration test on bitumen
7	Ductility test on bitumen
8	Viscosity test on bitumen
9	Softening point test on bitumen
10	Flash and fire point test on bitumen
11	Marshall Stability tests on bituminous

Course Outcomes:

On completion of this course, students will be able to :

- Study in detail about of road transport that includes characteristics features, various committee.
- Recognize different road patterns and road development programmes in India.
- Analyze factors influencing road alignment, different types of road surveys and factors influencing geometric design.
- Study Horizontal and vertical alignment, Pavement materials and its properties.
- Design Pavement as per IRC and details of pavement.
- Know the importance of Highway Drainage system and Highway Economics.

Text Books:

1. S.K. Khanna, Dr. C.E.G Justo, Dr. A. Veeraragavan: "Highway Engineering", (Chapters 1-4, 6, 7, 11, 14), Revised 10th Edition, Nem chand and Bros, Roorkee, 2014, ISBN: 9788185240725.
2. Dr. L.R. Kadiyali, Dr. N.B. Lal, "Principles of Highway Engineering", (Chapters 1, 2, 6, 16, 18, 19, 20, 22), Khanna Publishers, New Delhi -6, ISBN: 9788174091659.

Reference Books:

1. IRC Codes – IRC:37-2001, IRC:58-2002.
2. Specifications for Roads and Bridges- MoRT & H Specifications.
3. C. Jotin Khisty, B. Kent Lal, "Transportation Engineering", PHI Learning Pvt. Ltd., New Delhi.
4. James H Banks, "Transportation Engineering", McGraw Hill Pub., New Delhi.

E-Resources:

1. https://www.fhwa.dot.gov/environment/publications/flexibility/ch01.cfm
2. https://www.railelectrica.com/traction-mechanics/train-grade-curve-and-acceleration-resistance-2/
3. http://nptel.ac.in/courses/105104098/TransportationII/lecture6/7slide.htm/
4. http://www.aboutcivil.org/highway-drainage-design-guidelines-structures.html
5. http://nptel.ac.in/courses/105104098/45

Structural Analysis – II

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT52	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Analyze indeterminate structures by deflection method.
- Analyze the frames by moment distribution method.
- Understand the concepts of matrix method.
- Analyze the static indeterminate structures by matrix method.
- Understand the concepts of influence line diagrams and principles of dynamics.

Syllabus

Module – I

Slope Deflection Method: Introduction, Sign convention, Development of slope-deflection equations and Analysis of Beams, Analysis of Orthogonal Rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid). **08 Hours**

Module – II

Moment Distribution Method: Introduction, Definition of terms- Distribution factor, Carry over factor, Development of method and Analysis of beams and orthogonal rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid). **08 Hours**

Module – III

Sway Analysis: Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy ≤ 3) by slope deflection and moment distribution methods. **08 Hours**

Module – IV

Kanis Methods: Introduction, Basic Concept, Analysis of Continuous beams and Analysis of rigid jointed non-sway plane frames.

Stiffness Matrix Method of Analysis: Introduction, Development of stiffness matrix for plane truss element and axially rigid plane framed structural elements with kinematic indeterminacy ≤3. **08 Hours**

Module-V

Rolling Load and Influence Lines: Rolling load analysis for simply supported beams for several point loads and UDL, Influence line diagram for reaction, SF and BM at a given section for the cases mentioned above. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Solve beams and frames by slope deflection method
- Solve the problems connected with analysis of various structural components
- Solve the given frames by suitable method.
- Evaluate the continuous beams by suitable methods.
- Evaluate rolling load and influence line diagram for S.S beams.

Text Books:

1. S S Bhavikatti: "Structural Analysis - Vol. II", (Chapters 1, 3-6), Vikas Publishing House, 4th Edition, 2009, ISBN: 9789325968806, 9325968800.
2. S Ramamrutham and R Narayan: "Theory of Structures", (Chapters 9-12,14), Dhanpat Rai Publishing Company Private Limited, New Delhi, 9th Edition, 2014, ISBN: 978-9384378103.

Reference Books:

1. Reddy C. S: "Basic Structural Analysis", (Chapters 11-13,18), Tata McGraw Hill, New Delhi, 3rd Edition, 2010, ISBN: 9780070702769.
2. G.S. Pandit and R. Gupta: "Theory of Structures" Vol. 2, (Chapters 1-5), Tata McGraw Hill Publication Company Ltd., 1st Edition, ISBN: 9780074634981, 0074634984.

E-Resources:

1. http://elearning.vtu.ac.in/elcmys/13/ENotes/ECEEM/GR.pdf
2. http://elearning.vtu.ac.in/elcmys/e-con/Stru_Ana/ch5/html/0004.htm
3. http://elearning.vtu.ac.in/elcmys/P2/CV42/Chapter_05/html/0004.htm
4. http://elearning.vtu.ac.in/elcmys/StruAna.htm

Design of RCC Structural Elements (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVI53	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Fundamentals of concrete and steel reinforcement used for reinforced concrete design.
- Design methodologies of various structural components for different load conditions.

Syllabus

Module – I

Introduction: Objectives of the Design of Reinforced Concrete Structures, Method of Design, Design Loads, Properties of Steel, Principles of limit states, Partial safety factors, Characteristic and design loads, Characteristic and design strength, Stress block parameters for limit state of collapse by flexure, General Specification for flexure design of beams-practical requirements, size of beam, cover to reinforcement-spacing of bars Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length. **08 Hours**

Module – II

Design of Beams: Design procedures for critical sections for moment and shear, Slenderness limits for beams to ensure lateral stability, Design examples for singly reinforced, doubly reinforced Simply supported beams and Cantilever beams for rectangular and flanged sections. **08 Hours**

Module – III

Design of Slabs: General consideration of design of slabs, Rectangular slabs spanning in one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000. **08 Hours**

Module – IV

Design of Columns: Effective length of column, Slenderness ratio for columns, Minimum eccentricity, Design of short axially loaded columns, Design of column subject to combined axial load and uni-axial moment using SP – 16 charts.

Design of Stair cases: General features; types of stair case, Design of Dog legged and Open well stair cases. **08 Hours**

Module – V

Design of Footings: Introduction, Design of isolated rectangular footing for axial load. **Flexure and Serviceability Limit States:** General aspects of serviceability, Deflection limits in IS: 456 – 2000, Calculation of deflections and crack width. **08 Hours**

List of Experiments using Auto Cadd Software

Sl. No.	Name of the Experiment
1	Drawing of Singly and Doubly reinforced beams.
2	Drawing of one way, one way continuous and two way Slabs.
3	Drawing of columns.
4	Drawing of dog legged and open Well stair case.
5	Drawing of footings.

Course Outcomes:

On completion of this course, students will be able to :

- Recognize the design philosophies of reinforced concrete structures.
- Apply the principles, procedures and current code requirements to the analysis and design of reinforced concrete beams using limit state method.
- Design Reinforced Concrete slabs.
- Analyze and Design the Reinforced Concrete Columns and stair cases.
- Design structures for serviceability and footings.

Text Books:

1. M.L.Gambhir: "Fundamentals of Reinforced concrete Design", (Chapters 1,2,5-7), PHI Learning Private Limited, 2008-2009, ISBN: 978-8120330481.
2. S. S. Bhavikatti: "Design of RCC Structural Elements Vol-I", (Chapters 1-6, 8), New Age International Publications, New Delhi, ISBN: 978-8122416930.

Reference Books:

1. P.C. Varghese: "Limit State Design of Reinforced concrete", (Chapters 1,3,6,7,9), PHI Learning Private Limited 2008-2009, ISBN: 978-8120320390.
2. S.N.Shinha: "Reinforced concrete Design" TMH Education Private Limited, ISBN: 978-9351342472.
3. Indian Standard Codes: IS: 456-2000 and SP-16.

E-Resources:

1. http://nptel.ac.in/courses/105105105/6
2. https://constructionduniya.blogspot.in/2011/12/basic-concepts-for-civil-engineers-for_12.html
3. http://nptel.ac.in/courses/105105105/14

Construction Industry Practice-I

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT541	3:0:0:0	3	CIE:50 EE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand Different type on Loads on Structures and their impact on structural elements.
- Learn Concrete applications in Civil Engineering.
- Learn Construction Methodologies.
- Learn Masonry structures Specification/ Tendering and Contract Documentation.

Syllabus

Module – I

Scope of Civil Engineering **08 Hours**

Module – II

Different type of Loads of Structures and their impact on structural elements: Relevance of Codes - Indian and International Code rent type of buildings and occupancies Relevance of Structural Properties - Bending Moment, Shear Force, Torsion. **08 Hours**

Module – III

Concrete applications in Civil Engineering (Types of Concrete / Grade / Strength / Performance / Heat resistance/ Concrete Blocks/ Decorative Concrete / Transparent Concrete/ Permeable Concrete). **08 Hours**

Module – IV

Construction Methodologies / Workmanship / Standards for various works / Tools / Plants / Construction machinery. **08 Hours**

Module – V

Masonry structures, Basic Building Water supply / Plumbing Services BOQ / Data Sheet / Specification / Tendering and Contract Documentation. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Distinguish different type of Loads of Structures and their impact on structural elements.
- Execute Concrete applications in civil engineering.
- Summarize Construction Methodologies.
- Summarize Masonry structures Specification/ Tendering and Contract Documentations. .

Advanced Fluid Mechanics

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT542	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn the principles of dimensional analysis to design hydraulic models and Design of various models.
- Understand the flow physics of different fluids.
- Learn the aspects of boundary layer conditions and its application.
- Learn the basics of Impulse-Momentum principle.

Syllabus

Module – I

Dimensional Analysis: Dimensional analysis and similitude: Dimensional homogeneity, Non Dimensional parameter, Buckingham π theorem, dimensional analysis, choice of variables, examples on various applications. (Theory and Problems) **08 Hours**

Module – II

Model Analysis: Model analysis, similitude, types of similarities, force ratios, similarity laws, model classification, Reynolds model, Froude's model, Euler's Model, Webber's model, Mach model, scale effects, Distorted models. Numerical problems on Reynold's, and Froude's Model. (Theory and Problems). **08 Hours**

Module – III

Viscous Flow: Introduction, Flow of viscous fluid through circular pipe and parallel plates, power adsorbed in viscous flow, loss head due to friction in viscous flow, Method of determining coefficient of viscosity. (Theory and problems). **08 Hours**

Module – IV

Boundary Layer Flow: Introduction, drag force on a flat plate due to boundary layer, turbulent boundary layer on flat plate, Separation of boundary layer, method of preventing separation of a boundary layer. (Theory and problems). **08 Hours**

Module – V

Impact of Jet: Introduction, Impulse-Momentum equation. Direct impact of a jet on a stationary and moving curved vanes, Introduction to concept of velocity triangles, impact of jet on a series of curved vanes (theory and Problems). **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Apply the principles of dimensional analysis and similitude to solve engineering problems and use dimensionless parameters.
- Analyze models and compute the parametric values in prototype by analyzing the corresponding model parameters
- Analyze and apply viscous flow principle for engineering problems.
- Apply the concept of boundary layer condition for analyzing engineering problems.
- Apply the principles of Impulse-Momentum for engineering problems.

Text books:

1. P N Modi, S M Seth: "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th Edition, 2015, Standard Book House, New Delhi, ISBN: 978-81-894-0126-9.
2. R.K. Bansal: "A Text book of Fluid Mechanics and Hydraulic Machines", 9th Edition, 2014, Laxmi Publications, New Delhi, ISBN: 978-81-318-0815-3.
3. S K SOM and G Biswas: "Introduction to Fluid Mechanics and Fluid Machines", 2013, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, ISBN: 978-00713-2919-4.

Reference books:

1. K Subramanya: "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd., ISBN: 978-00-706-9980-9.
2. Mohd. Kaleem Khan: "Fluid Mechanics and Machinery", 2015, Oxford University Press, ISBN: 978-01-994-5677-2.
3. C.S.P. Ojha, R. Berndtsson, P.N. Chandramouli, "Fluid Mechanics and Machinery", Oxford University Publication, 2010, ISBN: 978-01-956-9963-0.
4. J.B. Evett, C. Liu: "Fluid Mechanics and Hydraulics", McGraw-Hill Book Company - 2009. ISBN: 978-00-702-3316-4.

Traffic Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT543	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Scope of traffic engineering and traffic characteristics.
- Various traffic engineering studies.
- Interpretation of the traffic study and traffic flow theory.
- Intersection design and Rotary intersection.
- Traffic regulation and control and ITS.

Syllabus

Module – I

Introduction to Traffic Engineering: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

Traffic Characteristics: Road user characteristics, Vehicular characteristics – static and dynamic characteristics, Power performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above. **08 Hours**

Module – II

Traffic Studies and Interpretation – Types, Objectives, Data collection, analysis and interpretation of results of classified traffic studies. Spot speed, speed and delay, origin and destination, Parking studies, Accident- causes, analysis of individual accidents, measures to reduce accident. Problems on above. **08 Hours**

Module – III

Traffic Flow Characteristics: Traffic flow variables, speed – flow – density relationship, PCU values, correlation and regression analysis (linear only) – Queuing theory, Poisson's distribution and Normal Distribution application to traffic engineering and relevant problems on above. Traffic Forecast and Simulation technique. **08 Hours**

Module – IV

Intersection Design: Principle At grade and Grade separated junctions – Types – channelization –Features of channelizing Island – median opening – Gap in median at junction.

Rotary Intersection: Elements – Advantages – Disadvantages – Design guide lines – Three legged inter section – Diamond inter change – Half clover leaf – Clover leaf- Advantages- Disadvantages only. **08 Hours**

Module – V

Traffic Regulation and Control: Driver, vehicle and road controls – Traffic regulations – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method – Street lighting, Road side furniture's. Relevant problems on above.

Intelligent Transport System: Definition, Necessities, Application in the present traffic scenario. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Know the objective and scope of traffic engineering and traffic characteristics.
- Interpret the traffic study and traffic flow theory.
- Conduct traffic studies and analyze traffic data
- Design traffic signal systems .
- Determine the capacity of highways.
- Recognize traffic regulation and control and ITS.

Text Books:

1. L.R. Kadiyali: "Traffic Engineering and Transport Planning", Khanna Publishers, (Chapters, 1-6,8-11,13-17), ISBN-10: 817409220X,ISBN-13: 978-8174092205.
2. Khanna, Justo: "Highway Engineering", Nemchand and Bros, Roorkee, (Chapter 5), ISBN: 978-81-85240-80-0.

Reference Books:

1. Salter RJ and Hounsell NB: "Highway, Traffic Analysis and Design"- Macmillan Press Ltd., London, (Chapters 1-4), ISBN: 9780333609033.
2. Matson T M, Smith W S, Hurd F W: "Traffic Engineering, McGraw Hill Book Co, NY, USA, ISBN 10: 0071761136 ISBN 13: 9780071761130.
3. Drew D R," Traffic Flow Theory and Control", McGraw Hill Book Co, NY, USA, ISBN: 978-3-642-02604-1.
4. Wohl, Martin: "Traffic System Analysis of Engineers and Planners", Mcgraw Hill Book Co., New York, USA, ISBN-10: 0070712743, ISBN-13: 9780070712744.
5. Pignataro: " Traffic Engineering", John wiley and sons, ISBN: 978-1-118-76230-1
6. Nicholas J Garber, Lester A Hoel: "Traffic and Highway Engineering"- Third Edition, Bill Stenquist, ISBN: 0-534-38743-8.
7. IRC: SP:41-1994, IRC SP:31-1992, IRC 43-1994, Indian Roads Congress.
8. MORTH: "Type Designs for Intersections on National Highways", Indian Roads Congress.
9. MORTH: "Manual for Road Safety in Road Design", Indian Roads Congress.

