B.Tech. CIVIL ENGINEERING

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FOREWORD

Engineering plays an important role on our life since the beginning of human existence. The practice of Civil Engineering started way back in 4000BC in "Ancient Egypt, the Indus Valley Civilization, and Mesopotamia" when human started to shift from nomadic to civilized culture, which required construction of shelter, movement and transportation of goods. Civil Engineering is the application of physical and scientific principles for solving the problems of the society. According to American Society of Civil Engineers(ASCE), Civil Engineering is defined as "The profession in which the knowledge of the mathematical and physical science gained by study, experience and practice and is applied with judgment to develop ways to utilize economically the materials and forces of nature for the progressive wellbeing of man". From the setting up of ancient civilizations, there is a remarkable development in Civil Engineering field like smart cities, high rise structures, underground infrastructure, bridges, dams, irrigation channels and tunnels, metros, flyovers, sustainable solar plans, eco-friendly green buildings, efficient water/sewage treatment plants and more.

The present Curriculum (R22), apart from strengthening and updating the basic subjects related to structures, materials, geography, geology, soil, hydrology, environment, mechanics, and transportation, innovative subjects have been included with amalgamation of software courses in to the curriculum which will strengthen student in design and development of software useful for societal problems.

R22 curriculum comprises of:

- *Revision in tune with National Education Policy 2020*
- *Various exit options*
- *Regular Degree along with Honours / Minor Degree*
- *The reduction in total credits*
- *Module wise course syllabus*
- *Advanced courses like Pre-stressed Concrete, Ground Improvement Techniques, Remote Sensing & Geographical Information System, Sanitary Engineering, Advanced Hydraulic, etc.*

The focus area of each unit in every course is clearly defined. Topics of contemporary relevance such as the Advanced and Sustainable Materials, Structural analysis and its behavior, Design of members, Construction Management and all other advanced topics are included. The Board of Studies consisting of eminent personalities along with experienced faculty members of the university have designed the curriculum to offer knowledge and skill of Civil Engineering on the above mentioned areas. The curriculum includes concepts with skill based tasks through integrated laboratory and activities combined with theory. The department aims to make graduates ready for the industrial needs.

External BoS Members:

1. Dr. G. Apparao, *Professor, Department of Civil Engineering, IIT Madras.*
2. Er. C. Sankarlingam, *Vice President & Head-Special Projects, L&T Construction, Chennai.*
3. Dr. D. Ramaseshu, *Professor, Department of Civil Engineering, NIT Warangal.*
4. Dr. K. Srinivasa Raju, *Professor, BITS Pilani, Department of Civil Engineering, Hyderabad.*

I thank all the BoS Members, internal faculty of the civil engineering department, Academic Council Members and University authorities for encouraging and supporting us in designing this innovative curriculum for our students.

Dr. N. Ruben
HOD, CIVIL

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be UNIVERSITY)
-Estd. u/s 3 of UGC Act 1956

VISION

To evolve into a Centre of Excellence in Science & Technology through creative and innovative practices in teaching – learning, towards promoting academic achievement and research excellence to produce internationally accepted, competitive and world class professionals who are psychologically strong & emotionally balanced, imbued with social consciousness & ethical values.

MISSION

To provide high quality academic programmes, training activities, research facilities and opportunities supported by continuous industry - institute interaction aimed at promoting employability, entrepreneurship, leadership and research aptitude among students and contribute to the economic and technological development of the region, state and nation.

Department of
CIVIL ENGINEERING

VISION of the department

To become the department of excellence that brings out engineers with high technical competencies and promotes high end research to meet current and future challenges in Civil Engineering.

MISSION of the department

M_1: To offer UG, PG and Ph.D. in Civil Engineering and other skill development courses that add value to student competencies..

M_2: To promote quality education, research and consultancy for industrial and society needs.

M_3: To impart knowledge with emphasis on leadership qualities in students.

M_4: To have regular interaction with industries and offer solutions to their problems.

B. Tech in Civil Engineering

Program Educational Objectives (PEOs)

PEO1: Professionally design and execute Civil Engineering projects.

PEO2: Successfully address technological and managerial challenges.

PEO3: Graduates of the programme will reveal lifelong learning and team work in their profession.

Programme Specific Outcomes (PSO)

PSO1: Ability to apply principles of Civil Engineering for the entire life cycle of the project ranging from initial design to the closure of the project.

PSO2: Demonstrate proficiency in one the following specialized areas of Civil Engineering, Construction Materials and Management, Structural and Geotechnical Engineering, Environmental and Water Resources Engineering, Transportation Engineering and Remote Sensing & Geographic Information Systems.

Program Outcomes (POs)

PO1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the 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.

PO5: **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex 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 engineering practice.

PO7: **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the 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 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 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.

R22 B.Tech.
4 YEAR
DEGREE PROGRAMME

COURSE STRUCTURE - R22

I Year I Semester

Course Code	Course Title	L	T	P	C
22MT103	Linear algebra and Ordinary differential equations.	3	2	-	4
22PY102	Engineering Physics.	2	-	2	3
22ME101	Engineering Graphics.	2	-	2	3
22CE101	IT Work Shop & Civil Engineering Products.	1	-	4	3
22TP103	Programming in C.	2	-	4	4
22EN102	English Proficiency & Communication Skills.	-	-	2	1
22TP101	Constitution of India.	-	2	-	1
22SA101	Physical Fitness, Sports & Games – I	-	-	3	1
Total		**10**	**4**	**17**	**20**
		31 Hrs			

I Year II Semester

Course Code	Course Title	L	T	P	C
22MT112	Partial differential equation and Vector calculus.	3	2	-	4
22CT103	Engineering Chemistry.	2	-	2	3
22EE101	Basic of Electrical & Electronics Engineering.	2	-	2	3
22TP104	Basic Coding Competency	-	1	3	2
22EN104	Technical English Communication	2	-	2	3
22CE102	Strength of Materials	3	2	-	4
22SA102	Orientation Session	-	-	6	3
22SA103	Physical Fitness, Sports & Games – II	-	-	3	1
Total		**12**	**3**	**20**	**23**
		35 Hrs			

Department Subject is extension of Basic sciences

R22 B.Tech.
4 YEAR
DEGREE PROGRAMME

COURSE STRUCTURE - R22

II Year I Semester

Course Code	Course Title	L	T	P	C
22ST202	Probability & Statistics.	3	2	-	4
22TP201	Data Structures.	2	2	2	4
22CE201	Fluid Mechanics & Hydraulic Machines.	3	-	2	4
22CE202	Building Materials & Concrete Technology.	2	-	2	4
22CE203	Surveying and Geomatics.	3	-	2	4
22CE204	Structural Analysis.	2	2	-	3
22SA201	Life Skills-I	-	-	2	1
	Total	16	6	10	24
	NCC/ NSS/ SAC/ E-cell/ Student Mentoring/ Social activities/ Publication with good impact factor (Only 2 students can claim 1 paper /patent). These credits maybe earned on or before the end of IV semester.	-	-	-	1
	Total	**16**	**7**	**10**	**25**
		33 Hrs			

II Year II Semester

Course Code	Course Title	L	T	P	C
22TP203	Advanced Coding Competency	-	-	2	1
22TP204	Professional Communication.	-	-	2	1
22CT201	Environmental Studies.	1	1	-	1
22MS201	Management Science.	2	2	-	3
22CE205	Environmental Engineering.	3	-	2	4
22CE206	Advance Structural Analysis.	2	2	-	3
	Department Elective – I	2	2	-	3
	Open Elective – I	2	2	-	3
22SA202	Life Skills-II	-	-	2	1
	Total	**12**	**9**	**8**	**20**
	Minor / Honours - 1	3	2	-	4
		15	**11**	**8**	**24**
	Total	**34 Hrs**			

R22 B.Tech.
4 YEAR
DEGREE PROGRAMME

COURSE STRUCTURE - R22

III Year I Semester

Course Code	Course Title	L	T	P	C
22TP301	Soft Skills Laboratory.	-	-	2	1
22CE301	Design of Reinforced Concrete Structures.	3	-	2	4
22CE302	Geotechnical Engineering.	3	-	2	4
22CE303	Transportation Engineering	3	-	2	4
	Department Elective – II	2	2	-	3
	Open Elective – II	2	2	-	3
22CE304	Inter-Disciplinary Project – Phase I	-	-	2	-
22CE305	Industry interface course (Modular Course)	1	-	-	1
	Total	**14**	**4**	**10**	**20**
	NCC/ NSS/ SAC/ E-cell/ Student Mentoring/ Social activities/ Publication with good impact factor (Only 2 students can claim 1 paper/patent). These credits maybe earned on or before the end of VI semester.	-	-	-	1
	Minor / Honours - 2	3	2	-	4
	Total	**17**	**6**	**10**	**25**
		33 Hrs			

III Year II Semester

Course Code	Course Title	L	T	P	C
22TP302	Quantitative aptitude & Logical reasoning.	1	2	-	2
22CE306	Design of Steel Structures.	3	2	-	4
22CE307	Water Resource Engineering.	2	-	2	3
	Department Elective – 3	2	2	-	3
	Department Elective – 4	2	2	-	3
	Open Elective – 3	2	2	-	3
22CE308	Inter-Disciplinary Project – Phase II	-	-	2	2
	Total	**12**	**10**	**2**	**20**
	Minor / Honours - 3	3	2	-	4
	Total	**15**	**12**	**2**	**24**
		28 Hrs			

R22 B.Tech. 4 YEAR DEGREE PROGRAMME

COURSE STRUCTURE - R22

IV Year I Semester

Course Code	Course Title	L	T	P	C
22CE401	Engineering Economics, Estimation and Costing	3	-	2	4
22CE402	Engineering Geology	3	-	2	4
	Department Elective – 5	2	2	-	3
	Department Elective – 6	2	2	-	3
	Department Elective – 7	2	2	-	3
	Department Elective – 8	2	2	-	3
	Total	**14**	**8**	**4**	**20**
	Minor / Honours – 4	3	2	-	4
	Total	**17**	**10**	**4**	**24**
		31 Hrs			

IV Year II Semester

Course Code	Course Title	L	T	P	C
22CE403/ 22CE404	Project Work / Internship	-	2	22	12
	Total	**-**	**2**	**22**	**12**
	Minor / Honours – 5 (for project)	-	2	6	**4**
	Total	**-**	**4**	**28**	**16**
		32 Hrs			

for interaction between Guide and students

COURSE STRUCTURE - R22

Department Electives

Course Code	Course Title	L	T	P	C
Odd Semester					
22CE801	Advanced Hydraulics.	2	2	-	3
22CE802	Disaster Management.	2	2	-	3
22CE803	Ground Improvement Techniques.	2	2	-	3
22CE804	Repair & Rehabilitation of Structures.	2	2	-	3
22CE805	Traffic Engineering & Management.	2	2	-	3
22CE806	Bridge Engineering.	2	2	-	3
22CE807	Remote Sensing & Geographical Information System	2	-	2	3
22CE808	Design & Analysis of Algorithms for Civil Engineering.	2	2	-	3
22CE809	Pre-Stressed Concrete.	2	2	-	3
22CE810	Advanced Remote Sensing.	2	-	2	3
22CE811	Finite Element Analysis.	2	-	2	3
22CE812	Advanced Reinforced Concrete Design.	2	-	2	3
22CE813	Construction Planning and Management.	2	2	-	3
22CE814	Earthquake Resistant Design of Structures.	2	2	-	3
22CE815	Seismic Evaluation & Retrofitting of Structures.	2	2	-	3
Even Semester					
22CE816	Sustainable Construction Methods.	2	2	-	3
22CE817	Engineering Seismology.	2	2	-	3
22CE818	Environmental Pollution & Control.	2	2	-	3
22CE819	Advanced Concrete Technology.	2	2	-	3
22CE820	Ecological Engineering.	2	2	-	3
22CE821	Structural Dynamics.	2	2	-	3
22CE822	Railway & Airport Engineering.	2	2	-	3
22CE823	EIA for Building Technology	2	2	-	3
22CE824	Soil Dynamics & Machine Foundation.	2	2	-	3

R22 B.Tech. 4 YEAR DEGREE PROGRAMME

Honours – 1: Structural Engineering

Course Code	Course Title	L	T	P	C
22CE951	Low Cost Materials & Techniques.	3	2	-	4
22CE952	Theory of Plates & Shells.	3	2	-	4
22CE953	Foundation Engineering.	3	2	-	4
22CE954	Design of Underground Water Structures.	3	2	-	4
22CE955	Industrial Structures. / Project Work.	3	2	-	4
	Total	**15**	**10**	**-**	**20**

Honours – 2: Civil Engineering

Course Code	Course Title	L	T	P	C
22CE956	Green Buildings.	3	2	-	4
22CE957	Solid & Hazardous Waste Management.	3	2	-	4
22CE958	Advanced Soil Mechanics.	3	2	-	4
22CE959	Intelligent transportation system	3	2	-	4
22CE960	Advanced Structural Design. / Project Work.	3	2	-	4
	Total	**15**	**10**	**-**	**20**

Honours – 3: Construction Technology and Project Management

Course Code	Course Title	L	T	P	C
22CE961	Construction Techniques and Equipments.	3	2	-	4
22CE962	Quality Control and Assurance in Construction.	3	2	-	4
22CE963	Resource Management and Control in Construction.	3	2	-	4
22CE964	Construction & Project Management.	3	2	-	4
22C3965	Lean Construction Management./ Project Work.	3	2	-	4
	Total	**15**	**10**	**-**	**20**

I

YEAR

B.Tech.

CIVIL ENGINEERING

I SEMESTER

22MT103	-	Linear algebra and Ordinary differential equations.
22PY102	-	Engineering Physics.
22ME101	-	Engineering Graphics.
22CE101	-	IT Work Shop & Civil Engineering Products.
22TP103	-	Programming in C.
22EN102	-	English Proficiency & Communication Skills.
22TP101	-	Constitution of India.
22SA101	-	Physical Fitness, Sports & Games – I

II SEMESTER

22MT112	-	Partial differential equation and Vector calculus.
22CT103	-	Engineering Chemistry.
22EE101	-	Basic of Electrical & Electronics Engineering.
22TP104	-	Basic Coding Competency
22EN104	-	Technical English Communication
22CE102	-	Strength of Materials
22SA102	-	Orientation Session
22SA103		Physical Fitness, Sports & Games – II

COURSE CONTENTS

I SEM & II SEM

22MT103 LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

Source: https://www.amazon.com/Differential-Equations/dp/B01H30X2JA

Hours Per Week :

L	T	P	C
3	2	-	4

PREREQUISITE KNOWLEDGE: Basics of matrices, Differentiation and Integration.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to build a grasp of the principles of mathematics through matrices, differential equations and applications that serves as an essential tool in several engineering applications.

MODULE-1

UNIT-1 **12L+8T+0P=20 Hours**

MATRICES:

Definition of matrix; Types of matrices; Algebra of matrices, adjoint of a matrix, inverse of a matrix through adjoint and elementary row operations, Rank of a matrix, Echelon form, Normal form.

Eigen values and Eigen vectors (up to 3 x 3 matrices only) and properties (without proofs).

UNIT-2 **12L+8T+0P=20 Hours**

APPLICATIONS OF MATRICES:

Consistency of system of linear equations, Solution of system of linear equations having unique solution and involving not more than three variables by Gauss elimination method and Gauss Jordan method.

Cayley-Hamilton theorem (without proof), Power of a matrix, Inverse of a matrix.

Strength of materials and strength of beams using Eigen value and Eigen vectors.

PRACTICES:

- Compute inverse of a matrix if exists.
- Explain with suitable examples how rank of matrix is independent of the elementary operations.
- Explain with suitable examples how rank of matrix is unique.
- Discuss with suitable examples when eigen values and eigen vectors are possible for a matrix.
- Discuss the possibility of solution of a system of equations.
- Discuss when inverse and power of a matrix exist using Cayley-Hamilton theorem.

MODULE-2

UNIT-1 **12L+8T+0P=20 Hours**

ORDINARY DIFFERENTIAL EQUATIONS (ODE):

First Order Differential Equations: Introduction to ODE, variable separable method, homogenous and non-homogenous differential equations, linear differential equations, Bernoulli's equations.

Second Order Differential Equations: Linear differential equations with constant coefficients with RHS of the form eax, xn, sin(ax) or cos(ax).

UNIT-2 **12L+8T+0P=20 Hours**

APPLICATIONS OF ODE:

SKILLS:

- ✓ *Find rank of a matrix using different methods.*
- ✓ *Compute the eigen values and eigen vectors of a matrix.*
- ✓ *Find analytical solution of a differential equation using appropriate method.*
- ✓ *Demonstrate any one numerical method to solve differential equation.*

Applications of ODE: Newton's law of cooling, Law of natural growth and decay, LR Circuit.

PRACTICES:

- Check the order and degree of an ODE.
- Find solution for any four ordinary differential equations by applying suitable method.
- Find numerical solution for any four ordinary differential equations by applying suitable method.
- Discuss some applications of ODE.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the concepts of rank, eigen values and eigenvectors of a matrix and finding inverse of a matrix and powers of a matrix.	Apply	1	1, 2, 9, 10, 12
2	Apply differential equations in real life problems.	Apply	2	1, 2, 9, 10, 12
3	Analyse the solution of a system of linear equations and find it.	Analyze	1	1, 2, 9, 10, 12
4	Inspect the analytical method for solving differential equations and applications.	Analyze	2	1, 2, 9, 10, 12

TEXTBOOK:

1. 1. N. P. Bali, K. L. Sai Prasad, "A Textbook of Engineering Mathematics I, II, III", 2nd Edition Universal Science Press, New Delhi, 2018.
2. B. S. Grewal, "Higher Engineering Mathematics", 44 Edition, Khanna Publishers, 2018.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, Inc, 2010.
2. H. K. Dass and Er. RajanishVerma, "Higher Engineering Mathematics", 3rd revised edition, S. Chand & Co., 2015.
3. B. V. Ramana, "Advanced Engineering Mathematics", TMH Publishers.
4. T. K.V. Iyengar et al, "Engineering Mathematics, I, II, III", S. Chand & Co., New Delhi,2018.

22PY102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
2	-	2	3

PREREQUISITE KNOWLEDGE: Atomic structure, electronic transitions, Bonding in solids and wave optics.

COURSE DESCRIPTION AND OBJECTIVES:

The course is aimed at realizing the concept of waves in understanding the applications of ultrasonics and quantum optics in lasers. It imparts knowledge on distinguishing crystal structures and synthesis of nanomaterials and their characterization.

MODULE – 1

UNIT-1 **8L+0P+8P=16 Hours**

WAVES, OSCILLATIONS AND ULTRASONICS:

Waves & Oscillations: Simple harmonic motion & Free oscillations- Equation of motion-Energy expressions; Damped oscillations-Differential equation-different cases of damping-logarithmic decrement-relaxation time-quality factor; Forced oscillations-Difference between free and forced oscillations-equation of motion- expression for amplitude and phase; Resonance and its examples.

Ultrasonics: Introduction – properties of ultrasonic waves- Production of ultrasonic waves by Piezoelectric method-Determination of velocity of ultrasonic waves in liquids-Interferometer method-NDT- Ultrasonic testing & X-ray radiography.

UNIT-2 **8L+0P+8P=16 Hours**

LASER AND FIBER OPTICS:

Laser: Introduction to Laser-population inversion and pumping methods-CO2 laser. Laser applications in industry and scientific research. Holography-construction of hologram-reconstruction of image and applications.

Fiber Optics: Introduction-Classification-Step and Graded index fibers- Acceptance angle-Numerical aperture- Fibre optic sensors and types of sensors.

PRACTICES:

- Melde's experiment- Determination of frequency of a given tuning fork.
- Ultrasonic Interferometer-Determination of the velocity of ultrasonic waves in liquids.
- Semiconductor laser- Determination of wavelength.
- Optical fibre- Determination of Numerical Aperture and Acceptance angle.

MODULE-2

UNIT-1 **8L+0P+8P=16 Hours**

CRYSTAL PHYSICS:

Fundamental terms of crystal Physics-Lattice parameters- Crystal Systems-Packing factor for SC, BCC and FCC - Miller indices-Important planes of cubic crystal system-Distance of separation between successive (h k l) planes- X-ray diffraction –Bragg's law - Defects in solids- Point defects- Line defects-Edge & Screw dislocations.

UNIT-2 **8L+0P+8P=16 Hours**

SKILLS:

- ✓ *To apply Ultrasonic waves in non-destructive testing.*
- ✓ *To compute the power of the laser and the signal carrying capacity of optical fiber.*
- ✓ *To distinguish various crystals and the orientation of crystal planes.*
- ✓ *To demonstrate the synthesis and characterization of nanoparticles in view of their application.*

NANOMATERIALS AND THEIR CHARACTERIZATION:

Introduction to nanoscience and technology-surface area to volume ratio & quantum confinement; Synthesis of nanomaterials Top-down & Bottom-up approach, Ball milling- Sol-Gel method; Applications of nanotechnology in various fields; X-Ray Diffraction-Bragg's law -Powder method- Electron microscopy-(SEM &TEM); Atomic force microscopy (AFM).

