Course Structure
for Degree Programme
B. Tech. in Civil Engineering

with effect from AY 2018-19

Dr. Babasaheb Ambedkar Technological University
Lonere 402 103, Dist- Raigad, Maharashtra, INDIA

Program Objectives

Goal of the Civil engineering with a specialization in Structural Engineering (SE) at Dr. Babasaheb Ambedkar technological University, Lonere (BATU) is to provide students with preparation to become worthy of professional careers in the field and to be motivated for lifelong learning. All prescribed courses have definite objectives and outcomes. Program objectives are expected qualities of engineers as under:

a) Preparation: To prepare students to excel in various educational programmes or to succeed in industry / technical profession through further education/training;

b) Core Competence: To provide students with a solid foundation in mathematical, scientific fundamentals required to solve Structural problems;

c) Breadth: To train students with a breadth of scientific knowledge to comprehend, analyze, design & create novel products and solutions for real life problems;

d) Professionalism: To inculcate in students professional/ethical attitude, effective team work skills, multidisciplinary approach and to relate engineering issues to a broader context;

e) Learning Environment: To provide students with academic environment of excellence, leadership, ethical guidelines and life-long learning needed for a long / productive career.

In addition to above DBATU graduate is expected to be

1. Taking pride in their profession and have commitment to highest standards of ethical practices and related technical disciplines;

2. Able to design structural system that is safe, economical and efficient;

3. Capable of using modern tools efficiently in all aspects of professional practices;

4. Dealing successfully with real life civil engineering problems and achieve practical solutions based on a sound science and engineering knowledge;

5. Shall be engage in continuous research, development and exchange of knowledge for professional development;

6. Be honest in their control and performing their duties and promote effective use of resources through open, honest and impartial services to the public;

7. Act in such a manner which will uphold the honour, integrity, or dignity of the engineering profession, and avoid knowingly engaging in business or professional practices of a fraudulent, dishonest or unethical nature;

8. Recognize that the lives, safety, health and welfare of the general public are dependent upon engineering, decision and practices;

9. Continue their professional development throughout their careers and provide opportunities for the professional development;

Course Structure

1) Subjects with code CV belong to Civil Engineering

2) Subjects with code CVE indicate Civil Engineering Elective Course

3) Elective Subject Codes suffixed as OS indicate an Open Subject. Students willing to register for such courses shall contact Course Coordinator for information on prerequisites

4) Subjects with code CVL indicate Civil Engineering Laboratory

5) Code CVP indicate Civil Engineering Project work

6) Code CVF indicate Civil Engineering Fieldwork related

7) Subjects with code CVA indicate Civil Engineering Audit Course which may be an Open Subject

Semester- III

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
Theory						
01		Mathematics – III	3	1	-	4
02	CV 302	Mechanics of Solids	3	1	-	4
03	CV 303	Hydraulics I	2	1	-	3
04	CV 304	Surveying I	2	1	-	3
05	CV 305	Building Construction	2	-	-	2
06	CV 306	Engineering Geology	2	-	-	2
07	CVA 301	Soft Skills Development	2	-	-	AU
Practical / Drawing and/or Design						
08	CVL 301	Hydraulics Laboratory I	-	-	2	1
09	CVL 302	Surveying Laboratory I	-	-	2	1
10	CVL 304	Building Construction - Drawings Laboratory	-	-	2	1
11	CVL 305	Engineering Geology Lab	-	-	2	1
12	CVF 301	Seminar on Topic of Field Visit to Foundation Work	-	-	1	AU
13		Field Training / Internship/Industrial Training Evaluation (from semester II)	-	-	-	1
		Sub-Total	16	4	09	
		Total	**29**			**23**

Semester- IV

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
Theory						
01	CV 401	Hydraulics II	2	1	-	3
02	CV 402	Surveying – II	3	1	-	4
03	CV 403	Structural Mechanics-I	3	1	-	4

04	CV 404	Product Design Engineering	2	-	-	2
05	CV E1	**Elective I**	3	-	-	3
06	CVA 402	Engineering Management	1	-	-	AU
07	CVA 403	Basic Human Rights	2	-	-	AU
		Practical / Drawing and/or Design				
08	CVL 401	Hydraulics Laboratory II	-	-	2	1
09	CVL 402	Surveying Laboratory II	-	-	4	2
10	CVL 403	Mechanics of Solids Laboratory	-	-	2	1
11	CVP 401	Mini Project	-	-	2	1
12	CVF 402	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	1	1
		Sub-Total	**16**	**3**	**11**	
		Total		**30**		**22**
		Elective I				
	CVE1 401 CVE1 402 OS CVE1 403 OS	Numerical Methods in Engineering Planning for Sustainable Development Instrumentation & Sensor Technologies for Civil Engineering Applications	3	-	-	3

Semester- V

Sr. No	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
		Theory				
01	CV 501	Design of Steel Structures	2	2	-	4
02	CV 502	Structural Mechanics-II	2	1	-	3
03	CV 503	Soil Mechanics	3	1	-	4
04	CV 504	Environmental Engineering	2	-	-	2
05	CV 505	Transportation Engineering	2	-	-	2
06	CV E2	**Elective II**	3	-	-	3
07	CVA 504	Essence of Indian Traditional Knowledge	1	-	-	AU
		Practical / Drawing and/or Design				
08	CVL 501	Soil Mechanics Laboratory	-	-	2	1
09	CVL 502	Environmental Engineering Laboratory	-	-	2	1
10	CVL 503	Transportation Engineering Laboratory	-	-	2	1
11	CVF 503	Seminar on Topic of Field Visit to works related to Building Services	-	-	1	AU
		Sub-Total	**15**	**4**	**7**	
		Total		**26**		**21**
		Elective II				
	CVE2-501 CVE2-502 OS CVE2-503 CVE3-504 OS	Materials, Testing & Evaluation Computer Aided Drawing Development Engineering Business Communication & Presentation Skills	3	-		3

Semester- VI

$: Students should register for the CVF 705 in Semester VI to undergo training during vacation after semester VI and appear at examination in Semester VII. Result shall appear in Grade-sheet of Semester VII

	Subject	Subject Title	Contact hours	Cre

Sr. No.	Code		L	T	P	Credit
01	CV 601	Design of Concrete Structures I	2	1	-	3
02	CV 602	Foundation Engineering	3	1	-	4
03	CV 603	Concrete Technology	2	-	-	2
04	CV 604	Project Management	2	1	-	3
05	CV E3	**Elective III**	3	-	-	3
06	CVA 605	Building Planning and Design	2	-	-	AU
		Practical / Drawing and/or Design				
07	CVL 601	Concrete Technology Laboratory	-	-	2	1
08	CVL 602	Building Planning, Design and Drawing Laboratory	-	-	4	2
09	CVL 603	Community Project (Minor Project)	-	-	2	1
10	CVF 604	Seminar on Topic of Field Visit Road Construction	-	-	1	AU
11	CVF 705	Industrial Training$	-	-	2	--
		Sub-Total	**14**	**3**	**11**	
		Total		**28**		**19**
		Elective III				
	CVE3-401	Waste Water Treatment				
	CVE3-402 OS	Operations Research				
	CVE3-403	Geographic Data Analysis and Applications				
	CVE3-404	Advanced Engineering Geology				