E-Resources:

1. https://en.wikipedia.org/wiki/Traffic_engineering(transportation)
2. http://www.faadooengineers.com/threads/7094-Traffic-Engineering-Ebooks-notes-pdf-ppt-download
3. http://nptel.ac.in/downloads/105101008/
4. http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=4114883

Advanced Surveying

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT551	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Introduction to advanced surveying techniques.
- Basic understanding of linear and angular measurements.
- Give an idea about surveying techniques.

Syllabus

Module – I

GPS – Principles: EDM – Principle, sources and error, GPS – Principles, Errors, Differential GPS, Instruments and Setting out of tunnel, bridge. **08 Hours**

Module – II

Map Projection: Fundamental properties of Map projection – Classification of Map projection- Principles of selecting map projection, Surveying and map projection. **08 Hours**

Module – III

Basics of Photogrammetry: Principles of photography – instruments – photographic measurements – vertical photographs – stereoscopic viewing and parallax. **08 Hours**

Module – IV

Types of Photogrammetry and Interpretation: Photomaps and Mosaics – Tilted photographs – Oblique and panoramic photographs – Terrestrial photogrammetry –around controls – photographic interpretation. **08 Hours**

Module – V

Astronomical Surveying: Field Astronomy, measurement of time, determination of Azimuth, Latitude and longitude. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Applying the principles of surveying and leveling in GPS.
- Prepare contouring and topographic maps and Map projections.
- Managing and controlling area to be surveyed effectively to minimize the error by Photogrammetric principles.
- Applying principles of governing error in measurement.
- Know the electronic principles on distance measurement and basic knowledge on Hydrographic surveying.

Text Books:

1. Bannister, A., Raymond, S., Baker, R.: "Surveying", Pearson Education, 2006, ISBN: 978-0582302495.
2. Kavanagh, Barry F: "Surveying: Principles and Applications", Vol-2, 8th Edition, 2009, Prentice Hall, ISBN: 978-0132365123.
3. Lille Sand: "Remote Sensing and Image Interpretation", 7th Edition, 2015, John Wiley and Sons, ISBN: 978-1-119-12846-5.
4. Paul R Wolf: "Elements of Photogrammetry with application of GIS", McGraw International, 4th Edition, 2014, ISBN: 978-0071761123.

Reference Books:

1. Chandra, A.M.: "Higher Surveying", New Age International Publishers, 2002, ISBN: 9788122438123.
2. Punmia P.C.: "Surveying", Volume 3, Fifteenth Edition, Laxmi publications, 2004, ISBN: 81-7008-825-9.
3. Peter A Burrough: "Principles of GIS", 3rd Edition, Oxford Publications, 2015, ISBN: 9780198742845.
4. Christopher Jones: "GIS and Computer Cartography", Longman Publications, 2007, ISBN: 9780582044395.
5. M Anji Reddy: "Remote Sensing and GIS", BS publication, 2008, ISBN: 978-81-7800-135-7.
6. Arthur Bannister, Stanley Raymond and Raymond Baker: "Surveying", Vol.2, 7th Edition, Pearson Education, 1998, ISBN: 978-0582302495.

E-Resources:

1. https://www.indiabix.com/civil-engineering/advanced-surveying/
2. https://www.safaribooksonline.com/library/advanced surveying/9789332501430/
3. www.asicivilsurvey.com/
4. https://www.slideshare.net/suryaom/advance-surveying-equipments

Construction Management and Engineering Economics

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT552	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the fundamentals of construction andproject management.
- Learn the fundamentals of Resource management.
- Study the concepts of Construction Economics and Finance.
- Learn financial management and construction accounting.

Syllabus

Module – I

Introduction: Construction Team and functions of a construction manager. Project Organization, Types, structure and practices. Stages of construction project, Delays. Job layout, Construction schedules - Preparation, uses and types of construction schedule. **08 Hours**

Module – II

Project management: Project Planning, Scheduling, Monitoring and Updating. Work Breakdown Structure, Introduction to CPM and its applications, Network fundamentals, Numerical on Fulkerson's rule. Introduction to PERT and its uses and importance, Numerical on Time estimates. **08 Hours**

Module – III

Resources management: Equipment-Selection, planning and financing. Equipment management and maintenance, Owning and operation costs. Materials management – Importance, objectives and uses. Functions of materials management department and stores management. **08 Hours**

Module – IV

Engineering economics: Basic principles, Time value of money, Nominal and Effective Interest, Discounted cash flow, Cash flow diagrams Equivalence – Single payment Compound amount factor, Uniform annual series payments – Derivations and problems. **08 Hours**

Module – V

Financial management–Working capital management, Sources of finance, Long term and short term Finance Construction accounting – Basic concepts and principles, Income statement, Financial statements – Profit and Loss, balance sheets Taxation Inflation and Depreciation – methods of depreciation. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Recognise the nature of construction industry and the importance of management.
- Formulate project management principles to solve problems on construction network and time estimates.
- Manage the resources efficiently in construction.
- Apply the concepts of economics and finance in constructions.
- Manage finance and accounts in construction.

Text Books:

1. Chitkara K K: "Construction Project Management", 10th Reprint, (Chapters 1-4,8,9), Tata McGraw Hill, 2006, ISBN-13: 978-9339205447.
2. Srinath L.S: "PERT and CPM", 3rd Edition, (Chapters 1-7), East West Press Pvt. Ltd., New Delhi, 2001, ISBN-13: 978-8185336206.
3. Courtland A. Collier and William B. Ledbetter, "Engineering Economics and Cost Analysis", (Chapters 1-4,7-12,14,15), Harper and Row, 2005, ISBN-13: 9780673983947.

Reference Books:

1. Peurifoy. R L: "Construction Planning, Equipment and Methods", 6th Edition, (Chapters 1,2), McGraw Hill, 2001, ISBN 13: 9780072321760.
2. Harris F and McCaffer R.: "Modern Construction Management", 7th Edition, (Chapters 4,6,7), BSP Professional Books, 2013, ISBN-13: 978-0470672174.

E-Resources:

1. nptel.ac.in/courses/105103023/
2. http://www2.aku.edu.tr/~icaga/kitaplar/fundamentals-of-construction-management.pdf
3. https://iimtstudies.files.wordpress.com/2014/03/finance_and_eco.pdf
4. https://www.openstaxcollege.org/files/textbook_version/low_res_pdf/21/principles-of-economics-LR.pdf

Green Buildings

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT561	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Understand the global and local environmental problems connected to the built environment.
- Understand how ecosystem can be enhanced and improved in building projects.
- Understand about life cycle assessment of building materials and products.
- Understand the importance and utilisation of solar energy in building construction.
- Explore the best use of non-renewable energy with minimal intrusion to the environments and of renewable energy to sustain the advancement of civilization.
- Become familiar with water consumption and water quality assessment.

Syllabus

Module – I

Introduction: Environmental implications of buildings energy, carbon emissions, High performance green buildings; Building materials: sources, methods of production and environmental implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings**.** **08 Hours**

Module – II

Implications of Building Technologies Embodied Energy of Buildings: Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings. Methods and tools for building assessment: LEED, Green globe, living building challenge. **08 Hours**

Module – III

Building energy and strategies: Low energy buildings, renewable energy systems. Economic issues and analysis, Life cycle assessment.

Comforts in Building: Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations. **08 Hours**

Module – IV

Solar buildings: Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings**.** **08 Hours**

Module – V

Green Composites for buildings: Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Know the applications of building materials and energy involved.
- Apply the different technologies and methods involved in green buildings.
- Study different Strategies involved in green building.
- Summarize importance of solar energy in green buildings.
- Assess the causes and effects of waste and to know the effects on green buildings.

Text Books:

1. K.S.Jagadish, B. U. Venkataramareddy, K. S. Nanjundarao: "Alternative Building Materials and Technologies", (Chapters 1-4,6), 2nd Edition, New Age International, 2007, ISBN: 978-93-859-2387-6 ,
2. Peavy, Tchobanoglous: "Environmental Engineering", Volume-2, (Chapters 6,10-12), ISBN: 0-07-049134-8.

Reference books:

1. Osman Attmann: "Green Architecture Advanced Technologies and Materials", (Chapters 2,4,6-9) McGraw Hill, 2010, ISBN: 9780071625012.
2. Jerry Yudelson: "Green building Through Integrated Design", (Chapters 5-7) McGraw Hill, 2009, ISBN: 9780071546010.
3. Walker, B, W. Steffen: "Global change and terrestrial ecosystems", International geosphere-biosphere programme book series, Cambridge University Press, 1996, ISBN-13: 9780521578103.

Building Services

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT562	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Provide fundamental knowledge of water supply system, drainage system, electrical services, illumination and lighting design, concept of HVAC.

Syllabus

Module – I

Water Supply: Water requirements for different types of buildings, simple method of removal of impurities, water saving practices and their potential Service connection from mains, sump and storage tank, types and sizes of pipes, special installation in multistoried buildings. Material, types of fixtures and fitting for a contemporary bathroom, taps, quarter turn, half turn, ceramic, foam flow etc, hot water mixer, hand shower Rainwater harvesting to include roof top harvesting, type of spouts, sizes of rainwater pipes and typical detail of a water harvesting pit. **08 Hours**

Module – II

Drainage: Principles of drainage, surface drainage, shape and sizes of drains and sewers, storm water over flow chambers, methods of laying and construction of sewers.

Traps: Shapes, sizes, types, materials and function, Inspection chambers - sizes and construction.

Ventilation of House drainage: Anti siphonage pipe, system of plumbing - single stack, one pipe system, one pipe partially ventilating system and two pipe system, grey water recycling and dual plumbing.

Types of fixtures and materials: sinks, shower tray, shower temple, bath tub, Jacuzzi, water closets, flushing cisterns, urinals, sinks, washbasins, bidet, etc. **08 Hours**

Module – III

Electrical Services: Electrical systems: Basic of electricity- Single/Three phase supply, Protective devices in electrical installation, Earthing for safety, Types of earthing, ISI Specifications. Electrical installations in buildings, Types of wires, Wiring systems and their choice, Planning electrical wiring for building, Main and distribution boards, Principles of illumination. **08 Hours**

Module – IV

Illumination and Lighting Design: Visual tasks, Factors affecting visual tasks. Modern theory of light and colour, synthesis of light, Additive and subtractive synthesis of colour, Luminous flux, Candle, Solid angle illumination, Utilization factor, Depreciation factor, MSCP, MHCP, Laws of illumination.

Electrical Layout of Simple Buildings: Electrical layout of a simple residential, school. **08 Hours**

Module – V

Heat Ventilation and Air Conditioning (HVAC): Behaviour of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity.

General methods of thermal insulation: Thermal insulation of roofs, exposed walls. **Ventilation:** Definition and necessity, system of ventilation. Principles of air conditioning Air cooling, Different systems of ducting and distribution, Essentials of air-conditioning system. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Analyze of water supply, water purifying techniques, different types of storages of water in multi-storeyed building.
- Adopt the principles of drainage, different types of traps, ventilation of house drainage and types of fixtures and materials.
- Apply the basic electrical system.
- Demonstrate the illumination and lighting design and electrical layout for different type of structures.
- Apply the concept of HVAC.

Text Books:

1. E.R.Ambrose: “Heat pumps and Electric Heating”, John and Wiley and Sons Inc., New York, 1968.
2. R.G.Hopkinson, J.D.Kay: “The Lighting of Buildings”, Faber, and Faber, London, 1969.

Reference Books:

1. Charangith Shah: “Water supply and sanitary engineering”, Galgotia publishers.
2. A. Kamala, D L Kanth Rao: “Environmental Engineering”, Tata McGraw-Hill publishing company limited.
3. Technical Teachers Training Institute (Madras): “Environmental Engineering”, Tata McGraw Hill publishing company limited.
4. National Building Code 2005.

E-Resources:

1. https://en.wikipedia.org/wiki/Building_services_engineering
2. https://en.wikipedia.org/wiki/HVAC
3. https://en.wikipedia.org/wiki/Building_services_engineering
4. https://en.wikipedia.org/wiki/Architectural_lighting_design

Hydrology and Irrigation Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT563	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Introduce student to hydrologic cycle and its components.
- Provide knowledge about the stream flow and important concepts associated with it.
- Provide basic knowledge about irrigation.
- Provide the knowledge about soil-water-crop relationship especially considering Indian conditions.
- Understand the methodology to assess irrigation water requirement.

Syllabus

Module – I

Hydrology and Precipitation: Introduction Atmospheric circulation, water vapor, formation of rainfall, Hydrologic cycle (Horton's representation). Water budget equation. Precipitation: Introduction, forms of precipitation, types of precipitation, measurement of precipitation, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall. (Theory and Problems). **08 Hours**

Module – II

Losses from Precipitation: Evaporation: Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer's and Rohwer's equation), evaporation control. Evapo-transpiration: Definition, factors affecting, measurement, estimation (Blaney criddle method). Infiltration: Definition, factors affecting, measurement (double ring in filtrometer), infiltration indices, Horton's equation of infiltration. (Theory and Problems). **08 Hours**

Module – III

Stream Flow and Hydrographs: Stream – classification of stream, stream gauging, measurement of discharge, stage-discharge relations. Introduction to Hydrograph – Definition, Factors affecting flood hydrograph, Components of a hydrograph, Base flow separation, Effective rainfall, Unit Hydrograph- Definition, Assumptions and Limitations of Unit hydrograph, Derivation of units of hydrograph, Unit hydrograph from complex storms, Unit hydrograph of different durations , S - Curve method.

08 Hours

Module – IV

Irrigation Engineering: Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation: Gravity irrigation, lift irrigation, well irrigation, tube-well irrigation, infiltration galleries, sewage irrigation, supplemental irrigation.

Introduction, soil profile, physical properties of soil, soil classification. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, frequency of irrigation. **08 Hours**

Module-V

Water Requirement of Crops and Design of Canals: Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period, Consumptive use, Irrigation efficiencies, Assessment of irrigation water.

Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain basic knowledge about hydrology and irrigation, and more precisely for Indian conditions.
- Analyze streamflow in accordance to the requirement.
- Gain basic knowledge about irrigation and irrigation system in Indian context.
- Formulate and analyze the relationship between soil-water-crop.
- Estimate irrigation water requirement, and design canals accordingly especially considering Indian conditions.

Text Books:

1. Subramanya K: "Hydrology", Tata McGraw Hill Co., New Delhi, ISBN: 9781259029974.
2. Madan Mohan Das, Mim Mohan Das: "Hydrology", PHI Learning Private Ltd., New Delhi, 2009, ISBN: 9788120337077.
3. Jayarami Reddy: "A Text Book of Hydrology", Lakshmi Publications, New Delhi, ISBN: 9788170080992.

Reference Books:

1. Ven Te Chow: "Handbook of applied hydrology", McGraw Hill Book company 1964, ISBN: 978-0070107748.
2. S. K. Garg: "Irrigation Engineering and Hydraulic structures", Khanna Publication, New Delhi, ISBN: 978-8174090478.

3. P.N.Modi: "Irrigation, Water Resources and Water Power Engineering", Standard Book house, New Delhi, ISBN: 978-8189401290.
4. R.K.Sharma: "Hydrology and Water Resources Engineering", New Delhi, ISBN: EBK0019826.