PRACTICES:

- Semiconductor- Determination of Bandgap.
- Diffraction grating- Determination of wavelength of a given light source.
- Photoelectric effect- Determination of Planks constant.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the knowledge of mechanical and sound waves from the perspective of engineering applications.	Apply	1	1, 2, 3, 4 , 9, 10
2	Apply the knowledge of crystal geometry to distinguish solids.	Apply	2	1, 2, 3, 4, 5, 9, 10
3	Analyze the wavelengths of lasers for relevant diverse applications and foster the knowledge to realize fiber optic sensors.	Analyze	1	1, 2, 5, 9, 10
4	Compute the dimensions of nano particles to the physical and chemical aspects of nanomaterials.	Evaluate	2	1, 2, 3, 4, 9, 10

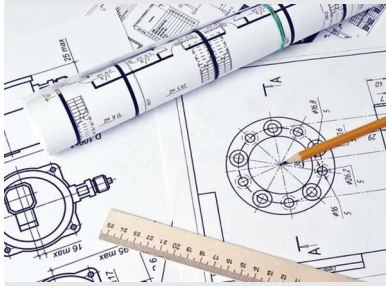
TEXT BOOK:

1. S.O.Pillai, "Solid State Physics", New age International publishers, 8th edition, 2018.
2. H. P. Myers, "Introduction to Solid State Physics", Taylor & Francis, 2009.
3. V.Rajendran, "Engineering Physics", Tata Mc –Graw Hill Publications, 2016.

REFERENCE BOOKS:

1. D. Halliday, R. Resnick and J. Walker, "Fundamentals of Physics", 6th edition, John Wiley and Sons, New York, 2001.
2. Charles Kittel, "Introduction to Solid State Physics", 7th edition, Wiley, Delhi, 2007.
3. Donald A. Neamen, "Semiconductor Physics and Devices: Basic Principle", 4th edition, McGraw-Hill, New York, 2012.
4. N.W. Ashcroft and N.D. Mermin, "Solid State Physics", International student edition, Brooks Cole, 2008.

22ME101 ENGINEERING GRAPHICS



Source Link: https://depositphotos.com/5087383/stock-photo-the-engineering-drawing.html
Image file name: Engineering Graphics

Hours Per Week :

L	T	P	C
2	-	2	3

PREREQUISITE KNOWLEDGE: Basics of Geometry

COURSE DESCRIPTION AND OBJECTIVES:

Engineering graphics is the language of engineers and is the most effective way of communicating and sharing technical ideas in the form of pictures/drawings. The objective of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided drawing.

MODULE-1

UNIT-1 **6L+0T+6P=12 Hours**

ENGINEERING CURVES:

Types of lines; Lettering, Dimensioning, Geometric constructions - lines, polygons (Angle, ARC, General and Inscribe in circle method), Conical curves (General method), Ellipse by Oblong method.

UNIT-2 **10L+0T+10P=20 Hours**

ORTHOGRAPHIC PROJECTIONS OF POINTS, LINES & PLANES:

Principles of projection; Projections of points; Projection of straight lines - Inclined to one plane, inclined to both planes; Projection of planes - Inclined to one plane.

PRACTICES:

- Construction of polygons using different methods (i.e. ARC, Angle, General).
- Inscribe a regular hexagon & pentagon in a circle of the given diameter.
- Tracing of conical curves (Ellipse, Parabola, Hyperbola) by using General Method.
- Draw the projections of the points situated in all the 4 quadrants.
- Draw the projections of a line when it is inclined to one plane (HP or VP).
- Draw the projections of a line when it is inclined to both the planes (HP &VP).
- Draw the projections of a plane when it is inclined to one plane (HP or VP).

MODULE-2

UNIT-1 **6L+0T+6P=12 Hours**

PROJECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES:

Projections of Solids: Projection of solids axis inclined to one reference plane - Prisms, pyramids, Cylinder and cone.

Development of Surfaces: Development of lateral surfaces of simple solids - Prisms, Pyramids, Cylinder and cone.

UNIT-2 **10L+0T+10P=20 Hours**

ORTHOGRAPHIC VIEWS AND DRAFTING USING COMPUTER PACKAGE:

Orthographic Views: Conversion of pictorial views into orthographic views.

Drafting Using Computer Package: Introduction to 2D modelling software - AutoCAD; Conversion of Isometric view into Orthographic views of simple castings; Conversion of Orthographic views into Isometric view of simple solids - Prisms, Pyramids, Cylinders and cones.

SKILLS:

- ✓ *Convert iso-metric views of objects into orthographic views and vice versa.*
- ✓ *Visualize the shape of the 3D components.*
- ✓ *Create pictorial views by using AutoCAD.*
- ✓ *Understand projections by visualization.*

PRACTICES:

- Draw the projections of Prisms, when they are inclined to one reference plane (HP or VP).
- Draw the projections of Pyramids, when they are inclined to one reference plane (HP or VP).
- Draw the projections of cylinder & cone, when they are inclined to one reference plane (HP or VP).
- Draw the complete surface development of prisms & pyramids with the given dimensions.
- Draw the complete surface development of cylinder & cone with the given dimensions.
- Draw the orthographic view's (i. e. front view, top view, and side view) of the given pictorial view of the sketches by using AutoCAD.
- Draw the Isometric view of simple solids (Prisms & Pyramids) by using AutoCAD.
- Draw the Isometric view of simple solids (Cylinder & Cone) by using AutoCAD.

COURSEOUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Communicate the technical ideas in the form of drawings.	Apply	1	1,2,3,5
2	Apply the drawing skills in representing various geometrical features.	Apply	1	1,2,3,5
3	Develop orthographic projections and isometric views of various objects.	Apply	1	1,2,3,5
4	Estimate the lateral surface area of regular geometrical solids.	Analyze	2	1,2,3,5
5	Sketch simple objects and their pictorial views using AutoCAD.	Analyze	2	1,2,3,5

TEXT BOOKS:

1. J Hole, "Engineering Drawing", 2nd edition, Tata McGraw-Hill, 2019.
2. N D Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.

REFERENCE BOOKS:

1. Basant Agrawal and C.M. Agrawal "Engineering Drawing", 2nd edition, Tata Mc Graw- Hill, 2018.
2. K L Narayana, "Engineering drawing", 3rd edition, SciTech Publications, 2011.
3. Colin H. Simmons, Dennis E. Maguire, Manual of Engineering Drawing, 2nd edition, 2003.

22CE101 IT WORKSHOP AND CIVIL ENGINEERING PRODUCTS

Source Link: https://zaitoon.com.pk/types-of-building-materials-used/

Hours Per Week :

L	T	P	C
1	-	4	3

PREREQUISITE KNOWLEDGE: Basics idea of home appliances & computer, bricks, timer, steel, glass.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with different Mechanical trades and IT tools. The objective of this course is to develop models using Carpentry, Fitting, Tin smithy, House wiring and giving hands on practice on assembling and disassembling, productivity tools like word processors, spreadsheets and presentations.

MODULE - 1

UNIT-1 **4L+0T+12P=16 Hours**

COMPUTER HARDWARE & TOOLS FOR REPORT WRITING & PRESENTATION

Computer Hardware: Peripherals of a computer, components in a CPU and its functions, block diagram of the CPU.

Tools for Report writing and Presentation: Overview and Installation of Microsoft Word, Excel and PowerPoint Presentation.

UNIT-2 **4L+0T+12P=16 Hours**

COMPUTER HARDWARE & TOOLS FOR REPORT WRITING & PRESENTATION

Computer Hardware: Disassemble and Assemble the PC back to working condition.

Tools for Report writing and Presentation: Creating project, Creating a Newsletter using Microsoft Word; Creating a Scheduler, Calculating GPA, Performance Analysis, Conditional Formatting, Charts and Pivot Tables using MS Excel; Power Point utilities and tools, Master Layouts, Design Templates, Background and textures using Power Point Presentation.

PRACTICES:

- Troubleshooting of a computer hardware.
- Assembly and disassembly of a computer.
- Creation of projects and newsletter using MS Word.
- Spreadsheet basics, modifying worksheets, formatting cells, formulas and functions, sorting and filtering, charts using MS Excel.
- Power point screen, working with slides, add content, work with text, working with tables, graphics, slide animation, reordering slides, adding sound to a presentation using MS PPT.

MODULE - 2

UNIT-1 **4L+0T+12P=16 Hours**

ENGINEERING MATERIALS

Engineering Materials: Properties of building stones, classification of stones, stone quarrying, dressing of stone, Wood: Structure Properties, Seasoning of timber Classification of various types of woods used in buildings Defects in timber. Alternative materials for wood, Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium. bricks. Characteristics of good tile, manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials.

SKILLS:

- ✓ *Understand the concepts of making various wooden joints for house hold purpose.*
- ✓ *Design and develop various sheet metal products.*
- ✓ *Illustrate the characteristics of different engineering materials.*
- ✓ *Application of materials in civil engineering.*

UNIT-2 **4L+0T+12P=16 Hours**

APPLICATIONS

Structural requirements of stone, Composition of good brick earth, English bond and Flemish bond - odd and even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner. King Post truss, Queen Post truss.

PRACTICES:

- Absorption Test on Bricks.
- Compressive Test on Bricks.
- Direct shear Test on Timber Specimen.
- Bending stress on Timber.
- Izod Impact Test on mild steel and Cast Iron.
- Torsion Test on Mild Steel.

COURSE OUTCOMES:

Upon successful completion of the course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Assemble and disassemble of a computer.	Apply	1	1, 2
2	Create documents, spread sheets and presentations using MS Tools.	Apply	1	1, 2, 5, 6, 12
3	Illustration of Different Engineering materials.	Analyze	2	1, 3, 8, 9,10
4	Analyzing the characteristics of Engineering materials.	Apply	2	1, 2 ,5,6,7,11
5	Application of Engineering materials for civil Engineering.	Analyze	2	1, 6, 7

TEXT BOOKS:

1. Peter Norton, —Introduction to Computers‖, Tata Mc Graw Hill Publishers, 7th Edition, 2017.
2. G. C Sahu and Joy Gopal Jana Building Materials and Construction, Mcgraw Hill Education (P) India Ltd. New Delhi.

REFERENCE BOOKS:

1. T.V.Gopal, T.Kumar and G. Murali, —A first Course on Workshop Practice: Theory, Practice and Work Book‖, Suma Publication, 2005.
2. K.V.N.Pakirappa, —Workshop Technology‖, 5 th edition, Radiant Publishing House, 2011.
3. S.K Hazra Choudhury, —Elements of Work Shop Technolog, 11th edition, Media Promoters.

22TP103 PROGRAMMING IN C

✓ Techgig.com

Hours Per Week :

L	T	P	C
2	-	4	4

PREREQUISITE KNOWLEDGE: Fundamentals of Problem Solving.

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed to impart knowledge on basic concepts of C programming language and problem solving through programming. It covers basic structure of C program, data types, operators, decision making statements, loops, functions, strings, pointers, and also file manipulations. At the end of this course, students will be able to design, implement, test and debug complex problems using features of C.

MODULE- 1

UNIT-1 **8L+0T+16P=24 Hours**

INTRODUCTION TO ALGORITHMS AND PROGRAMMING LANGUAGES:

Introduction to Algorithms: Basics of algorithms; Flow charts; Generations of programming languages. Introduction to C: Structure of a C program - pre-processor statement, inline comments, variable declaration statements, executable statements; C Tokens - C character set, identifiers and keywords, type qualifiers, type modifiers, variables, constants, punctuations and operators.

Data Types and Operators: Basic data types; Storage classes; Scope of a variable; Formatted I/O; Reading and writing characters; Operators - assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, sizeof, dot, arrow, parentheses operators; Expressions - operator precedence, associative rules.

Control Statements: Introduction to category of control statements; Conditional branching statements - if, if– else, nested-if, if – else ladder, switch case; Iterative statements - for, while, do - while, nested loops; Jump statements - break, jump, goto and continue.

UNIT-2 **8L+0T+16P=24 Hours**

ARRAYS & STRINGS:

Arrays: Introduction; Types of arrays; Single dimensional array - declaration, initialization, usage, reading, writing, accessing, memory representation, operations; Multidimensional arrays.

Strings: Character array, Reading string from the standard input device, Displaying strings on the standard output device, Importance of terminating a string, Standard string library functions.

PRACTICES:

Questions on Data Handling – Level 1:

- Write a program to accept a character as input from the user and print it.
- Write a program to accept a number as input from the user and print it.
- Write a program to accept a float value from the user and print it.
- Write a program to accept a message as input from the user and print it.
- Write a program to accept a message from the user as input and print it in 3 different lines.
- Write a program to accept 2 numbers from the user as input and print their sum.
- Write a program to accept 2 numbers from the user as input and print their product.
- Write a program to accept a number as input from the user which denotes the temperature in Celsius, convert it to Fahrenheit reading and print it.

SKILLS:

- ✓ *Analysis of the problem to be solved.*
- ✓ *Select static or dynamic data structures for a given problem and manipulation of data items.*
- ✓ *Application of various file operations effectively in solving real world problems.*
- ✓ *Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.*

- Write a program to accept a number as input from the user which denotes the radius and print the area of the circle.
- Write a program to accept a character as input from the user and print it's corresponding ASCII value.

Questions on Control Statements - Looping – Level 1:

- Write a C program to print all the characters from a to z once.
- Write a C program to print all the characters from Z to A once.
- Write a C program to print all the characters from A to Z 3 times.
- Write a C program to print the first N natural numbers, where N is given as input by the user.
- Write a C program to print the first N natural numbers and their sum, where N is given as input by the user.
- Write a C program to print all the odd numbers between 1 and N where N is given as input by the user.
- Write a C program to print all the even numbers between I and N where N is given as input by the user.
- Write a C program to print the squares of the first N natural numbers between 1 and N, where N is given as input by the user.
- Write a C program to print the cubes of the first N natural numbers between 1 and N, where N is given as input by the user.
- Write a C program to print the squares of every 5th number starting from 1 to N, where N is given as input by the user.

Questions on Control Statements – Decision Making – Level 1:

- Write a program to accept two numbers as input check if they are equal.
- Write a program to accept two characters as input and check if they are equal.
- Write a program to accept two numbers as input and print the greater of the 2 numbers.
- Write a program to accept two numbers as input and print the lesser of the 2 numbers.
- Write a program to accept 3 numbers as input and print the maximum of the 3.
- Write a program to accept 3 numbers as input and print the minimum of the 3.
- Write a program to accept a number as input and print EVEN if it is an even number and ODD if it is an odd number.
- Write a program to accept a number as input and check if it is divisible by 3. If it is divisible by 3 print YES else print NO.
- Write a program to accept a number as input and check if it is divisible by both 3 & 5. If it is divisible print YES else print NO.
- Write a program to accept a number as input and check if it is positive, negative or zero.

Questions on Patterns – Level 1:

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

```
*****
*****
*****
*****
*****
```

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

```
*****
*   *
*   *
*   *
*****
```

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

  *

  **

  ***

  ****

  *****

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

    *

   **

  ***

 ****

*****

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

  1

  12

  123

  1234

  12345

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

  1

  22

  333

  4444

  55555

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

  54321

  4321

  321

  21

  1

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

  12345

  2345

  345

  45

  5

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

  A
  AB
  ABC
  ABCD
  ABCDE

- Write a program to accept a number N as input from the user and print the following pattern. Sample N = 5.

  A

  BC

  DEF

  GHIJ

  KLMNO

Questions on Number Crunching – Level 1:

- Write a program to accept a number as input and print the number of digits in the number.
- Write a program to accept a number as input print the sum of its digits.
- Write a program to accept a number as input, reverse the number and print it.
- Write a program to accept a number and digit as input and find the number of occurrences of the digit in the number.
- Write a program to accept a number as input and check if it is an Armstrong number.
- Write a program to accept a number as input and check if it is an Adam number.
- Write a program to accept a number as input and check if is a prime number.
- Write a program to accept 2 numbers as input and check if they are amicable or not.
- Write a program to accept a number as input and check if it is a power of 2.
- Write a program to accept 2 numbers as input and find their LCM.

Questions on Arrays – Level 1:

- Print the contents of an array from the left to the right.
- Print the contents of an array from the right to the left.
- Find the sum of the elements of an array.
- Find the maximum element in an unsorted array.
- Find the minimum element in an unsorted array.
- Find the average of the elements in an unsorted array.
- Count the number of 0s and 1s in an array having 0s and 1s in random order.
- Count the number of elements in an array whose elements are lesser than a key element in an unsorted array.
- Print all the elements in an array whose values are lesser than a key element in an unsorted array.
- Find the repeated elements in a sorted array.

Questions Number crunching – Level 2:

- Write a program to accept a number as input and print the product of its digits.
- Write a program to accept a number as input and check if it is a palindrome.
- Write a program to accept a number as input and print the frequency of occurrence of each digit.
- Write a program to accept a number as input and print its factors.
- Write a program to accept a number as input and print its prime factors.
- Write a program to accept a number as input and check if it is a perfect square of not.
- Write a program to accept 2 numbers as input and check if they are betrothed numbers or not.
- Write a program to accept 2 numbers as input and print their HCF.
- Write a program to accept a number as input and check if is a strong number.
- Write a program to generate prime numbers between two intervals given as input.

Questions on Arrays – Level 2:

- Find the sum of the maximum and minimum numbers of an unsorted array.
- Replace every element in an array with the sum of its every other element.
- Replace every element in an array with the sum of its right side elements.
- Replace every element in an array with the sum of its left side elements.
- Reverse the elements of an array (in place replacement).
- Reverse the first half of an array.

- Reverse the second half of an array.
- Write a program to find the second largest element in an unsorted array.
- Write a program to find the second smallest element in an unsorted array.
- Write a program to print the number of odd and even numbers in an unsorted array.

Questions on Strings – Level 1:

- Write a program to accept a string as input and print it.
- Write a program to accept a string as input and count the number of vowels in it.
- Write a program to accept a string as input and count the number of consonants in it.
- Write a program to accept a string as input and print its length.
- Write a program to accept a string as input and print the reversed string.
- Write a program to accept 2 strings as input and check if they are the same.
- Write a program to accept a string as input and copy the contents into a second string and print the second string.
- Write a program to accept 2 strings as input and concatenate them into a third string and print the third string.
- Write a program to accept a string as input and check if it is a palindrome.
- Write a program to accept two strings as input and check if the second string is a substring of the first.

Questions on Strings – Level 2:

- Implement the string length function.
- Implement the string copy function.
- Implement the string concatenate function.
- Implement the string compare function.
- Implement the vowel count function.
- Implement the consonant count function.
- Implement the count words function.
- Implement the string reverse function.
- Implement the strstr function.
- Complete the code snippet to implement the is Palindrome function that checks if a given string is a palindrome. You will need to use the 3 functions string Copy, str Reverse and string Compare functions provided to accomplish this.

MODULE-2

UNIT-1 **8L+0T+16P=24 Hours**

FUNCTIONS & POINTERS:

User-defined functions: Function declaration - definition, header of a function, body of a function, function invocation; Call by value; Call by address; Passing arrays to functions; Command line arguments; Recursion; Library Functions.

Pointers: Declaration, Initialization, Multiple indirection, Pointer arithmetic, Relationship between arrays and pointers, Scaling up - array of arrays, array of pointers, pointer to a pointer and pointer to an array; Dynamic memory allocation functions.

UNIT- 2 **8L+0T+16P=24 Hours**

STRUCTURES, UNIONS & FILES:

Structures: Defining a structure, Declaring structure variable, Operations on structures, Pointers to structure - declaring pointer to a structure, accessing structure members using pointer; Array of structures, Nested structures, Passing structures to functions - passing each member of a structure as a separate argument, passing structure variable by value, passing structure variable by reference/ address; Typedef and structures.

Unions: Defining a union - declaring union variable, operations on union; Pointers to union - declaring pointer to a union, accessing union members using pointer; Array of union, Nested union, Typedef and union, Enumerations, Bit-fields.

Files: Introduction to files, Streams, I/O using streams – opening a stream, closing stream; Character input, Character output, File position indicator, End of file and errors, Line input and line output, Formatted I/O, Block input and output, File type, Files and command line arguments.

PRACTICES:

Questions on Strings – Level 3:

- Write a program to swap two given strings and print the swapped strings.
- Write a program to swap two given words of the given sentence and print the altered string.
- Return the maximum occurring character in the string.
- Write a program to print the character in the string with the count where count is the occurrence of the character.
- Write a program to print the duplicate characters in the given string.
- Write a program to remove the duplicate characters in the given string.
- Write a program to remove the vowels from a given string.
- Write a program to rotate a given string N number of times.
- Write a program to check if 2 strings are rotations of each other.
- Write a program to remove the characters from the first string that are present in the second string.

Questions on 2D Arrays – Level 1:

- Print the contents of a 2D array row-wise.
- Print the contents of a 2D array column-wise.
- Print the contents of a 2D array in a zig-zag order.
- Print the contents of a 2D array diagonal-wise.
- Print the contents of a 2D array right-diagonal order.
- Print the contents of a 2D array left-diagonal order.
- Print the contents of a 2D array in the upper triangular order – left top to right bottom.
- Print the contents of a 2D array in the lower triangular order.
- Find and print the maximum element along with its position in a matrix.
- Find and print the minimum element along with its position in a matrix.

Questions on 2D Arrays – Level 2:

- Find and print the maximum element of each row of a matrix.
- Find and print the minimum elements of each row of a matrix.
- Find and print the maximum element of each column of a matrix.
- Find and print the minimum element of each column of a matrix.
- Find the lowest value in the upper triangle area and the largest value in the lower triangular area of a matrix and print their product.
- Find the sum of the elements of each row and each column of a matrix and print the minimum row sum and maximum sum column.
- Write a program to find the row with the maximum number of 1’s in a matrix consisting of only 0’s and 1’s.
- Write a program to print the quotient and remainder on dividing sum of left-top to right-bottom diagonal by sum of right-top to left-bottom diagonal.
- Write a program to print the absolute difference of the sum of major diagonal elements and the sum of minor diagonals of the given matrix.
- Write a program to search a given element in a row-wise and column-wise sorted 2D array.