Semester – VII

| Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	CV 701	Design of Concrete Structures II	2	1	-	3
02	CV 702	Infrastructure Engineering	3	-	-	3
03	CV 703	Water Resources Engineering	2	1	-	3
04	CV 704	Professional Practices	2	1	-	3
05	CV E4	**Elective IV**	3	-	-	3
06	CV E5	**Elective V**	3	-	-	3
		Practical / Drawing and/or Design				
07	CVL 701	Professional Practices Laboratory	-	-	2	1
08	CVL 702	Structural Design & Drawing of Steel Structures	-	-	4	2
09	CVP 702	Project Stage-I (Major Project)	-	-	2	1
10	CVF 705	Industrial Training	-	-	-	AU
		Sub-Total	15	3	08	
		Total		26		22
		Elective IV				
	CVE4-701	Plastic Analysis and Design				
	CVE4-702 OS	Machine Foundations				
	CVE4-703	Modern Surveying Techniques	-	-	-	
	CVE4-704 OS	Engineering Economics				
	CVE4-705	Ground Improvement Techniques				
		Elective V				
	CVE5-701	Advanced Structural Mechanics				
	CVE5-702	Town and Urban Planning				
	CVE5-703	Construction Economics & Finance	-	-	--	
	CVE5-703	Intelligent Transportation Systems				

Semester – VIII

Sr. No.	Subject Code	Subject Title	Contact hours L	T	P	Credit
01	CV 801	Introduction to Earthquake Engineering	2	1		3
02	CV E6	**Elective VI**	3	-		3
03	CV E7	**Elective VII**	3	-		3
04	CV E8	**Elective VIII**	3	-		3
		Practical / Drawing and/or Design				
05	CVL 801	Earthquake Engineering Laboratory	-	-	2	1
06	CVL 802	Structural Design and Drawing of RC Structures	-	-	4	2
07	CVF 806	Self-Study Report based on field visit to Infrastructure Project Works	-	-	2	1
08	CVP 803	Project Stage-II	-	-	8	4
		Sub-Total	**11**	1	16	
		Total		28		**20**
		Elective VI				
	CVE6-801	Limit State Design of Steel Structures				
	CVE6-802	Construction Techniques				
	CVE6-803	Pavement Management System	-	-		-
	CVE6-804 OS	Composite Materials				
	CVE6-805 OS	Disaster Preparedness & Planning Management				
		Elective VII				
	CVE7-801	Bridge Engineering				
	CVE7-802	Structural Audit				
	CVE7-803	Design of Hydraulic Structures	-	-		-
	CVE7-804	Environmental Impact Assessment and Life Cycle Analyses				
		Elective VIII				
	CVE8-801 OS	Rock Mechanics				
	CVE8-802 OS	Water Power Engineering				
	CVE8-803	Water Resources Economics Planning and Management	-	-		-
	CVE8-804 OS	Finite Element Method				
	CVE8-805	Repair & Rehabilitation of Structures				
		Overall Total	**50+168 = 218**			**125**

Detailed Syllabus

Semester III

Semester- III

Sr. No.	Subject Code	Subject	Contact Hours L	T	P	Credit
		Theory				
01		Mathematics – III	3	1	-	4
02	CV 302	Mechanics of Solids	3	1		4
03	CV 303	Hydraulics I	2	1		3
04	CV 304	Surveying I	2	1		3

05	CV 305	Building Construction	2	-	⚕	2
06	CV 306	Engineering Geology	2	-	⚕	2
07	CVA 301	Soft Skills Development	2	-	-	AU
		Practical / Drawing and/or Design				
08	CVL 301	Hydraulics Laboratory I	-	-	2	1
09	CVL 302	Surveying Laboratory I	-	-	2	1
10	CVL 304	Building Construction - Drawings Laboratory	-	-	2	1
11	CVL 305	Engineering Geology Lab	-	-	2	1
12	CVF 301	Seminar on Topic of Field Visit to Foundation Work	-	-	1	AU
		Sub-Total	16	4	09	
		Total		29		22

MA 301 Mathematics – III

Pre Requisites: Mathematics - I and Mathematics – II

Course Contents

Module 1: Laplace Transform Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by tn, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

Module 2: Inverse Laplace Transform Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

Module 3: Fourier Transform Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.

Module 4: Partial Differential Equations and Their Applications: Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations);   Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\left(\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2} \right)$, and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$)

Module 5: Functions of Complex Variables (Differential calculus) Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

Module 6: Functions of Complex Variables (Integral calculus)
 Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Text Books
1) Grewal B. S., "Higher Engineering Mathematics" Khanna Publishers, New Delhi.

2) Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New York.

3) Das H. K. and Er. Verma Rajnish, "Higher Engineering Mathematics", S. Chand & Co. Pvt. Ltd., New Delhi.

4) Dr. Singh B. B., "A course in Engineering Mathematics (Vol III)", Synergy Knowledgeware, Mumbai.

5) Wartikar J.N. and Wartikar P.N., "Engineering Mathematics Vol. I & II", Pune Vidyarthi Griha Prakashan, Pune, 1992

6) Ramana B. V., "Higher Engineering Mathematics", Tata McGraw-Hill Publications, New Delhi.

Reference Books
1) Peter O' Neil, "A Text Book of Engineering Mathematics" Thomson Asia Pte Ltd., Singapore.

2) Wylie C. R. & Barrett L. C., "Advanced Engineering Mathematics", Tata Mcgraw-Hill Publishing Co. Ltd., N. Delhi.

3) Dr. Singh B. B., "Integral Transforms and their Engineering Applications", Synergy Knowledgeware, Mumbai.

4) Sneddon I. N., "Integral Transforms", Tata McGraw-Hill , New York.

Course Outcomes: On completion of the course, student will be able to formulate and solve mathematical model of civil engineering phenomena in field of structures, survey, fluid mechanics and soil mechanics.

<div align="center">⬜⬜⬜⬜⬜⬜⬜⬜⬜</div>

CV 302 Mechanics of Solids

Pre Requisites: Engineering Mechanics (EM02)

Course Contents

Module 1: Stress and Strain
Simple stress - Analysis of internal forces, simple stress, shearing stress, bearing stress, diaphragm or skin stresses in thin walled vessels, statically indeterminate members, thermal stresses

Simple strains - Stress strain diagram for different engineering materials and its importance for elastic and plastic analysis, Hooke's law: axial and shearing deformations, Poisson's ratio: biaxial and triaxial deformations, strain measurement devices basis of sensors, working principles and operation, data acquisition

Module 2: Axial Force, Shear Force and Moment in Beams
Axial force, shear force and moment in beams – concept of unbalanced forces at a transverse section, axial forces, shear forces and moment – interaction of these, relations among load shear and moment, introduction to moving loads

Stresses in beams: Derivation of flexural formula, economic sections, floor framing, unsymmetrical beams, analysis of flexure action derivation of formula for horizontal shearing stress, design for flexure and shear

Torsion - Assumptions, derivation of torsion formulae, torsion of circular shafts, power transmission, stresses and deformation in determinate solid/hollow homogeneous/composite shafts

Module 3: Combined Stresses
Combined axial and flexural loads, Kern of a section; load applied off the axes of symmetry, variation of stress with inclination of element, relationship between modulus of rigidity and modulus of elasticity, variation of stress at a point: analytical derivation, Mohr's circle, absolute maximum shearing stress, application of Mohr's circle to combined loadings (principal stresses), state of simple shear, transformations of strain components, strain rosette