E-Resources:

1. http://nptel.ac.in/downloads/105105110/
2. http://www.vtulive.com/downloads/download/civil-v-hydrology-and-irrigation-engineering-notes-pdf/
3. http://www.uobabylon.edu.iq/uobColeges/ad_downloads/4_23319_838.pdf
4. https://www.slideshare.net

Fluid Mechanics Lab

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVL57	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Provide an opportunity to apply the knowledge gained in the field of fluid mechanics and hydraulics.
- Analyze static and dynamic fluid conditions using Bernoulli's equation of motion.
- Calibrate various types of notches and weirs used in measurement of flows.
- Estimate the major loss of head in pipe flow.
- Visualize and analyze the impact of jets on various types of vanes and evaluate performance characteristics of turbines and pump.

Syllabus

1. Calibration of collecting tank (gravimetric method)
2. Calibration of pressure gauge (dead weight method)
3. Verification of Bernoulli's equation
4. Calibration of 90° V-notch
5. Calibration of Rectangular notch
6. Calibration of Venturiflume
7. Calibration of Venturimeter
8. Determination of Darcy's friction factor for a straight pipe
9. Determination of vane coefficients for a flat vane andsemicircular vane
10. Performance characteristics of a multi-stage centrifugal pump
11. Performance characteristics of a Pelton wheel
12. Performance characteristics of a Kaplan turbine.

Course Outcomes:

On completion of this course, students will be able to :

- Apply the knowledge gained in the field of fluid mechanics and hydraulics.
- Demonstrate and analyze static and dynamic fluid conditions.
- Gain knowledge about measurement of flows and will be able to calibrate them.
- Estimate the major loss of head in pipe flow.
- Analyze the impact of jets on various types of vanes and evaluate performance characteristics of turbines and pump.

Reference Books:

1. Sarbjit Singh: "Experiments in Fluid Mechanics", PHI Pvt. Ltd., New Delhi, ISBN: 978-8120337626.
2. Dr. N. Balasubramanya: "Hydraulics and Hydraulic Mechines Laboratory Manual".
3. Lab manual provided by Dept. of Civil Engg., NCET.

Analysis and Design Lab – I

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVL58	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Use different types of FEM software in Civil Engineering.
- Impart the basic knowledge of Analysis of different components of Structures.
- Impart the knowledge of spread sheet in solving Civil Engineering problems.

Syllabus

Structural Analysis Software:

Use of commercially available FEM software for the analysis of :

i. Propped cantilever beams Fixed beams , Continuous beams
ii. Slabs
iii. Cables and Arches
iv. 2D Portal frames-single storied and multi-storeyed

Use of Excel In Civil Engineering Problems:

Use of spread sheet for the following civil engineering problems :

i) SFD and BMD for Cantilever and simply supported beam subjected to Point load, uniformly distributed and uniformly varying load acting throughout the span
ii) Computation of earthwork
iii) Design of horizontal curve by offset method
iv) Design of super elevation
v) Design of singly reinforced and doubly reinforced rectangular beams
vi) Design of columns and footings
vii) Design of one way slabs

Course Outcomes:

On completion of this course, students will be able to :

- Impart knowledge of FEM software for the analysis of structural elements.
- Draw SFD and BMD for various kind of beam using Excel.
- Prepare design spared sheet.
- Design RCC components using Excel.
- Plot graph for various problems using excel

Text Books:

1. Dr. M.N.Shesha Prakash, Dr. G.S.Suresh: "Computer Aided Design Laboratory", Lakshmi Publications.
2. M.A.Jayaram, D.S.Rajendra Prasad: "CAD Laboratory", Sapna Publications Learning.
3. Ramesh Bangia: "Excel", Khanna Book Publishing Co. (P) Ltd., Microsoft, 2002, ISBN-10: 8187522577, ISBN-13: 978-8187522577.
4. Krishnamoorthy, C.S., Rajeev, S.: "Computer Aided Design and Analytical Tools", Narosa, 1993, 2nd Edition, ISBN: 978-81-7319-495-5.

Reference Books:

1. Vazirani V.N., Ratwani N.M.: "Strength of Materials", Vol. II, Khanna Publishers, 1996.
2. Ashok, Kumar Jain: "Reinforced Concrete Limit State Design", Nem Chand Brothers, 1990.
3. Jindal. R.L: "Indeterminate Structures", Chan Tea, New Delhi, 2000.
4. Punmia B.C.: "Theory of Structures", Standard Book House, New Delhi, 2000.
5. Lab manual provided by Dept. of Civil Engg., NCET.

E-Resources:

1. https://www.researchgate.net/publication/273453659_CAD_in_Civil_Engineering_A_La
2. www.sit.ac.in/department/mca/publication/jayaram.pdf

General Aptitude

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVH59	2:0:0:0	2	CIE:50 SEE:50	3 Hours	HSS

Course Objectives:

This course will enable students to :

- Understand different types of Numerical / Arithmetical problems.
- Understand the different Data interpretation problems.

Syllabus

Module – I

Numerical Ability-I: Numbers, HCF and LCM of numbers, Decimal Fractions, Average, Problems on Numbers, Problems on Ages. **06 Hours**

Module – II

Numerical Ability-II: Percentage, Profit and Loss, Ratio and Proportion, Partnership, Chain Rule, Time and Work. **05 Hours**

Module – III

Numerical Ability-III: Pipes and Cistern, Time and Distance, Problems on Trains, Alligation or Mixture, Simple Interest, Compound Interest. **05 Hours**

Module – IV

Numerical Ability-IV: Races and Games of Skill, Calender, Clocks, Permutations and Combinations, Probability, Odd man out and Series. **05 Hours**

Module-V

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs. **05 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Solve and analyze different types of Numerical / Arithmetical problems.
- Solve and analyze different Data interpretation problems.

Text Books:

1. R S Aggarwal, “Quantitative Aptitude for competitive examinations”, (Chapters 1-3,6-8,10-18,20-22,26-28,30,31,35-39), S. Chand Publishing, New Delhi, 2014, ISBN-13: 978-81-219-2498-6.

Sixth Semester B.E. – Syllabus
Design of Steel Structures (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVI61	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn the Limit State Design concept of structural steel members.
- Understand the plastic behaviour of steel structural beams.
- Analyze the behavior of different connections used in steel structures.
- Understand the procedure of designing a steel structural component such as tension members, compression members and flexural members.

Syllabus

Module – I

Introduction: Advantages and Disadvantages of Steel structures, loads, load combination, Failure criteria for steel, Codes, Specifications and section classification.

Plastic Behavior of Structural Steel: Introduction, Plastic theory, Plastic hinge concept, conditions of plastic analysis, Theorem of Plastic collapse and Plastic analysis of continuous beams. **08 Hours**

Module – II

Bolted Connections: Advantages and Limitations of bolted joints, Design strength of ordinary Black Bolts and High Strength Friction Grip bolts (HSFG), Design of Simple Connections, Moment resistant connections.

Welded Connections: Advantages of Welding, Types and Properties of Welds, Weld specifications, Design of welds, Simple joints and Moment resistant connections. Design and drawing of Beam to Beam connection. **08 Hours**

Module – III

Design of Tension Members: Introduction, Types of tension members, Design of strands, slenderness ratio, behaviour of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, Other sections, Design of tension member, Lug angles, Splices, Gussets. **08 Hours**

Module – IV

Design of Compression Members: Introduction, Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members, Built up compression members. **08 Hours**

Module-V

Flexural Members: Introduction, Beam types, lateral stability of beams, factors affecting lateral stability, Design of laterally supported and laterally unsupported beams.

Bases: Design of simple slab base and gusseted base. **08 Hours**

Laboratory Activities: Students have to draw the following structural elements using AUTO-CAD software.

Sl. No.	Name of the Activity
1	Bolted and welded connections.
2	Beam to Beam connections.
3	Beam to column connections.
4	Flexural members.
5	Simple slab base and gusseted base connections

Course Outcomes:

On completion of this course, students will be able to :

- Apply the concept of Limit State Design of steel structures.
- Analyze and design steel structural beams subjected to plastic behavior.
- Capable of design various steel components using bolted and welded connections and also to develop a Cad drawing for the fabrication of different components of structures.
- Apply Indian Standard codal provisions for the design of tension and compression members.
- Design flexural members and bases.

Text Books:

1. N Subramanian: “Design of Steel structures”, (Chapters 1,5-9), Oxford University Press, 11th Edition, 2013, ISBN: 9780195676815.
2. Duggal: “Limit State Design of Steel Structures”, (Chapters 1-8), Tata Mcgraw Hill, Edition, 2010, ISBN: 9781259083785.

Reference Books:

1. S S Bhavikatti: “Design of Steel Structures”, (Chapters 1-6), I K International Pvt. Ltd., 2009, ISBN: 9789380026619.
2. Dr. B C Punmia, Dr. A K Jain: “Comprehensive Design of Steel Structures”, (Chapters 2-6), Firewall Media, 1998, ISBN: 9788170080930.

E-Resources:

1. http://nptel.ac.in/courses/105106112/
2. http://nptel.ac.in/courses/IITMADRAS/Design_Steel_Structures_I/index.php
3. http://iitmweb.iitm.ac.in/phase2/courses/105103094/12

Geotechnical Engineering - I

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT62	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to : :

- Understand what Geotechnical Engineering is and how it is important to civil engineering. Usage of three phase system.
- Estimate soil properties in the laboratory.
- Understand role of water in soil behavior and how soil stresses, permeability and moisture content-dry density relationships are estimated.
- Estimate the magnitude and time rate of settlement due to consolidation.
- Determine shear parameters and stress changes in soil due to foundation loads.

Syllabus

Module - I

Introduction: Introduction, origin and formation of soil, Phase Diagram, Basic definitions and their interrelationships.

Index Properties of Soils and their Determinations: Moisture content, Specific Gravity, Particle size distribution by Sieve analysis, In-situ density by core cutter and sand replacement methods. **08 Hours**

Module – II

Consistency of Soils: Atterberg limits and indices. Liquid Limit by Casagrande's method, Plastic limit and shrinkage limit determination.

Classification of Soils: Purpose of soil classification, basis for soil classification, Particle size classification and IS classification, Unified soil classification, Plasticity chart and its importance, Field identification of soils. **08 Hours**

Module – III

Soil Water and Permeability of Soil : Darcy's law- assumptions and validity, coefficient of permeability and its determination in laboratory, factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, quick sand phenomenon, Capillary Phenomena.

Compressibility of Soils: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, types of field compaction. **08 Hours**

Module – IV

Consolidation: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumptions, limitations and applications (no derivation), Normally, under and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (Cc, av, mv and Cv). Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index, and coefficient of consolidation, Determination of coefficient of consolidation by square root of time fitting method, logarithm of time fitting method. **08 Hours**

Module – V

Shear Strength of Soils: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Total and effective shear strength parameters, Concept of pore pressure, factors affecting shear strength of soils, Measurement of shear parameters- Direct shear test, Unconfined compression test, Triaxial compression test and Vane shear test, Shear strength tests under different drainage conditions, importance of pore pressure and shear strength in geotechnical applications. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Solve three phase system problems.
- Carry out index properties of soil and classification.
- Solve any practical problems related to permeability and compaction.
- Solve practical problems related to consolidation settlement and time rate of settlement.
- Estimate the shear strength parameters in cohesive and cohesion less soils.

Text Books:

1. Punmia B.C.: "Soil Mechanics and Foundation Engg.", 16th Edition, Laxmi Publications Co., New Delhi, 2005, ISBN: 978-8170087915.
2. Gopal Ranjan, Rao A.S.R.: " Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi, 2006, ISBN: 978-8122412239.
3. Venkatramiah C., "Geotechnical Engineering", New Age International (P) Ltd., Publishers, New Delhi, 2010, ISBN: 978-8122433517.

4. Head K.H.: "Manual of Soil Laboratory Testing", Vol. I, II, III, Princeton Press, London, 1986, ISBN: 978-0727313058.5.
5. Bowles J.E.: "Engineering Properties of Soil and Their Measurements", McGraw Hill Book Co. New York, 1988, ISBN: 978-0070067516.

Reference Books:

1. Lambe, Whitman: "Soil Mechanics", Wiley India Pvt. Ltd., New York, 2012, ISBN: 978-8126539918.
2. Terzaghi. K., Peck. R.B.: "Soil mechanics in Engineering practice", 3rd Edition, John Wiley and Sons, New York, 1996, ISBN: 978-0471086581.
3. Ramamurthy T.N., Sitharam T.G.: "Geotechnical Engineering", S.Chand and Company, New Delhi, 2010, ISBN: 978-8121924573.
4. Alam Singh, Chowdhary G.R.: "Soil Engineering in Theory and Practice"' CBS Publishers and Distributors Ltd., 2nd Edition, New Delhi, 2009, ISBN: 978-8123900391.
5. Murthy V.N.S.: "Soil Mechanics and Foundation Engineering", 4th Edition, UBS Publishers and Distributors Ltd., New Delhi, 2009, ISBN: 978-8123913629.
6. Dr. K.R.Arora: "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi,ISBN: 978-8180141126.
7. Braja M. Das: "Principles of Geotechnical Engineering", 8th Edition, Cengage Learning India (P) Ltd., India, 2015, ISBN: 978-8131526132.

E-Resources:

1. http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/soil_mech/index.htm
2. http://www.eng.fsu.edu/~tawfiq/soilmech/lecture.html
3. http://aboutcivil.org/soil-mechanics/soil-mechanics-1-high.pdf
4. http://en.m.wikipedia.org/wiki/geotechnical _engineering
5. accessengineeringlibrary,com/browse/geotechnical-engineering-soil-and-foundation-principles-and-practice-fifth-Edition

Environmental Engineering (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVI63	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the basic concepts and principles of Collection and conveyance of water.
- Identify the ill effects of environmental pollution.
- Understand the basic principles, concepts and Design of unit operations and
- Processes involved in water treatment and waste water.
- Develop a student's skill in evaluating the performance of water and waste water treatment plants.
- Understand the concepts estimating different parameters of the water and waste water quality

Syllabus

Module - I

Introduction: Requirement of water for various beneficial uses.

Demand of Water: Types of water demands-domestic demand, institutional and commercial, public uses, fire demand. Per capita consumption-factors affecting per capita demand, population forecasting, different methods with merits and demerits-variations in demand of water. Fire demand by kuichling's formula, Freeman formula and national board of fire underwriters formula, peak factors, design period and factors governing the design periods. **08 Hours**

Module – II

Quality of Water: Objectives of water quality management. Wholesomeness and palatability, Water quality parameters-physical, chemical, microbiological. Drinking water standards BIS and WHO guidelines.

Water Treatment: Objectives- Treatment flow-chart. Sedimentation: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test. **08 Hours**

Module – III

Aeration: Principles, types of Aerators.

Filtration: Mechanism-theory of Filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design-excluding under drainage system-back washing of filters. Operational problems in filters.

Disinfection: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV rays. Treatment of swimming pool water**.**

Softening: definition methods of removal of hardness by lime soda process and zeolite process RO and membrane technique. **08 Hours**

Module – IV

Introduction to waste water: Necessity for sanitation, methods of domestic waste water disposal.

Waste Water Characterization: Sampling, significance, techniques and frequency. Physical, chemical and biological characteristics, aerobic and anaerobic activities, CNS cycles. BOD and COD. Their significance and problems. **08 Hours**

Module – V

Treatment of waste water: Flow diagram of municipal waste water treatment plant.

Primary and Secondary waste water treatment: Screening, Primary sedimentation tank. Trickling filter, Activated sludge process and Anaerobic sludge digestion tanks including theory and operation.. **08 Hours**

Environmental Engineering Laboratory

Sl. No.	Name of the experiment
1	Determination of pH and Electrical conductivity.
2	Determination of Acidity, Alkalinity.
3	Determination of Calcium, magnesium and Total hardness.
4	Determination of Solids in sewage: Total solids, suspended solids, Dissolved solids and settle able solids.
5	Determination of Chlorides.
6	Determination of Dissolved oxygen and BOD.
7	Determination of COD.
8	Determination of Optimum Dosage of Alum using Jar Test Apparatus, Turbidity determination by Nephelometer.
9	Determination of percentage of available chlorine in bleaching powder.