Questions on 2D Arrays – Level 3:

- Write a program to find the Kth smallest element in the given matrix.
- Write a program to find the Kth largest element in the given matrix.

- Write a program to check whether the given two two-dimensional array of same dimensions are equal or not.
- Write a program to add the given two two-dimensional array of same dimensions.
- Write a program to subtract the given two two-dimensional array of same dimensions.
- Write a program to multiply the given two two-dimensional array of same dimensions.
- Write a program to sort each row of a matrix.
- Write a program to find the sum of the elements in 'Z' sequence of the given 2D array.
- Write a program to print the unique rows of the given two-dimensional array consisting of only 0's and 1's.
- Write a program to print the unique columns of the given two-dimensional array consisting of only 0's and 1's.

Questions on Files, Structures & Unions:

- Write a C program to create a struct, named Student, representing the student's details as follows: first_name, last_name, Age and standard.

  Example

  Read student data

  john

  carmack

  15

  10

  Display the data in the following format

  First Name: john

  Last Name: carmack

  Age: 15

  Standard: 10

- Declare a structure POINT. Input the coordinates of point variable and write a C program to determine the quadrant in which it lies. The following table can be used to determine the quadrant.

Quadrant	X	Y
1	Positive	Positive
2	Negative	Positive
3	Negative	Negative
4	Positive	Negative

  Example

  Input the values for X and Y coordinate: 7 9

  The coordinate point (7,9) lies in the First quadrant.

- Bob and Alice both are friends. Bob asked Alice how to store the information of the books using Structures. Then Alice written a c program to store the information of books using book structure by taking different attributes like book_name, author, book_id, price. Write a C program to read and display the attributes of the books using structures.

  Sample Input:

  Enter number of books: 1

  Enter the book name: c Programming

  Enter the author name: balaguruswamy

  Enter the book ID: 23413

  Enter the book price: 500

  Sample Output:

  The details of the book are:

  The book name is: c Programming

The author name is: balaguruswamy

The book ID is: 23413

The book price is: 500.00

- Ramesh wants to do addition on complex numbers. He did it with regular practice but Charan asked him to do with the help of structures by following below Criteria.

  Write a C program that defines a structure named 'Complex' consisting of two floating point members called "real and imaginary". Let c1 and c2 are two Complex variables; compute the sum of two variables.

  Example:

  c1= 2 8
  c2= 6 4
  Sum= 8.000000+12.000000i

- Customer Payment Details is a structure with members as customers_name, address, account_number, payment_status(paid(1)/ not_paid(0)), due_date, and amount. In this example, payment_date is another structure with month, day and year as integer members. So, every customer record can be considered as an array of structures.

  Write a C program that displays the amount to be paid by each customer along with their names. If payment_status is 1, display NIL for such customers.

  Input Format:

  First line of input contains 'n' number of customers, followed by 8 lines of input for each customer. Each line represents (customers_name, address, account_number, amount payment_status(paid(1)/ not_paid(0)), and due_date).

  Output Format:

  First line of output is Amount to be paid by each customer as on date: followed by n lines of output. Each line contains name of the customer followed by tab space, and amount to be paid.

  Hint: Use nested structure to represent date.

  Write a 'C' program to accept customer details such as: Account_no, Name, Balance using structure. Assume 3 customers in the bank. Write a function to print the account no. and name of each customer whose balance < 100 Rs.

- Write a C program to accept details of 'n' employee(eno, ename, salary) and display the details of employee having highest salary. Use array of structure.

- Write a C program to print the bill details of 'N' number of customers with the following data: meter number, customer name, no of units consumed, bill date, last date to deposit and city. The bill is to be calculated according to the following conditions:

No. of units	**Charges**
For first 100 units	Rs.0.75 per unit
For the next 200 units	Rs.1.80 per unit
For the next 200 units	Rs.2.75 per unit

  Sample Input

  Enter no. of customers

  1

  Enter Meter Number AP01213

  Enter Customer Name: Karthik

  Enter No. of units consumed: 200

  Enter Bill date:22/01/2021

  Enter Last date: 12/2/2021

  Enter City: Guntur

  Sample Output

  Meter Number AP01213

  Customer Name: Karthik

No. of units consumed: 200

Bill date:22/01/2021

Last date: 12/2/2021

City: Guntur

Total Amount: 255.000000

- Write a C program that creates a student file containing {Roll No, Student Name, Address, Stream}, where the data will be inserted and display the list of students who are in CSE (Stream=CSE).

  Input: A file name

  Output: The attributes such as Roll_No, Student_Name, Stream, Address.

  Sample Input

201fa4200	Raja	CSE	Guntur
201fa4201	Bala	IT	Tenali

  Sample Output

201fa4200	Raja	CSE	Guntur

- Write a C program that reads content from an existing text file and write the same in a new file by changing all lowercase alphabetic character to upper case. (Existing file may contain digit and special characters).

  Example:

  Input: Enter the file name.

  Output: New file with updated content.

- Write a C program to count the occurrences of the given string in a file.

  Example:

  Input: Enter the File name to read the string to be counted.

  Output: Display the count of occurrences of the string.

- Write a C Program to transfer the data from one location to another location without changing the order of the content.

  Example:

  Read the file name from the user. If the source file exists, Transfer the data and display the message as “Data is transferred successfully” otherwise display the message “No such file is existing in the directory.”

- Write a C program that reads numbers and write them into a text-file. Also find odd and even numbers in that file and store it in 2 separate files named odd.txt and even.txt. All the values should be in ascending order.

  Input: Enter the values.

  Output: Creates a separate file for Even and Odd numbers.

  Sample Input:

  4 43 2 53 45

  Sample Output:

  Even.txt: 2 4

  Odd.txt: 43 45 53

- Write a C program to replace the content in the given text file.

  Input: Enter the file name, line number to be replaced and the new content

  Output: New file with replaced lines.

  Example:

  Sample Input: Enter the file name: abc.txt

  Enter the line no to replace: 3

  Enter the content: Files stores data presently.

Sample Output:

Line no 3 is replaced with the given content.

The content of the file abc.txt contains:

test line 1

test line 2

Files stores data presently

test line 4

COURSE OUTCOMES:

Upon successful completion of the course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify suitable data type for operands and design of expressions having right precedence.	Apply	1,2	1
2	Apply decision making and iterative features of C Programming language effectively.	Apply	1,2	1
3	Select problem specific data structures and suitable accessing methods.	Analyze	1,2	1,2
4	Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.	Evaluate	1,2	3,4
5	Design and develop non- recursive and recursive functions and their usage to build large modular programs and also able to design string manipulation functions.	Create	1,2	3

TEXT BOOKS:

1. Behrouz A. Forouzan, Richard F.Gilberg, “Programming for Problem Solving”, 1st edition, Cengage publications, 2019.
2. Ajay Mittal, “Programming in C - A Practical Approach”, 1st edition, Pearson Education, India, 2010.

REFERENCE BOOKS:

1. Reema Thareja, “Computer Fundamentals and Programming in C”, 1st edition, Oxford University Press, India, 2013.
2. Herbert Schildt, “C: The Complete Reference”, 4th edition, Tata McGraw-Hill, 2017.
3. Byron S Gottfried, “Programming with C”, 4th edition, Tata McGraw-Hill, 2018.

22EN102 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
-	-	2	1

PREREQUISITE KNOWLEDGE: Basics of grammar, Read and understand for global context, Cultural sensitivity and Basic writing skills.

COURSE DESCRIPTION AND OBJECTIVES:

English Proficiency and Communication Skills seeks to develop the students' abilities in grammar, speaking, reading, writing and overall comprehension skills. The course will provide students an exposure on a wide range of language use in everyday situations. It will make the students to equip with functional English and make them use it confidently in their professional and social contexts. Finally, students will strengthen their reading, writing, listening and speaking skills in English

MODULE-1

UNIT-1 **0L+0T+8P=8 Hours**

MY LIFE AND HOME – MAKING CHOICES – HAVING FUN:

Reading: Understanding main message, factual information global meaning, specific information and paraphrasing.
Writing: Developing hints based mail, Writing short messages/paragraphs.
Listening: Understanding short monologues or dialogues and choose the correct visual.
Speaking: Express simple opinions /cultural matters in a limited way.
Vocabulary: Discerning use of right word suiting the context, B1 Preliminary word list.
Grammar: Frequency Adverbs, State Verbs, AFV and Prepositions.

UNIT-2 **0L+0T+8P=8 Hours**

ON HOLIDAY - DIFFERENT FEELINGS – THAT'S ENTERTAINMENT!:

Reading: Longer text for detailed comprehension, gist and inference.
Writing: Developing notes and responding to penfriends or 'e-pals'.
Listening: Understand straightforward instructions or public announcements.
Speaking: Describing people, things and places in a photograph.
Vocabulary/Grammar:
Comparatives and Superlatives, Gradable and non-gradable adjectives, Cloze tests.

PRACTICES:

- Developing hints based mail.
- Writing short message.
- Writing paragraphs.
- Expressing opinions and cultural matters.
- Understanding short monologues.
- Understanding straightforward instructions and public announcements.
- Describing people, things and places in a photograph.

MODULE-2

UNIT-1 **0L+0T+8P=8 Hours**

GETTING AROUND – INFLUENCES - STAY FIT AND HEALTHY:

Reading: Reading for understanding coherence of the text and drawing inferences.
Writing: Reading an announcement from a magazine or website for preparing an article.

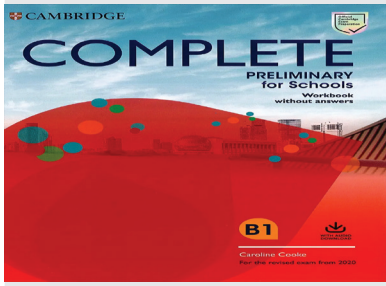


Image source: https://www.scribd.com/document/502301821/Cambridge-Complete-B1-Preliminary-for-Schools-Workbook-2020-Edition

SKILLS:

- ✓ *Use of appropriate grammar and vocabulary with syntactic patterns in short texts.*
- ✓ *Read and extract the main message, global meaning, specific information, detailed comprehension, understanding of attitude, opinion and writer purpose and inference.*
- ✓ *Listen to understand key information, specific information, gist and detailed meaning and to interpret meaning.*
- ✓ *Understand questions and make appropriate responses and talk freely on everyday topics.*

Listening: Discussion activities and listening to understand the gist of each short dialogue.

Speaking: Snap Talks, Make and respond to suggestions, discuss alternatives and negotiate agreement.

Vocabulary / Grammar: Punctuation, Prepositions, Phrasal Verbs, B1 Preliminary word list.

UNIT-2 **0L+0T+8P=8 Hours**

LOOKS AMAZING! – THE NATURAL WORLD – EXPRESS YOURSELF!:

Reading: Content, Communicative Achievement, Organisation and Language.

Writing: Developing a story with clear links to the given opening sentence.

Listening: An interview for a detailed understanding of meaning and to identify attitudes and opinions.

Speaking: Discuss likes, dislikes, experiences, opinions, habits, etc.

Vocabulary/Grammar: Modals, Conditionals, Verb forms (Time and Tense).

PRACTICES:

- Listening to understand the gist of each short dialogue.
- Listening to an interview for a detailed understanding of meaning and to identify attitudes and opinions.
- Preparing an article.
- Discuss for alternatives and negotiate agreement.
- Discussion on likes, dislikes, experiences, opinions, habits, etc.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply to read and grasp content on a range of topics/ texts related to their everyday life like notifications, advertisements, travel brochures, news reports, articles.	Apply	1	7, 8, 9, 10, 12
2	Apply suitable strategies to achieve comprehension, like listening for main points and checking comprehension using contextual clues etc.	Apply	1	7, 8, 9, 10, 12
3	Demonstrate vocabulary beyond that of the familiar subjects.	Analyze	1, 2	7, 8, 9, 10, 12
4	Show sufficient control of English grammar and sentence variety to coherently organise information at sentence and discourse levels.	Evaluate	2	7, 8, 9, 10, 12
5	Use functional English to communicate and interact effectively in everyday situations.	Create	2	7, 8, 9, 10, 12

TEXT BOOKS:

1. Emma Heyderman and Peter May, “Complete Preliminary”, Student’s Book with Answers, 2nd edition, Cambridge University Press, 2019.

REFERENCE BOOKS:

1. Annette Capel and Rosemary Nixon, “Introduction to PET”, Oxford University Press, 2009.
2. Adrian Doff and Craig Thaine, “Empower Pre intermediate”, Cambridge University Press, 2015.
3. Louise Hashemi and Barbara Thomas, “Objective PET”, Cambridge University Press, 2010.

22TP101 CONSTITUTION OF INDIA

Image: https://commons.wikimedia.org/wiki/File:Constitution_india.jpg

Hours Per Week :

L	T	P	C
-	2	-	1

PREREQUISITE KNOWLEDGE: High School-level Civics and Social Studies.

COURSE DESCRIPTION AND OBJECTIVES:

To provide students with a basic understanding of Indian Polity and Constitution and make students understand the functioning of government at the center and state level besides local self-government. This course also equips students with knowledge pertaining to fundamental rights and fundamental duties of a citizen in a democracy such as India.

MODULE-1

UNIT-1 **0L+8T+0P=8 Hours**

HISTORICAL BACKGROUND TO THE INDIAN CONSTITUTION:

Meaning of the constitution law and constitutionalism; Historical perspective of the Constitution of India; Salient features and characteristics of the Constitution of India.

UNIT-2 **0L+8T+0P=8 Hours**

FUNDAMENTAL RIGHTS, DUTIES, DIRECTIVE PRINCIPLES, AND AMENDMENT:

Scheme of the fundamental rights - scheme of the Fundamental Right to Equality; scheme of the Fundamental Right to certain Freedom under Article 19; scope of the Right to Life and Personal Liberty under Article 21; Scheme of the Fundamental Duties and its legal status; Directive Principles of State Policy – its importance and implementation; Amendment of the Constitution - Powers and Procedure.

PRACTICES:

- Enactment of Constituent Assembly debates to further understand the rationale for the provisions of the constitution.
- Fundamental Rights in our popular culture - discussion in the movie Jai Bhim.

MODULE-2

UNIT-1 **0L+8T+0P=8 Hours**

STRUCTURE AND FORM OF GOVERNMENT:

Federal structure and distribution of legislative and financial powers between the Union and the States; Parliamentary Form of Government in India – The constitution powers and status of the President of India; Emergency Provisions: National Emergency, President Rule, Financial Emergency.

UNIT-2 **0L+8T+0P=8 Hours**

LOCAL SELF GOVERNMENT:

Local Self Government – Constitutional Scheme in India – 73rd and 74th Amendments.

PRACTICES:

- Debate on federalism in India.
- Collect news published in the local papers about panchayats in the nearby areas.

SKILLS:

- ✓ *Understanding the basics of the Indian constitution.*
- ✓ *Know the fundamental rights, fundamental duties, and Directive Principles of State Policy.*
- ✓ *Fair knowledge about the functioning of various institutions in a democracy.*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyse major articles and provisions of the Indian constitution.	Analyze	1	6
2	Appreciation for the constitution and safeguarding individual rights.	Apply	1	6
3	Evaluating functions of various organs of the State in a democracy.	Evaluate	2	6

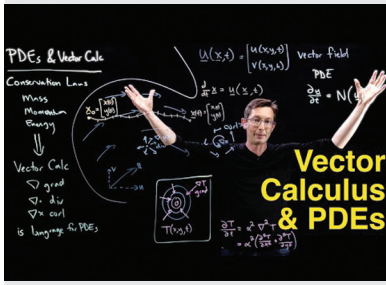
TEXTBOOK:

1. PM Bhakshi, “Constitution of India”, 15th edition, Universal Law Publishing, 2018.

REFERENCE BOOKS:

1. B. R. Ambedkar, “The Constitution of India” Educreation Publishing, India, 2020.
2. Subhash Kashyap, “Our Constitution” 2nd edition, National Book Trust, India, 2011.
3. Arun K. Thiruvengadam, “The Constitution of India: A Contextual Analysis”, Hart Publishing India, 2017.

22MT112 PARTIAL DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS



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Hours Per Week :

L	T	P	C
3	2	-	4

PREREQUISITE KNOWLEDGE: Differentiation, Integration, Vectors.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to build an ability of understand how partial differential equations arise in the mathematical description of heat flow and vibration. The methods to explain the physical interpretations of common forms of PDEs and solution for initial and boundary value problems will be the primary focus. Students will gain deeper knowledge of multiple differentiation operations such as Gradient, Divergent and Curl.

MODULE-1

UNIT-1 **12L+8T+0P=20 Hours**

PARTIAL DIFFERENTIAL EQUATIONS:

Partial differential equations: Order and degree, Formation of partial differential equations, Lagrange linear equations, Method of multipliers.

Classification of Second Order PDE, Method Separation of variables.

UNIT-2 **12L+8T+0P=20 Hours**

APPLICATIONS AND NUMERICAL METHODS:

Solution to one dimensional wave equation, heat equation and Laplace's equation.

Numerical Methods: Numerical methods to solve Laplace's equation: Standard five-point formula, Diagonal five-point formula (Liebmenn's iteration process).

PRACTICES:

- Learn method of forming partial differential equations.
- Identify and apply different methods to solve differential equations.
- Determine the displacement of a vibrational string is initially at rest in equilibrium position.
- Evaluate the temperature distribution in insulated rods.
- Determine solutions of Laplace equation.

MODULE-2

UNIT-1 **12L+8T+0P=20 Hours**

VECTOR CALCULUS:

Vector Differentiation: Scalar and vector point functions, Differentiation of vector functions, Gradient, Divergence, Curl.

Vector Integration: Introduction to multiple integrals (Review), Line integral, Surface integral, Volume integral.

SKILLS:

- ✓ *Apply the transformation between line integral, surface integral and volume integral.*
- ✓ *Gain deeper knowledge of differential operators.*
- ✓ *Be able to use the separation of variables technique to solve partial differential equations.*

UNIT-2 **12L+8T+0P=20 Hours**

APPLICATIONS OF VECTOR CALCULUS

Normal vector, Directional Derivate, Solenoidal and Irrotational flow. Green's theorem for plane, Gauss divergence theorem, Stokes' theorem (without proofs).

PRACTICES:

- Compute the work done when an object moves along the path subject to a force.
- Use divergence and curl to measure the tendency of the fluid to collect or disperse at a point and the tendency of the fluid to swirl around the point.
- Compute the flux of a vector per unit time flowing across in the direction of a vector.
- Verify Green's theorem, stokes theorem and Divergence theorem for the functions over a region.
- Compute the tangent vector to a curve in space.
- Compute the directional derivative of a scalar point function at a point.
- Compute any integral which is to be evaluated over a curve, over a surface or over a volume.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the numerical methods to solve Laplace's equation.	Apply	1	1, 2, 9, 10,12
2	Apply Green's theorem for plane, Gauss divergence theorem, Stokes' theorem.	Apply	2	1, 2, 9, 10,12
3	Evaluate differential operators and the solutions of first order and some second order partial differential equations.	Evaluate	1	1, 2, 9, 10,12
4	Evaluate the line integrals, surface integrals and volume integrals.	Evaluate	2	1, 2, 9, 10,12

TEXT BOOK:

1. N. P. Bali, K. L. Sai Prasad, A Textbook of Engineering Mathematics I, II, III, 2nd Edition, Universal Science Press, New Delhi, 2018.
2. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers,
3. 2018.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley and Sons, Inc,
2. H. K. Dass and Er. Rajanish Verma, Higher Engineering Mathematics, S. Chand and Co., Third revised edition, 2015.
3. B. V. Ramana, Advanced Engineering Mathematics, TMH Publishers.
4. T. K.V. Iyengar et al: Engineering Mathematics, I, II, III, S. Chand and Co., New Delhi, 2018.

22CT103 ENGINEERING CHEMISTRY

Image source: https://www.rsc.org/journals-books-databases/about-journals/reaction-chemistry-engineering/

Hours Per Week :

L	T	P	C
2	-	2	3

PREREQUISITE KNOWLEDGE: Concept of bonding, chemical reactions and electrochemical cell

COURSE DESCRIPTION AND OBJECTIVES:

The course aims to cover the importance of chemistry and its applications in engineering disciplines particularly focusing on developing new engineering materials (such as polymers, nanomaterials etc.) and understanding their property for scientific and engineering applications. In addition, the students are also expected to acquire knowledge on electrochemistry and construction of batteries and fuel cells.

MODULE-1

UNIT-1 **8L+0T+8P=16 Hours**

POLYMERS:

Introduction, classification, molecular weight determination, (Mw & Mn), types of polymerization, preparation, properties and applications of PE, PMA, Nylon-6,6; Rubber-vulcanization, synthetic rubbers – Neoprene, Introduction to polymer composites, glass fiber and metal oxide/metal composites.

UNIT-2 **8L+0T+8P=16 Hours**

NANOMATERIALS & ENGINEERING MATERIALS:

Nanomaterials: Introduction, classification, properties, Top-down (Ball Milling) and Bottom-up (Sol-Gel) synthetic methods; Synthesis, properties and applications of Carbon Nanotubes and Graphene.