Module 4: Beam Deflections
Calculations of deflection for determinate beams by double integration, Macaulay's method, moment area method, moment diagram by parts, conjugate beam method, deflection by method of superposition, introduction to energy methods

Module 5: Columns and Struts
Concept of short and long columns, formulae by Euler and Rankin, limitation of Euler's formula, equivalent length, eccentrically loaded short compression members

Module 6: Theories of Failure
Concept of failure in strength and failure in deformation, statement and application of maximum principal stress theory, maximum principal strain theory, maximum strain energy theory, maximum shear stress theory, maximum shear strain theory

Text Books

- Singer F.L. and Pytle, "Strength of Materials", Harper Collins Publishers, Fourth Edition
- Junnarkar S.B. (2014), "Mechanics of Structures", Charotor Publishers, Anand, 31st edition,
- Khurmi R.S., "Strength of Material", S. Chand and Co., Edition revised 1968, New Delhi
- Sadhu Singh, "Strength of Materials", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-048-7
- Prasad I.B, "A text book of Strength of Materials", Khanna Publishers, N. Dehli, ISBN NO:978-81-7409-069-X
- Beer F P., Jhonston E. R., John. T. D E wolf, "Mechanics of Materials" TMH, 7th edition
- Timoshenko S.P. and Young D.H., "Elements of Strength of Materials", East West Press, 4th edition 1962, New Delhi
- Prasad I.B, "A text book of Strength of Materials", ISBN: 978-81-7409-069-X

- Dr. Sadhu Singh, "Strength of Materials", ISBN: 978-81-7409-048-7

Reference Books

- Popov E.P., "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005
- Crandall S.H., Dahl N.C., & Lardner T.J., "An Introduction to Mechanics of Solids", Tata McGraw Hill, 2nd Edi, 1978
- Nash W., "Strength of Materials Schaum's outline series", McGraw Hill, fourth edition
- Punmia B. C., "Mechanics of Materials" Laxmi Publications, revised edition, 2016
- Subramanian R., "Strength of Materials" Oxford University Press, 2nd edition, New Delhi
- Dr. Sadhu Singh, "Theory and Solved Problems in Adv. Strength of Materials", ISBN: 978-81-7409-212-7

Course Outcomes: On completion of the course, the students will be able to:

CO1: Perform the stress-strain analysis.

CO2: Draw force distribution diagrams for members and determinate beams.

CO3: Find deflections in determinant beams.

CO4: Visualize force deformation behavior of bodies.

〰〰〰〰〰〰〰〰〰

CV 303 Hydraulics I

Pre Requisites: Engineering Mechanics (EM02)

Course Contents

Module 1: Fundamental Concepts
Definition of fluids, fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure, types of fluids - Newtonian and non-Newtonian fluid, continuum, fluid pressure

Module 2: Fluid Statics
Forces on fluid elements, fundamental equation, manometers, hydrostatic thrust on submerged surfaces, buoyancy, stability of unconstrained bodies, fluids in rigid body motion

Module 3: Fluid Kinematics
Types of flow, continuity equation, derivation and applications of momentum equation, Euler's equation, Bernoulli's equation, velocity potential and stream function, concept of flow net

Module 4: Laminar Flow
Fully developed laminar flow between infinite parallel plates, both plates stationary, upper plate moving with constant speed, fully developed laminar flow in pipe.

Turbulent flow: Shear stress distribution and turbulent velocity profiles in fully developed pipe flow, velocity distribution and shear stresses in turbulent flow, Prandtl mixing length theory, Nikuradse's experiment, Introduction to Boundary Layer Theory

Module 5: Dimensional Analysis and Similitude
Nature of dimensional analysis, Rayleigh's Method, Buckingham pi theorem, dimensionless groups and their physical significance, flow similarity and model studies, Scale Effects, Distorted and Undistorted Models

Module 6: Flow Measurement
Direct methods, restriction flow meters, linear flow meters, traversing methods, measurements in open channel flow

Flow Through Pipes: Loss of energy in pipes, pipe discharging from a reservoir, pipe connecting two reservoirs in series and parallel, siphon, transmission of power through nozzle, water hammer in pipes- rigid and elastic water column theory, surge tanks - function, calculation of head loss, introduction to Moody's chart, nomograms and other pipe diagrams

Text Books

- Fox. R. W. and Mc-Donald. A. T., "Introduction to Fluid Mechanics", John Wiley and Sons, Fifth Edition
- Modi and Seth, "Fluid Mechanics and Hydraulic Machinery", Standard Book House, Tenth Edition , 1991
- Kumar K. L., "Fluid Mechanics"
- Bansal R. K., "Fluid Mechanics"
- Jain A.K, "Fluid Mechanics including Hydraulic Machines" ISBN: 978-81-7409-194-7

Reference Books

- Streeter V. L., Bedford K. W. and Wylie E. B., "Fluid Dynamics", New York, McGraw-Hill, Ninth Edition, 1998

- Som S. K. & Biswas G., "Introduction to Fluid Mechanics & Fluid Machines", Tata McGraw-Hill, 2nd Edi., 2003

Course Outcomes: On completion of the course, the students will be able to:

CO1: Calibrate the various flow measuring devices.

CO2: Determine the properties of fluid and pressure and their measurement.

CO3: Understand fundamentals of pipe flow, losses in pipe and analysis of pipe network.

CO4: Visualize fluid flow phenomena observed in Civil Engineering systems.

□□□□□□□□□□□

CV 304 Surveying - I

Pre Requisites: Basic Civil Engineering (BCE06)

Course Contents

Module 1: Chain Surveying

Definition, principles, classification, fields and office work, scales, conventional signs, survey instruments, their care and adjustment, ranging and chaining, reciprocal ranging, setting perpendiculars, well-conditioned triangles, traversing, plotting , enlarging and reducing figures

Module 2: Compass Surveying

Prismatic compass, surveyor's compass, bearing systems and conversions, local attraction, magnetic declination, dip traversing, adjustment of errors

Module 3: Plane Table Surveying

Plane table instruments and accessories, merits and demerits, methods: radiation, intersection, resection, traversing

Module 4: Leveling and Applications

Level line - Horizontal line - Levels and Staves, Sprit level – Sensitiveness, Bench marks - Temporary and permanent adjustments, Fly and Check leveling, Booking, reduction, Curvature and Refraction – reciprocal leveling - Longitudinal and cross sections - Plotting - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs. Planimeter-Types, Theory, concept of zero circle, Study of Digital Planimeter, Computation of Areas and Volumes

Module 5: Theodolite Surveying

Theodolite - Vernier and micro-optic - Description and uses - temporary and permanent adjustments of vernier transit - Horizontal angles - Vertical angles - Heights and Distances - Traversing - Closing error and distribution - Gales's tables - Omitted measurements

Module 6: Engineering Surveys

Reconnaissance, Preliminary and location surveys for engineering projects, Layout, Setting out works, Route Surveys for highways, railways and waterways, introduction to curve ranging, Mine Surveying - Instruments – Tunnels: correlation of underground and surface surveys, shafts

Text Books
- Kanetkar T.P. and Kulkarni S. V., "Surveying and Leveling", Vols. I, II and III, Vidyarthi Gruh Prakashan, Pune

- Punmia B.C., "Surveying", Vols. I, II and III, Laxmi Publications, 16th edition, 2016

Reference Books
- Clark D., "Plane and Geodetic Surveying", Vol. I & II, C.B.S. Pub. and Distri., N. Delhi, 6th edi.