Course Outcomes:

On completion of this course, students will be able to :

- Recognize the importance of water to protect the water resources which is facing a continuous degradation in water quality.
- Recognize that water supply and sanitation is an important professional and ethical responsibility of civil engineer.
- Demonstrate an ability to recognize the type of unit operations and processes involved in water and waste water treatment plants.
- Demonstrate an ability to design individual unit operation in treatment of water and waste water.
- Demonstrate ability in monitoring and analysis of water and waste water quality parameters.

Text Books:

1 Garg S.K.: "Environmental Engineering", Vols. I and II, (Chapters 1,2,8,9 and Chapters 2-8), 12th Edition, Khanna Publishers, New Delhi, 2001, ISBN: 81-7409-120-3.

2. B.C.Punmia: "Water Supply Engineering", (Chapters 1,5,6,8,9), Arihant Publications, ISBN: 81-7008-092-4.

3. Metcalf and Eddy Inc.: "Waste water Treatment, Disposal and Reuse", (Chapters 1-9), Tata McGraw Hill Publications, ISBN: 9780070495395.

Reference Book:

1. Rangwala: "Water supply and sanitary engineering", (Chapters 1,2,5-10,17-20,27-30), ISBN: 81-85594-59-7.

E-Resources:

1. https://ecommons.cornell.edu
2. https://doi.org/10.1016/j.enbsoft

Construction Industry Practice – II

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT641	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to : :

- Learn about Geotechnical investigation,
- Principles of Analysis of RC and steel Buildings,
- Implement these principles in designing and detailing of RC and steel Buildings.

Syllabus

Module - I

Geotechnical Investigation: (Bore Hole Location, Types of test, Importance and Interpretation of report). **08 Hours**

Module – II

Analysis and design of RC building. **08 Hours**

Module – III

Analysis and design of steel building. **08 Hours**

Module – IV

Detailing of RCC building. **08 Hours**

Module – V

Detailing of steel building. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Execute Soil Investigation.
- Execute analysis and design of RC Buildings.
- Execute analysis and design of Steel Buildings.
- Gain the Knowledge of Detailing of RC and Steel Buildings.

Advanced Transportation Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT642	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the importance of Railway Engg and rail requirements in India and Sleepers and Ballast.
- Understand the importance of Traction and Tractive resistance and Geometric design of rails.
- Understand the introduction to airport and runway design.
- Understand the introduction Tunnel Engineering.
- Understand the importance of Harbors and Docks.

Syllabus

Module - I

Railway Engineering: Advantages of railways as transportation mode, Typical cross sections, suitability of different gauges, Coning of wheels, components of the permanent way - Rails, Sleepers, Ballast and Fixtures - functions, types, requirements. Functions, requirements, Track fitting and fasteners-Fish plates-bearing plates, Calculation of quantity of materials required for laying a track-Examples. **08 Hours**

Module – II

Traction And Tractive Resistance: Traction and Tractive resistance, Gradients, super elevation, cant deficiency, Negative super elevation, Points and crossings, Salient features of Metro transport.

Geometric Design of Railways: Necessity, Safe speed on curves, Cant-cant deficiency-negative cant-safe speed based on various criteria, (both for normal and high speed tracks) Transition curve, Gradient and types, grade compensation, Examples on above. **08 Hours**

Module – III

Airport Engineering: Features and Role of Airways in transportation, Aircraft characteristics, Air transportation planning, site selection, Airport components and diagram, basic length and corrected length of runway length, Taxiway - Turning radius, exit taxiway, design factors and elements. **08 Hours**

Module – IV

Tunnel Engineering And Harbours: Advantages and disadvantages, Different shapes of tunnels, Surveying-Transferring centre line, and gradient from surface to inside the tunnel working face, Tunneling in rocks-Drift method, Heading and benching method, Tunneling methods in soils-Needle beam, Liner plate, Tunnel lining, Tunnel ventilation, Pilot tunneling. **08 Hours**

Module – V

Harbours and Docks: Types, components, Natural phenomenon affecting the design of harbours. Wind, wave and tides. Currents, Breakwaters - types, wharf and quays, Jetties and piers. Spillways.

Docks: Dry dock and wet docks, Slipways, Navigational aids, warehouse and transit-shed. **08 Hours**

Course Outcomes:

On completion of the course, This course will enable students to :

- Know the importance of Railway Engineering in transportation sector.
- Recognize the importance of Traction and Tractive resistance and Geometric Design in Railways.
- Recognize the importance of Airport Engg and Basic Runway Design.
- Define the Tunnel, Different types of tunnels and methods of tunneling.
- Learn the importance of Harbour and dock construction.

Text Books:,

1. S.C. Saxena and S.P Arora: "Railway Engineering", (Chapters 1-11, 15), 7th Edition, Dhanpat Rai Publications, New Delhi, ISBN: 9788189928834.
2. S.K Khanna, M.G Arora, S.S Jain - Airport Planning and Design, (Chapters 1,3,5-8), 6th Edition, Nem Chand Bros - Roorkee, ISBN: 81-85240-68-10.
3. R. Srinivasan: "Harbour, Dock and Tunnel Engineering", (Chapters 1-3), Charaotar Publishing House, 28th Edition, 2016, ISBN: 9789385039195.

Reference Books:

1. J S Mundery: "Railway Track Engineering", (Chapters 1-5), Tata McGraw-Hill Education, 4th Edition, 2009.
2. Hasmukh P. Oza, Gautam H. Oza "Dock and Harbour Engineering", (Chapters 8-12,17,21), 7th Edition, Charotar Publishing house Pvt. Ltd., Gujarat, India, ISBN: 9789380358789.

E-Resources:

1. http:nptel.ac.in/courses/105107123/
2. https://www.railelectrica.com/traction-mechanics/train-grade-curve-and-acceleration-resistance-2/
3. http://www.faa.gov/airports/engineering/
4. https://sites.google.com/a/venusict.org/dha/material

Earthquake Resistant Design of Structures

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT643	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn the principles of engineering seismology.
- Learn the design of reinforced concrete building for earthquake resistance.
- Learn the Seismic response of the structure.

Syllabus

Module - I

Introduction: Earthquake ground Motion, Engineering Seismology, Theory of plate tectonics, seismic waves, Magnitude and intensity of earthquakes, local site effects, seismic zoning map of India.

Seismic Design Parameters: Seismic Design Parameters Types of Earthquakes, earthquake ground motion characteristics response spectra and design spectrum.

08 Hours

Module – II

Structural Modelling: Code based seismic design methods. Response control concepts, seismic evaluation and retrofitting methods.

Structural Irregularities: Effect of Structural Irregularities on seismic performance of RC buildings. Vertical irregularity and plan configuration problems, Seism resistant building architecture – lateral load resistant systems, building characteristics.

08 Hours

Module – III

Lateral force analysis: Seismic design philosophy, Determination of design lateral forces -Equivalent lateral force procedure, dynamic analysis procedure.

Seismic analysis: Step by step procedure for seismic analysis of RC buildings (maximum of 4storeys , without infill's) - Equivalent static lateral force method, response spectrum methods. **08 Hours**

Module – IV

Earthquake Resistant Analysis And Design of Rc Buildings – Preliminary data, loading data, load combinations, analysis and design of sub frames. (maximum of 4 storeys, without infill's). **08 Hours**

Module – V

Earthquake Resistant Design of Masonry Buildings: Elastic properties of structural masonry, lateral load analysis, Design of two storied masonry buildings.

08 Hours

Course Outcomes:

On completion of this course, students will be able to :

- Achieve knowledge of earthquake and seismic design parameter.
- Summarize the structural irregularities and seismic deign methods.
- Analyze seismic forces acting on building by various method.
- Analyze and design sub frames and RC buildings.
- Design masonry building for earthquake resistance

Text Books:

1. Pankaj Agrawal, Manish Shrikhande: "Earthquake Resistant Design of Structure", PHI Learning Pvt. Ltd., 2006, 3rd Edition, ISBN: 9788120328921.
2. S.K Duggal, "Earthquake-resistant Design of Structures", Oxford University Press, 2nd Edition, ISBN: 9780198083528.

Reference Books:

1. Edmund Booth ,"Earthquake design practice for building", 3rd Edition, ICE Publishing, 2014, ISBN: 978-0727757944.
2. Miha Tomaževič: "Earthquake-resistant Design of Masonry Buildings", 2nd Edition, Imperial College Press, ISBN: 9781860940668.

E-Resources:

1. http://elearning.vtu.ac.in/06CV834.html
2. http://elearning.vtu.ac.in/18/enotes/06CV834/EQ-GPCt.pdf
3. http://elearning.vtu.ac.in/18/enotes/06CV834/Unit1&2-SKP.pdf
4. http://elearning.vtu.ac.in/18/enotes/06CV834/Unit7-PN.pdf

Pollution Control and Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT651	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Understand the factors that must be satisfied for potable water, land and air for the removal and treatment of pollutants.
- Provide a strong link between the Pollution Damage, Public Authority Control Systems and Technical Control Systems.
- Know the relationship between social, legislative and biological constraints in a modern developed society

Syllabus

Module - I

Water Pollution and Control: Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.

08 Hours

Module – II

Air Pollution and Control: Pollution and their sources-effects of pollution on human health, vegetation and climate prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation. **08 Hours**

Module – III

Noise Pollution and Control: Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation etc; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation **08 Hours**

Module – IV

Solid Waste Management: Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.

08 Hours

Module – V

Environmental Sanitation: Relation of food to disease-principles of food sanitation-sanitation of kitchens, restaurants and other catering establishments-quality changes in milk-milk as carrier of infection-pasteurisation of milk-HTST and LTLT processes – cattle shed sanitation. Orientation of buildings with respect to the direction of prevailing winds and solar movement. Air movement inside the buildings for a healthy residential environment **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Describe the principles of the biological and chemical treatment processes that are required to ensure adequate quality and quantities of potable water.
- Implement the principal techniques currently in use for wastewater treatment and to review operational procedures for the plant involved.
- Use advanced methods for monitoring and modeling spatial and temporal patterns of pollution.
- Analyze the different methods for solid waste management in the cities.
- Apply the concept of environmental sanitation process.

Text Books :

1. Peavy, H.S., Rowe, D.R, George Tcnobanoglous, "Environmental Engineering", Mc-Graw Hill company, New Delhi, 2001, ISBN: 978-9351340263.
2. Rao C.S.: "Environmental Pollution Control Engineering", Wiley Eastern Ltd., New Delhi, 1996, ISBN: 978-8122418354.

Reference Books :

1. Vesilind: "Introducing to Environmental Engineering", PWS Publishing Company, 1997, ISBN: 1118785991.
2. Gerard Kiley: "Environmental Engineering", 1st Edition, Irwin McGraw-Hill, 1997, ISBN: 9780077091279.

E-Resources:

1. https://qualifications.pearson.com/Unit-17-Pollution-Control-and-Management.pdf
2. www.ilocis.org/documents/chpt55e.html
3. www.indiaenvironmentportal.org.in/indian-journal-of-air-pollution-control/
4. www.scimagojr.com/journalsearch.php?q=23413&tip=sid

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Water Resources Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT652	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Prepare the students for a successful career as hydrologist and water resources engineers.
- Develop the ability among students to synthesis data and technical concepts for application in hydrology and water resources engineering.
- Provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, analyze, solve engineering problems and to prepare them for their career.
- Provide students with advanced tools of data collection and the analysis of the same with respect to water resources.
- Promote student awareness for the lifelong learning and to introduce them professional ethics and codes of professional practice in water resources management.

Syllabus

Module - I

Basics of Hydrometeorology: Hydrologic cycle Global water budget Practical applications – Hydrometeorology Air front cyclones Formation of precipitation Types and forms of precipitation Climate and Weather Meteorological Observations.

Precipitation: Measurement of rainfall Rain gauges Radar Measurement of rainfall Rainfall Hyetograph Intensity Duration and Frequency analysis Consistency Missing data Rain gauge network Average depth of rainfall analysis (Theory and Problems).

10 Hours

Module – II

Surface Runoff: Concept of catchment ,Linear, Areal and Relief Aspects, Detailed study of Runoff process, Factors affecting Runoff, Runoff estimation, Strange and SCS methods, yield estimation. **06 Hours**

Module – III

Ground Water: Groundwater in Hydrologic Cycle Origin of groundwater, Rock properties affecting groundwater, Types of aquifer, Darcy‟s law, coefficient of permeability, groundwater flow rates, permeability formulae, laboratory and field measurement of permeability, Ground water movement. **08 Hours**

Module – IV

Water Harvesting And Conservation: Water Harvesting Techniques Micro Catchments Design of Small Water Harvesting Structures – Farm Ponds Percolation Tanks Yield from a Catchment, Site selection for artificial recharge Rain water and Runoff Harvesting in Rural and Urban Areas Reservoir Sedimentation. **08 Hours**

Module – V

Watershed Management: Project Proposal Formulation Watershed Development Plan Entry Point Activities Estimation Watershed Economics Agroforestry Grassland Management Wasteland Management Watershed Approach in Government Programmes Developing Collaborative know how People‟s Participation Evaluation of Watershed Management. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Explain hydrologic cycle and hydro meteorological measurements with a know how about various methods of field measurements and estimation of precipitation.
- Recognize the process of abstraction and runoff which they apply to carry out the assessment of water balance and runoff potential.
- Gain knowledge about basic aquifer parameters and groundwater resources for different hydro-geological boundary conditions.
- Recognize the need of water harvesting and conservation.
- Develop the water shed management concepts in accordance with importance to society.

Text Books:

1. Subramanya K: “Hydrology”, Tata McGraw Hill Co., New Delhi, ISBN: 9781259029974.
2. Jeya Rami Reddy P: “Hydrology”, Laxmi Publications, New Delhi, ISBN: 9788170080992.
3. Vir Singh: “Watershed Planning and Management”, Raj Yash Publishing House, Bikaner, ISBN: 9788186882405.

Reference Books:

1. Ven Te chow: “Handbook of applied hydrology”, McGraw Hill Book company. ISBN: 978-0070107748.
2. S. K. Garg: “Irrigation Engineering and Hydraulic structures”, Khanna Publication, New Delhi, ISBN: 978-8174090478.
3. P.N.Modi: “Irrigation, water Resources and water power Engineering”, Standard book house, New Delhi, ISBN: 978-8189401290.

Pavement Materials and Construction

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT653	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Learn the basic road construction materials such as soils, aggregates, bitumen and Portland cement types, source, functions, requirements, properties.
- Know the various tests and specifications of different materials for use in various components of road.
- Know appropriate equipments required for construction depending upon the requirement.
- Prepare quality assurance and quality control plans in an attempt to construct better performing pavements

Syllabus

Module - I

Soil: Types, source, functions, properties. Preparation of subgrade, quality control tests. Construction of embankments for roads, compaction studies in laboratory and field, properties of compacted soils.

Soil Stabilization: Principle, methods and tests, proportioning of materials. Stabilizers and waste materials in road construction, their properties and scope in road construction. **08 Hours**

Module – II

Aggregates: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation, maximum aggregate size, Importance of aggregate gradation problems on Rotchfutch. **08 Hours**

Module – III

Bitumen and Tar: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.