Engineering Materials: Lubricants – classification, viscosity, viscosity index, flash and fire points, cloud and pour points and mechanical stability; Refractories – classification, refractoriness RUL, chemical & thermal stability.

PRACTICES:

- Synthesis of Nanoparticles.
- Synthesis of Bakelite.
- Determination of viscosity of oil (Biodiesel, castor oil and coconut oil).
- Water Analysis.
- Synthesis of Iron oxide nanoparticles.
- Synthesis of Au/Ag nanoparticles using plant extract.
- Preparation of Nylon-6,6.
- Preparation of Polystyrene.

MODULE-2

UNIT-1 **8L+0T+8P=16 Hours**

ELECTROCHEMISTRY & CORROSIONS:

Electrochemical Cells: Galvanic and electrolytic cells; Redox reactions; Electrode potential; Electrochemical series, EMF of an electrochemical cell; Nernst equation - applications and significances; Reference electrodes – Standard hydrogen electrode.

Corrosion: Introduction, dry & wet corrosion; Galvanic series; Corrosion prevention by cathodic protection.

SKILLS:

- ✓ *Synthesize various polymers.*
- ✓ *Synthesize nanomaterials.*
- ✓ *Identify the properties of different industrially relevant engineering materials.*
- ✓ *Understand the different components of an electrochemical cell.*
- ✓ *Design electrochemical cell such as battery.*
- ✓ *Identify the types of energy conversion/storage systems.*

UNIT-2 **8L+0T+8P=16 Hours**

BATTERIES & FUEL CELLS:

Batteries: Introduction and importance; Classification of batteries - Lead-acid storage cell and Lithium-ion batteries.

Fuel Cells: Classification of Fuel Cells; Construction, working principle and applications of Hydrogen-Oxygen fuel cell, Biofuel cells - Microbial fuel cells.

PRACTICES:

- Determination of EMF and ΔG of an electrochemical cell.
- Determination of rate of corrosion by weight loss method.
- Construction of Batteries.
- Determination of Molecular weight by viscometer.
- Determination of Fe (II) by dichrometry method.
- Determination of available chlorine in bleaching powder.
- Determination of strength of Weak acid by pH-method.
- Determination of concentration of mixture of acids by conductometry.
- Electroplating of Copper and Zinc on metallic objects.
- Determination of rate of corrosion by weight loss method.
- Construction of galvanic cell and measure the EMF.

COURSEOUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply various synthetic methods for preparing polymers for engineering applications.	Apply	1	1, 2, 4, 9, 10, 11, 12
2	Analyze characteristics in different engineering nanomaterials for the applications of electronic engineering.	Analyze	1	1, 2, 3, 5, 9, 10, 11, 12
3	Distinguish different types of electrochemical cells and corrosions for the real time analysis.	Analyze	2	1, 2, 3, 5, 6, 7, 9, 10, 11, 12
4	Analyze possible corrosion types and their different protection methods.	Analyze	2	1, 2, 3, 5, 6, 7, 9, 10, 11, 12
5	Recommend the principle of electrochemistry for designing various batteries and fuel cells.	Evaluate	2	1, 2, 3, 5, 6, 7, 9, 10, 11, 12

TEXT BOOKS:

1. S. Chawala, “A Textbook of Engineering Chemistry Engineering Materials and Applications”, Dhanpat Rai Publications, 3rd Edition, 2015.
2. P.C. Jain and M. Jain, “Engineering Chemistry”, Dhanpat Rai Publications, 17th Edition, 2015.

REFERENCE BOOKS:

1. K. S. Maheswaramma and M. Chugh, “Engineering Chemistry”, Pearson, 1st Edition, 2015.
2. B. S. Bahl, Arun Bahl and B. D. Tuli, “Essentials of Physical Chemistry”, S. Chand and Co. Ltd., 2007.
3. G. Raj and C. Anand, “Instrumental Methods of Analysis”, Himalaya Publications, 5th edition, 2007.
4. T. Pradeep, “Nano: The Essentials; Understanding of Nano Science and Technology” Tata McGraw-Hill, New Delhi, 2012.
5. J. Mendham, R. C. Denney, J. D. Bares, M. Thomas and B. Siva Sankar, “Vogel’s Textbook of Qualitative Chemical Analysis” (vol. 1), Pearson Publications, 2009.

22EE101 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Source : https://vita.vision.org.in/emerging-technologies-in-electrical-engineering/

Hours Per Week :

L	T	P	C
2	-	2	3

PREREQUISITE KNOWLEDGE: Electrostatics and Electromagnetism.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an insight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of AC machines. It also deals with the basic electronic components like P-N junction diode, Zener diode, Transistor and their characteristics.

MODULE–1

UNIT-1 **8L+0T+8P=16 Hours**

FUNDAMENTALS OF ELECTRIC CIRCUITS:

DC Circuits: Concept of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws, Application to simple series, Parallel circuits, Mesh and nodal analysis of resistive circuits with DC source.

AC circuits: Generation of AC voltage, Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only.

UNIT-2 **8L+0T+8P=16 Hours**

SEMICONDUCTOR DEVICES:

Classification of semiconductors, P-N junction diode -operation and its characteristics, Half wave rectifier - operation, efficiency; Full wave rectifiers -types, operation, efficiency; Zener diode and its characteristics, Zener diode as Voltage regulator.

Bi polar junction transistor- operation, types (NPN & PNP).

PRACTICES

- Verification of Ohm's law.
- Verification of Kirchhoff's current law.
- Verification of Kirchhoff's voltage law.
- Determination of R.M.S. Values of sinusoidal waveform.
- Verification of PN junction diode characteristics under both forward and reverse bias.
- Verification of Zener diode characteristics under reverse bias.

MODULE–2

UNIT-1 **8L+0T+8P=16 Hours**

ANALYSIS OF AC CIRCUITS:

Analysis of single- phase ac circuits consisting of R, L, C, RL, RC (series and parallel) (simple numerical problems). Introduction to three phase system, Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT-2 **8L+0T+8P=16 Hours**

AC MACHINES:

Electromagnetism: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self-inductance and mutual inductance, Coefficient of coupling.

Static & Rotating AC Machine: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

Rotating AC Machine Principle of operation of three phase induction motor, Slip ring and squirrel cage motors, Torque equation; Constructional details of synchronous machine.

PRACTICES

- Transformation ratio of a single phase transformer at different loads.
- Measurement of Energy in single phase resistive load circuit.
- Measurement of Power in single phase resistive load circuit
- Determination of impedance in complex AC circuits.
- Verification of line and phase quantities in a balanced three phase system.

COURSE OUTCOMES:

Upon successful completion of the course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Solve the AC (single and three phase) and DC circuits using different methods.	Apply	1,2	1,2,9,12
2	Apply the concepts of electromagnetism for its applications.	Apply	2	1,2,3,9,12
3	Analyze the resistive circuits with independent sources and find its solution.	Analyze	1,2	1,2,6,9
4	Examine the different electrical equipment.	Evaluate	2	1,2,9,12
5	Acquire the knowledge of semiconductor devices to create circuits.	Create	1	1,2,3,9,12

TEXT BOOKS:

1. V. K. Mehta, “Principles of Electrical Engineering and Electronics”, S.Chand& Co., Publications, New Delhi, 2019.
2. D.P. Kothari, “Basic Electrical and Electronics Engineering”, TMH, New Delhi, 2017.

REFERENCE BOOKS:

1. Millman and Halkias, “Electronic Devices and Circuits”, Mc Graw Hill, 2006.
2. A.K. Thereja and B.L.Thereja, “Electrical Technology”, Vol.–II, S. Chand & Co., Publications, 2020.
3. U. Bakshi and A. Bakshi, “Basic Electrical Engineering”, 1st edition, Technical Publications, Pune, Nov 2020.

22TP104 BASIC CODING COMPETENCY

Source: https://www.geeksforgeeks.org/best-way-to-start-with-competitive-programming-geeksforgeeks-cp-live-course/

Hours Per Week :

L	T	P	C
-	1	3	2

PREREQUISITE KNOWLEDGE: Programming in C.

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed to impart knowledge on advanced concepts of C programming language and problem solving. At the end of this course, students will be able to design, implement, test and debug complex problems using features of C.

MODULE-1

UNIT-1 **0L+4T+12P=16 Hours**

NUMBER CRUNCHING :

PRACTICES:

Problems On Number Crunching

- Write a program to check if a given number is perfect or not.
- Write a program to check if a given number is deficient or not.
- Write a program to check if 2 given numbers are amicable or not.
- Write a program to check if 2 given numbers are betrothed or not.
- Write a program to check whether a given number is an Armstrong number or not.
- Write a program to print the series of prime numbers in the given range.
- Write a program to print all the perfect numbers in a given range.
- Write a program to generate all deficient numbers in a given range.
- Write a program to generate all the amicable numbers in a given range.
- Write a program to generate all the betrothed numbers in a given range.
- Write a program to find the largest prime factor of a given number.
- Write a program to check whether the given number is a palindrome or not.
- Write a program to calculate sum of the individual digits for the given number.
- Write a program to find the first number that has more than ‘n’ factors, excluding 1 and that number.
- Write a program to accept a number as input and print its factorial.
- Write a program to accept a number n, print first N Fibonacci numbers.
- Write a program to check if an input number is Armstrong number or not.
- Write a program that takes input a,b. Print a power b.
- Write a program that takes input a number n, check if it a perfect square or not.
- Print array in spiral format.
- Print sum of each row in a matrix.
- Print sum of each column in matrix.
- Print left->right and right->left diagonals in a matrix.
- Initially you are at (0,0) find the shortest path count to reach the (n, n) block in matrix.
- Remove all the elements present in row and column of unsafe elements. An element is called unsafe if it is equal to smallest or largest value. Count number of remaining elements.
- Write a program to check if the string contains all the letters of alphabet.

SKILLS:

- ✓ *Analysis of the problem to be solved.*
- ✓ *Application of various file operations effectively in solving real world problems.*
- ✓ *Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.*

- Check if a string is matching password requirements.
- Check if String A contains String B (String searching).
- Check if a number is harshad number or not.
- Write a program to get 3 numbers as input. The first is the number num1 and second is the digit that needs to be replaced. The third is the digit that is to replace the 2nd digit. Print the number after performing this operation.
- Write a program to accept a number and swap its alternate digits. Print the number generated.
- Write a program to accept a number and choice as input. If the choice is 0 rearrange the number such that the odd digits are ordered first followed by the even digits. If the choice is 1 rearrange the number such that the even digits are ordered first followed by the odd digits. Print the rearranged number. The order of occurrence of the digits is to be preserved.
- Write a program to determine that whether the given quadrilateral is cyclic or not. You are given the sizes of angles of a simple quadrilateral (in degrees) A, B, C and D, in some order along its perimeter.

  Note: A quadrilateral is cyclic if and only if the sum of opposite angles is 180^0.
- Chef is a very lazy person. Whatever work is supposed to be finished in x units of time, he finishes it in m*x units of time. But there is always a limit to laziness, so he delays the work by at max d units of time. Given x,m,d, find the maximum time taken by Chef to complete the work.
- Suppose Chef is stuck on an island and currently he has x units of food supply and y units of water supply in total that he could collect from the island. He needs xr units of food supply and yr units of water supply per day at the minimal to have sufficient energy to build a boat from the woods and also to live for another day. Assuming it takes exactly D days to build the boat and reach the shore, tell whether Chef has the sufficient amount of supplies to be able to reach the shore by building the boat? Read five integers x,y,xr,yr,D from the user and display “YES” if Chef can reach the shore by building the boat and “NO” if not (without quotes).
- There are 3 problems in a contest namely A,B,C respectively. Alice bets Bob that problem C is the hardest while Bob says that problem B will be the hardest.

  You are given three integers SA,SB,SC which denotes the number of successful submissions of the problems A,B,C respectively. It is guaranteed that each problem has a different number of submissions. Determine who wins the bet.

  1) If Alice wins the bet (i.e. problem C is the hardest), then output Alice.

  2) If Bob wins the bet (i.e. problem B is the hardest), then output Bob.

  3) If no one wins the bet (i.e. problem A is the hardest), then output Draw.

  Note: The hardest problem is the problem with the least number of successful submissions.

  Input Format

  - The first line of input contains a single integer T denoting the number of test cases. The description of T test cases follows.
  - The first and only line of each test case contains three space-separated integers SA,SB,SC, denoting the number of successful submissions of problems A,B,C respectively.

  Output Format

  For each test case, output the winner of the bet or print Draw in case no one wins the bet.

  Sample Input 1

  3

  1 4 2

  16 8 10

  14 15 9

  Sample Output 1

  Draw

  Bob

  Alice

- In a season, each player has three statistics: runs, wickets, and catches. Given the season stats of two players A and B, denoted by R, W, and C respectively, the person who is better than the other in the most statistics is regarded as the better overall player. Tell who is better amongst A and B. It is known that in each statistic, the players have different values.

  Input

  The first line contains an integer T, the number of test cases. Then the test cases follow.

  Each test case contains two lines of input.

  The first line contains three integers R1, W1, C1, the stats for player A.

  The second line contains three integers R2, W2, C2, the stats for player B.

  Output

  For each test case, output in a single line "A" (without quotes) if player A is better than player B and "B" (without quotes) otherwise.

- Write a program to find the direction.

  Chef is currently facing the north direction. Each second he rotates exactly 90 degrees in clockwise direction. Find the direction in which Chef is facing after exactly X seconds.

  Note: There are only 4 directions: North, East, South, West (in clockwise order). Initially chef is at 0th second i.e., facing North direction.

  Input Format

  - First line will contain T, number of testcases. Then the testcases follow.
  - Each testcase contains of a single integer X.

  Output Format

  For each testcase, output the direction in which Chef is facing after exactly X seconds.

  Sample Input 1

  3

  1

  3

  6

  Sample Output 1

  East

  West

  South

- Chef is playing in a T20 cricket match. In a match, Team A plays for 20 overs. In a single over, the team gets to play 6 times, and in each of these 6 tries, they can score a maximum of 6 runs. After Team A's 20 overs are finished, Team B similarly plays for 20 overs and tries to get a higher total score than the first team. The team with the higher total score at the end wins the match.

  Chef is in Team B. Team A has already played their 20 overs, and have gotten a score of R. Chef's Team B has started playing, and have already scored C runs in the first O overs. In the remaining 20−O overs, find whether it is possible for Chef's Team B to get a score high enough to win the game. That is, can their final score be strictly larger than R?

  Input: There is a single line of input, with three integers, R, O, C.

  Output: Output in a single line, the answer, which should be "YES" if it's possible for Chef's Team B to win the match and "NO" if not.

- Make Array Zeros using pointers

  You are given an array A of length N (size should be created using Dynamic memory allocation) and can perform the following operation on the array:

  Select a subarray from array A having the same value of elements and decrease the value of all the elements in that subarray by any positive integer x.

  Find the least possible number of operations required to make all the elements of array A equal to zero.

The first line contains an integer N denoting the number of elements in the array.

The next line contains space-separated integers denoting the elements of array A.

Print the least possible number of operations required to make all the elements of array A equal to zero.

Sample Test case

Input:

5

2 2 1 3 1

Output:

4

UNIT-2 **0L+4T+12P=16 Hours**

PATTERNS

PRACTICES:

Problems on Number Patterns

- Write a program to generate Floyd triangle. Sample input N= 4.
  1
  2 3
  4 5 6
  7 8 9 10
- Write a program to generate the following pattern. Sample input N=5.
  13579
  3579
  579
  79
  9
- Write a program to generate the following pattern. Sample input N=4.
  1111111
  222222
  33333
  4444
  333
  22
  1
- Write a program to generate the following pattern. Sample input N=5.
  5432*
  543*1
  54*21
  5*321
  *4321
- Write a program to generate the following pattern. Sample input N=5.
  12 21
  123 321
  1234 4321
  123454321

- Write a program to generate the following pattern. Sample input N=5.

  1
  2*2
  3*3*3
  4*4*4*4
  4*4*4*4
  3*3*3
  2*2
  1
- Write a program to generate the following pattern. Sample input N=4.

  1
  212
  32123
  4321234
- Write a program to generate the following pattern. Sample input N=5.

  *
  * *
  * * * *
  * *
  *
- Write a program to print Pascal triangle for the given number of rows. Sample input N=5.

```
                1
            1       1
        1       2       1
    1       3       3       1
1       4       6       4       1
```

- Write a program to generate the following pattern. Sample input N=4.

  1234
  2341
  3421
  4321
- Print Hollow Diamond pattern.
- Print pascals triangle.
- Print Floyds triangle.
- Print Butterfly Pattern.
- Print palindromic pattern.
- Print full inverted number triangle.
- Check if a number is prime or not (Efficient Approach).
- Find sum of all the digits of the number.
- Print transpose of given matrix.
- Rotate a two dimensional matrix by 90, 180, 270 degrees.

MODULE-2

UNIT-1 **0L+4T+12P=16 Hours**

ARRAYS:

PRACTICES:

Problems On Arrays

- Given an unsorted array of size N, and the array elements are in the range of 1 to N. There are no duplicates, and the array is not sorted. One of the integers is missing. Write a program to find the missing number.
- Given an array consisting of only 0s and 1s in random order rearrange the array such that all the 0s are to the left of the array and 1s to the right.
- Give an array consisting of odd and even numbers in random order, rearrange the array such that all the odd numbers are to the left of the array and even numbers are to the right of the array.
- Write a program to find all the unique elements in an array.
- Write a program to merge two arrays of the same size sorted in descending order.
- Write a program to count the frequency of each element in an array of integers.
- Write a program to find the second largest element in an array.
- Write a program to find the second smallest element in an array.
- Write a program to find that one element in array that occurs odd number of times, where every other element appears even number of times.
- Create a jagged array (adjacency list representation of a graph) with no of rows and no of columns in each row as specified by the user.

  Hint: Use Dynamic memory allocation (malloc() or calloc())

  Input:

  Enter no of rows: 3

  Enter no of columns Row in 1: 3

  Enter no of columns Row in 2: 5

  Enter no of columns Row in 3: 2

  Enter the elements row wise:

  8 6 5

  8 4 6 9 7

  9 2

  Output:

  8 6 5

  8 4 6 9 7

  9 2
- Write a program to find second largest number in the array.
- Write a program to find first repeating element in the array.
- Write a program to left rotate the array.
- Write a program to right rotate the array.
- Write a program to find the largest continuous sum.
- Write a program to print the sum of 2nd largest and 2nd smallest elements.
- Write a program to find the maximum product of two numbers multiplies in array (same index should not be used twice).
- Rearrange an array consisting of 1s and 0s such that they are alternatively arranged. Print minimum number of moves required.
- In a given array, find two numbers whose sum equal k.
- Find the difference between positive and negative elements in the array.
- Implement sorting algorithms (Insertion, selection, bubble).

UNIT-2 **0L+4T+12P=16 Hours**

STRINGS:

PRACTICES:

Problems on Strings:

- Write a program to reverse a given string word by word.
- Write a program to find the first occurrence of non-repeating character in the given string.
- Write a program to compress the string as provided in the example.
- Write a program to expand a string as provided in the example.
- Write a program to reverse those words of a string whose length is odd.
- Write a program to check if a given matrix is symmetric or not.
- Write a program to convert all the cases of letter (Lower case -> Upper Case, Upper Case-> Lower Case).
- Write a program to reverse all the words (Not the entire sentence but individual words).
- Find the longest palindrome in a given string.
- Check if two strings are anagrams or not.
- Find minimum number of changes to be done to make a string palindrome.
- Convert Excel sheet name to number (A-1, B-2, Z-26, AA-27).
- Find number of possible palindromes present in a string.
- Write a C program to read a string s, and determine the number of words in s.
  Example : s=oneTwoThree

  There are 3 words in the string: 'one', 'Two', 'Three'.
- Write a C program that reads a string S and remove all duplicates characters from the given string S.
  NOTE: 1) Order of characters in output string should be same as given in input string.

  2) String S contains only lowercase characters ['a'-'z'].

  Example: S = Vignanuniversity

  The program should generate the output as: Vignauersty
- Today Ron is reading the book. Due to some reason, he started hating the word 'are' (without quotes). So he decided to replace the substring 'are' with 'R'. Write a C program that reads a line of message 's' and replace the substring 'are' with 'R'. Example: s= Howareyou.
  The program should generate the output as: HowRyou
- Write a program to concatenate the characters of the two given strings alternatively.
- Given a string S consisting of uppercase and lowercase letters, change the case of each alphabet in this string. That is, all the uppercase letters should be converted to lowercase and all the lowercase letters should be converted to uppercase.
  Input: Vignan University

  Output: vIGNAN uNIVERSITY
- Write a program to insert a given character at the beginning and end of the given string.
- Given two Strings A and B. They are said to be friends if ASCII sum of the each individual string is divisible by 4 else they are not friends. You need to find whether given two strings are friends or not.
  Sample Test case:

  Input:

  man nam

  vignan university

  Output:

  YES

  NO
- Write a program to find the frequency of each digit in the given string.
  Input Format

  The first line contains a string, which is the given number.

  Output Format

  Print ten space-separated integers in a single line denoting the frequency of each digit, indicate

that the integers are from 0 to 9.

Sample Input 0

a11472o5t6

Sample Output 0

0 2 1 0 1 1 1 1 0 0

Explanation 0

In the given string:

- 1 occurs two times.
- 2,4,5,6 and 7 occur one time each.
- The remaining digits and don't occur at all.

- Sherlock considers a string to be valid if all characters in the given string appear the same number of times. It is also valid if he can remove just 1 character at 1 index in the string, and the remaining characters will occur the same number of times.