- Anderson J. M. and Mikhail E. M., "Introduction to Surveying", McGraw Hill Book Company

- Bannister A. and Raymond S., "Surveying", ELBS, Sixth Edition, 1992

- Kahmen Heribert and Faig Wolfgang, "Surveying", Walter de Gruyter, 1995

Course Outcomes: On completion of the course, the students will be able to:

CO1: Perform measurements in linear/angular methods.

CO2: Perform plane table surveying in general terrain.

CO3: Know the basics of leveling and theodolite survey in elevation and angular measurements.

□□□□□□□□□□

CV 305 Building Construction

Pre Requisites: Engineering Graphics (EGP04), Basic Civil Engineering (BCE06)

Course Contents

Module 1: Masonry Construction
Stone masonry: Random rubble, un-coursed rubble, coursed rubble & ashlar brickwork & brick bonds - english, flemish, principles to be observed during construction composite masonry, various partition walls, brick, aluminum & timber, solid concrete blocks, hollow concrete blocks and light weight blocks (aerated autoclaved), soil stabilized blocks, fly ash blocks, cement concrete walls

Module 2: Concrete for Construction
Introduction and properties of ingredients, importance of admixture materials such as pozzolona, fly ash, specific purpose chemical admixtures, Properties of fresh and hardened concrete

Module 3: Arches and Lintels
Arches and their stability, technical terms in arches, types of arches, methods of construction; Lintel: Necessity, materials: wood, stone, brick, steel, R.C.C. and reinforced brick lintels, beams: types according to material, layout such as primary and secondary, continuous beams, formwork for RCC elements: function, requirements

Module 4: Means of Lateral Communication
Doors and windows

Doors - classification based on parameters such as material, geometry, fixtures and fastening

Windows - classification based on parameters such as material, geometry, fixtures and fastening

Use of composite materials for doors and window frames and shutters, laying out of passages

Stairs: Terminology, requirements of a good stair, various types, uses and limitations

Ramps: Requirements and types, planning aspects for physically handicapped persons

Elevators: Types and their Use

Module 5: Flooring Roofs and Types
Flooring: Types, factors for selections of floorings, flooring in ground and upper floors, various types of tiled flooring: natural, composite, synthetic, and special purpose flooring, concrete flooring for industrial purpose: tremix flooring

Roof coverings: Terms used, roof and their selection, pitched roofs and their types, roof coverings and their selection. Natural, composite, synthetic, and special purpose roof coverings, timber trusses (King Post and Queen Post), steel trusses types and their suitability

Module 6: Precast and Pre-engineered Buildings

Principles- advantages and disadvantages, types of prefabricate, standardization, basic, nominal and actual dimensions, tolerances, joints production, transportation and erection

Text Books
- Punmia B.C., Jain A. K., "Building Construction", Laxmi Pub. Pvt. Ltd., 10th Edi, N. Delhi
- Arora S. P. and Bindra S. P., "Text Book of Building Construction", Dhanpat Rai Publications
- Kumar Sushil, "Building Construction" Standard Publishers, 20th Edition, 2010.
- P. Purushothama Raj, "Building Construction Materials and Techniques", Pearson Education
- Jain V.K., "Automation Systems in Smart and Green Buildings" ISBN NO: 978-81-7409-237-3

Reference Books
- NBC 2005, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi
- Chudley R., "Construction Technology", Vol.1, 2, 3 and 4 ELBS Publisher
- SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi
- I.S. 962 - 1989 Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi
- Sikka V. B., "A Course in Civil Engineering Drawing", S. K. Kataria and Sons
- Catalogues. Information Brochures, Trade Literature by material or product manufacturers
- Mehta, Scarborough, Armpriest, "Building Construction", Pearson Education
- Macay W.B, "Building Construction", Vol. I, II, III, IV, Pearson Education
- Jain V.K., "Handbook of Designing and Installation of Services in High Rise Building Complexes" ISBN : 978-81-7409-245-8

Course Outcomes: On completion of the course, students will be able to:

CO1: Understand types of masonry structures.

CO2: Understand composition of concrete and effect of various parameters affecting strength.

CO3: Comprehend components of building and there purposes.

CO4: Comprehend the precast and pre-engineered building construction techniques.

█████████████

CV 306 Engineering Geology

Pre Requisites: Basic Civil Engineering (BCE06)

Course Contents

Module 1: Introduction and Physical Geology
Definition, Scope and subdivisions, applications of Geology in Civil Engineering, Major features of the Earth's structure, internal structure of earth, and Geological work of river: features of erosion, deposition and transportation, Civil Engineering Significance, Geological work of wind: Processes and features of erosion, deposition and transportation, Civil Engineering Significance. Volcano: Central and Fissure types, Products of volcano, Mountain: Origin and formation, types, examples

Module 2: Mineralogy and Petrology
Mineralogy: Physical properties of mineral, Classification of minerals, Petrology: Definition, rock cycle, Igneous rocks: Origin, Textures and Structures, Classification, Concordant and Dis-concordant Intrusions, Civil Engineering significance,

Secondary rocks: Formation, Classification, Residual deposits: Soil, Laterite and Bauxite and their importance, Sedimentary deposits: Formation, Textures, Classification and Structures, Civil Engineering significance, Chemical and organic deposits, Metamorphic rocks: Agents and Types of Metamorphism, Stress and anti-stress Minerals, Structures, Products of metamorphism

Module 3: Structural Geology
Outcrop, Strike and Dip, Unconformity-Types, Outliers and Inliers, Overlap Fold and Fault: Parameters, Classification, Causes, Civil Engineering significance Joint: Types, Civil Engineering considerations

Module 4: Building Stones
Properties of rocks, Requirement of good building stone, Building stones of India

Groundwater: Sources of groundwater, water table, Zones of groundwater, Porosity and permeability

Module 5: Geology of Dams and Reservoirs, Tunnels and Bridges
Preliminary geological survey, Influence of geological conditions on location, alignment, Design and Type of a dam, geological considerations in site selection for dams, Site improvement techniques, dams on carbonate rocks, sedimentary rocks, folded strata and Deccan traps, favorable and unfavorable geological conditions for reservoir site

Tunnels and Bridges: Influence of geological conditions on tunneling, difficulties during tunneling, tunnel lining, tunneling in folded strata, sedimentary rocks and Deccan traps, dependence of types of bridges on geological conditions

Module 6: Preliminary Geological Investigations
Steps in geological investigations, consideration of structural features exploratory drilling: Observations, Preservation of cores, Core logging, Core recovery, Graphical representation of core log, Limitation of exploratory drilling method

Text Books
- Singh Prabin, "Engineering and General Geology", S. K. Katariya and sons, Delhi
- Mukerjee P. K., "A Text Book of Geology", World Press Pvt. Ltd., Calcutta
- Gokhale K.V.G.K. and Rao D. M., "Experiments in Engineering Geology", TMN, New-Delhi
- Gupte R. B., "A Text Book of Engineering Geology", Pune Vidyarthi Griha Prakashan, Pune
- Subinoy Gangopadhyay , "Engineering Geology ",oxford university

Reference Books
- G. W. Tyrrell, "Principles of Petrology", B. I. Publication Pvt. Ltd., New Delhi
- A. Holmes, "Principles of Physical Geology", ELBS Chapman & Hall, London
- Billings M. P., "Structural Geology", Prentice Hall of India Private Ltd., New Delhi
- Legget R. F., "Geology Hand book in Civil Engineering", McGraw-Hill, New York
- Krynine D. P. & Judd W. R., "Principles of Engineering Geology & Geo-technics", CBS Publishers & Distri., New Delhi
- Reddy Dr. D. V., "Engineering Geology for Civil Engineering", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
- Read H. H., "Rultey's Elements of Mineralogy", CBS Publishers & Distributors, Delhi

Course Outcomes: On completion of the course, the students will be able to:

      CO1: Recognize the different land forms which are formed by various geological agents.