Bituminous Emulsions and Cutbacks: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion. **08 Hours**

Module – IV

Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavements. **08 Hours**

Module – V

Construction of Flexible and Cement Concrete Pavements: Specifications of materials, construction methods and field control checks for various types of flexible and rigid pavements layers. (PQC Importance of providing DLC as sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes
- Analyze flexible pavements.
- Analyze rigid pavements.
- Identify the various equipments required for construction of highways.
- Construct flexible pavement and rigid pavement.
- Prepare quality assurance and quality control plans during construction.

Text Books:

1. Khanna, S.K., Justo, C.E.G.: "Highway Engineering", (Chapters 6-9), Nem Chand and Brothers, Roorkee, ISBN: 9788185240800.
2. S.C. Sharma: "Construction Equipment and its Management", (Chapters 1-4,6,7), Khanna Publishers, Delhi ,2013, ISBN: 9788174092281, 8174092285.
3. Freddy L. Roberts, Kandhal, P.S: "Hot Mix Asphalt Materials, Mixture Design and Construction", (Chapters 1,2), University of Texas Austin, Texas, NAPA Education Foundation Lanham, Maryland., ISBN-10: 0914313010, ISBN-13: 9780914313014.

Reference Books:

1. Freddy L Roberts, Prithvi S Kandhal: "Hot Mix Asphalt Materials, mixture design and construction", 2nd Edition, National Asphalt Pavement Association Research and Education Foundation, Maryland, USA, ISBN-10: 0914313010, ISBN-13: 978-0914313014.
2. RRL, DSIR: "Bituminous Materials in Road Construction", HMSO Publication, ISBN: 9781138893764.
3. RRL, DSIR: "Soil Mechanics for Road Engineers", HMSO Publication, ISBN: 0115502785, 9780115502781.
4. Relevant IRC codes and MoRT and H specifications.

E-Resources:

1. http://www.fhwa.dot.gov/pavement/pavemat.cfm
2. http://library.iitbbs.ac.in/book-info.php?id=53c3bce66e43be4f209556518c2fcb54
3. http://www.pppcatalog.com/store/pavement-maintenance-and-construction/
4. http://cce.oregonstate.edu/ptm
5. http://www.fhwa.dot.gov/pavement/asphalt/

LabVIEW - Level I

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE661	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the fundamental of graphical coding system.
- Learn to develop basic level of LabVIEW coding.
- Study the different component of LabVIEW operating tools.
- Study and develop state machine for a specific problem.
- Develop integrated coding solution for analysis and presentation with MyRio hardware using accelerometer.

Syllabus

Module - I

LabVIEW programming concepts, environment and Software constructs: Data flow, Polymorphism, Front panel window, block diagram, and connector pane, Menus and palettes, Configuration options. Controls, indicators, IO controls, and refnums Terminals, constants, nodes, update modes, and legends of charts and graphs. Mechanical action of Boolean objects Property Nodes. Numeric, string, Boolean, and path data types. Array and cluster data types. Shift registers, Case, Sequence and Event structures. **10 Hours**

Module - II

Programming, Data communication and synchronization VIs and functions: Conversion, comparison, and manipulation, Timing and Timing functions related to Timed structures. Data storage and file I/O formats, Waveform and waveform file I/O, Dynamic and User events Local, global, and shared variables Data Socket TCP and UDP Notifiers Queues Semaphores Property Nodes, and Invoke Nodes. **08 Hours**

Module - III

Error handling VIs and functions: Error clusters Dialog and User Interface VIs Custom error codes.

Design patterns: Simple state machine, User interface event handler, Queued message handler, producer/consumer (data) and producer/consumer (events), Functional global variables. **06 Hours**

Module - IV

Sub VI design: SubVI creation methods, Connector panes and connection types, Polymorphic subVIs, Options related

Debugging tools and techniques: Debugging tools, Error list window, Execution highlighting, Breakpoints and single stepping, Generic and custom probes, Debugging practices and techniques for different situations. **08 Hours**

Module - V

VI design and documentation (style) practices: Refer to the LabVIEW Style Checklist topic of the LabVIEW Help for information on the following items

i. User interface design and block diagram layout

ii. Modular and hierarchical design

iii. SubVI icons and connector pane layout (standard)

iv. Properties

v. Documenting Vis

Memory, performance, and determination

a. Tools for identifying memory and performance issues

Profile memory and performance, Show buffer allocations and VI metrics

b. Programming practices

Enforcing dataflow, User interface updates and response to user interface controls, Data type selection, coercion, and buffer allocation, Array, string, and loop operations **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Formulate basic aspects of the graphical programming using LabVIEW 2016.
- Develop LabVIEW coding for a specific problem of datalogging, measurement and presentation.
- Handle the error function and errors in the LabVIEW coding.
- Develop coding for data handling and Analysis on the acquired data.
- Design a state machine LabVIEW coding for an applied problem.

Text Books:

1. "LabVIEW - Getting Started with LabVIEW", M/s National Instruments, 2013 373427J-01.
2. Jovitha Jerome: "Virtual instrumentation using labview", PHI Learning Pvt. Ltd., 2010.
3. Hans-Petter Halvorsen: "Introduction to LabVIEW," University College of Southeast, Norway.
4. S. Sumathi, P. Surekha, "LabVIEW based Advanced Instrumentation Systems", Springer.
5. Lab manual provided by Dept. of Civil Engg., NCET.

Reference Books:

1. Jeffrey Travis, Jim Kring: "Introduction to Graphical Programming with LabVIEW", Pearson, 2006.
2. Malan Shiralkar: "LabVIEW Graphical Programming Course Collection", National Instruments.

E-Resources:

1. http://cnx.org/content/col10241/1.4.

Yoga and Meditation

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE662	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Introduce the main principles of Yoga.
- Generate knowledge and skills of students to use the tools and techniques for using Yoga in day to day life for better health and well being.
- Improve communication and increase concentration through Yoga and Meditation.
- Equip the individual to handle stressful situations and manage day to day activities.

Syllabus

Module – I

Definition and meaning of yoga: Meaning of Asanas, Types of Asanas: standing, sitting and supine asanas. Standing Asanas (Trikon asan, padhastasan, ardhachakrasan, veerbhadrasan), Sitting Asanas (Vajrasan, padmasan, suptavajrasan, Ardhamaschendrasan, vakrasan), Supine Asanas (Sarvangasan, Matsyasan, Natarajasan, Shavasan) **08 Hours**

Module – II

Patanjali's Yoga Sutra: Eight limbs of yoga, Importance of discipline in Yoga, Stillness of mind, Five Modulations (vritti) of the mind, Practice and Dispassion, Obstacles in the path of Yoga, Overcoming distractions of the mind through Yoga. **08 Hours**

Module – III

Understanding physiological implications of Yoga, Three types of Gunas (Satva, Rajas and Tamas) and their effects on body and mind, Food Habits, Meaning of Prana, Pranayama and its advantages, Different types of Pranayama. **08 Hours**

Module – IV

Ayurveda: The science of life, Three types of doshas (Vata, Pitta and Kapha), Balancing the different doshas for a healthy life, Ayurvedic principles of food and activity, Advanced Asanas: Mayurasana, Sirsasana, Gomukh Asana, Vrkshasana, Baddha Konasana. **08 Hours**

Module – V

Meditation: Meaning of meditation, Meditation vs Concentration, Advantages of Meditation, Effects of Meditation on body and mind, Effect on health and general well being, Reducing stress through meditation, Increasing concentration, Improving communication, Effect on Environment **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Know the basic principles of Yoga.
- Know and practice the basic asanas and their benefits.
- Use Pranayama and Meditation for improving health and mental peace.
- Know the difference between meditation and concentration.
- Apply the principles of Ayurveda and implement them for one's benefit.

Text Books:

1. Yoga Sutras of Patanjali (ancient text).
2. B K S Iyengar: "Light on Yoga".

Reference Books:

1. A traditional touch to Yogasanas for beginners and Sadhakas, Swami Vivekananda Yoga Prakashana (SVYP).
2. Dr. Vasant Lad: "Ayurveda: The Science of Self-Healing: A Practical Guide".

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Martial Arts

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE663	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

The following types of Martial arts are offered,

1. Karate
2. Taekwondo
3. Judo
4. Kung-fu

Expert Trainers will be provided during the academic year through experts in Martial Arts. Students who enroll for this elective should attend the regular Training classes and maintain a minimum of 85% attendance.

At the end of the training programme the performance Evaluation will be made by team of experts. Students who secure at least a satisfactory grade will be issued a certificate and deemed to have been completed the above said 3 Credit course. However, the students who have shortage of attendance will be consider for the award of 3 credits provided they undergo training at any of the training centers in the above said Martial Arts, complete the certification programme and give a demo along with viva in the presence of experts in the campus.

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Music (Carnatic Vocal/Instrumental)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE664	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Get familiarized with the conceptual understanding of Carnatic music.
- Gain knowledge about the basics of Swaravalis.
- Understand the use of different Talas.
- Gain understanding about various Raagas.
- Gain understanding about intricacies of Swaras.

Syllabus

Module – I

Theoretical Aspects: Father of Carnatic music, Famous personalities in Carnatic music, Concept of Sapta Swara, Taala, Melody, Pitch, Rhythm, Janaka Raaga, Janya Raaga. **03 Hours**

Module – II

Sarale Varase (Any 5), Janti Varase (Any 5), Daatu Varase, Tara Stayi, Mandra Stayi. **08 Hours**

Module – III

Alankaras: Druva Taala, Matya Taala, Triputa Taala, Rupaka Taala, Jampe Taala, Atta Taala, Eka Taala. **08 Hours**

Module – IV

Geethagalu, Pillari Geethe (4), Sanchari Geethe (5), Lakshana Geethe (1). **10 Hours**

Module – V

Swarajatis (Any 2), Kalyani, Bilahari, Neelambari, Kamach.
Varna (Any 2), Shankarabarana, Kalyani, Hamsadwani , Mohana. **10 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain knowledge about the theoretical background of carnatic music
- Acquire practical knowledge on basics of Carnatic music.
- Practical demonstration of different Talas.
- Distinguish among various Raagas based on swara sthanas.
- To synchronize the Raaga and Taala.

Text books:

1. Dr. Sachidevi: "Karnataka Sangeetha Darpana", Sreenivasa Prakashana, Bengaluru, 2014.
2. Junior Carnatic Music – C Shiva Musicals, Malleshwaram, Bengaluru, 2013.

Dance (Bharatanatya)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE665	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Gain theoretical knowledge about various types of Indian dances.
- Understand about various musical instruments used in Bharatanatya.
- Learn Practical demonstrations of Bharatanatya steps on Prarthane Namaskara and Shlokas.
- Learn the movements of head, neck, eyes, hands according to Bharatanatya steps.
- Learn the brisk movements in Bharatanatya with the help of ADAVUS.

Syllabus

Module – I

Indian Classical dance, It's history and Significance, Types of Classical Dance, Bharatanatya, Kathakali, Mohini Attam, Koochipudi, Katahak, Odissi, Manipuri.

04 Hours

Module – II

Musical Instuments used in Bharatanatya: Tabala, Mrudanga, Kamsale, Kolata, Taala vadya. Famous personalities in Bharatanatya, Composers of Natya Grantas.

03 Hours

Module – III

Practical exercises on Prarthane, Namaskara and Shloka, Vyayama Kriye for Bharatanatya (Two Shlokas and Two Prarthanes). **10 Hours**

Module – IV

Abhinaya Steps (Chaturvidha) ShiroBedha, Drushti Bedha, Greeva Bedha, Brubedha, Hasta Bedha (Samyuta and Asamyuta). **10 Hours**

Module – V

Adavugalu (DashaVidha) Tattu adavu, Mettu Adavu, Nat Adavu, Egaru Tattu Adavu, Egaru Mettu adavu, Jaaru Adavu, Mandi adavu, TattuMettu Adavu, Rangakarma Adavu, Teermana Adavu. **12 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Get an insight into various types of Indian dances.
- Gain knowledge of different instruments used to perform dance.
- Perform exercises on prarthane, Namaskara according to Bharatanatya style.
- Perform basic steps in Abhinaya.
- Recognise and perform different Adavus.

Reference Book:

1. "Bharatanatya shastra", Department of Public Instruction, Karnataka State Government**.**

Sports

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE666	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Students who are selected by the University to represent the VTU teams and for participating at State level / National level Sports in the following sports are exempted from taking open elective (Code:16HOE666) and will be awarded 3 credits.

Outdoor games	Indoor games
Cricket	Carrom
Foot ball	Chess
Hockey	Shuttle Badminton
Basket Ball	Squash
Kabbadi	Table – Tennis
Kho – Kho	Gymnastics
Hand – Ball	
Athletics	
Swimming	
Lawn Tennis	

The achievement in Sports as said above should have been made during the academic year during which the said open elective is offered.

After representing at VTU / State / National level in any of the above said sports, the students should produce the certificates from the competent authorities. Based on the certificates the institution will issue another certificate related to the achievement and awarding of three credits.

Detailing of Structural Elements Lab

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVL67	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Gain knowledge on building drawing in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.
- Impart the basic knowledge of Analysis of different views of Structures.

Syllabus

Building Drawing:

Use of commercially available software for the drawing of RCC and Steel Structures

i. Combined Footing
ii. Retaining Wall
iii. Portal frame
iv. Truss
v. Plate girder
vi. Gantry girder

Course Outcomes:

On completion of this course, students will be able to :

- Execute computer aided drawing for detailing different structural components.
- Develop working drawing for structural fabrication based on design.
- Set up a drawing of different components which are useful for the industries.
- Interpret and Analyze views of a drawing.

Text Books:

1. Dr. M.N.Shesha Prakash, Dr. G.S.Suresh: “Computer Aided Design Laboratory”, Lakshmi Publications.
2. M.A. Jayaram, D.S. Rajendra Prasad : “CAD Laboratory”, Sapna Publications Learning.
3. James D. Bethune: “Essentials of Drafting”, Prentice-Hall publication, 1977, ISBN-13: 9780132844307.

Reference Books:

1. Ashok, Kumar Jain: "Reinforced Concrete Limit State Design", Nem Chand Brothers, 1990.
2. Varghese: "Limit state design of concrete", Oxford IBH, 2000.
3. N Subramanian: "Design of steel structures", Oxford University Press, 11th Edition, 2013, ISBN: 9780195676815.
4. Duggal: "Limit State Design of Steel Structures", (Tata Mcgraw Hill, 2010, ISBN: 9781259083785.
5. Lab manual provided by Dept. of Civil Engg., NCET.

E-Resources:

1. https://www.autodesk.com/solutions/cad-software

Extensive Survey Camp

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVL68	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to : :

- Learn how the new project should be started and the work carried out to complete the project.
- Learn how to calculate the earth work for Embankment and Filling.
- Learn how to set a horizontal curve on a highway alignment.
- Understand the use of total station in all the projects.

Syllabus

An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days).

The student shall submit a project report consisting of designs and drawings.

1. General instructions: Reconnaissance of the sites and fly leveling to establish bench marks.

2. New Tank Projects: The work shall consist of

i) Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line.

ii) Capacity surveys.

iii) Details at Waste weir and sluice points.

iv) Canal alignment

3. Restoration of an Existing Tank: The work shall consist of:

i) Alignment of centre line of the existing bund, Longitudinal and Cross sections along the centre line.

ii) Capacity surveys, Details at sluice and waste weir.

4. Water Supply and Sanitary Project: Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.

5. Highway Project: Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road. (Drawing should be preferably done using AutoCAD).

Course Outcomes:

On completion of this course, students will be able to :

- Gain a basic understanding of the principles and operation of the Global Positioning System for locating salient features by Total Station.
- Gain the ability to measure differences in elevation, draw and utilize contour plots, and calculate volumes for earthwork for civil engineering projects.
- Appreciate the need for licensed surveyors to establish positioning information for property and structures.