  Write a C program that reads a string s and determine whether it is valid or not. If valid, return YES, otherwise return NO.

  Example: S=abc
  This is a valid string because frequencies are {a:1,b:1,c:1}
  S=abcc
  This is a valid string because we can remove one c and have 1 of each character in the remaining string.
  S=abccc
  This string is not valid as we can only remove 1 occurrence of c. That leaves character frequencies of {a:1,b:1,c:2}

- Read a string containing characters A and B only. Your task is to change it into a string such that there are no matching adjacent characters. To do this, you are allowed to delete zero or more characters in the string.

  Write a C program that finds the minimum number of deletions required.

  Example: S=AABAAB

  Remove A at positions 0 and 3 to make S=ABABA in 2 deletions.

  Input Format

  The first line contains an integer (the number of queries).

  The next q lines each contain a string s to analyze.

  Sample Input:

  5

  AAAA

  BBBBB

  ABABABAB

  BABABA

  AAABBB

  Sample Output:

  3
  4
  0
  0
  4

- Write a C program that reads a string 's' and it is said to be complete if it contains all the characters from a to z.

  Input Format

  First line of the input contains the number of strings N. It is followed by N lines each contains a single string.

  Output Format

For each test case print “YES” if the string is complete, else print “NO”
Constraints 1 <= N <= 10
The length of the string is at max 100 & the string contains only the characters a to z.

- Write a C program that reads two strings and determine whether they share a common substring or not. A substring may be as small as one character.
  Example;
  S1=and
  S2=art
  The common substring in these two strings: a.
  Sample Input
  2
  hello
  world
  hi
  world
  Sample Output
  YES
  NO

COURSE OUTCOMES:

Upon successful completion of the course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Mod-ule No.	Mapping with POs
1	Write simple, but complete, C programs.	Apply	1,2	1
2	Identify suitable data type for operands and design of expressions having right precedence.	Apply	1,2	1
3	Apply decision making and iterative features of C Programming language effectively.	Apply	1,2	1
4	Select problem specific data structures and suitable accessing methods.	Analyze	1,2	1,2
5	Design and develop non- recursive and recursive functions and their usage to build large modular programs and also able to design string manipulation functions.	Create	1,2	3
6	Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.	Create	1,2	3,4

TEXT BOOKS:

1. Behrouz A. Forouzan, Richard F.Gilberg, “Programming for Problem Solving”, 1st edition, Cengage publications, 2019.
2. Ajay Mittal, “Programming in C - A Practical Approach”, 1st edition, Pearson Education, India, 2010.

REFERENCE BOOKS:

1. Reema Thareja, “Computer Fundamentals and Programming in C”, 1st edition, Oxford University Press, India, 2013.
2. Herbert Schildt, “C: The Complete Reference”, 4th edition, Tata McGraw-Hill, 2017.
3. Byron S Gottfried, “Programming with C”, 4th edition, Tata McGraw-Hill, 2018.

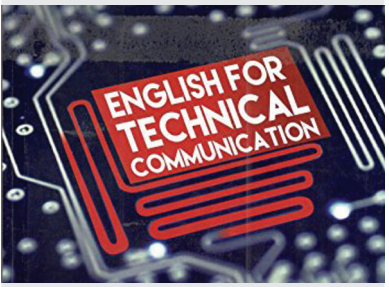


Image source: https://www.abebooks.com/9781316640081/English-Technical-Communication-Students-Book-1316640086/plp

22EN104 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
2	-	2	3

PREREQUISITE KNOWLEDGE: Basic sentence formation, understanding contextual meanings, basic writing skills and moderate fluency in English.

COURSE DESCRIPTION AND OBJECTIVES:

In this course students will read, analyze, and interpret material from technical and general fields, and practice reading, writing, listening and speaking skills to gain exposure and functional English on a variety of contemporary topics. The overall course objective is to provide English for Specific Purposes(ESP) instruction to enhance students' reading, writing, listening and speaking skills through a practice in the language. It will aim to build students' confidence and motivation through exposure to academic skills like Note making/taking, Paraphrasing, Summarizing, Report Writing, Making Presentations etc., so as to generate interest in the language from an ESP perspective. Finally, students are expected through the course to gain key strategies and expression for communicating with professionals and non-specialists.

MODULE-1

UNIT-1 **8L+0T+8P=16 Hours**

GENETICS:

Reading: Reading for Note Making Sub skills: Reading for global understanding (skimming), specific information (scanning), understanding main ideas and supporting ideas, guessing contextual meanings from the text. -Vocabulary building: commonly used roots, prefixes, and suffixes.

Writing: Note making, organising main points and sub points, numbering and sequencing, suggesting titles, paraphrasing and summarising.

Functional grammar: Common Errors in Articles and Prepositions (Handout).

Listening: Listening for Note Taking: top down and bottom up approach, listening for main ideas and supporting points.

Speaking: Presentation in teams - ideas on the topic summarised, making a PPT, effective introductions and conclusions, logical organisation of content, using appropriate structure and cohesive devices.

UNIT-2 **8L+0T+8P=16 Hours**

ALIENS:

Reading : Predicting, skimming, scanning, reading for inference, extrapolative reading

Vocabulary building: Academic vocabulary from the text: synonyms, antonyms, Words often confused.

Writing : Paragraph writing; writing a topic sentence, supporting sentences, effective introductions and conclusions, use of cohesive devices. Types of Paragraphs: Descriptive, narrative, argumentative and expository.

Functional grammar: Common Errors in Verb forms and Conditional sentences (Handout).

Listening : Listening for identifying parts from a description, listening to and sorting information, listening for specific information.

Speaking : Narrating/Retelling an incident, using suitable cohesive devices/discourse markers Speaking of past and present habits/ activities/events - Speaking of future plans.

PRACTICES:

- Note making.
- Summarizing.
- Paragraph Writing.
- Error correction and Restructuring.
- Vocabulary building.
- Listening comprehension.
- Note taking.

MODULE-2

UNIT - 1 **8L+0T+8P=16 Hours**

SOCIAL MEDIA – HEALTH AND NUTRITION:

Reading : Reading for factual information researching for supporting evidence - skimming, scanning, Vocabulary building: One-word substitutes.

Writing : Letter Writing- E-mail writing – New age communication – Format, protocol, and style- WhatsApp, Facebook and Twitter Functional grammar: Common Errors in Sub-Verb Agreement and Modals.

Listening : Listening to a Business Presentation: Listening for deducing information, for abstract details and specific details, listening for taking a message.

Speaking : Making a presentation with a PPT on a topic assigned- organising the presentation using appropriate discourse markers - presenting a point of view - Extempore.

UNIT-2 **8L+0T+8P=16 Hours**

FASHION:

Reading : Reading for data interpretation and information transfer from graphical aids to text reports (pictograms. tables, graphs, pie charts, flow charts), deducing specific information and general information

Vocabulary building: Business vocabulary, collocations, idioms and phrasal verbs.

Writing: Writing a Report: Drafting general and factual reports - writing an overview - an effective introduction - organising information into paragraphs (Stages of writing: planning /organising /writing / editing /rewriting)

Functional grammar: Transformations and miscellaneous common errors.

Listening : Listening to a Ted talk and sorting information – taking notes from a discussion.

Speaking : Group Discussion – prerequisites -generating content - initiating a discussion - expressing one's opinion ~ leading a discussion - agreeing/ disagreeing to someone's view - cutting into a speech - body language and voice modulation.

PRACTICES:

- E-mail writing.
- Letter writing.
- Report writing.
- Messaging in Social media.
- Extempore.
- Making PPTs.

SKILLS:

- ✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc. to understand different kinds of text.*
- ✓ *Apply different sub skills like top down, bottom up approaches to listening.*
- ✓ *Use functional vocabulary relevant to engineering and technology to express ideas lucidly.*
- ✓ *Use appropriate sentence structure, cohesive devices to construct simple text in regular correspondence like e-mails and letters.*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply a variety of strategies to interpret and comprehend spoken texts/ discourse using contextual clues.	Apply	1	6, 7, 8, 9, 10, 12
2	Apply appropriate reading strategies to interpret content / material related to engineering and technology domain.	Apply	1	6, 7, 8, 9, 10, 12
3	Possess an ability to write clearly on topics related to technology and workplace communication.	Analyze	2	6, 7, 8, 9, 10, 12
4	Choose functional language, grammar structures, cohesive devices and skills of organisation to express clearly in speaking.	Evaluate	2	6, 7, 8, 9, 10, 12
5	Participate in discussions and make short presentations on general and technical topics.	Create	2	6, 7, 8, 9, 10, 12

LANGUAGE LAB ACTIVITIES

Session - 1: Dictionary Skills

Session - 2: Introduction to Phonetics and Identifying Phonemes

Session - 3: Pronunciation Practice (Commonly mispronounced words)

Session - 4: Rosetta Stone (Exercises on LSRW)

Session - 5: Listening Comprehension (Summarising exercise on a Ted Talk)

Session - 6: Technical Presentations (Individual)

Session - 7: Technical Presentations (Team)

Session - 8: TOEFL Mastery

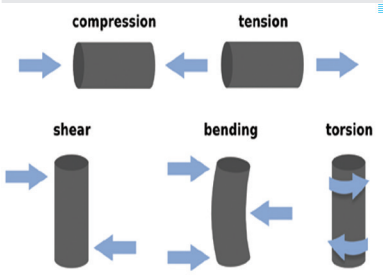
TEXT BOOK:

1. N P Sudharshana & C Savitha, “English For Technical Communication”, Cambridge University Press, 2016.

REFERENCE BOOKS:

1. Balasubramanian T,“A Text book of Phonetics for Indian Students”, Orient Longman, New Delhi, 1989.
2. Krishnaswamy, N and Sriraman, T, “Current English for Colleges”, Trinity publications, 2016.
3. Mohan Krishna and Meera Banerjee, “Developing Communication Skills”, Macmillan India Ltd. New Delhi, 1990.
4. Ashraf Rizvi M, “Effective Technical Communication”, 2nd Edition, McGraw Hill Education, 2017.
5. Narayana Swamy V R, “Strengthen your Writing”, Third Edition Orient Black Swan, New Delhi, 2005.

22CE102 STRENGTH OF MATERIALS



Source Link: https://mechanicstips.blogspot.com/2016/03/stress-types.html

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Centroids, Moment of Inertia.

COURSE DESCRIPTION AND OBJECTIVES:

Strength of Materials introduces you to the concept of stress, strain and deformation of solid and state of stress. It will also introduce the elastic constants and mechanical properties. The concept of shear force and bending moment diagram will be discussed. It focuses on the concepts of bending stresses and shear stresses in beams. The behaviour of structural elements under flexure, torsion is emphasized at the end of the course.

MODULE - 1

UNIT-1 **10L+4T+0P = 14 Hours**

STRESS AND STRAIN

Concept of stress and strain, Elasticity and Plasticity, Types of stresses and strains, Hooke's law, Stress, Strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic moduli and the relationship between them, Bars of varying section, Composite bars, Temperature stresses. Stresses on an inclined section of a bar under axial loading, Compound stresses, Normal and tangential stresses on an inclined plane for biaxial stresses, two perpendicular normal stresses accompanied by a state of simple shear.

UNIT-2 **14L+12T+0P = 26 Hours**

ELASTIC CONSTANTS, SHEAR FORCE AND BENDING MOMENT

Mohr's circle of stresses, Principal stresses and strains, Analytical and graphical solutions. Introduction to Failure Theories. Hoop and Longitudinal stresses and strains, thin spherical shells. Definition of beam, Types of beams, Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, Simply supported and overhanging beams subjected to point loads, Uniformly distributed load, Uniformly varying loads and combination of these loads, Point of contra flexure, Relation between S.F, B.M and rate of loading at a section of a beam.

PRACTICES:

- Relationship of stress – strain curve.
- Analysis of elastic moduli.
- Analytical and graphical solutions.
- Shear force and bending moment.
- Relation between S.F, B.M and rate of loading at a section of a beam.

MODULE – 2

UNIT-1 **10L+4T+0P = 14 Hours**

FLEXURAL STRESSES AND SHEAR STRESSES

Theory of simple bending, Assumptions, Derivation of bending equation: M/I = f/y = E/R, Neutral axis, Determination bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections. Shear Stresses - Derivation of formula, Shear stress distribution across various beam sections like Rectangular, Circular, Triangular,

SKILLS:

- ✓ *Determine shear force and bending moment at a given section of a beam.*
- ✓ *Determine principal stresses and principal strains.*
- ✓ *Determine shear stress and bending stresses in all types of beams.*
- ✓ *Calculate biaxial stresses on an inclined plane.*
- ✓ *Analyse stability of columns by applying Euler's and Rankine's formula.*

I, T, Angle sections.

UNIT-2 **14L+12T+0P = 26 Hours**

THEORY OF TORSION, DIRECT AND BENDING STRESSES

Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs, Leaf springs. Stresses under the combined action of direct loading and B.M, core of a section, Determination of stresses in the case of dams, Conditions for stability.

PRACTICES:

- Determination bending stresses.
- Design of simple beam sections.
- Shear stress distribution across various beam sections.
- Applications of the equation of the hollow and solid circular shafts.
- Combined torsion and bending of circular shafts.

COURSE OUTCOMES:

Upon successful completion of this course, students will have to ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify various structural elements under various loading conditions.	Apply	1	1, 2
2	Apply the principles of solid mechanics to calculate internal stresses/strains, stress resultants and strain energies in structural elements subjected to axial/transverse loads and bending/ twisting moments.	Apply	1	1, 2
3	Analyze the shear forces and bending moments for different beams with various loading.	Analyze	1	1, 2,4,6,12
4	Analyze thin cylinders and the behavior of circular shafts & springs for torsion.	Analyze	2	1, 2,4,6,12
5	Estimate the flexural, shear stresses, direct and bending stresses for various cross- sections of the beams.	Create	2	1, 2,4,6,12

TEXT BOOKS:

1. S. S. Bhavikatti, "Strength of Materials‖, Vikas Publishing House, 3rd edition, 2008.
2. R. K. Bansal, "Strength of Materials", Laxmi Publications (P) Ltd, New Delhi, 6th edition, 2018.

REFERENCE BOOKS:

1. S. Ramamrutham, "Strength of Materials‖, Dhanpat Rai Publishing House, 7th Edition, 2011.
2. L. N. Srinath, —Advanced Mechanics of Solids‖, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd edition, 2009.
3. S. Timshenko, —Strength of Materials‖, 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

II
YEAR

B.Tech.

CIVIL ENGINEERING

COURSE CONTENTS

I SEM & II SEM

I SEMESTER

22ST202	-	Probability & Statistics.
22TP201	-	Data Structures.
22CE201	-	Fluid Mechanics & Hydraulic Machines.
22CE202	-	Building Materials & Concrete Technology.
22CE203	-	Surveying and Geomatics.
22CE204	-	Structural Analysis.
22SA201	-	Life Skills-I

II SEMESTER

22TP203	-	Advanced Coding Competency
22TP204	-	Professional Communication.
22CT201	-	Environmental Studies.
22MS201	-	Management Science.
22CE205	-	Environmental Engineering.
22CE206	-	Advance Structural Analysis.
	-	Department Elective – I
	-	Open Elective – I
22SA202	-	Life Skills-II

22ST202 PROBABILITY AND STATISTICS

Image Source: https://images.app.goo.gl/QBM6C8TQNTbNWXuA8

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE KNOWLEDGE: Basic knowledge in statistics and mathematics.

COURSE DESCRIPTION AND OBJECTIVES:

To provide students with foundation in elementary topics of statistics and probability such as descriptive statistics, correlation, probability, random variables, correlation, regression, and testing of hypothesis. The course emphasizes statistics to solve engineering and management problems.

MODULE-1

UNIT-1 **12L+8T+0P = 20 Hours**

DESCRIPTIVE STATISTICS:

Basic Definitions, Frequencies, Graphical Representation, Histogram, Ogive curves; Measures of Central tendency, Arithmetic mean, Median, Mode, Mean deviation, Standard deviation; Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT-2 **12L+8T+0P = 20 Hours**

PROBABILITY AND RANDOM VARIABLES:

Probability: Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem and Bayes theorem.

Random Variables: Random variables, Discrete and Continuous variables and distribution function. Expectation, Variance of random Variables, Tchebysher's inequality.

PRACTICES:

- Various graphical presentation techniques.
- Measures of central tendency.
- Skewness.
- Karl Pearson's coefficient of skewness.
- Definitions of probability.
- Applications of addition theorem.
- Applications of multiplication theorem.

MODULE-2

UNIT-1 **12L+8T+0P = 16 Hours**

REGRESSION ANALYSIS AND DISTRIBUTIIONS:

Correlation and regression: Correlation, Types, Pearson's and Spearman's Coefficient of correlation, Regression, Regression lines.

Distributions: Introduction to Distributions: Binomial, Poisson and Normal distributions with properties and applications.

UNIT-2 **12L+8T+0P = 20 Hours**

TESTING OF HYPOTHESIS:

Testing large samples - single mean, two means, one proportion and two proportions. Testing small samples – single mean, two means (independent and paired samples), Chi square test -goodness of fit and independence of attributes.

SKILLS:

- ✓ *Collect the data from various data sources and evaluate mean, median, mode mean deviation and standard deviation.*
- ✓ *Identify the areas which we can apply the probability theory.*

PRACTICES:

- Correlation.
- Karl Pearson's coefficient of correlation.
- Regression and regression lines.
- Applications of statistical distributions.
- Testing the large sample tests-one mean and two sample means.
- One proportion and two proportion tests.
- Testing small samples-one, two samples and paired tests.
- Chi-square test for goodness of fit.
- Chi-square test for independence of attributes.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply measures of central tendency, skewness, and Karl Pearson's coefficient of skewness to study the statistical data sets.	Apply	1	1,2
2	Apply the probability theory and their applications to measure the uncertainty.	Apply	1	1,2
3	Study the relations between statistical variables and can fit the mathematical models for association.	Analyze	2	1,2,3
4	Test the statistical significances for various samples.	Evaluate	2	1,2,4
5	Identify the distribution type to measure the occurrences of chance.	Evaluate	2	1,4,5

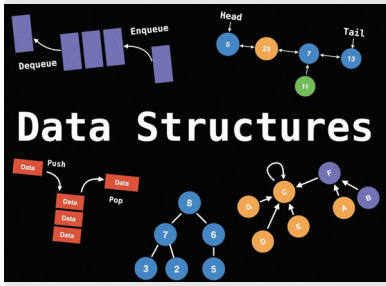
TEXT BOOKS:

1. Sheldon M. Ross, An Introduction to Probability and Statistics for Engineers and Scientists, 3rd Edition, Academic Press, Elsevier.
2. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 2012.

REFERENCE BOOKS:

1. P. R. Vittal, "Mathematical Statistics", Margham Publications, Chennai, 2018.
2. Kishore S. Trivedi, "Probability and Statistics with Realiability, Queueing and Computer Science Applications", 2nd edition, Wiley Student edition, 2008.
3. A. Singaravelu, "Probability and Statistics", 22nd edition, Meenakshi Agency, 2015.

22TP201 DATA STRUCTURES



Source: https://www.youtube.com/watch?v=Qmt0QwzEmh0

Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Programming in C.

COURSE DESCRIPTION & OBJECTIVES:

This course is aimed at offering fundamentals concepts of data structures and explains how to implement them. It begins with the basic concepts of data, data structures and then introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

MODULE-1

UNIT-1 **5L+6T+6P = 17 Hours**

DATA STRUCTURES BASICS:

Basic Terminology – data, information, datatype; Data Structures – Introduction, storage structures-sequential and linked storage representations; classification of data structures; Applications of data structures.

Sorting: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort and Merge Sort.

Searching: Linear Search and Binary Search.

UNIT-2 **11L+10T+10P = 31 Hours**

LINKED LISTS AND STACKS, QUEUES:

Linked List: Introduction, Types of linked list – Singly linked list, doubly linked list and circular linked list, representation of linked list, Operations of linked list: Traverse forward/ reverse order, searching, insertion and deletion; Applications of linked lists.

Stack – Introduction, array and linked representations, implementation and their applications; Queue – Introduction, array and linked representations, implementation; Types – Linear, circular and doubly ended queues – operations; Applications of Queues.

PRACTICES:

Problems on Recursion – Level 1

- Find the product of 2 numbers using recursion.
- Find the sum of natural numbers using recursion.
- Find the factorial of a number using recursion.
- Find the Nth term of Fibonacci series using recursion.
- Calculate the power using recursion.
- Write a recursive program for checking if a given number is a prime number.
- Given two integers write a function to sum the numbers without using any arithmetic operators.
- Convert a decimal to binary using recursion.
- Print all factors using recursion.
- Find the maximum product of digits among numbers less than or equal to N.

SKILLS:

- ✓ *Experienced to Store data and various types of data to handle.*
- ✓ *Ordering and sorting of data.*
- ✓ *Indexing and Searching of required data from large data sequences.*
- ✓ *Exposed to various characteristics such as Linear or non-linear, Homogeneous or heterogeneous and Static and Dynamic.*

Problems Recursion – Level 2

- Implement insertion sort recursively.
- Write a program to find the numbers less than N that are product of exactly 2 distinct prime numbers - using recursion.
- Implement selection sort recursively.
- Find the middle of a singly linked list using recursion.
- Find the sum of even numbers of an array using recursion.
- Check if a given array is in sorted order using recursion.
- Print alternate nodes of a linked list using recursion.
- Reverse a doubly linked list using recursion.
- Write a recursive function that returns all permutations of a given list.
- Implement bubble sort recursively.