      CO2: Identify the origin, texture and structure of various rocks and physical properties of mineral.

      CO3: Emphasize distinct geological structures which have influence on the civil engineering structure.

      CO4: Understand how the various geological conditions affect the design parameters of structures.

□□□□□□□□□□□□

CVA 301 Soft Skills Development

Program Educational Objectives:

1) To build the skills like team building so that they can work efficiently in groups.

2) To provide knowledge of conflict management while working in large organizations.

3) To develop management skills required in routine work environment.

4) To polish the personality of the learners in order to make them good leaders and employees.

5) To imbibe qualities like manners & etiquettes co-ordination, mutual understanding while working in a group.

Module 1: Development of Proficiency in English: Speaking skills, Feedback & questioning technique, Objectivity in argument (Both one on one and in groups), 5 Ws & 1 H & 7 Cs for effective Communication, Imbibing Etiquettes and manners, Study of different pictorial expressions of non-verbal communication and their analysis

Module 2: Self-Management: Self Evaluation, Self-discipline, Self-criticism, Recognition of one's own limits and deficiencies, dependency, etc., Self-Awareness, Self-Management, Identifying one's strengths and weaknesses, Planning & Goal setting, Managing self-emotions, ego, pride, Leadership & Team Dynamics

Module 3: Time Management Techniques: Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time

Module 4: Motivation/ Inspiration: Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation

Motivation techniques: Motivation techniques based on needs and field situations

Module 5: Interpersonal Skills Development: Positive Relationship, Positive Attitudes, Empathise: comprehending others' opinions, points of views, and face them with understanding Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

Module 6: Effective Computing Skills: Designing an effective Presentation, Contents, appearance, themes in a presentation, -Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference Books

1) Mitra, Barun, "Personality Development and Soft Skills", Oxford University Press, 2016

2) Ramesh, Gopalswamy, "The Ace of Soft Skills: Attitude, Communication & Etiquette for Success", Pearson Education, 2013

3) Covey, Stephen R., "Seven Habits of Highly Effective People: Powerful Lessons in Personal Change"

4) Rosenberg Marshall B., "Nonviolent Communication: A Language of Life"

***Program* Educational Outcomes**

1) Learners will acquire interpersonal communication skills.

2) Learners will develop the ability to work independently.

3) Learners will develop the qualities like self-discipline, self-criticism and self-management.

4) Learners will have the qualities of time management and discipline.

5) Learners would be able to present themselves as an inspiration for others.

□□□□□□□□□□□

CVL 301 Hydraulic Engineering Laboratory I

Practical: 2 hours / week

Practical Work consists of at least eight performances from list below and detailed reporting in form of journal. Practical examination shall be based on above.

1) Measurement of Viscosity of various fluids

2) Demonstration of working of different types of valves and pipe fittings

3) Measurement of pressure Piezometer, manometers, Pressure gauges

4) Measurement of discharge - Calibration of measuring tank, Use of hook or point gauge.

5) Verification of Bernoulli's Theorem

6) Determination of metacentric height.

7) Calibration of an orifice / mouthpiece / venturimeter / orifice meter

8) Study of factors affecting coefficient of friction for pipe flow (for two different materials and two different diameters)

9) Determination of loss of head due to Pipe Fittings

Use of computer programs such as MS Excel is desirable for post-processing of results.

CVL 302 Surveying Laboratory - I

Practical: 2 hours / week

Practical Work consists of performances among the list below and detailed reporting in form of field book, journal and drawing sheets. Practical examination shall be based on above practical course.

Essential Practical

1) Use of Dumpy Level, Auto Level and Tilting Level.

2) Sensitivity of Bubble Tube using Dumpy Level.

3) Evaluation of constant of Planimeter, and use of Digital Planimeter for measurement of areas.

4) Study of Theodolite.

5) Methods of Plane Table Survey

6) Study and use of Total Station

Among following any four shall be performed

1) Reciprocal Levelling.

2) Illustration of Permanent adjustment of Dumpy Level

3) Measurement of Horizontal Angle by Various Methods

4) Measurement of Magnetic Bearing and Vertical Angle by Theodolite

5) Two Point and Three Point Problems

6) Study and use of Minor Instruments

Course Outcomes: On completion of the course, the students will be able to:

CO1: Use the theodolite along with chain/tape, compass on the field.

CO2: Apply geometric and trigonometric principles of basic surveying calculations.

CO3: Plan a survey, taking accurate measurements, field booking, and adjustment of errors.

CO4: Apply field procedures in basic types of surveys, as part of a surveying team.

CO5: Employ drawing techniques in the development of a topographic map.

□□□□□□□□□□□

CVL 303 Building Construction - Drawings Laboratory

Practical: 2 hours / week

List of Drawing Assignments

1) Sketch Book consisting of free hand proportional scale sketches for items to be drawn on drawing sheets as mentioned below.

2) Drawing to scale on a half imperial drawing sheet covering following aspects.

   a) Lettering, Symbols, Types of lines and dimensioning as per IS 962.

b) Foundations: - Isolated, Combined Footings, Under Reamed Piles, Rafts.

c) Types of Stone Masonry: Elevation and Sectional Drawings.

d) Types of Brick masonry: Elevation and Sectional Drawings.

e) Types of Doors: Elevation and Sectional Drawings.

f) Types of Windows: Elevation and Sectional Drawings, Standard Aluminum Sections.

g) Types of Stairs: Plan and Sectional Drawings.

h) Trusses: Various types, various roof covering materials, sketches for sectional profiles

i) Typical plan for a single room and sectional views.

3) Site visit: To understand various building materials and their use.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Draw plan, elevation and section of various structures.

CO2: Apply the principles of planning and by laws used for building planning.

CO3: Prepare detailed working drawing for doors and windows.

□□□□□□□□□□

CVL 304 Engineering Geology Laboratory

Practical: 2 hours / Week

List of Experiments

Practical Work consists of study of relevant rock and mineral samples. Detailed report is expected.

- Megascopic study of Rock forming minerals
- Megascopic study of Ore forming minerals
- Megascopic study of Igneous rocks
- Megascopic study of Secondary rocks
- Megascopic study of Metamorphic rocks
- Cross-section Preparation and interpretation of geological maps
- Study of Structural Geological models
- Preparation of bore log /lithologs

- Interpretation of bore- hole data

Study tour to the places of Engineering Geological importance

A Journal containing record of above practical work shall be examined as Term Work. Practical examination shall be based on above practical course.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Calculate the linear measurement on surface.

CO2: Find out engineering properties of various geological materials.

CO3: Draw subsurface lithologs.

CO4: Identify minerals and rocks by studying physical properties.

□□□□□□□□□□

CVF 301 Seminar on Topic of Field Visit to Foundation Work

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of foundation execution. It is desirable to collect basic information of geotechnical aspects of foundations, types and components of foundations, tools and plants, construction machinery, etc. Intention is to introduce students to process of collection and presentation of technical information. Report shall be submitted to cover above aspects as studied.