Text Books:

1. Dr. B C Punmia: "Surveying Volume I", (Chapters 1-4, 6,7,9-13,16,18,22), Lakshmi Publications Pvt. Ltd., 6th Edition, 2005, ISBN: 978-81-700-8853-0.
2. Dr. B C Punmia: "Surveying Volume II", (Chapters 1-4,6,7,15), Lakshmi Publications Pvt Ltd, 6th Edition, 2005, ISBN: 978-81-700-8853-0.

Reference Books:

1. Chandra, A.M.: "Higher Surveying", New Age International Publishers, 2002, ISBN: 9788122438123.
2. Punmia P.C.: "Surveying", Volume 3, 15th Edition, Laxmi publications, 2004, ISBN: 81-7008-825-9.
3. Lab manual provided by Dept. of Civil Engg., NCET.

E-Resources:

1. http://lib.uniten.edu.my/libsite/index.php?option=com_joomd&view=item&layout=detail&typeid=2&id=202&Itemid=790
2. http://ascelibrary.org/journal/jsued2
3. www.survivorlibrary.com/engineers_surveying_instruments_1892.pdf
4. www.asicivilsurvey.com/
5. https://www.slideshare.net/suryaom/advance-surveying-equipments

Technical Aptitude and GD

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVH69	2:0:0:0	2	CIE:50 SEE:50	3 Hours	HSS

The respective branches shall conduct training programmes related to important and latest programming languages and other emerging technologies, such as Solar and Electric power based gadgets, IoT, ROBOT's, Environmental friendly and cost effective construction techniques, UAV's and technologies pertaining to the respective department.

Seventh Semester B.E. – Syllabus
Geotechnical Engineering-II (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT71	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the significance of investigation of soil in the field and various methods to carry on the investigation.
- Understand the seepage conditions and stresses that develop in the soil.
- Understand how to calculate the lateral pressures that develop in the soil.
- Analyze and predict the possible instability of slopes, how to make them stable.
- Appreciate the most important parameter called SBC of soils, which is used while designing the shallow foundations of structures.

Syllabus

Module - I

Subsurface Exploration: Importance of exploration program, Methods of exploration: Boring, sounding tests. Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearances, stabilization of boreholes – Typical bore log. Number and depth of borings for various civil engineering structures. **08 Hours**

Module – II

Seepage Analysis: Laplace equation (no derivation), assumptions and limitations only. Flow nets characteristics and applications. Flow nets for sheet piles and below the dam section. phreatic line (Casagrande's method - with toe filter).

Stresses in Soils: Boussinesq's and Westergard's theories – assumptions and limitations, Equations for concentrated, circular and rectangular loads. Comparison of Boussinesq's and Westergard's. Pressure bulb. Newmark's chart and its application. **08 Hours**

Module – III

Lateral Earth Pressure: Active and Passive earth pressures, Earth pressure at rest, Earth pressure coefficient. Earth pressure theories- Rankine's and Coulomb's theories – assumptions and limitations, Lateral earth pressure in cohesive and cohesion-less soils. Graphical solutions for active earth pressure (cohesion-less soil only) – Culmann's and Rebhann's graphical methods. **08 Hours**

Module – IV

Stability of Earth Slopes: Types of slopes, causes of failure and type of failure of finite slopes. Definition of factor of safety, stability of infinite slopes, Stability of finite slopes by - Method of slices, Friction Circle method and Taylor's stability number.

Foundation Settlement: Calculation of settlement - immediate, consolidation and secondary settlements (no derivations), differential settlement, tilt, permissible settlements and tilts as per B.I.S. – Matrices. **08 Hours**

Module-V

Bearing Capacity of Shallow Foundations: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's bearing capacity equations-assumptions and limitations, IS Code's bearing capacity equations, Bearing capacity of footings subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity – Plate load test, Standard penetration test and cone penetration test **08 Hours**

Lab Session	Topic for a Session (3 Hours)	Tests/Assignments/ Tutorials
1	Specific gravity of soil grains.	Soil identification and record
2	Field density test (Core cutter and sand replacement methods).	Density test, record
3	Grain size distribution Sieve analysis.	Soil identification and record
4	Determination of moisture – Density relationship using Standard Proctor test and Modified Proctor test	Density and water content, record
5	Permeability determination (Constant head and falling head methods).	Seepage calculation, record
6	Determination of shear strength parameters: a) Direct shear test on cohesion less soil. b) Unconfined compression test on cohesive soil. c) Triaxial compression test.	Shear parameters calculation, Identification of soil, record

7	Determination of the bearing capacity of soil for three different sites.	Calculation of SBC
8	Demonstration of one dimensional consolidation test (Determination of co-efficient of consolidation only).	Identifying instruments and record
9	Demonstration of miscellaneous equipments such as Augers, Samplers, rapid Moisture meter, proctor's needle and Vane shear test.	Identifying instruments and record

Course Outcomes:

On completion of this course, students will be able to :

- Analyze any field situation with the knowledge gained.
- Estimate the stresses that will develop in the soil.
- Solve any practical problems related to soil stresses estimation, and seepage including flow net diagram.
- Solve the lateral pressure by different methods.
- Carry out stability analysis and settlement calculation andSolve the SBC of the soil.

Text Books:

1. Terzaghi. K. and Peck. R.B.: "Soil mechanics in Engineering practice", 2nd Edition, John Wiley and Sons, New York , 1996, ISBN: 978-0471086581.
2. Punmia B.C.: "Soil Mechanics and Foundation Engg.", 16th Edition, Laxmi Publications Co., New Delhi, 2005, ISBN: 978-8170087915.
3. Gopal Ranjan, Rao A.S.R.: " Basic and Applied Soil Mechanics",New Age International (P) Ltd., New Delhi, 2000, ISBN: 978-8122412239.
4. Venkatramiah C.: "Geotechnical Engineering", New Age International (P) Ltd. Publishers, New Delhi, 2006, ISBN: 978-8122433517.

Reference Books:

1. Bowles J.E. (2012), 'Foundation Analysis and Design"' 5th Edition, McGrawHill Pub. Co. New York, 2012, ISBN: 978-1259061035.
2. Bowles J.E.: "Engineering Properties of Soil and their Measurements", McGraw Hill Book Co., New York, 1988, ISBN: 978-0070067516.

4. Craig R.F.: "Soil Mechanics", 7th Edition, Spon press, New York, 2004, ISBN: 978-0415327022.
5. Head K.H.: "Manual of Soil Laboratory Testing", Vol. I, II, III, Princeton Press, London, 1986, ISBN: 978-0727313058.
6. Lambe T.W.: "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi, ISBN: 978-8126539918.
7. Terzaghi. K. and Peck. R.B.,"Soil mechanics in Engineering practice", 3rd Edition, John Wiley and Sons, New York, 1996, ISBN: 978-0471086581.
8. Alam Singh and Chowdhary G.R.: " Soil Engineering in Theory and Practice", CBS Publishers and Distributors Ltd., New Delhi, 2009, ISBN: 978-8123900391.

E-Resources:

1. http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/soil_mech/index.htm
2. http://www.eng.fsu.edu/~tawfiq/soilmech/lecture.html
3. http://aboutcivil.org/soil-mechanics/soil-mechanics-1-high.pdf elearning.vtu.ac.in/06cv64

Estimation and Evaluation (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVI72	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the various drawings and to learn the calculation of quantities of materials.
- Learn the rate analysis.
- Compute the earthwork for roads.
- Learn various concepts of contracts.
- Learn the definition and objective of specifications.

Syllabus

Module – I and II

Estimation: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – centre line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components. **16 Hours**

Module – III

Estimates: Manhole and Septic tanks. Specifications, Contracts: Types of contract — essentials of contract agreement —legal aspects, penal provisions on breach of contract. **08 Hours**

Module – IV

Rate Analysis: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centring and form work for different RCC items. **08 Hours**

Module – V

Measurement of Earthwork for Roads: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal and Prismoidal formula with and without cross slope.

08 Hours

Sl. No.	Module	Practical Exercises
1	I	Interpret civil engineering drawings
2	I	List of various items to be provided to learn the modes of measurements according to prevailing IS 1200
3	II	Estimate in detail for load bearing structure, RCC retaining wall, RCC culverts, etc.
4	III	Collect specifications for at least 10 items of construction work
5	IV	Analyze rate for at least 10 items of residential building construction.

List of Software:

i. MS Project

ii. Microsoft Excel

Course Outcomes:

On completion of this course, students will be able to :

- Explain types of estimate and duties of an Estimator.
- Undertake rate analysis of civil engineering works.
- Determine the rates of various items of civil works.
- Calculate estimated cost of civil construction projects.
- Evaluate the actual value of any property.

Text Books:

1. B. N. Dutta: "Estimating and costing", UBS publishers Distributors Ltd., India, 27th Edition, ISBN-13: 978-8174767295.
2. P.L. Basin: "Quantity Surveying", 3rd Revised Edition, S. Chand and company, New Delhi, ISBN-10: 8121900859.
3. S.C. Rangwala: "Estimating and Specification", 16th Edition, Charotar publishing house, 2014, ISBN: 978-93-80358-97-0.

Reference Books:

1. G.S. Birde: "Text book of Estimating and Costing", 6th Edition, Dhanpath Rai and sons, New Delhi, ISBN: 9789384378134.
2. D.D. Kohli, R.C. Kohli: "A text book on Estimating, Costing and Accounts", 2nd Edition, S. Chand, New Delhi, ISBN-10: 8121903327.

E-Resources:

1. https://www.schandpublishing.com/books/...textbook-estimating-costing.
2. nfra.eresourceerp.com/estimation.html
3. nfra.eresourceerp.com/Project-estimation.html
4. https://www.mynewsdesk.com/in/view/pressrelease/job-costing-estimation

Construction Industry Practice-III

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT731	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Know principles of safety and good practices of Civil Engineering.
- Implement the principles of Durability,
- Learn Quality control and sustainability of buildings.

Syllabus

Module - I

Innovation / Creativity / Leadership / Team Work **08 Hours**

Module – II

Good practices of civil engineering and safety requirements **08 Hours**

Module – III

Durability of structure / NDT. **08 Hours**

Module – IV

Quality assurance / Quality control **08 Hours**

Module – V

Sustainability and green building **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain the knowledge about detailing of Structural elements.
- Develop creativity and leadership qualities.
- Acquire the knowledge about good practices and safety requirement of Buildings.
- Gain the information about durability of buildings.
- Obtain the knowledge about quality control and sustainability of buildings.

Pre-Stressed Concrete Structures

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT732	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the concept of pre stressing, devices and pre and post tensioning.
- Understand the analysis of the stresses due to pre stress and the imposed load.
- Understand the calculation of loss of pre stress and deflections in PSC members.
- Understand the limit state of PSC beams in flexure and shear, and anchorage zone stress.
- Understand the design of pre and post tensioned simple PSC beams.

Syllabus

Module - I

Introduction: Definition and scope of pre stressed concrete, its applications, High strength concrete and steel, Stress-Strain characteristics and properties.

Basic Principles of Prestressing: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages. **08 Hours**

Module – II

Analysis of Sections for Flexure: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles. **08 Hours**

Module – III

Losses of Pre-Stressing: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force. **08 Hours**

Module – IV

Limit State of Collapse: Flexure -IS Code recommendations –Ultimate flexural strength of sections Shear -IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability –control of deflections and cracking.

Design of End Blocks: Transmission of prestress in pretensioned members,

transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses end blocks-Methods, I.S. Code, provision for the design of end block reinforcement. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Recognize the basic concepts of principles of dynamics.
- Solve the problems connected with analysis of various structural components.
- Analyze the given frames by suitable method.
- Evaluate the continuous beams by suitable methods.
- Analyze the truss elements by matrix method.

Text Books:

1. Krishna Raju N.: "Pre-stressed Concrete", 5th Edition, Tata McGraw Hill, New Delhi, 2007.
2. Dayaratnam P.: "Pre-stressed Concrete Structures", Oxford and IBH Publications, New Delhi, 1996.

Reference Books:

1. Mallick S. K., Gupta A. P.: "Pre-stressed Concrete", Oxford and IBH, New Delhi, 1983.
2. Lin T.Y., Ned. Burns H.: "Design of Pre-stressed Concrete Structures", John Wiley and Sons, New York, 1982.
3. Natarajan V.: "Fundamentals of Pre-Stressed Concrete", 1976, BIP, Bombay.
4. Libby J.R.: "Modern Pre-stressed Concrete", CBS Publishers, New Delhi, 1986.
5. IS:1343-1980, Code of Practice For Prestressed Concrete, Bureau of Indian Standards, New Delhi, 1981.

E-Resources:

1. http://www.vtuupdates.com>vtunotes
2. http://www.vidhayarthiplus.com
3. http://www.iitg.ernet.in>qip>cd_cell>chapters

Pavement Design

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT733	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the concepts of pavement components in flexible and rigid pavement.
- Understand the ability to focus on the basic fundamental elements of pavements.
- Understand the concepts of stress strain in flexible pavements based on the layered elastic and viscoelastic solutions.
- Understand the ability to identify, formulate the stresses and deflections in rigid pavements.
- Understand the concepts of joints in rigid pavements and its design concepts.

Syllabus

Module - I

Introduction: Desirable characteristics of pavement, types and components, Difference between Highway pavement and Air field pavement – Design strategies of variables – Functions of sub-grade, sub base – Base course – surface course – comparison between Rigid and flexible pavement. **08 Hours**

Module – II

Fundamentals of Design of Pavements: Design life – Traffic factors – climatic factors – Road geometry – Subgrade strength and drainage, Stresses and deflections, Boussinesqs theory – principle, Assumptions – Limitations and problems on above - Busmister theory – Two layered analysis – Assumptions – problems on above.

08 Hours

Module – III

Design of Flexible Pavements: Empirical methods of Group index method, Plate load test, CBR method – Testing as per IRC, AASHTO, CRV method –Design of pavement by Equivalent C-Value and R-Value method, Triaxial test– Kansas method, McLeod's method, Burmisters layered system concepts and Numerical on above

08 Hours

Module – IV

Stresses in Rigid Pavement: Principle – Factors - wheel load and its repetition – properties of sub grade – properties of concrete. External conditions – joints – Reinforcement – Analysis of stresses – Assumptions – Westergaard's Analysis –

Modified Westergaard equations – Critical stresses – Wheel load stresses, Warping stress – Frictional stress – combined stresses (using chart / equations) - problems on above. **08 Hours**

Module – V

Design of Rigid Pavement: Design of C.C. Pavement by IRC: 38 – 2002 for dual and Tandem axle load – Reinforcement in slabs – Requirements of joints – Types of joints – Expansion joint – contraction joint – warping joint – construction joint – longitudinal joint, Design of joints, Design of Dowel bars, Design of Tie bars – problems of the above. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Apply the knowledge of pavement components in flexible and rigid pavement.
- Know the basic fundamental elements of pavements.
- Evaluate the stresses and strains in flexible pavements.
- Apply the knowledge to identify and formulate the stresses and deflections in rigid pavements.
- Utilize the design concepts of joints and rigid pavements.