Problems on Sorting and Searching – Level 1

- Implement the insertion sort function.
- Implement the bubble sort function.
- Implement the quick sort function.
- Implement the merge sort function.
- Implement the selection sort function.
- Implement linear search function.
- Implement binary search function.

Problems on SLL – Level 1

- Implement the insert function to insert nodes into a singly linked list (ascending order).
- Implement the insert function to insert nodes into a singly linked list (descending order).
- Implement the search node function.
- Implement the delete node function.
- Display forwards function.
- Display backwards function.
- Count the number of nodes in a singly linked list.
- Swap alternate nodes of a singly linked list.
- Move last node to the front of the linked list.
- Move first node to the last of the linked list.

Problems on Stacks – Level 1

- Implement two stacks using a single array.
- Given an array replace every element with nearest greater element on the right.
- Given a stack reverse the elements using only push and pop functions.
- Postfix evaluation using stack.
- Balance symbols.
- Find middle element in a stack.
- Remove middle element from a stack.
- Implement push and pop using linked list.
- Given an array of characters with the middle marked by X, check if the string is a palindrome.
- Maximum sum in sliding window.

Problems on Queues – Level 1

- Write a program to accept two numbers as input check if they are equal.
- Write a program to accept two characters as input and check if they are equal.
- Write a program to accept two numbers as input and print the greater of the 2 numbers.
- Write a program to accept two numbers as input and print the lesser of the 2 numbers.
- Write a program to accept 3 numbers as input and print the maximum of the 3.
- Write a program to accept 3 numbers as input and print the minimum of the 3.
- Write a program to accept a number as input and print EVEN if it is an even number and ODD if it is an odd number.
- Write a program to accept a number as input and check if it is divisible by 3. If it is divisible by 3 print YES else print NO.
- Write a program to accept a number as input and check if it is divisible by both 3 & 5. If it is divisible print YES else print NO.
- Write a program to accept a number as input and check if it is positive, negative or zero.

Problems on DLL – Level 1

- Implement insert function.
- Implement display forward function.
- Implement display backward function.
- Implement search function.
- Implement delete function.
- Reverse a doubly linked list from M to N.
- Find the sum of the odd and even nodes.
- Count odd keys of the linked list.
- Merge two sorted lists.
- Delete adjacent duplicate nodes.

Problems on CLL – Level 1

- Insert function (circular doubly linked list).
- Search function.
- Display forward.
- Display backward.
- Delete node (circular doubly linked list).
- Print the middle N nodes of a circular singly linked list.
- Move the last node of a circular singly linked list to the beginning.
- Delete adjacent duplicate nodes of a circular singly linked list.
- Delete nodes greater than a value from a circular doubly linked list.
- Find the sum of the nodes of a circular linked list.

Problems on Linked List – Level 2

- Given 2 sorted linked lists, print the common elements.
- Reverse a list (using Stack).
- Given a pointer to a node (not the last node), delete the node.
- Reverse a list (Recursive).
- Reverse a list (Iterative).
- Reverse a singly linked list in pairs (recursive).
- Reverse a singly linked list in pairs (iterative).
- Check if a singly linked list is a palindrome or not.
- Remove the loop if exists.
- Given 2 linked lists with data in the ascending order, merge them into a single list.

MODULE-2

UNIT-1 **8L+8T+8P=24 Hours**

TREES:

Trees: Basic Terminology, Types of Trees, Binary Tree – Introduction, properties, array and linked representations; Tree traversals and their implementation; Expression trees; BST – definition and operations, AVL trees – definition and construction; Applications of binary trees.

UNIT-2 **8L+8T+8P=24 Hours**

GRAPHS & HASHING:

Graphs: Basic Terminology, Types of Graphs, Graphs representations – adjacency matric, adjacency list; Traversals - breath first search and depth first search; Applications of graphs.

Hashing: Introduction, Different hash functions, collision: avoidance and handling methods.

PRACTICES:

Problems on BST – Level 1

- Insert function.
- Insert function (recursive).
- Search function.
- Pre order traversal.
- Post order traversal.
- In order traversal.
- Level order traversal.
- Delete child node.
- Delete parent node.
- Delete nodes greater than a value from a circular doubly linked list.

Problems on Priority Queues – Level 1

- Meeting rooms problem.
- Ugly number.
- Find median from data stream.
- Find the top K frequent elements.
- Find K Pairs with smallest sums.
- Find the Kth smallest element in a sorted matrix.
- Trapping Rain Water.
- Rearrange String k distance apart.
- Sort characters by frequency.
- Solve the maze problem.

Problems on Graphs – Level 1

- Implement Graph data structure.
- Implement BFS - iterative solution.
- Implement BFS - recursive solution.
- Implement DFS - iterative solution.
- Implement DFS - recursive solution.
- Check if given graph is strongly connected or not.
- Check if given graph is strongly connected or not - using DFS.
- Given a graph find the arrival and departure time of its vertices in DFS. Arrival time is the time when the vertex was explored for the first time, and departure time is the time at which all the neighbours are explored and are ready to backtrack.
- Given a directed acyclic graph and a source vertex, find the cost of the shortest path from source vertex to all other vertices present in the graph. If a vertex cannot be reached from given source vertex that distance may be printed as infinite.
- Given an undirected graph, check if the graph is 2 edge connected or not.

Problems on Hashing – Level 1

- Print a binary tree in vertical order.
- Find whether an array is subset of another array.
- Given an array A [] and a number x, check for pair in A [] with sum as x.
- Minimum operation to make all elements equal in array.
- Maximum distance between two occurrences of same element in array.
- Check if a given array contains duplicate elements within k distance from each other.
- Find duplicates in a given array when elements are not limited to a range.
- Most frequent element in an array.
- Smallest subarray with all occurrences of a most frequent element.
- First element occurring k times in an array.

Problems on Graphs – Level 2

- Find the shortest graph distances between every pair vertex in a given path. Assume that the graph does not have any negative edges.
- Find the shortest graph distances between every pair of vertices in a given path. The graph can have negative edges.
- Detect cycle in DFS.
- Count the number of connected components of a graph represented in the adjacent matrix.
- Count the number of connected components of a graph represented in the adjacent matrix - using DFS.
- Find a spanning tree - not necessarily a minimum spanning tree.
- Detect cycle in an undirected graph.
- Given an undirected graph, find its depth.
- Determine if a directed graph has a unique topological ordering.
- Given a directed acyclic graph and two vertices v and w, find the lowest common ancestor.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

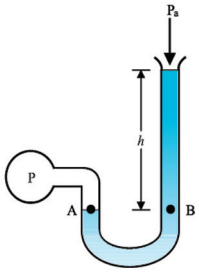
CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Explore the organization of several ADTs and the manipulation (searching, insertion, deletion, traversing) of data stored in various data structures.	Apply	1,2	1
2	Apply different data structures to solve a given problem.	Apply	1,2	1
3	Analyze the efficiency of using different data structures and choose the efficient data structure for solving a given problem.	Analyze	1,2	2
4	Develop new algorithms to solve various problems.	Create	1,2	3,4

TEXT BOOKS:

1. Reema Thareja, “Data Structures Using C”, 2nd Edition, Oxford University Press, 2014.
2. Seymour Lipschutz, “Data Structures with C”, 1st Edition, McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures”, illustrated edition, Computer Science Press, 2006.
2. Richard F. Gilberg and Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd Edition, CENAGE Learning, 2005.
3. R G Dromey and Pearson, “How to solve it by Computer”, 2nd edition, Impression edition, 1998.



Source Link: https://www.britannica.com/science/fluid-mechanics

22CE201 FLUID MECHANICS AND HYDRAULIC MACHINES

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE KNOWLEDGE: Resolving forces, Centroid, Moment of Inertia.

COURSE DESCRIPTION AND OBJECTIVES:

The main objective of this course is to make the student aware of basic ideas of fluid mechanics and Hydraulic machines like Pumps and Turbines. It is the branch of science which deals with the behaviour of the fluids at rest as well as in motion. It will give them the wisdom required to choose a suitable turbine or pump as per the requirements. It also deals with the Open channel hydraulics.

MODULE - 1

UNIT 1 **14L+0T+0P = 14 Hours**

PROPERTIES OF FLUIDS, PRESSURE MEASUREMENT

Properties of fluids, Pascal‘s law, Variation of pressure -hydrostatic law, Pressure measurement, piezometers and manometers. Hydrostatic forces exerted on submerged surfaces. Equation of continuity, Euler‘s equations Bernoulli‘s equation, Applications Analysis of Pipe Flow: Darcy‘s equation, Moody‘s chart. Minor losses, Pipes in series and in parallel, Total energy line and hydraulic gradient line, Hardy-Cross Method for Pipe Network design. Laminar Flow: Reynolds‘s experiment.

UNIT-2 **10L+0T+16P=26 Hours**

COMPUTATION OF FLUID FLOW

Compute pressure measurement by manometers and mechanical gauges for given real pipe flow phenomenon. Compute hydrostatic forces acting on submerged surfaces. Measurement of flow/ discharge in pipes, Tanks and open channels: Venturi meter, Orifice meter, Orifices and mouth pieces, Determination of friction factor for a given pipeline by using Darcy‘s Law, Analyse the head loss/minor losses due to sudden contraction in a pipeline.

PRACTICES:

- Calibration of Venturi meter and Orifice Meter.
- Friction factor for a given pipe line.
- Head loss due to sudden contraction in a pipeline.
- Verification of Bernoulli‘s equation.
- Coefficient of discharge of Orifice and Mouthpiece.
- Discharge by Rectangular and V-Notch.
- Design simple pipe systems by using EPANET/SAP /AFT IMPULSE software.

MODULE - 2

UNIT-1 **14L+0T+0P = 14 Hours**

HYDRAULIC MACHINES AND OPEN CHANNEL FLOWS

Impact of Jet on Vanes, Turbines: Classification, Working Principles, Efficiencies, Characteristic C u r v e s , Draft Tube, Governing of Turbines, Unit Quantities, Selection of suitable type of turbine. Pumps: Classification, Working Principles, Efficiencies, Characteristic Curves, Priming, NPSH, Specific Speed, Pumps in parallel and series, Uniform Flow: Introduction, Classification of Open channel flows, Types of channels, Chezy Manning‘s, Bazin, Kutter‘s Equations, hydraulically efficient channel sections, Rectangular, Trapezoidal and circular channels.

UNIT-2 **10L+0T+16P = 26 Hours**

PERFORMANCE OF PUMPS AND TURBINES

To perform Pelton wheel and Francis's turbine test, and to calculate analytically the vane angles and power developed by the turbines based on the fundamental principles, To perform multistage centrifugal pump and Reciprocating pump performance test. Design channels by Chezy' concept, Measurement of discharge in open channels: Triangular and trapezoidal notches.

PRACTICES:

- Impact of jets on Vanes.
- Pelton wheel performance test.
- Francis's turbine performance test.
- Multi stage centrifugal pump performance test.
- Reciprocating pump performance test.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Compute pressure measurement by manometers and mechanical gauges.	Apply	1	1, 2, 12
2	Calculate the power and efficiency of turbines and pumps.	Apply	1, 2	1, 2, 12
3	Analyze the pipe flow by various pressure measuring devices.	Analyze	1, 2	2, 5, 12
4	Design the Irrigation channels.	Creating	1, 2	2, 3, 4, 5, 12

TEXT BOOKS:

1. R. K. Bansal, —Fluid Mechanics and Hydraulic Machines‖, Laxmi Publications, 9th Revised edition, 2021.
2. Dr. D. S. Kumar, —Fluid Mechanics and Fluid Power Engineering‖, S.K. Kataria and Sons Publishers, 2019.

REFERENCE BOOKS:

1. F M White, —Fluid Mechanics‖, Tata McGraw Hill Publication, 2020.
2. P. N. Modi and S. N. Seth, —Hydraulics and Fluid Mechanics‖, Standard book house Publishers, 22nd edition, 2019.
3. Subramanyam, K., —Flow in Open Channel‖, Tata McGraw Hill Publications, 2019.

SKILLS:

- ✓ *Fluid pressure using different types of measuring gauges.*
- ✓ *Hydrostatic forces on a body immersed in a fluid.*
- ✓ *Use flow measuring devices like venturi meter etc.,*
- ✓ *Different flow conditions in open channels.*
- ✓ *Impact of jet on blades of turbines.*
- ✓ *Performance characteristics of different types of pumps and Turbines.*

Source Link: https://readcivil.com/methods-compaction-concrete/

22CE202 BUILDING MATERIALS & CONCRETE TECHNOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE KNOWLEDGE: Stones, Bricks, Steel and Timber.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understanding of various engineering properties of materials like cement, fine aggregate and coarse aggregate. The objective of this course is to provide basic knowledge about properties and testing of various building materials used in civil constructions.

MODULE - 1

UNIT-1 **14L+0T+0P = 14 Hours**

ENGINEERING MATERIALS

Building Materials: Stones, Bricks, Lime, Timber & Steel.

Cement: Manufacturing of cement, Chemical composition, Hydration, Structure of hydrated cement, Different grades and types of cement.

Aggregates: Classification, Source, Size and shape, Texture and influence of texture on strength, Standard grading curve, grading limits of fine aggregates as per BIS.

Admixtures: Chemical and Mineral admixtures, Effect of admixtures on fresh and hardened concrete.

UNIT-2: **[10L+0T+16P=26 Hours]**

PROPERTIES OF ENGINEERING MATERIALS

Physical Properties of Cement, Fine & Coarse Aggregates; Experimental case studies on Admixtures.

PRACTICES

- Determine modulus of rigidity by conducting torsion test on solid circular shaft.
- Evaluate the Normal consistency, Initial setting and Final setting time of cement.
- Assess the properties of cement.
- Assess the properties of fine aggregate.
- Assess the properties of coarse aggregate.

MODULE – 2

UNIT-1 **14L+0T+0P = 14 Hours**

SPECIAL CONCRETE & DURABILITY

Water/Cement ratio, Gel space ratio, Gain of strength with age, Maturity concept of concrete; Light weight concrete, Fibre reinforced concrete, types of fibre, High performance concrete and Self compacting concrete; Factors contributing to cracks in concrete, Sulphate attack and Methods of controlling sulphate attack, Chloride attack, Corrosion of steel and its control.

UNIT-2 **10L+0T+16P=26 Hours**

TESTING OF FRESH, HARDENED CONCRETE & MIX DESIGN

Workability, Factors affecting workability, Measurement of workability by different tests; Compression tests, Flexure test, Splitting tests, Non-destructive testing methods, Codal provisions for NDT, Chloride test, Proportioning of concrete mixes by various methods.

PRACTICES:

- Interpret the workability of a given concrete sample.
- Determine the compressive strength & split tensile strength of concrete.
- Determine the flexural strength of concrete.
- Examine the durability of a given concrete sample by chloride tests.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the concepts of building materials in construction.	Apply	1	1, 2, 5, 6, 10, 12
2	Analyse the properties of concrete in fresh and hardened state.	Analyze	1, 2	1, 2,12
3	Determine the properties of cement, aggregates and concrete.	Evaluating	1, 2	1, 12
4	Develop mix design according to IS 10262 for various concrete proportions.	Creating	2	1, 2, 5, 12

TEXT BOOKS:

1. Shetty. M. S, —Concrete Technology‖, S. Chand and Co publications, 7th revised edition, 2015.
2. S. C. Rangwala, —Engineering Materials‖, Charotar Publishing House, 42nd edition, 2015.

REFERENCE BOOKS:

1. M. L. Gambhir, —Concrete Technology‖, Tata McGraw Hill Publishers, New Delhi, 5th edition, 2013.
2. A.R. Santha Kumar, —Concrete Technology‖, Oxford University Press, New Delhi, 3rd edition, 2009.
3. IS-10262-2019-New-Mix-design.

SKILLS:

- ✓ *Engineering properties of various aggregates and their applications.*
- ✓ *A Mastery of the various Cementitious Materials.*
- ✓ *The Impact of Water to Cement Ratio.*
- ✓ *Make Concrete mix proportions of different grades.*
- ✓ *Test on physical properties of concrete.*

SourceLink:https://dreamcivil.com/wp-content/uploads/2021/12/shutterstock_100289888-min.jpg

22CE203 SURVEYING AND GEOMATICS

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE KNOWLEDGE: NIL

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understanding and application of taking measurements on earth surface using conventional and nonconventional methods. The objective of this course is to provide basic knowledge about taking measurements using different instruments like chain, tape, auto level, theodolite, total station, GPS.

MODULE - 1

UNIT-1 **14L+0T+0P = 14 Hours**

SURVEYING AND ITS INSTRUMENTS

Surveying and Its Classification, Principles of surveying and Scale of Map.

Chain and Tape: Principle, Basic Definitions, Equipment and Accessories, Establishment of Intermediate Points.

Compass: Principle, Traversing, Measurement, Bearing types and its designations, Instruments.

Levelling: Principle, Basic Definition, Classification and Its Methods, Theodolite and Auto Level.

Contours and Curves: Characteristics and Elements of curve.

UNIT-2 **10L+0T+16P = 26 Hours**

FIELD PROCEDURE AND ITS MEASUREMENTS

Chain: Field Procedure and its linear measurements with chain and Tape, Errors and Corrections.

Compass: Traversing using Compass, Local Attraction and Its Correction.

Theodolite and Levelling: General Procedure of levelling and Measurement of Horizontal Angles, Vertical Angles.

PRACTICES:

- Chaining of a line using Chain / Tape and Recording of details along the chain line.
- Measurement of Area using Chain and Tape.
- Traversing using Compass.
- Measurement of elevation difference between two points using any leveling Instrument.
- Elevation difference between two points by reciprocal levelling method.
- Measurement of Horizontal and vertical Angles using Repetition method.
- Estimation of Height of Building.

MODULE - 2

UNIT -1 **14L+0T+0P = 14 Hours**

MODERN SURVEY METHODS

EDM: Principle, Types of EDM, Total Station

GNSS: GPS and its Segments, GPS measurements and Errors and Biases, Accuracy Consideration.

Photogrammetry: Basic Definitions, Perspective Geometry, Relief Displacement and Tilt Displacement, Drone Survey, aerial triangulation Mosaic.

Remote Sensing: Principle, Basic Process, Energy Interactions, Elements of Image Interpretation.

UNIT-2 **8L+0T+16P = 26 Hours**

FIELD PROCEDURE AND ITS MEASUREMENTS

Total Station Survey and GPS Survey Field Procedure, Drone Flight Planning, Applications of Remote Sensing.

PRACTICES:

- Study of instrument, determination of distances, directions and elevations.
- Identifying boundaries and Determination of area using total station.
- Preparation of contour map using total station.
- Stake out using total station.
- Preparation of map using GPS Hand held Receiver.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Interpret the basic concepts of chaining, ranging, bearings, and traversing, levelling.	Apply	1	1, 2 ,5
2	Illustrate the basic concepts of EDM, GPS measurements and Errors, Photogrammetric Survey and Remote Sensing.	Apply	2	1, 4, 5, 6
3	Computing the linear and vertical measurements using metric chain, tape, compass, Auto level and Theodolite.	Evaluate & Create	1	1, 2, 4, 5, 8, 9, 10
4	Determine the scale, positional measurements using Total station, GPS instruments, Drone and Remote sensing Satellites.	Evaluate & Create	2	1, 2, 4, 5, 8, 10

TEXT BOOKS:

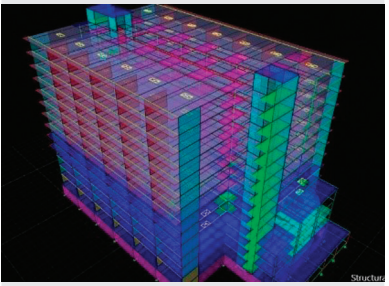
1. Basak N N, Surveying and Levelling 2nd Edition McGraw Hill Education, 2017.
2. Manoj S, Arora K and Badjatia R C, Geomatics Engineering, Nem Chand & Bros, 2011.

REFERENCE BOOKS:

1. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I. K. International, 2019.
2. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2015.
3. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 4th Edition 2012.

SKILLS:

- ✓ *Proficiency in taking Linear and vertical measurements on earth surface.*
- ✓ *Mastery of using Theodolite and Levelling equipment.*
- ✓ *Ability to conduct plane table, Total station and GPS Survey.*
- ✓ *Utilization of various remote sensing satellites and drones for different applications.*



Online Source Link:
https://nptel.ac.in/courses/105105166

22CE204 STRUCTURAL ANALYSIS

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Supports, Beams, Shear force and Bending Moment.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers fundamental concepts to analyze all structural components for different load conditions. It gives a detailed idea about different methods involved in calculating the deformations in a structure. The objective is to make students understand the influence of loads and forces on determinate structures. In addition to that, provide knowledge about strain energy concepts for analysing determinate and indeterminate structures.

MODULE - 1

UNIT-1 **8L+4T+0P = 12 Hours**

DETERMINATE STRUCTURES

Introduction to structural analysis, Classification of structures, Deflection of beams: double integration, conjugate beam and moment area method, principle of virtual displacement, Maxwell's reciprocal theorem, Maxwell-Betti's generalized reciprocal theorem, Castigliano's first theorem, Introduction to three Hinged arches.