□□□□□□□□□□

Semester- IV

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
		Theory				
01	CV 401	Hydraulics II	2	1	滚	3
02	CV 402	Surveying – II	3	1	滚	4
03	CV 403	Structural Mechanics-I	3	1	-	4
04	CV 404	Product Design Engineering	2	-	-	2
05	CV E1	**Elective I**	3	-	-	3
06	CVA 402	Basic Human Rights	2	-	-	AU
07	CVA 403	Engineering Management	1	-	-	AU
		Practical / Drawing and/or Design				
08	CVL 401	Hydraulics Laboratory II	-	-	2	1
09	CVL 402	Surveying Laboratory II	-	-	4	2
10	CVL 403	Mechanics of Solids Laboratory	-	-	2	1
11	CVP 401	Mini Project	-	-	2	1
12	CVF 402	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	1	AU
		Sub-Total	**16**	**3**	11	
		Total		**30**		**21**
		Elective I				
	CVE1 401 CVE1 402 OS CVE1 403 OS	Numerical Methods in Engineering Planning for Sustainable Development Instrumentation & Sensor Technologies for Civil Engineering Applications	3	-	-	3

CV 401 Hydraulics II

Pre Requisites: Hydraulics - I

Course Contents

Module 1: Uniform Flow in Open Channel
Introduction, difference between pipe flow and open channel flow, types of open channels, types of flows in open channel, geometric elements, velocity distribution, measurement of velocity-(pitot lube, current meter) weir & spillway: sharp, broad & round crested weirs, calibration of weir, time of emptying tank with weir, profile of ogee spillway, flow below gates

Module 2: Steady & Uniform Flow
Chezy's & Manning's formula, Roughosity coefficient, uniform flow computations, hydraulically efficient section-considerations for rectangular, triangular, trapezoidal, circular sections

Specific energy: definition & diagram, concept of critical, sub-critical, super-critical flow, specific force, specific discharge derivation of relationships and numerical computations

Module 3: Varied Flow
Gradually (G.V.F.): Definition, classification of channel Slopes, dynamic equation of G.V.F. (Assumption and derivation), classification of G.V.F. profiles-examples, direct step method of computation of G.V.F. profiles

Rapidly varied flow (R.V.F.): Definition, examples, hydraulic jump- phenomenon, relation of conjugate depths, parameters, uses, types of hydraulic jump

Module 4: Impact of Jet
Impulse momentum principle, impact of jet on Vanes-flat, curved (stationary and moving), inlet & outlet velocity triangles under various conditions, Series of flat, curved vanes mounted on wheel

Module 5: Hydraulic Machines

Turbines: Importance of hydro-power, classification of turbines, description, typical dimensions and working principle of Pelton, Francis & Kaplan turbine (detailed design need not to be dealt with), Module quantities, specific speed, performance characteristics, selection of type of turbine, description & function of draft tube, Thomas's cavitation number

Pumps: Classification, component parts, working of centrifugal pump, performance characteristics, selection of pump, common pump troubles & remedies, introduction to different types of pumps such as reciprocating, multi-stage, jet, air lift, submersible pump

Module 6: Boundary Layer Theory: Concept, Boundary layer along thin plate- Characteristics, Laminar, Turbulent Boundary Layer, laminar sub layer, Various Thicknesses- Nominal, displacement, Momentum, Energy. Hydraulically smooth and Rough boundaries, Separation of Boundary layer, control of Separation, Introduction to Drag and Lift on submerged bodies (like Flat plates, Sphere, Cylinder, aerofoil), Stokes law, Drag and Lift coefficients

Text Books
- Modi, Seth, "Fluid Mechanics – Hydraulic & Hydraulic Mechanics" Standard Book House
- Bansal R.K., "Fluid Mechanics", Laxmi Publications, 9th edition 2017
- Garde R. J., "Fluid Mechanics through Problems", New Age Publications, 3rd edition 2011
- Jain A. K., "Fluid Mechanics", Khanna Publications, 8th edition, 2003, Delhi
- Kumar K. L., "Fluid Mechanics", Eurasia Publication House, 11th edition, Delhi
- Rangaraju, "Open Channel flow", Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., "Fluid Mechanics through Problems" Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., "Flow in Open Channel", Tata McGraw-Hill Pub. Co., Delhi

Reference Books
- Streeter, "Fluid Mechanics" McGraw-Hill International Book Co., 3rd edition, Auckland
- Shames, "Mechanics of Fluids", McGraw Hill, 4th edition
- Chaw V. T., "Flow in Open Channel", McGraw-Hill International Book Co., Auckland
- Hughes & Brighton, "Fluid Mechanics", Tata McGraw Hill

Course Outcomes: On completion of the course, the students will

CO1: Design open channel sections in a most economical way.

CO2: Know about the non uniform flows in open channel and the characteristics of hydraulic jump.

CO3: Understand application of momentum principle of impact of jets on plane

𝌆𝌆𝌆𝌆𝌆𝌆𝌆𝌆

CV 402 Surveying – II

Pre Requisites: Survey-I (CV304), Engineering Mathematics

Course Contents

Module 1: Tachometry
Significance and systems, principle, constants, basic formulae and field work stadia method, auto reduction tachometer, tangential system

Electronic Distance Measurement: Importance, principles of electronic distance measuring (EDM) instruments, classification of EDM's based on carrier waves used, study and use of total station

Module 2: Triangulation
Principle & classification, system, selection of station, base line measurement, correction and use of subtense bar, signals, satellite station, reduction to center, spherical excess, angular observations, tri-iteration

Triangulation Adjustments: Theory of errors, laws of weights, concept of most probable value

Module 3: Field Astronomy
Terms, co-ordinate systems, determination of latitude and true bearing by observation on the sun and pole star

Module 4: Curves
Horizontal and vertical curves, simple curves, setting with chain and tapes, tangential angles by theodolite, double theodolite, compound and reverse curves, transition curves, functions and requirements, setting out by offsets and angles, vertical curves, sight distance requirements

Module 5: Photogrammetry
Terms, types, vertical photographs, scale, ground coordinates, relief displacement, flight planning photomaps and mosaics, stereoscopy and photo interpretation

Module 6: Remote Sensing
Introduction, classification and principles, electromagnetic energy and its interaction with matter, idealized systems, sensors, platforms, and application in civil engineering, G.P.S & G.I.S. as surveying techniques – Overview, uses and applications

Text Books
- Bannister A., Raymond S., Wartikar J.N., Wartikar P.N., "Surveying", ELBS, 6th Editon, 1992
- Heribert Kahmen and Wolfgang Faig, "Surveying ", Walter de Gruyter, 1995
- Kanetkar T.P., "Surveying and Leveling", Vols. I, II and III, Vidyarthi Gruh Prakashan, Pune
- Punmia B.C., "Surveying", Vols. I , II and III, Laxmi Publications

Reference Books
- James M. Anderson and Edward M. Mikhail, "Introduction to Surveying", McGraw Hill Book Company
- Clark D., "Plane and Geodetic Surveying", Vol. I and II, C.B.S. Publishers and Distributors, New Delhi, Sixth Edition
- Agor, "Advanced Surveying", Khanna Publications, Delhi
- Arora K. L., "Surveying", Vol.1 & 2
- Basak, "Surveying and Levelling"
- Duggal S. K., "Surveying", Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi
- Gopi S., Satikumar R. and Madhu N., "Advanced Surveying", Pearson Education,
- Chandra A. M., "Higher Surveying", New Age International Publication

Course Outcomes: On completion of the course, the students will be able to:

CO1: Understand basics different types of curves on roads and their preliminary survey.