Text Books:

1. Khanna, Justo: “Highway Engineering”.
2. L R Kadiyalli, N B. Lal: “Principles and Practices of Highway Engineering”.
3. Yang H. Huang: “Pavement Analysis and Design”, 2nd Edition.
4. Relevant IRC codes Reference books:

E-Resources:

1. www.virginiadot.org/business/resources/bu-mat-pde-aashtoforconsultants0503.pdf
2. pressholland-pub2017.hol.es/pavement-design-vtu-notes.pdf
3. http://nptel.ac.in/downloads/105101087/
4. elearning.vtu.ac.in/
5. ISBN-13: 978-8185240770 Nem Chand andBros; 10th Edition 2015 Edition (2001)
6. ISBN-13: 978-8174091659 Khanna Publisher (1 December 2004)
7. ISBN: 9788131721247 Pearson Edition: 2008

Fire Safety and Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT741	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Provide an in-depth knowledge about the science of fire.
- Understand the causes and effects of fire.
- Know the various fire prevention systems and protective equipments.
- Understand the science of explosion and its prevention techniques.
- Understand the various fire prevention techniques to be followed in a building..

Syllabus

Module - I

Basic Physics and Chemistry Related to Fire: Fire properties of solid, liquid and gases - fire spread - toxicity of products of combustion - theory of combustion and explosion – vapour clouds – flash fire – jet fires – pool fires – unconfined vapour cloud explosion, shock waves - auto-ignition – boiling liquid expanding vapour explosion.

07 Hours

Module – II

Fire Prevention and Protection: Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E- Fire extinguishing agents- Water ,Foam, Dry chemical powder, Carbon-dioxide- Halon alternatives Halocarbon compounds Inert gases , dry powders – types of fire extinguishers – fire stoppers – hydrant pipes – hoses – monitors – fire watchers – lay out of stand pipes – fire station-fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations – fire drills – notice-first aid for burns.

07 Hours

Module – III

Industrial Fire Protection Systems: Sprinkler-hydrants-stand pipes – special fire suppression systems like deluge and emulsifier, selection criteria of the above installations, reliability, maintenance, evaluation and standards – alarm and detection systems.

07 Hours

Module – IV

Building Fire Safety: Objectives of fire safe building design, Fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design - exit – width calculations - fire certificates–fire safety requirements for high rise buildings.

07 Hours

Module – V

Explosion Protecting Systems: Principles of explosion-detonation and blast waves-explosion parameters – Explosion Protection, Containment, Flame Arrestors, isolation, suppression, venting, explosion relief of large enclosure explosion venting-inert gases, plant for generation of inert gas rupture disc in process vessels and lines explosion, suppression system based on Carbon dioxide (CO_2) and halons-hazards in LPG, Ammonia (NH_3). **07 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Make familiar about basic concepts of fire and explosion science.
- Know the different source of ignition and their prevention techniques.
- Operate the various types of fire fighting equipments.
- Differentiate the causes and prevention of explosion.
- Equip the students to effectively employ explosion protection techniques and their significances to suit the industrial requirement.

Text Books:

1 Derek, James: "Fire prevention Handbook", Butter worths and company, London, 1986.

2. Arthur E Cote: "Fire protection handbook", nfpa, 2008.
3. Jain V K: "Fire safety in building", New age international, 1996.
4. Purandare D D, Abhayd Purandare: "Handbook on Industrial fire safety", Panda publications, New Delhi, 2006.

Reference Books:

1. Gupta, R.S.: "Hand Book of Fire Technology", Orient Blackswan, 2010.
2. McElroy, Frank E: "Accident Prevention manual for industrial operations", N.S.C., Chicago, 1988.
3. Dinko Tuhtar: "Fire and explosion protection – A System Approach" Ellis Horwood Ltd. Publisher, 1989.
5. "Fire fighters hazardous materials reference book", Van Nostrand 60 Rein Hold, New York, 1993.
6. Dennis P. Nolan: "Handbook of Fire and Explosion Protection Engineering Principles for Oil, Gas, Chemical, and Related Facilities", William Andrew Publishers, 1996.
7. James G. Quintiere: "Fundamentals of Fire Phenomena", John Wiley and Sons Ltd., England, 2006.

E-Resources:

1. www.ind-safety.com
2. www.firesafety

Fundamentals of Energy, Environment and Climate Change

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT742	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Understand the Earth's Energy Budget, Environment and the processes leading to climate change.
- Understand the inter-relatedness of the Terrestrial Energy-Environment-Climate System.
- Understand the perturbing effects of anthropogenic activities on this system.
- Understand the meaningful climate change quantification, and thence the means of ameliorating adverse climate change impacts.

Syllabus

Module – I

Overview: on the Earth's energy requirement vis-à-vis Climate Change. Origins of the terrestrial atmosphere. Earth's early atmosphere. Introduction to Climate. Layers of the atmosphere. Composition of the present day atmosphere. Post Industrial Revolution Scenario. **08 Hours**

Module – II

Energy Balance: Earth –Atmosphere System. Solar and Terrestrial Radiation. Absorption of Radiation by gases. Energy balance. Solar variability and the Earth's Energy Balance –Basic concepts only. **08 Hours**

Module – III

Atmospheric Chemistry and Climate: The Global Temperature Record. Green House Gas theory. Possible effects of Global Warming – Indian Context. The Ozone depletion problem. Atmospheric Aerosol and Cloud Effects on Climate. **08 Hours**

Module – IV

Environmental Variability: Natural and Anthropogenic. Effects of urbanization, Landscape changes, Influence of Irrigation, Desertification and Deforestation. **08 Hours**

Module – V

Equipment for Production of Alternative Materials: Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Acquire a basic understanding of the terrestrial eco-system comprising of 3 principal components: Energy, Environment and Climate change.
- Comprehend a global picture of the inter-relatedness of the Energy-Environment-Climate system.
- Assess as qualified professionals, the perturbing effects of human activities on the earth's climate.
- Acquire the necessary skills to predict emerging climate change trends globally as well as within the Indian Subcontinent.
- Acquire the requisite professional skills to undertake policy decisions on the use and efficient management of the Earth's resources.

Text Books:

1. Jill Jaeger: "Climate and Energy Systems. A review of their interactions", John Wiley, 1983.
2. "Policy interventions to promote energy efficient and environmentally sound technologies in SMI", Asian Institute of Technology, 2002, ISBN: 974-8209-01-6.

E-Resources:

1. www.springer.com/br/book/9789027727688
2. onlinelibrary.wiley.com/doi/10.1002/j.1477-8696.1989.tb04972.x/pdf
3. onlinelibrary.wiley.com/doi/10.1029/2003GL018206/full

Industrial Waste Water Treatment

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVT743	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Identify, formulate, and solve various types of industrial pollution.
- Function on multi-disciplinary teams in the areas of different types of industries to reduce, recycle and reuse the waste from industries.
- Apply knowledge of mathematics, science, and engineering in industrial waste water treatment, like planning, analysis and designing of treatment units including details of statuary rules and regulations.
- Design a system, components, or processes to meet desired needs in industrial waste water treatment.
- Identify, various types of industrial wastes and suitable treatment techniques.

Syllabus

Module - I

Industrial scenario in India - Industrial activity and Environment - Uses of Water by industry - Difference between domestic and industrial wastewater- Parameters of pollution and their effects receiving streams- Classification of streams based on the mixing of effluents-Self-purification of streams - Oxygen sag curve- Derivation of streeter – phelps equation – Numerical problems **08 Hours**

Module – II

Environmental standards for industrial effluents - Effluent sampling – grab and composite sampling, Treatment methods of industrial effluent – pretreatment of waste - Equalization – Neutralization-Flotation-Volume reduction and strength reduction. **07 Hours**

Module – III

Introduction to Secondary treatment of industrial effluents – Design of an aeration unit – design of a trickling filter – design of an oxidation pond - Introduction and feasibility of combined treatment municipal waste and industrial waste -volume ratio -Rental charges and economics. **07 Hours**

Module – IV

Manufacturing process flow sheet with source of wastewater, Characteristics of waste, effects of untreated waste on streams or on land and the treatment of the following industrial effluents Cotton textile Industry, Dairy industry and Sugar Mill. **07 Hours**

Module – V

Manufacturing process flow sheet with source of wastewater, Characteristics of waste, effects of untreated waste on streams or on land and the treatment of the following industrial effluents Paper and pulp Industry, Distillery industry, Food Processing industry. Processing industry. **07 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Characterize the different types of industrial effluents.
- Advise the regulating authority about the possible danger specific industries.
- Develop planning skill in designing water pollution control systems in industries.
- Differentiate red category industries from green category industries.
- Characterize the different effluents from specific industries.

Text Books:

1. Nelson L Nemerow: "Liquid Waste of industry, Theories, Practices and Treatment", Addison-Wesley, 1st Edition, 1971, ISBN-13: 978-0201052640.
2. Rao M N, Dutta A.K: "Waste water treatment", 3rd Edition, Oxford and IBH Publications Pvt. Ltd., New Delhi, 2008, ISBN: 9788120417120, 8120417127.

Reference Books:

1. Mahajan S P.: "Pollution control in Process Industries", Tata McGraw Hill Company, New Delhi, 1985, ISBN: 9780074517727, 0074517724.
2. Eckenfelder: "Industrial Water pollution Control", McGraw Hill Company, New Delhi American Chemical Society, Washington D.C., USA, 2000, ISBN: 9789339220433.

E-Resources:

1. www.neerienvis.nic.in/pdf/
2. www.fao.org/
3. www.gewater.com/applications
4. www.waterleau.com/en

Tax Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE751	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Familiarise the students with the significance of taxation system.
- Understand the structure of Indian Taxation system.
- Gain knowledge about the practical aspects of Indian taxation.
- Understand the system of computation of tax from Salaries.
- Sketch the recent trends in Indian taxation system.

Syllabus

Module – I

Introduction to taxation system, Objectives of taxation, Factors to be considered for tax planning Canons of taxation, Types of taxation, Direct tax, Indirect tax (Broad perspective only). **07 Hours**

Module – II

Taxation system in India, Types of taxes levied in India, Various heads of income tax (Broad outline only} Basic concepts in taxation, Assessment year, Financial year, assessee, Residential status, Tax liability **08 Hours**

Module – III

Income tax authorities in India, Constitution, Powers, Functions specimen of Form 16, Filing of returns, tax evasion, Penalties for contravening the provisions of income tax. **08 Hours**

Module – IV

System of computation of tax from salaries, Taxable income, Permissible deductions from 80C to 80U Fringe benefits exempted from tax, exempted income under section 10 of Income tax act. **10 Hours**

Module – V

Trends in Indian taxation system, Self assessment, PAN card, Budgetary provisions of the financial year 2017-18 on taxation, GST, Advantages, Problems in implementing GST, Measures to overcome the limitations of GST. **06 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain knowledge about the system of taxation prevailing in the country.
- Compute tax under different heads.
- Gain practical knowledge on filing returns.
- Calculate the payable tax for salaried individuals.
- Gain insight into recent practices on taxation.

Reference Books:

1. Dr. Vinod K. Singhania: “Direct taxes-Law and Practice”, Taxmann Publication.
2. Dr. Mehrotra, Dr. Goyal: “Direct taxes- Law and Practice”, Sahitya Bhavan Publication.
3. “7 lectures-Income tax-I “, VBH.
4. Swaminathan: “Income Tax”, KPH.
5. T.N.Manoharan: “Income tax including VAT”.
6. R.G.Saha, Ushadevi: “Taxation”, HPH.

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Assessment of Building Energy Performance

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE752	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

- Provide a foundation for performing a building energy audit.
- Perform assessment tasks on building energy performance.
- Submit a Building EQ rating.
- Understand the methods and processes to be performed in the field.
- Know the process of certifying professionals in energy assessment.

Syllabus

Module – I

Introduction, global energy consumption characteristics and the role of commercial and residential buildings, building energy end use consumption characteristics, impact of time variations in building energy consumption, Building mechanical, electrical, and lighting systems. **08 Hours**

Module – II

Anatomy of typical HVAC systems in commercial buildings, typical primary and secondary HVAC equipment and their role in meeting system requirements, basics of electrical distribution systems and their equipment in commercial buildings, basics of lighting system in buildings, including performance terminology, lighting technologies, energy performance, and the role of day lighting. **08 Hours**

Module – III

Introduction to building energy benchmarking and assessment, differences between benchmarking, labeling programs, and energy and environmental auditing, role of building type and climate zone on energy use, key aspects of ENERGY STAR® Portfolio Manager and other tools for benchmarking, ASHRAE Building EQ As Designed and In Operation ratings, differences between Building EQ and Portfolio Manager, Preliminary Energy Use Analysis (PEA). **08 Hours**

Module – IV

Measuring and monitoring building performance, instrumentation for measuring indoor environmental quality and building energy flows, Perform measurements of indoor environmental quality and building energy flows, accuracy of building measurements, Identify the components of an ASHRAE Level 1 walk through survey and the differences between Level 1, 2, and 3 surveys, Indoor Environment Quality. **08 Hours**

Module – V

Energy Efficiency Measures – Building Envelope and Lighting, role of building envelope characteristics on energy use, energy conservation and energy efficiency measures related to envelope and lighting characteristics, Energy Efficiency Measures – HVAC Systems, energy conservation and energy efficiency measures related to HVAC systems, financial analysis of expected improvements to HVAC systems. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Produce an ASHRAE Building EQ In Operation rating for the buildings provided in the class.
- Produce a listing of potential Energy Efficiency Measures (EEM) including financial payback analysis.
- Perform measurements of indoor environmental quality and HVAC system performance.
- Identify different building types and determine the impact of climate on energy use.
- Analyze raw energy consumption data from measured-meter readings.

Text Books:

1. ASHRAE Building Energy Quotient Program website.
2. ASHRAE BEAP certification study guide.
3. ASHRAE Standard 105-2014 Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emission.

Reference Books:

1. ASHRAE Performance Measurement Protocols for Commercial Buildings: Best Practices Guide.
2. ENERGY STAR® Portfolio Manager website.

Natural Disaster Mitigation and Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE753	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand about types of natural and environmental disasters.
- Develop skills in various stages of disaster preparedness, mitigation and management.
- Understand the methodologies for disaster risk assessment.

Syllabus

Module – I

Natural Disasters – Overview: Introduction- Natural Disasters around the world- Natural Disaster Risk Assessment- Earth and its characteristics Human Dimensions of Global environment Change – Disaster mitigation, preparedness, response and recovery comprehensive emergency management Early warning systems and Disaster Preparedness– Rehabilitation, Vulnerable Populations - Logistics and Services, Food, Nutrition and Shelter -Role of UN Red cross and NGOs. **08 Hours**

Module – II

Natural Hazards: Introduction and Review - Natural Disasters - Principles, Elements, and Systems- Geological-Geomorphological aspects, Earthquake- Geology, Seismology, Characteristics and dimensions – Landslides - Human impact on the mountainous terrain and its relationship with Rainfall, liquefaction etc.- Tsunami - Nature and characteristics. **08 Hours**

Module – III

Climate system aspects and Processes: Oceanic, Atmospheric and Hydrologic cycles - Severe Weather and Tornadoes , Cyclones, Floods and Droughts - Global Patterns - - Mitigation and Preparation – Drought – Famine- nature and dimensions – Drought Assessment and Monitoring. **08 Hours**

Module – IV

Natural Disaster Communication: Mapping - Modeling, risk analysis and loss estimation – Natural disaster risk analysis - prevention and mitigation - Applications of Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies (ICT) in Early warning Systems - Disaster Monitoring and Support Centre– Information Dissemination, mobile communication – etc. **08 Hours**

Module – V

Administrative mechanisms: Community and Social organizations – Education and Training – Establishment of capacity building among various stake holders – Government - Educational institutions – Use of Multi-media knowledge products for self education. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Learn about the types of natural and environmental disasters and its causes.
- Learn about organizational and Administrative strategies for managing disasters.
- Learn about the early warning systems, monitoring of disasters effect and necessity of rehabilitation.
- Learn about the engineering and non-engineering controls of mitigating various natural disasters.
- Apply the key roles of capacity building to face disaster among government bodies, institutions, NGO's, etc.
- Learn methodologies for disaster risk assessment with the help of latest tools like GPS, GIS, Remote sensing, information technologies, etc.