UNIT-2 **4L+16T+0P = 20 Hours**

ANALYSIS OF DETERMINATE STRUCTURES AND INFLUENCE LINES

Computing the deflection and slopes for beams using Double Integration method, conjugate beam method and Moment Area method, Analysis of determinate beams and trusses using energy principles. Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment –absolute maximum bending moment - influence lines for member forces in pin jointed plane frames. Analysis of three hinged parabolic arch and segmental arches. Determination of Horizontal thrust.

PRACTICES:

- Concept of Deflection and slope computation.
- Analysis of methods through semi graphical methods and energy methods.
- Developing the influence lines for various parameters.
- Estimating critical points through influence lines for various loading conditions.
- Computation of horizontal thrust in three hinged arches.

MODULE - 2

UNIT-1 **12L+0T+0P = 12 Hours**

INDETERMINATE STRUCTURES

Propped Cantilever beam, Fixed beam – End moments and support reactions, Method of Consistent deformation, effect of sinking of supports, Claypeyron's three moment theorem for continuous beams. Strain energy method for analysis of Indeterminate structures. Introduction to Two hinged arches.

UNIT-2 **4L+16T+0P = 20 Hours**

ANALYSIS OF INDETERMINATE STRUCTURES

Analysis of propped cantilever by method of consistent deformation, fixed end moments for a fixed beam of uniform section for different types of loading, Calculating the effect of sinking of supports, bending moment diagram for fixed beams. Analysis of continuous beam by Clapeyron's theorem of three moments. Strain energy method for analysis of continuous beams, rigid jointed plane frames and pin jointed frames up to second degree redundancy. Two hinged arches - determination of horizontal thrust, normal thrust and radial shear for parabolic and segmental arch – temperature effect.

PRACTICES:

- Computation of redundant forces in continuous beams.
- Evaluating the Fixed end moments for different load conditions.
- Determination of horizontal thrust for two hinged arch.
- Asses the effect of temperature on two hinged arch.
- Analyse indeterminate frames using energy principles.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Determine the displacements of structures using strain energy principles.	Application	1,2	1, 2
2	Analyse the indeterminate structures using various theorems.	Analyze	2	1, 2,12
3	Analyse the two hinged and three hinged arches.	Analyze	1,2	1,2
4	Compute slope and deflection of different beams by various methods.	Evaluate	1	1,2
5	Compute SFD & BMD using influence line diagrams for determinate beams.	Evaluating	1	1, 2

TEXT BOOKS:

1. Bhavikatti,S.S, Structural Analysis, Vol.1, & 2, Vikas Publishing House Pvt.Ltd. NewDelhi-4, 2014.
2. Vazrani.V.N and Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.

REFERENCE BOOKS:

1. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.
2. Hibbeler, R.C., Structural Analysis, X Edition, Prentice Hall,2017.
3. Reddy.C.S, —Basic Structural Analysisll, TataMcGraw Hill Publishing Company, 2017.

SKILLS:

- ✓ *Classify different types of structures based on degrees of indeterminacy.*
- ✓ *Identify the deflection profile of structures subjected to several types of loadings.*
- ✓ *Analyze the behaviour of structures subjected to moving loads.*
- ✓ *Analyze pin jointed frames for dead and live loads.*
- ✓ *Analyze continuous beams and arches.*

Source: https://www.geeksforgeeks.org/best-way-to-start-with-competitive-programming-geeksforgeeks-cp-live-course/

22TP203 ADVANCED CODING COMPETENCY

Hours Per Week :

L	T	P	C
-	-	2	1

PREREQUISITE KNOWLEDGE: Programming in C, Data Structures.

COURSE DESCRIPTION AND OBJECTIVES:

This course helps to understand the impact of the choice of data structures and design strategies to solve the problem in an efficient manner. This course also provides the understanding of advanced graph applications and also throw light in tractable intractable problems.

MODULE-1

UNIT-1 **0L+0T+8P =8 Hours**

STACKS, QUEUES AND SINGLE LINKED LISTS:

PRACTICES:

Problems On Stacks & Queues

- Check if given stack of integers are consecutive or not (could be ascending or descending).
- Find the maximum sum in a sliding window using queues.
- Given a queue of integers, rearrange the elements by interleaving the first half with the second half.
- Given an integer k and a queue of integers, reverse the order of the first k elements of the queue.
- Given a maze in the form of a rectangular matrix filled with O, X or M where O represents an open cell, X represents a blocked cell and M represents landmines, find the shortest distance of every open cell in the maze from its nearest mine.
- For a given parenthesis expression, check whether it is balanced parenthesis or not.
- Reverse a number using stack.
- You are given a string s consisting of lowercase English letters. A duplicate removal consists of choosing two adjacent and equal letters and removing them. We repeatedly make duplicate removals on s until we no longer can.
- Find first Unique character in a string (Queue).
- Implement Tower of Hanoi problem.

Problems On Linked Lists

- Given a random pointer to a random node in a singly linked list, clone the list.
- Given a list rotate the list to the right by k places.
- Remove duplicates from a sorted list.
- Find fractional node in a singly linked list.
- Sort a linked list using constant space complexity.
- Delete a node in start, middle, end of Singly linked list.
- Add a node in start, middle, end of Singly linked list.
- Find whether given single linked list is circular or not.
- Arrange a singly linked list in Descending order.
- Addition of two numbers using Singly Linked List.

UNIT-2 **0L+0T+8P =8 Hours**

DOUBLY LINKED LISTS, CIRCULAR LINKED LISTS:

PRACTICES:

Problems on Double Linked Lists and Circular Linked Lists

- Implement a clockwise rotation of a doubly linked list by N places.
- Count triplets in a sorted doubly linked list whose product is equal to a given value x.
- Find the product of all prime nodes in a doubly linked list.
- Find the count of common nodes in two doubly linked lists.
- Find pairs with given product in a sorted doubly linked list.
- Delete all the even nodes of a circular singly linked list.
- Count nodes in a circular linked list.
- Delete all prime nodes from a circular singly linked list.
- Exchange first and last nodes in a circular linked list.
- Reverse a doubly circular linked list.
- Linear search using a stack of incomplete sub problems.
- 1 2 3 4 5 6 in stack S is push X is pop, SSSSXXSSSXXX.
- Recursively remove all adjacent duplicates.
- Check if a given singly linked list is a palindrome using stack.
- Convert a multilevel singly linked list to a singly linked list.
- Remove duplicates from an unsorted doubly linked list.
- Sort a doubly linked list using insertion sort.
- Check if a doubly linked list of characters is palindrome or not.
- Swap Kth node from beginning with Kth node from end in a Double Linked List.
- Convert a Binary Tree into Double Linked List.

SKILLS:

- ✓ *Experienced to Store data and various types of data to handle.*
- ✓ *Ordering and sorting of data.*
- ✓ *Indexing and Searching of required data from large data sequences.*
- ✓ *Exposed to various characteristics such as Linear or non-linear, Homogeneous or heterogeneous and Static and Dynamic.*

MODULE-2

UNIT-1 **0L+0T+8P =8 Hours**

TREES:

PRACTICES:

Problems on Trees

- Given a sorted doubly linked list, convert it into a balanced BST.
- Given a singly linked list with data in the ascending order, convert it into a height balanced BST.
- Print the leaf to root path for every leaf node in a binary tree.
- Write a function to implement the reversed level order traversal of a binary tree.
- Truncate a given binary tree to remove nodes that lie on a path having sum less than K.
- Find the vertical sum in a given binary tree.
- Delete minimum & Maximum element from a BST.
- Implement Inorder, preorder and postorder tree traversal techniques.
- Print Kth largest element in a BST.
- Implement Zig-Zag tree traversal.

UNIT-2 **0L+0T+8P =8 Hours**

GRAPHS:

PRACTICES:

Problems on Graphs

- Given a directed acyclic graph, determine whether there is a path that visits every vertex exactly once.
- Reverse a directed graph such that each edge from v to w is replaced by an edge from w to v.
- Find the shortest path in a graph that visits each vertex at least once, starting and ending at the same vertex.
- Find the minimum number of throws required to win a snake and ladder game.
- Implement DFS of a Graph.
- Implement BFS of a Graph.
- Detect whether a cycle is present in an undirected graph.
- Detect cycle in a Directed Graph.
- Find Shortest Distance to goal node from root node in a graph.
- Find no. of nodes in Kth level of a Graph.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply various data structures to solve a different algorithm.	Apply	1,2	1
2	Investigate the various data structures to solve a given problem in an efficient manner.	Analyse	1,2	2
3	Design and implement an appropriate hashing function for an application.	Create	1,2	4

TEXT BOOKS:

1. Reema Thareja, “Data Structures Using C”, 2nd Edition, Oxford University Press, 2014.
2. Seymour Lipschutz, “Data Structures with C”, 1st Edition, McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures”, illustrated edition, Computer Science Press, 2006.
2. Richard F. Gilberg and Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd Edition, CENAGE Learning, 2005.
3. R G Dromey and Pearson, “How to solve it by Computer”, 2nd edition, Impression edition, 1998.

22TP204 PROFESSIONAL COMMUNICATION LABORATORY

Source: https://www.coursera.org/specializations/improve-english

Hours Per Week :

L	T	P	C
-	-	2	1

PREREQUISITE KNOWLEDGE: High School-level English.

COURSE DESCRIPTION AND OBJECTIVES:

To improve the overall professional communication skills (LSRW) of students and prepare them for their profession as engineers and managers. To provide them exposure to conventions of corporate communication and training them on how to function in the business world.

MODULE-1

UNIT-1 **0L+0T+8P=8 Hours**

BASICS OF BUSINESS WRITING SKILLS, PRACTICING BUSINESS CORRESPONDENCE AND REPORT WRITING:

Business English Vocabulary: Glossary of most commonly used words (formal and informal usage).

Elements of Technical Writing: Sentence structure, reducing verbosity, arranging ideas logically, building coherence, cohesive devices and transitional words.

Mechanics of Writing: Elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication.

Business Correspondence: E-mail: nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and notice, circular and memo.

Letter-Writing: Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiring, claim letter – letter of apology etc], introductory and concluding paragraphs and clear call for action.

Professional Proposal/Report: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts of a report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusion and recommendations).

New Age Corporate Communication Media: Importance of social media communication and Etiquettes, form and structure, sharing texts through Twitter, Whatsapp, instgram etc.

UNIT-2 **0L+0T+8P=8 Hours**

PRACTICING COMMUNICATIVE LANGUAGE IN VARIOUS PROFESSIONAL CONTEXTS:

Speaking: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), delivering the presentation effectively, telephone etiquettes, delivering seminar/proposal/report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations(JAM) and participating in Group Discussions.

PRACTICES:

- Basic grammar practice, framing paragraphs on topics allocated, paraphrasing an article or a video in your own words, finding topic sentences in newspaper articles, finding out new words from a professional viewpoint and understanding the meaning and its usage.

SKILLS:

- ✓ *To enhance listening and spoken abilities of students needed for professional and social success in interpersonal situations, group interactions, and personal and professional presentations.*
- ✓ *Understand and practice specific functions and vocabulary in a business context.*
- ✓ *Produce short business reports, proposals and correspondence.*
- ✓ *Write various business documents through reading techniques.*

- Perusing samples of well-prepared business emails, memo, letter writing and short proposals and reports, students will draft business correspondence writing tasks and different proposals/ reports on topics assigned.
- Watching videos/listening to audios of business presentations, classroom activities of team and individual presentations, using PPTs, mock exercises for BEC speaking, agreeing, disagreeing politely, developing content, extended speaking in Group Discussion(s).

MODULE-2

UNIT-1 **0L+0T+8P=8 Hours**

READING AND COMPREHENDING BUSINESS DOCUMENTS:

Reading: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning a text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT-2 **0L+0T+8P=8 Hours**

IMPARTING AND PRACTICING LISTENING SKILLS:

Listening: Specific information in business context, listening to telephonic conversations / messages and understanding the correct intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion, enable active listening.

PRACTICES:

- Hand-outs; matching the statements with texts, finding missing appropriate sentence in the text from multiple choices, using right vocabulary as per the given context and editing a paragraph.
- Working out BEC/TOEFL/IELTS listening exercises with hand-outs; matching the statements with texts, finding missing appropriate sentence in the text from multiple choice- multiple choices, using right vocabulary in context-editing a paragraph, listening to a long conversation such as an interview and answer MCQ s based upon listening.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Possess comprehensive skills in listening and reading business texts in formal context.	Apply	2	7
2	Communicate effectively both in their academic as well as professional environment.	Apply	2 &1	10
3	Clear grasp on the register of business language.	Analyze	1	8
4	Possess the ability to write business reports and proposals clearly and precisely to succeed in their future.	Create	1	12
5	Make effective presentations and participate in formal context.	Create	2	10

TEXT BOOK:

1. S. Schnurr, "Exploring Professional Communication: Language in Action", London: Routledge, 2013

REFERENCE BOOKS:

1. Brook Hart Guy, "Cambridge English Business Bench Mark: Upper Intermediate", 2nd Edition: CUP, 2014.
2. Cambridge University Publication, "Cambridge: BEC VANTAGE Practice Papers", CUP, 2002.
3. J. Seely, "The Oxford Guide to Effective Writing and Speaking", Oxford University Press, 2005.

22CT201 ENVIRONMENTAL STUDIES

Image source: Biogas plant at VFSTR

Hours Per Week :

L	T	P	C
1	1	-	1

PREREQUISITE KNOWLEDGE: General awareness regarding environmental problems and importance of environmental protection.

COURSE DESCRIPTION AND OBJECTIVES:

It is a multidisciplinary subject where different aspects of society and environment are dealt using a holistic approach. It is evolving to be the education for sustainable and ethical development both at a local and global level. It helps to prepare the next generation for planning appropriate strategies to address environmental issues. It identifies and creates solutions that conserve to manage ecosystem and biodiversity and helps to eliminate pollutants, toxicants, preserve air, water and soil quality. Environmental education recognizes impacts of global issues, enhances the public awareness and helps to take decisions towards environmentally responsible actions.

MODULE-1

UNIT-1 **4L+4T+0P=8 Hours**

INTRODUCTION TO ENVIRONMENT: NATURAL RESOURCES, ECOSYSTEMS AND BIODIVERSITY:

Environment and sustainable development; Natural resources- forest, water, energy and land resources; Ecosystem – basic structural components, function and interactions in ecosystem, ecological succession.

UNIT-2 **4L+4T+0P=8 Hours**

BIODIVERSITY AND CONSERVATION:

Introduction to biodiversity, types of biodiversity- species, genetic and ecosystem diversity; Threats to biodiversity - natural and anthropogenic, species extinctions, man wildlife conflicts; Biodiversity conservation - principles and strategies; in-situ and ex-situ conservation.

PRACTICES:

- Visit to a Biogas plant, Solar Power plant.
- Visit to a local area: river / pond / lake / forest / grassland / hill / mountain and study of different types of ecosystems, biodiversity study and documentation (herbarium sheet preparation).
- Set up an aquarium.
- Case study: Renewable energy use.

MODULE-2

UNIT-1 **4L+4T+0P=8 Hours**

ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE:

Air, water, soil, radioactive and noise pollution; Study of different pollutants (SOx, NOx, PAN, PAH etc.); Toxicity study; Climate change - greenhouse effect, acid rain, ozone layer depletion.

UNIT-2 **4L+4T+0P=8 Hours**

POLLUTION CONTROL DEVICES AND WASTEWATER TREATMENT TECHNOLOGIES:

Air pollution control devices - Gravitational settling chambers, cyclonic separators, electrostatic precipitators, fabric filters and bio filters, Wastewater management.

SKILLS:

- ✓ *Create a bio-diversity map of any habitat/ ecosystem.*
- ✓ *Strategize different ways of using renewable energy resources.*
- ✓ *Design novel strategies and approaches for pollution control and waste management.*

PRACTICES:

- Visit to a sewage treatment plant and wastewater analysis.
- Case study: Recycling Technologies.
- Case study: Effects of contaminants on microorganisms.
- Report writing: 12 principles of green chemistry for environmental sustainability.
- Report writing: Environmental Impact Analysis, Local Disaster Management Plan.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the basic concepts of sustainable development, natural resource utilization and ecology for the purpose of environmental protection	Apply	1	1,6,7, 9, 10, 11, 12
2	Design remediation technologies for their abatement	Apply	2	1, 3,6,7, 9, 10, 11, 12
3	Analyze the biodiversity of different ecosystems and formulate various conservation approaches	Analyze	1	1, 7, 8, 9, 10, 11, 12
4	Analyze the presence of various environmental pollutants	Analyze	2	1, 6,7,9, 10, 11, 12
5	Recommend various waste management approaches and their implementation strategies	Evaluate	2	1,2, 7,8,9,10,11, 12

TEXT BOOKS:

1. A. Kaushik and C. P. Kaushik, “Perspectives in Environmental Studies”, New Age International Publishers, 5th Edition, 2016.
2. Y. Anjaneyulu, “Introduction to Environmental Science”, B. S. Publications, 2015.

REFERENCE BOOKS:

1. B. Joseph, “Environmental Studies”, Mc Graw Hill Education, 2nd Edition, 2015.
2. S. Subash Chandra, “Environmental Science”, New Central Book Agency, 2011.
3. M. Basu and S. Xavier, “Fundamentals of Environmental Studies”, Cambridge University Press, 2016.
4. K. Mukkanti, “A Textbook of Environmental Studies”, S. Chand Company Ltd., 2009.
5. M. Anji Reddy, “A Textbook of Environmental Science and Technology”, B. S. Publications, 2008.

22MS201 MANAGEMENT SCIENCE

Source: https://xueqi326.wordpress.com/semester-3/management-science/

Hours Per Week :

L	T	P	C
2	2	-	3

PREREQUISITE KNOWLEDGE: Basic knowledge of management

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to analyze the importance of management, significance of operation management and carry out production operations through work-study. Students will be able to analyse the markets, customers, competitors, and then plan HR function effectively. These management practices, functional areas of the organisation will helps the students to build up their career in the corporate world.

MODULE-1

UNIT-1 **6L+6T+0P =12 Hours**

INTRODUCTION TO MANAGEMENT:

Concepts of Management and organization- nature, importance and Functions of Management, Systems approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Leadership Styles, Social responsibilities of Management.

UNIT-2 **10L+10T+0P =20 Hours**

OPERATIONS MANAGEMENT:

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement, Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records. Statistical Quality Control: control charts for variables and attributes (simple problems).

PRACTICES:

- Collect some examples with videos for types of production.
- Carry out production operations through work-study.
- Practice problems with Inventory control methods and Quality Control charts.

MODULE-2

UNIT-1 **8L+8T+ 0P =16 Hours**

HUMAN RESOURCES MANAGEMENT:

Concepts of Human Resource Management, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation, and Merit Rating.

UNIT-2 **8L+8T+0P =16 Hours**

MARKETING MANAGEMENT:

Evolution of Marketing, Functions of Marketing Selling Vs Marketing, 4 P's of Marketing – Product Mix - Product Life Cycle – Place Mix – Channels of Distribution – Price Mix – Pricing Methods – Promotion Mix – Tools of Promotions.

SKILLS:

- ✓ *Expert in managerial skills*
- ✓ *Maintain social relations*
- ✓ *Evaluate pricing strategies*

PRACTICES:

- Select any Designation in an organization and try to describe its job description and job specifications
- How do you deal with grievances at your work
- Analyze marketing mix in various situations

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Carry out production operations through work-study	Apply	1, 2	1, 2, 3, 5
2	Analyze the nature and importance of management	Analyze	1	1,2,4,6
3	Significance of Operations Management.	Analyze	1, 2	1,2,5
4	Analyze the markets, customers, and competition	Analyze	2	1,2,4,5,6
5	Plan and control the HR function effectively	Evaluate	1, 2	1,2,3,4,5,6

TEXT BOOKS:

1. Rajan Saxena: Marketing Management, 4th Edition, TMH, 2013.
2. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.

REFERENCE BOOKS:

1. Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithleshwar Jha: Marketing Management, 13th Edition, Pearson Education, 2012.
2. Dipak Kumar Bhattacharyya, Production and Operations Management, Universities Press, 2012.
3. Gary Dessler, “Human Resource Management”, 12th Edition, Pearson- 2012.
4. K.Aswathappa, “Human Resource Management”, Text and Cases”, TMH, 2011.
5. Harold Koontz, Heinz Weihrich, A.R. Aryasri, Principles of Management, TMH, 2010.

22CE205 ENVIRONMENTAL ENGINEERING

Source Link: https://www.pngegg.com/en/search?q=environmental+Engineering

Hours Per Week :

L	T	P	C
3	-	2	4

PRE-REQUISITE KNOWLEDGE: Environmental Studies.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers fundamental concepts on various types of water sources, estimation of quantity requirements of water, treatment of water/wastewater to the desired degree. It also includes design concepts of various water/wastewater treatment methods. The objective of this course is to provide knowledge and analysis about sedimentation, filtration and disinfection methods in water/wastewater treatment process and disposal by Understanding the function of natural and engineered environmental systems, and ability to design their components and processes to meet the desired needs of society.

MODULE - 1

UNIT-1 **14L+0T+0P = 14 Hours**

WATER SUPPLY ENGINEERING

Introduction: Need for protected water supplies, Objectives of water supply systems, Role of environmental engineers. Quantity of water: Estimating requirements, Design period, Per capita consumption, Factors affecting per capita consumption, Prediction of population, Fire demand, Fluctuations in demand, Sources & Intake Works: Classification of sources of water supply, Choice of source, Suitability with regard to quality and quantity, Intakes. Transportation and pumping of water: Types of conduits, Materials for pipes, Laying and Jointing of pipes, Classification, Efficiency and choice of pumps.