CO2: Perform setting of curves, buildings, culverts and tunnels.

CO3: Comprehend different geodetic methods of survey such as triangulation, trigonometric leveling.

CO4: Comprehend modern advanced surveying techniques.

⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛

CV 403 Structural Mechanics - I

Pre Requisites: Engineering Mechanics (EM02), Solid Mechanics (CV302)

Course Contents

Module 1: Introduction
Different structural systems, concept of analysis, basic assumptions, indeterminacy, choice of unknowns, Castiglano's theorems

Module 2: Energy Principles

Strain energy and strain energy density, strain energy in traction, shear, flexure and torsion - Castiglano's and Engessor's energy theorems, principle of virtual work, application of energy theorems for computing deflections in beams and trusses, Maxwell's reciprocal theorem, Williot Mohr diagrams

Module 3: Method of Consistent Deformation
Indeterminate Beams: Analysis of indeterminate beams: Propped cantilever and fixed beams - fixed end moments and reactions for standard cases of loading – slopes and deflections in fixed beams - continuous beams - theorem of three moments - analysis of continuous beams - Shear Force and Bending Moment diagrams for continuous beams, settlement effects, thermal effect

Frames up to Three Degree of Indeterminacy: Analysis of pin jointed trusses, externally and internally redundant trusses, effects of settlement and pre-strains

Module 4: Moment Distribution Method
Analysis of continuous beams propped cantilevers, portal frames with and without sway

Module 5: Slope Deflection Method
Analysis of continuous beams, analysis of rigid frames, frames with sloping legs, gabled frames, frames without sway and with sway, settlement effects

Module 6: Thin Cylinders
Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders, thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, maximum shear stress, concept of stresses in thick cylinders

Text Books
- Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill,3rd edition 2010
- Wang C.K., "Statically Indeterminate Structures", McGraw Hill
- Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I", ISBN NO: 978-81-7409-140-8
- Khurmi R.S., "Theory of Structures", S Chand, Delhi
- Punmia B.C., "Structural Analysis", Laxmi Publications

Reference Books
- Timoshenko and Young, "Theory of structures", McGraw Hill
- Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", McGraw Hill
- Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH
- Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition
- Schodek, "Structures", Pearson Education, 7th edition
- Ramamrutham S. and Narayanan R., "Theory of Structures" Dhanpat Rai Publishers, Delhi

Course Outcomes: On completion of the course, the students will be able to:

CO1: Describe the concept of structural analysis, degree of indeterminacy.

CO2: Calculate slopes and deflection at various locations for different types of beams.

CO3: Identify determinate and indeterminate trusses and calculate forces in the members of trusses

Perform the distribution of the moments the in continuous beam and frame.

⬛⬛⬛⬛⬛⬛⬛⬛⬛

CV 404 Product Design Engineering

Course Contents
Module 1: Creating Simple Products and Modules

Module 2: Document Creation and Knowledge Sharing

Module 3: Self and Work Management

Module 4: Team Work and Communication

Module 5: Managing Health and Safety

Module 6: Data and Information Management

Reference Books
- Model Curriculum for "Product Design Engineer –Mechanical", NASSCOM (Ref. ID: SSC/Q4201, Ver 1.0, NSQF Level: 7)
- Eppinger, S., & Ulrich, K. (2015), "Product Design and Development". McGraw-Hill Higher Education.
- Green, W., & Jordan, P. W. (1999), "Human Factors in Product Design: Current Practice and Future Trends", CRC Press.
- Sanders, M. S., & McCormick, E. J. (1993), "Human Factors in Engineering and Design", McGraw-Hill Book Company
- Roozenburg, N. F., & Eekels, J. (1995), "Product Design: Fundamentals and Methods (Vol. 2)", John Wiley & Sons Inc.
- Lidwell, W., Holden, K., & Butler, J. (2010), "Universal Principles of Designs: Revised and Updated: 125 ways to Enhance Usability, Influence Perception, Increase Appeal, make Better Design Decisions and Teach through Design", Rockport Pub.

CVE2 401 Numerical Methods in Engineering

Pre Requisites: Mathematics - I and Mathematics – II

Course Contents

Module 1
Basis of Computations, Matrix Operations on Computer, Multiplication and Inversion, Solution of Simultaneous Equations, Gauss Elimination Method, Cholesky Decomposition method, Gauss Jordan and Gauss Sceidal Methods

Module 2
Roots of Equation, Trial and Error, Bisection, Secant Iteration, Newton Rapson Method, Solution of Ordinary Differential Equation, Euler's Method, Modified Euler's Method and Runga Kutta Methods.

Module 3
Interpolation with Newton's Divided Differences, Lagrange's Polynomial, Finite Difference Method, Central, Forward and Backward Differences, Least Square Polynomial Approximations Application in Deflection of Determinate Beams, Buckling Load of Long Columns

Module 4
Numerical Integration: Trapezoidal Rule, Simpon's Rules, Gauss Quadrature Rules

Module 5
Statistical Analysis of Experimental Data, Mean, Median, Mode, Deviation, Measures of Dispersion, Least Square Method, Regression Analysis: Linear, Parabolic, Curve Fitting

Module 6
Implementation of above methods by algorithm development leading to programming in Fortran / C / C++

Text Books
- Balaguruswami E., "Numerical Methods", Tata Mc-Graw Hill
- Scheid F, "Numerical Analysis (Schaum's series)", Tata Mc-Graw Hill
- Chapra. S. C. and Canale R. P., "Numerical Methods for Engineers", by, Tata Mc-Graw Hill
- Shantha Kumar M , "Computer Based Numerical Analysis", Khanna Publication
- Grewal B.S. and Grewal J.S., "Numerical Methods in Engineering and Science", Khanna Publication, N. Delhi
- Sastry, S.S., "Introductory Methods of Numerical Analysis", Printice Hall of India, New Delhi

Reference Books
- Jain, Aryengon, "Numerical Methods for Scientific and Engineering Applications", Wiley Eastern Publication
- Numerical Recipe , Oxford Publishing

- Manuals for the Commercial Computer Programmes

□□□□□□□□□□□□

CVE1- 402 OS Planning for Sustainable Development

Course Contents

Module 1:

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability,

Module 2:

Strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

Module 3:

Innovation for sustainable development- Environmental management and innovation strategies.

Module 4: Societal transformations. Institutional theory.

Module 5: Governance for sustainable development. Policy responses to environmental degradation.

Module 6: Capacity development for innovation. Research methods.

Text/Reference Books:

- Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment
- Institute, working paper 00-04, available at: http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable %20Development.PDF
- Robinson, J. (2004), "Squaring the circle? Some thoughts on idea of sustainable Development" Ecological Economics 48(4): 369-384.
- Hjorth, P. & A. Bagheri (2006), "Navigating towards Sustainable Development: A System Dynamics Approach", Futures 38: 74-92.
- Mog, J.M. (2004) „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs", World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
- Arundel, A., R. Kemp, and S. Parto (2004) Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.
- Douthwaite, B. (2002) Enabling Innovation. A practical guide to understanding & fostering innovation, London, Zed Books.