Text Books:

1. Kovach, Robert L.: "Earth's Fury: An Introduction to Natural Hazards and Disasters", Englewood Cliffs, N.J., Prentice Hall, 1995.
2. Siddhartha Gautam, K Leelakrishna Rao: "Natural disaster Management", 3rd Edition, 2012, ISBN: 9381604320.

Reference Book:

1. Arul Jothi, D L Balaji: "Safety and Disaster Management Education In Schools", 1st Edition, Anmol Publications, 2009, ISBN: 9380252609.

E-Resources:

1. https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr.../bt-dsstr-mtgtn-en.aspx
2. www.nrdms.gov.in/natural_disaster.asp
3. https://www.ncbi.nlm.nih.gov › NCBI › Literature › Bookshelf

Small and Medium Enterprise Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE761	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the various concepts of Entrepreneurship and familiarize them with the understanding of contemporary environment of MSMEs.
- Understand the business Environment to MSMEs.
- Understand the process of Enterprise Creation.
- Understand the effective Business Plan and Institutional Support Mechanism.
- Understand the concepts of marketing management in the MSMEs.

Syllabus

Module – I

Basic Aspects: Concept, nature of Entrepreneur and Entrepreneurship, Distinction between Entrepreneur and Manager, Entrepreneurship, Medium, Small and Tiny Business : Definition, Role in the economy and significance, Changing scenario of MSMEs in the era of Liberalization and Globalization, Competitiveness. **08 Hours**

Module-II

Environment assessment: Political, Legal, Economic, Social, Technological, Global environment, Assessment of business opportunities, Government initiatives and private sector opportunity. **08 Hours**

Module-III

Enterprise Creation: Starting a small industry, Entrepreneurial function or process of starting a new venture based on personal competencies, requirements to start a business venture, Feasibility of the project, Business incubators . **08 Hours**

Module-IV

Business Plan: Developing effective business plan-meaning, benefits of business plan, Timing of the business plan, Length of the business plan, composition of the business plan or detailed project report. Institutional Support Mechanism: District Industries Centre, State Directorate of Industries, SIDBI, NSIC, SISI, KSFC, KIADB, TECSOK. **08 Hours**

Module-V

Small Business Marketing: Concept of Marketing, Scope of Marketing, Marketing Mix, Product Mix, Channels of Distribution, Market Segmentation, Role of Middlemen, Distribution Strategies, Sales Promotion, Advertising and Publicity, Packaging Strategies, Branding Strategies. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Visualize the various concepts of Entrepreneurship and understand of current environment of MSMEs.
- Know the Business Environment with respect to MSMEs.
- Know the Process of Enterprise Creation.
- Prepare Business Plan and Understand the Institutional Support Mechanism.
- Know the marketing management with reference to MSMEs.

Text Books:

1. Shukla. M.B: "Entrepreneurship and Small Business Management", Kitab Mahal, Allahabad, 2011.
2. Sahay A., V. Sharma: "Entrepreneurship and New Venture Creation", Excel Books, New Delhi, 2008.
3. Lall, Sahai: "Entrepreneurship", Excel Books, New Delhi, 2006.
4. S. Anil Kumar: "Small Business and Entrepreneurship", I.K.International Publishing House Pvt. Ltd., 2008.
5. Kotler, Keller, Koshy, Jha: "Marketing Management", 13th Edition, Pearson Education.

Reference Book:

1. Wickham, Phillip A: "Strategic Entrepreneurship", Pitman, UK, 1998.

Occupational Safety and Health Administration

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE762	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the occupational health and safety and sector specific occupational health and safety issues.
- Understand the socio-economic aspects of occupational health and safety.
- Understand the health screening measures.
- Understand the legal Provisions on Occupational Health and Safety.
- Understand the participatory Research and Occupational Health.

Syllabus

Module – I

Introduction to Occupational Health and Safety: Definition and Context of OHS, Objectives and Principles of OHS, Workplace and Health Occupational Health, Hygiene and Ergonomics.

Sector Specific Occupational Health and Safety Issues: Health and Safety Risks in Mining, Health Hazards in Electronic Industry, Health Hazards in Food Processing Industry, Health Hazards in Other Industries. **07 Hours**

Module – II

Socio-Economic aspects of Occupational Health and Safety: Women's occupational and health safety, Child labour issues in occupational health and safety, Health issues in the unorganized sector.

Basics of Preventive Techniques: Definition of Accident, Accident Analysis, Monitoring of Hazards, Reporting and Investigation of Accidents. **08 Hours**

Module – III

Health Screening Measures: Stages of Medical Examination, Occupational History, Pulmonary Function Test (PFT), Noise Induced Hearing Loss (NIHL). **07 Hours**

Module – IV

Legal Provisions on Occupational Health and Safety: Overview of existing OHS Legislations in India, The Factories Act, The Mines Act, The Workmen's Compensation Act, The Employee's State Insurance Act. **07 Hours**

Module-V

Participatory Research and Occupational Health: Philosophy of Participatory Research (PR) Analysis based on PR Methodologies Conducting Participatory Research for OHS. **07 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Develop the ability to know the occupational health and safety.
- Have the knowledge of the socio-economic aspects of occupational health and safety.
- Demonstrate purpose of health screening measures.
- Know the legal Provisions on Occupational Health and Safety.
- Participate in Research and Occupational Health.

References:

1. International Labour Organinization. Mining: a hazardous work [Internet]. ; 2015 ([cited 2015 Feb 2]. Available from: http://www.ilo.org/safework/areasofwork/hazardous-work/WCMS_124598/lang--en/index.htm
2. Gyekye, S.A. Workers' perceptions of workplace safety: an African perspective. Int J Occup Saf Ergon. 2006;12:31–42.Crossref | PubMed| Scopus (4)
3. Amponsah-Tawiah, K., Jain, A., Leka, S., Hollis, D., Cox, T. Examining psychosocial and physical hazards in the Ghanaian mining industry and their implications for employees' safety experience. J Safety Res. 2013;45:75–84.Crossref PubMed| Scopus (5)
4. Owiredu D. Annual chamber of mines presidential review. 83rd Annual General Meeting of the Ghana Chamber of Mines [Internet]. 2011 [cited 2014 Mar 1]. Available from:http://www.ghanachamberofmines.org.
5. Helliwell, J.F., Putnam, R.D. The social context of wellbeing. Philos Trans R Soc Lond B Biol Sci. 2004;35:1435–1446.Crossref| Scopus (550)
6. Bhagawati, B. Basics of occupational safety and health. IOSR J Environ Sci Toxicol Food Technol. 2015;9:91–94.
7. Amponsah-Tawiah, K., Dartey-Baah, K. Occupational health and safety: key issues and concerns in Ghana. Int J Bus Soc Sci. 2011;14:120–126.

   National Safety Council. Injury facts. NSC, Itasca (IL); 2004.

Animation and Multimedia Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE763	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

- Understand the basics of Animation.
- Understand computer animation using characters.
- Learn how to create quality animation characters.
- Learn about volume construction and action made from face, gestures.
- Understand Acting and Sketching techniques.

Syllabus

Module – I

Introduction to Animation: History of Animation, The Origins of Animation, Types of Animation, Terms used in Animation, Basic Principles of Animation.

Introduction to equipment required for Animation: Animator's Drawing Tools, Rapid Sketching and Drawing, Developing Animation Character. **07 Hours**

Module – II

Developing the characters with computer animation: Anatomy and Body Language, 2-D virtual drawing for animation.

Motion studies: : Thumbnails, sequential movement drawing, drawing for motion. **08 Hours**

Module – III

Essentials and qualities of good animation characters: Three dimensional drawings of characters.

Skills and Basic proportions: Visual and creative development of an artist, how to draw gestures, Heads, Rotation in Arcs, Key Lines, Perspective. **08 Hours**

Module – IV

Volume Construction: Balance, Muscles, Light and shade.

Shape and Action: Hands and Legs, Foreshortening, Facial expressions. **08 Hours**

Module – V

Acting and Sketching techniques: Introduction to Acting, Modeling, Sketching from Acting, Sketching from live models, Introduction to Rapid Sketching Techniques, Sketching from Memory, live action. **09 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Recognize the basics of animation along the tools.
- Develop characters with computer animation.
- Develop 3D drawings of characters and acquire skills regarding basic level of sketching.
- Explain Foreshortening, Facial expressions.
- Develop small animation characters by using acting and sketching techniques.

Text Books:

1. Chris Patmore: "The Complete Animation course: The Principles, Practice and Techniques of Successful Animation", (Chapters 1-10), Barons Educational Series New York, 2003, ISBN-13: 978-0764123993.

Reference Books:

1. Frank Thomas, Ollie Johnston: "The Illusion of Life by Walt Disney", Abbeville Press, 1981.
2. Daniel Carter, Michael Courtney: "Anatomy for the Artist: A Comprehensive Guide to Drawing the Human Body, A Complete Guide", 2011.

E-Resources:

1. http:// www.animationmentor.com/
2. https://www.bloopanimation.com/animation-for-beginners/
3. https://robots.thoughtbot.com/css-animation-for-beginners

Project Management Lab

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVL77	0:0:2:0	1	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the principles of construction project management.
- Prepare work break down plan and estimate resources required in a construction project.
- Prepare precedence diagram and network diagrams.
- Implement resource allocation and levelling using MSP.
- Prepare the reports using MSP.

Syllabus

1. Preparing Calendar for project.
2. Create Task and its relationship.
3. Planning and Scheduling the resources.
4. Creating work break down structure.
5. Preparing the resource sheet.
6. Assign and levelling the resource.
7. Time Estimate for activities.
8. Earned value.
9. Tracking.
10. Filters and groups.
11. Calculation for residential building.

Course Outcomes:

On completion of this course, students will be able to :

1. Prepare project plans, schedule of construction.
2. Utilize the concept of construction project management in software.
3. Analyze construction project techniques using PERT and CPM networks.
4. Allocating the resource in construction project management using software.
5. Create the construction project reports.

Text books:

1. Peurifoy. R L: "Construction Planning, Equipment and Methods", McGraw Hill,8 th Edition, ISBN-10: 0073401129.
2. Chitkara K K: "Construction Project Management", Tata McGraw Hill, 3rd Edition, ISBN: 9789339205454.
3. Srinath L.S: "PERT and CPM", East West Press Pvt. Ltd., New Delhi, ISBN-13: 978-8185336206.

Reference Books:

1. Harry G Harris and Gajanan M Sabnis: "Structural Modeling and Experimental Techniques", 2nd Edition, ISBN: 0849324696.
2. Lab manual provided by Dept. of Civil Engg., NCET.

E-Resources:

1. www.youtube.com/watch?v=iABaMkWtuPw
2. support.office.com/en-us/article/Set-the-general...
3. www.wrike.com/blog/project-manager-calendar
4. www.tacticalprojectmanagement.com/ms-project-export

Analysis and Design Lab–II

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVL78	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Different types of FEM software in Civil Engineering.
- Impart the basic knowledge of Analysis of different components of Structures.
- Impart the knowledge of spread sheet in solving Civil Engineering Problems.

Syllabus

Use of commercially available FEM software for the analysis and design of

- **Multistorey Building**
  - i. Residential Building
  - ii. Commercial building
- **Industrial Building**
  - i. Truss
  - ii. Girder

Use of Excel sheets in Civil Engineering Problems.

Use of spread sheet for the following civil engineering problems,

- **Regression analysis for rainfall and runoff relation**
- **Determination of**
  - i. Grain size analysis
  - ii. Density of soil
  - iii. Shear parameters of soil

Course Outcomes:

On completion of this course, students will be able to :

- Design and Analysis of Different components of Structures.
- Apply Spreadsheet calculations to Civil Engineering.
- Analyze water resource networks.

- Apply computing skills to geotechnical engineering.
- Make use of various software package.

Text Books:,

1. Dr. M.N. Shesha Prakash, Dr. G.S. Suresh: "Computer Aided Design Laborator", Lakshmi Publications.
2. Ramesh Bangia: "Excel 2002", Khanna Book Publishing Co. (P) Ltd., Microsoft, ISBN-10: 8187522577, ISBN-13: 978-8187522577, Mathieson SA -Excel, Starfire Publishers.

Reference Books:

1. Ragunath. H.M.: "Hydrology", Wiley Eastern, 1990, ISBN: 93-220-0880-6.
2. Punmia, B.C.: "Soil Mechanics and Foundation Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 1995, ISBN-13: 9788170087915.
3. Ashok, Kumar Jain: "Reinforced Concrete Limit State Design", Nem Chand Brothers, 1990, ISBN: 9788131802410.
4. N Subramanian: "Design of steel structures", Oxford University Press, 11th Edition, 2013, ISBN: 9780195676815.
5. Duggal: "Limit State Design of Steel Structures", Tata Mcgraw Hill, Edition, 2010, ISBN: 9781259083785.
6. Lab manual provided by Dept. of Civil Engg., NCET.

E-Resources:

1. https://www.scribd.com/doc/148477559/staad-pro-manual-pdf
2. https://www.google.co.in/webhp?ei=amQ6Wdn1C8TevgTd0rsw&yv=2&rct=j#
3. https://www.google.co.in/webhp?ei=amQ6Wdn1C8TevgTd0rsw&yv=2&rct=j#
4. https://www.google.co.in/webhp?ei=amQ6Wdn1C8TevgTd0rsw&yv=2&rct=j#

Project Phase–I

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CVP79	1:0:4:0	3	CIE:50 SEE:50	3 Hours	FC

Phase	Activity	Credits
I	Batch formation, project identification, literature survey, finalization of problem statement with objectives and outcomes, Synopsis submission, Preliminary seminar for the approval of selected topic and objectives.	3

Eighth Semester B.E. – Syllabus

Phase	Activity	Credits
II	Design, Theoretical/experimental investigation and Mid-term seminar to review the progress of the work and documentation(Mid term report)	4
III	Completion of the project work, participation in the project exhibition, Submission of project report Final Internal seminar and demonstration, Publications	4
	Evaluation and Viva voce	5 + 5

Program Educational Objectives (PEOs)

Civil engineering graduates are expected to fulfill the following PEOs after few years of their graduation.

PEO1	Graduates in Civil Engineering will apply the technical knowledge for sustainable societal growth.
PEO2	Graduates of civil Engineering will demonstrate designing,modeling and analyzing skills.
PEO3	Graduates in Civil Engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection
PEO4	Civil Engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.
PEO5	Civil engineering graduates will have the ability to become entrepreneurs thereby switching over from responsive engineering to creative engineering.

Program Outcomes (POs)

PO1	**Engineering Knowledge:** Apply knowledge of mathematics and science, Engineering fundamentals and Civil Engineering principles to the solution of complex problems in Civil Engineering.
PO2	**Problem Analysis:** Identify, Formulate, review research literature and analyze complex Civil Engineering problems and reaching substantiated conclusions using first principles of mathematics and engineering sciences.
PO3	**Design/ Development of solutions:** Design solutions for complex Civil Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, cultural, societal and environmental considerations.
PO4	**Conduct Investigations of Complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions related to Civil Engineering problems

PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering tools such as CAD, FEM, GIS, etc. including prediction and modeling to complex Civil Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Civil Engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional Civil Engineering solutions in societal and environmental contexts and demonstrate the knowledge and the need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Civil Engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex Civil Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage Civil Engineering projects and in multidisciplinary environments.
PO12	**Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.