CVA- 402 Engineering Management

Course Contents

Module 1: Evolution of Management Thought
Scientific, human behavior, system approach, introduction to elements of systems – input, output, process restriction, feedback, contingency approach, contributions by Taylor, Frank and Lillion, Gilbreth, Henry Fayol, Elton Mayo, McGregor (theory X and theory Y), H. L. Gantt, Maslow

Module 2: Functions of Management
Planning – nature and purpose of planning, strategies and policies, management by objectives, formal and informal organization, centralization, decentralization, line, line and staff, functional organization, principles of site layout, leading and directing, controlling and coordination (introduction only), communication process, motivation

Module 3: Decision Making

Importance of decision making, steps in decision making, analysis of decision, decision under certainty, uncertainty and decision under risk, criterion of optimism and regret, sensitivity of criteria and decision under conflict, expected monitory value, decision tree, theory of games (dominance pure and mixed strategy).

Module 4: Operations Research
Linear programming, simple l-p model, simplex method - duality, sensitivity analysis, application of linear programming in transportation and assignment models

Module 5: Simulation Studies
Monte-Carlo simulation, queuing or waiting line theory (simple problems), dynamic programming, introduction to emerging optimization techniques

Module 6: Material Management
Material management – purchasing principles, stores, coding system function, responsibilities, record and accounting. Inventory control – an introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks

Text Books
- Deshpande S. H., "Operation Research"
- Deshpande A. S., "A Text book of Management"
- Gopal Krishnan, "Material Management", Sdueshan.
- Taha, "Operation Research"
- Banga and Sharma, "Engineering Managnment"

References
- Stoner, "Engineering Management"
- Davar, "Principles of Management"
- Koontz, Dounell and Weigrick, "Essentials of Management"
- Kast and Rosinweig, "Management and Organization", Tata McGraw Hill Publication.
- Wagner, "Operation Research", Wikey Easter Ltd., New Delhi
- Zhamb L.C., "Quantitative Techniques in Management", Vol. I,
- Miller and Stars, "Executive Decisions & Operation Research", Prentice Hall of India

Course Outcomes: On completion of the course, the students will be able to:

CO1: Demonstrate the nuances of management functions.

CO2: Analyze the framework of a business organization.

CO3: Adopt an empirical approach toward business situations.

CO4: Apply various Management techniques.

☐☐☐☐☐☐☐☐☐☐

CVA 403 Basic Human Rights

Course Contents

Module 1: The Basic Concepts
Individual, group, civil society, state, equality, justice. Human Values, Human rights & Human Duties: Origin, Contribution of American bill of rights, French revolution. Declaration of independence, Rights of citizen, Rights of working & exploited people

Module 2: Fundamental Rights and Economic Program
Society, religion, culture, and their inter-relationship. Impact of social structure on human behavior, Social Structure and Social Problems: Social and communal conflicts and social harmony, rural poverty, unemployment, bonded labour.

Module 3: Workers and Human Rights

Migrant workers and human rights violations, human rights of mentally and physically challenged. State, Individual liberty, Freedom and democracy.

Module 4: NGOs and Human Rights in India
Land, Water, Forest issues.

Module 5: Human Rights in Indian Constitution and Law
i) The Constitution of India: Preamble; ii) Fundamental rights; iii) Directive principles of state policy; iv) Fundamental duties; v) Some other provisions

Module 6: UDHR and Indian Constitution
Universal declaration of human rights and provisions of India; Constitution and law; National human rights commission and state human rights commission.

References

1) Shastry, T. S. N., "India and Human Rights: Reflections", Concept Publishing Company India (P Ltd.), 2005.

2) C. J. Nirmal, "Human Rights in India: Historical, Social and Political Perspectives (Law in India)", Oxford India.

□□□□□□□□□□

CVL 401 Hydraulic Engineering Laboratory II

Practical: 2 hours / week

Practical Work consists of at least three performances from groups listed below and detailed reporting in form of journal.

Practical examination shall be based on above.

Group (A)

1) Calibration of V notch / Rectangular notch.
2) Calibration of Ogee Weir.
3) Study of hydraulic jump
   a) Verification of sequent depths,
   b) Determination of loss in jump.
   c) Study of parameters with respect to Fraud Number: i) Y2/Y1; ii) Length; iii) Energy loss
4) Study of flow below gates – Discharge v/s head relation, Equation of flow, Determination of contraction in fluid in downstream of gate.
5) Velocity distribution in open channel in transverse direction of flow.

Group (B)

1) Impact of jet.
2) Study of Turbines (Demonstration).
3) Tests on Centrifugal Pump.
4) Study of Charts for Selection of Pumps

Use of computer programs such as MS Excel is desirable for post-processing of results.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Understand various properties of fluids and measurement techniques.

CO2: Carry out calibrations of various flow measuring devices.

CO3: Understand mechanism of hydraulic jump, various jets and pumps.

□□□□□□□□□□

CVL 402 Surveying Laboratory - II

Practical: 2 hours / week

Practical Work consists of performing field practical from the list below and detailed reporting in form of journal. Practical examination shall be based on above.

1. Tacheometry

a) Determination of tachometric constants,   b) Determination of grade of a line.

2. Use of subtense bar for distance measurement.

3. Setting out of curves

a) Simple circular curves,   b) Transition curves

4. Study of topo sheets

5. Study of Aerial Photographs under Stereoscope

6. Traversing by Total Station.

Projects: 1) Road Project 2) Radial Contouring. 3) Block Contouring Project   4) Theodolite Traversing

Course Outcomes: On completion of the course, the students will be able to:

CO1: Determine contour level of field.

CO2: Determine the tachometric constants and grade of a line.

CO3: Use sub tense bar for distance measurement.

□□□□□□□□□□□□

CVL 403 Solid Mechanics Laboratory

Practical: 2 hours / week

Practical Work consists of performance of at least seven experiments from the list below (excluding the eleventh study) experiment: Detailed report is expected.

List of Experiments

1. Tension test on ferrous and non-ferrous alloys (mild steel / cast iron /aluminum etc.)

2. Compression test on mild steel, aluminum, concrete, and wood.

3. Shear test on mild steel and aluminum (single and double shear tests).

4. Torsion test on mild steel and cast iron solid bars and pipes.

5. Flexure test on timber and cast iron beams.

6. Deflection test on mild steel and wooden beam specimens.

7. Graphical solution method for principal stress problems.

8. Impact test on mild steel, brass, Aluminum, and cast iron specimens.

9. Experimental on thermal stresses.

10. Strain measurement involving strain gauges / rosettes.

Assignment involving computer programming for simple problems of stress, strain computations.

Course Outcomes: On completion of the course, the students will be able to:

Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.

Determine the strength of coarse aggregates.

Find the compressive strength of concrete cubes and bricks.

Determine physical properties of given coarse aggregates, fine aggregates and cement samples.

□□□□□□□□□□□□

CVP 401 Mini Project

Practical: 2 hours / week

Students shall take up work leading to product development. Needs of community around may be of prime concern. Work may target at easing out conventional construction operation by improvement of traditional devices / tools or development of altogether new approach.

□□□□□□□□□□

CVF 402 Seminar on Topic of Field Visit to works involving Superstructure Construction

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of execution of superstructure of buildings or other. It is desirable to collect basic information on components of superstructure, tools and plants, construction machinery, etc. Intention of the work is to introduce the student to the chronological order of execution of works and generate data on vocabulary of terms in field.

□□□□□□□□□□□