UNIT-2 **10L+0T+16P=26 Hours**

WATER TREATMENT AND ANALYSIS

Impurities in water, Routine water analysis, BIS Standards for drinking water, Methods of purification of water, Sequence of treatment, Sedimentation tanks, Design aspects, coagulation, filtration: construction operation and design of slow and rapid sand filters, Troubles in filters, Different methods of disinfection, Chlorination, Water softening, Removal of color, Odour and taste from water, DE fluoridation, Reverse osmosis. Methods of supply, Layouts of distribution networks, Appurtenances in the distribution system.

PRACTICES:

- Calibration and analysis of PH.
- Chlorides concentrations for a given sample.
- Hardness levels of the given pipeline.
- Coagulation reactions and dosage levels for water treatment.
- Total Solids analysis of the given samples.
- Design simple filter beds for treatment.

MODULE - 2

UNIT -1 **14L+0T+0P = 14 Hours**

WASTE WATER ENGINEERING

Sanitation, Conservancy and water carriage systems, Sewage and storm water estimation, Time of concentration, Storm water overflows combined flow characteristics of sewage, Decomposition of sewage, B.O.D., C.O.D. Equations, Design of sewers, Sewer appurtenances, man holes, drop man

SKILLS:

- ✓ *Analyse characteristics of water and wastewater.*
- ✓ *Estimate the quantity of drinking water and domestic wastewater generated.*
- ✓ *Design components of water supply systems Design sewerage system.*

holes, Lamp holes, Flushing tanks, Inverted syphons, Street inlets, Catch basins. Layout and general outline of various units in a waste water treatment plant, Primary treatment design of screens, Grit chambers, Skimming tanks, Sedimentation tanks, Principles of design.

UNIT-2 **10L+0T+16P = 26 Hours**

SEWAGE TREATMENT AND ANALYSIS

Biological treatment, trickling filters, Standard and high rate, activated sludge process, Principle of action, activated sludge process vs. trickling filter process, Non-Conventional methods of Sewage Treatment (Wetlands). Sewage disposal, Disposal by dilution, Disposal by irrigation, Examination of Dissolved Oxygen, B.O.D, C.OD, Sewage sickness, Reuse of treated sewage, Ground water recharge. Characteristics of sewage sludge, Sludge digestion, Factors effecting the sludge digestion, Sludge disposal by drying, Sludge thickening, Sludge conditioning, Methods of dewatering the sludge, Methods of sludge disposal.

PRACTICES:

- Levels of D O Content in Sewage.
- Turbidity for a given sample.
- Verification of BOD equation.
- Nitrates levels for water treatment.
- Sulphates analysis of the given samples.
- Design simple treatment systems.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Design a filter medium and water/wastewater softening models.	Apply	1	1, 2, 12
2	Estimate water requirements for a given city.	Analyze	1, 2	2, 5, 12
3	Analyze characteristics of water/wastewaters and the contamination level of water bodies	Analyze	1, 2	1, 2, 12
4	Prepare and update environmental investigation and recommendation reports	Creating	1, 2	2, 3, 5, 12

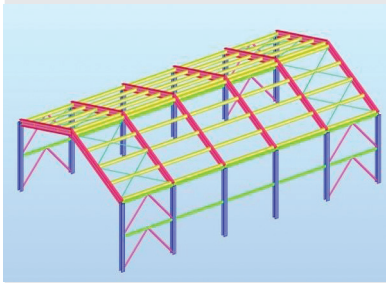
TEXT BOOK:

1. 1. N. N. Basak, —Environmental Engineering‖, Vol. I, McGraw Hill Education, India, 2nd edition, 2017.
2. C. S. Rao, —Environmental Pollution Control Engineering‖, Vol. I, Wiley Eastern Ltd., New Delhi, 5th edition, 2006.

REFERENCE BOOKS:

1. Donald R. Rowe, George, —Environmental Engineering‖, Vol. I, McGraw Hill, New York, 1st Edition, 2013.
2. Met Calf and Eddy, —Wastewater Engineering Treatment, Disposal and Reuse‖, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 4th Edition, 2012.
3. S. K. Garg, —Environmental Engineering‖, Vol. II, Khanna Publishers, Delhi, 4th edition, 2005.
4. Ministry of Works and Housing, —Manual on Sewerage and Sewage Treatment‖, 2nd edition, CPH and EEO, Govt. of India, New Delhi, 2nd edition, 1996.

22CE206 ADVANCED STRUCTURAL ANALYSIS



Source Link:
https://nptel.ac.in/courses/105105166

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Structural Analysis.

COURSE DESCRIPTION AND OBJECTIVES:

This course is offered to calculate the reaction of statically indeterminate structures by using various displacement methods of analysis. The objective is to gain ability to analyse continuous beams and multi-storey frames by various methods like slope deflection, moment distribution and Kani's method.

MODULE - 1

UNIT-1 **10L+2T+0P = 12 Hours**

DISPLACEMENT METHODS OF ANALYSIS

Slope deflection method, slope deflection equations. Moment distribution method – principles and carry over moment. Kanis method of analysis – Rotation factor and Rotation contributions. Approximate method of analysis for multi-storeyed frames – portal and cantilever.

UNIT-2 **4L+16T+0P = 20 Hours**

ANALYSIS OF INDETERMINATE BEAMS AND MULTI STOREYED STRUCTURES

Slope deflection method – analysis of continuous beams – settlement. Moment distribution method – analysis of continuous beams and portal frame (single, single storey with vertical legs) – settlement of support. Kani's method - analysis of continuous beams and portal frame (single, Two storey). Computation of Final end moments using various displacement method. Comparision of the results and testing the accuracy of methods. Approximate methods - Portal frame method and Cantilever method of analysis.

PRACTICES

- Analysis of multi storeyed structures using portal and cantilever method.
- Estimating the sway due to different types of unsymmetry.
- Developing the BMD for multi-storeyed structure.
- Computation of final end moments using displacement methods.

MODULE - 2

UNIT-1 **6L+6T+0P = 12 Hours**

CABLES AND SUSPENSION BRIDGES

Analysis of cables under uniformly distributed and concentrated loads, Shape of the cable under self-weight, Effect of temperature changes in suspension cables, Anchor cables.

UNIT-2 **8L+12T+0P = 20 Hours**

MATRIX METHODS OF ANALYSIS

Flexibility Method (MATRIX APPROACH): Flexibility matrix analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) by flexibility method with matrix approach.

Stiffness Method (MATRIX APPROACH): Stiffness matrix, Relationship between flexibility matrix and stiffness matrix, Analysis of continuous beams, Rigid jointed plane frames (Single bay, single storey with vertical legs only) by stiffness method with matrix approach.

SKILLS:

- ✓ *Determine slope and deflection of beams.*
- ✓ *Determine internal stresses under loading.*
- ✓ *Perform analysis of framed structures for different loading case.*
- ✓ *Analyse the arches for different support conditions.*
- ✓ *Justification of sway in structures.*

PRACTICES:

- Asses the behaviour of cable due to different load conditon.
- Evaluate the tension developed in the anchorage cables for various support condition.
- Analyse the indeterminate structure using matrix methods.
- Computing the unknown displacements and redundant forces.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Determine end moments in multi storeyed structures using approximate methods.	Application	1	1, 2, 12
2	Analyze continuous beams and portal frames by using slope-deflection.	Analyze	1	1,2,12
3	Calculate the tension in cables under different types of loading.	Evaluate	2	1, 2,4
4	Compute the redundant forces and displacements of continuous beams and rigid jointed plane frames using matrix methods.	Create	2	1, 2,12

TEXT BOOK:

1. Bhavikatti,S.S, Structural Analysis, Vol.1, &2,Vikas Publishing House Pvt. Ltd., NewDelhi-4, 2014.
2. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt. Ltd. New Delhi-4, 2014.

REFERENCE BOOKS:

1. Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.
2. PanditG.S.andGuptaS.P., Structural Analysis–A Matrix Approach, Tata McGraw Hill Publishing Company Ltd.,2006.

III YEAR

B.Tech.

CIVIL ENGINEERING

COURSE CONTENTS

I SEM & II SEM

I SEMESTER

22TP301	-	Soft Skills Laboratory.
22CE301	-	Design of Reinforced Concrete Structures.
22CE302	-	Geotechnical Engineering.
22CE303	-	Transportation Engineering
	-	Department Elective – II
	-	Open Elective – II
22CE304	-	Inter-Disciplinary Project – Phase I
22CE305	-	Industry interface course (Modular Course)
		NCC/ NSS/ SAC/ E-cell/ Student Mentoring/ Social activities/ Publication with good impact factor (Only 2 students can claim 1 paper /patent). These credits maybe earned on or before the end of VI semester.
		Minor / Honors – 2

II SEMESTER

22TP302	-	Quantitative aptitude & Logical reasoning.
22CE306	-	Design of Steel Structures.
22CE307	-	Water Resource Engineering.
	-	Department Elective – 3
	-	Department Elective – 4
	-	Open Elective – 3
22CE308	-	Inter-Disciplinary Project – Phase II
	-	Minor / Honors – 3

22TP301 SOFT SKILLS LABORATORY

Source: https://choosework.ssa.gov/blog/2019-07-23-soft-skills-an-intro-to-effective-communication

Hours Per Week :

L	T	P	C
-	-	2	1

PREREQUISITE KNOWLEDGE: Grasp on their own academic achievements.

COURSE DESCRIPTION AND OBJECTIVES:

To impart employability skills like resume preparation and facing interviews. To enable trainees to develop interpersonal and leadership skills and to train them on work place skills like making presentations, participating in group discussions etc.

MODULE-1

UNIT-1 **0L+0T+8P=8 Hours**

PERSONALITY DEVELOPMENT:

Soft Skills: Need for soft skills, professionalism, employability skills; Communication: Need for effective communication - the process of communication, levels of communication, flow of communication, choice of diction and style with reference to setting (formal, semi-formal or informal); communication networks, barriers to communication, miscommunication, noise and ways to overcome the barriers; Career Planning: Job vs. career, SWOT analysis.

UNIT-2 **0L+0T+8P=8 Hours**

LANGUAGE AND VOCABULARY:

Vocabulary Building: Word etymology, roots, prefixes & suffixes, synonyms & antonyms, collocations, one-word substitutes, analogies, idioms and phrases, contextual guessing of unfamiliar words, task-oriented learning; Reflection of language on Personality, Gender sensitive language in MNCs, Mind your language, Seven essential skills for a team player; attentive listening, intelligent questioning, gently persuading, respecting other's views, assisting others, sharing, participating actively.

PRACTICES:

- Self-Introduction.
- Personal and Academic SWOC.
- Johari Window.
- Giving and taking opinions of Self Vs others and assessing oneself.
- Goal setting.
- Short, Mid and Long Term goals planning the semester.
- Time management: four quadrant system.
- Stephen Covey Time Management Matrix planning a semester.
- Stress-management.
- Questionnaire to assess level of stress.
- 50 words towards resume preparation and interviews.
- Newly coined words.
- Gender sensitive words and Words acceptable in Indian context and objectionable international context.

MODULE-2

UNIT-1 **0L+0T+8P=8 Hours**

LANGUAGE IN ACTION:

Functional English: Situational dialogues, Role plays (including small talk); Group Discussion: Articulation and flow of oral presentation, dynamics of group discussion, intervention, summarizing and conclusion, voice modulation, content generation, Key Word Approach (KWA), Social, Political, Economic, Legal

SKILLS:

- ✓ *Balance social and emotional intelligence quotients though SWOC, JOHARI etc. activities.*
- ✓ *Prepare tailor made resume and face various job interviews with enriched personality traits.*
- ✓ *Career planning with clear personal and professional goals.*
- ✓ *Solve personal and professional life hiccups with confidence and maturity.*

and Technical Approach (SPELT), View Point of Affected Part (VAP), language relevance, fluency and coherence – 11th and 12th weeks; Resume preparation: Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter-Statement of Purpose.

UNIT-2 **0L+0T+8P=8 Hours**

PREPARING FOR PRESENTATIONS AND INTERVIEWS:

Facing Interviews: Interview process, understanding employer expectations, pre-interview planning, opening strategies, impressive self-introduction, answering strategies, other critical aspects such as body language, grooming, other types of interviews such as stress-based interviews, tele- interviews, video interviews, frequently asked questions (FAQs) including behavioral and HR questions and the aspect looked at by corporate during interviews; Presentation Skills: Selection of a topic, preparing an abstract, gathering information, organizing the information, drafting the paper, citing reference sources – writing striking introductions, discussing the methodology used, developing the argument, presentation style, language, presenting the paper and spontaneously answering audience questions.

PRACTICES:

- Opening and closing a telephonic conversation.
- Making an appointment.
- Making a query.
- Offering/Passing on information.
- Communicating with superiors.
- Expressing agreement/objection.
- Opening bank account (combination of prepared and impromptu situations given to each student).
- Group Discussions on various topics.
- Preparing SoP and Resume.
- Mock interviews on the FAQs including feedback.
- Oral presentation with the help of technology (Preparing PPT and presenting).

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Have the ability to introspect on individual strengths and weaknesses, and emerge as a balanced personality with improved self-awareness and self-worth .	Apply	1	12
2	Observe gender sensitive language and workplace etiquette in his professional life.	Analyze	1	9
3	Be able to prepare a resume and gain the confidence to face an interview.	Create	1&2	10
4	Possess the interpersonal skills to conduct himself/herself effectively in everyday professional and social contexts.	Apply	2	8
5	Bring professionalism into his/her daily activities.	Create	2	8

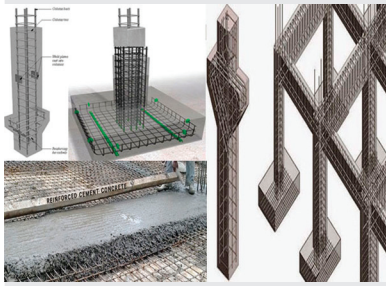
TEXT BOOKS:

1. Adrian Furnham, "Personality and intelligence at work", Psychology Press, 2008.
2. S. P. Dhanvel, "English and Soft skills", Orient Blackswan, 2011.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the corporate personality", McGraw Hill, 2001.
2. John Adair Kegan Page, "Leadership for innovation", Kogan, 2007.
3. Krishna Mohan & NP Singh, "Speaking English effectively", Macmillan, 2008.
4. Rajiv K. Mishra, "Personality Development", Rupa & Co. 2004.

22CE301 DESIGN OF REINFORCED CONCRETE STRUCTURES



Source Link: https://www.constructioncost.co/reinforced-cement-concrete.html

Hours Per Week :

L	T	P	C
3	-	2	4

PRE-REQUISITE KNOWLEDGE: Strength of Materials, Structural Analysis.

COURSE DESCRIPTION AND OBJECTIVES:

Reinforced concrete members are designed according to the existing codes ofpractice[IS456-2000, SP16(456-1978), and IS875 (Part I to V)]. The course provides all the fundamental topics in reinforcedconcrete design and enable students to design and detail reinforced concrete structuralmembers such as beam, slab, column and footing.

MODULE - 1

UNIT-1 **10L+0T+0P = 10 Hours**

DESIGN PHILOSOPHIES FOR FLEXURAL MEMBERS

Review of Concrete making materials, Structural concrete, Grades, properties of Concrete, Modulus of elasticity, flexural strength, Characteristic and Design values, Partial safety factor. Objectives of RC design, Working stress methodcomparison of design approaches. Limit State method. Assumptions, Stress-Strain behaviour of Steel and Concrete, Stress block parameters.

UNIT-2 **20L+0T+10P = 30 Hours**

ANALYSIS AND DESIGN OF BEAMS, SHEAR AND SLABS

Analysis and Design of Singly reinforced Rectangular beams by Working Stress Method and Limit State Method. Analysisand design of Flanged beams. Behaviour of rectangular RC beamsin shear & torsion. Design of RC members for combined bending, shear &torsion. Design of members for serviceability requirementsof deflection and cracking. Analysis and design of one way, two way and continuous slabs, Boundary conditions and corner effects.

PRACTICES (USING STAAD PRO. FOR ANALYSIS AND DETAILING BY AUTOCAD)

- Design and detailing of Singly reinforced beam. Doubly reinforced beam.
- Design and detailing of One-way slabs, Two-way slabs.
- Design and detailing of shear reinforcements.

MODULE - 2

UNIT-1 **10L+0T+0P = 10 Hours**

DESIGN PHILOSOPHIES FOR COMPRESSION MEMBERS

Types of columns, Concepts of Proportioning footings and foundations based on soil Properties.

UNIT-2 **20L+0T+10P = 30 Hours**

ANALYSIS AND DESIGN OF STAIRCASE, COLUMNS AND FOOTINGS

Design of dog-legged Staircase. Analysis and design of short columns for uniaxial and biaxial bending. Design of axially andeccentrically loaded Square, Rectangular footing, Design of Combined Rectangular footing for two columns only.

SKILLS:

- ✓ *Design beams for limit state of collapse.*
- ✓ *Design beams for limit state of serviceability.*
- ✓ *Study about bond and anchorage.*
- ✓ *Analyze and design slabs.*
- ✓ *Design and analysis of substructure.*

PRACTICES (USING STAAD PRO. FOR ANALYSIS AND DETAILING BY AUTOCAD)

- Design and detailing of
  - Staircase.
  - Columns.
- Design and detailing of footings
  - Rectangular
  - Square

COURSE OUTCOMES:

Upon successful completion of this course, students will have to ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the concepts of limit state design and code provisions for design of concrete members under bending, shear, compression and torsion.	Analyze	1	1, 2, 3, 4, 5, 6, 7, 8, 10, 12
2	Analyze reinforced concrete sections to determine the ultimate capacity in bending, shear and compression.	Analyze	1, 2	1, 2, 3, 4, 5, 6, 7, 8, 10, 12
3	Design and detail beams, slab, and shear using IS code provisions.	Evaluating	1	1, 2, 3, 4, 5, 6, 7, 8, 10, 12
4	Design and detail columns, stairs and footings using IS code and SP 16 design charts.	Evaluating	2	1, 2, 3, 4, 5, 6, 7, 8, 10, 12

TEXT BOOKS:

1. Punmia, B.C.Limit State Design of Reinforced Concrete, Laxmi Publications, 2016.
2. Varghese,P.C. Limit State Design Of Reinforced Concrete, 2nd Edition, Phi, 2009.

REFERENCE BOOKS:

1. Krishnaraju, N. Design of Reinforced Concrete Structures, Fourth Edition, CBS Publishers & DistributorsPvt. Ltd., NewDelhi. 2019.
2. Subramanian, N. Design of Reinforced Concrete Structures, Oxford University Press,New Delhi,2014.
3. Ramachandra, Limit state Design of Concrete Structures, Standard Book House, New Delhi. 2014.
4. Unnikrishna Pillai, S.,Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill Education, 2003.
5. IS 456:2000, IS 3370(Part-IV), BIS 2000; SP16 (IS 456-1978)

22CE302 GEOTECHNICAL ENGINEERING

Source Link: http://fisatx.fisat.ac.in/courses/course-v1:FISAT+CET283+2020_T1/about

Hours Per Week :

L	T	P	C
3	-	2	4

PRE-REQUISITE KNOWLEDGE: Soil formation and types.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers study of the behaviour of soils under the influence of loading forces, soil- water interaction and knowledge on design of foundations, retaining walls, earth dams, clay liners and geosynthetics for waste containment. The objective of this course is to provide a basic understanding of the physical and mechanical characteristics of soils and how to relate these to the engineering behaviour of soil and understanding of the meaning and measurement of parameters for geotechnical engineering design.

MODULE - 1

UNIT-1 **14L+0T+0P = 14 Hours**

FUNDAMENTALS OF GEOTECHNICAL ENGINEERING

Introduction & Soil Classification: Soil formation and soil types, Phase diagrams, Simple definitions, important relationships.

Soil Classification: Introduction, Particle size classification as per IS code, Unified soil classification system, Indian standard soil classification system.

Permeability & Seepage through soils: Capillary rise, Darcy's law and its validity, Factors affecting permeability, Permeability of stratified soil deposits: Total, Neutral and effective stresses, Seepage force, Quick sand condition, Flow nets – Characteristics and uses.

UNIT -2 **10L+0T+16P = 26 Hours**

PROPERTIES OF SOIL

Index Properties: Mechanical analysis – Sieve analysis, Stroke's law, Hydrometer analysis, and Atterberg's limits.

Mechanical Properties: Determination of coefficient of permeability constant and variable head method. Compaction of soils: Laboratory tests, Effects of compaction, Factors affecting compaction, Compaction in the field, Compaction specification and field control. Shear strength of soils: Stress at a point, Mohr circle of stress, Measurement of shear strength, Shear strength of clayey soils & sands, Drainage conditions and strength parameters.

PRACTICES:

- Estimate the water content in a given sample by oven drying method.
- Determine the specific gravity by Density bottle method & Pycnometer method.
- Examine gradation analysis by Mechanical sieve & Hydrometer analysis.
- Determination of Atterberg's Limit & Free Swell Index.
- Interpretation of Field Unit weight by Core cutter & Sand Replacement method.
- Evaluate permeability of a given soil sample by Constant Head & Variable Head Permeability methods.
- Determine compaction of a given sample by Standard Proctor and Modified Proctor test.

SKILLS:

- ✓ *Identify and classify soils.*
- ✓ *Determine permeability for different soils.*
- ✓ *Assess the compaction characteristics of soils.*
- ✓ *Measure the effective stresses in soils at different conditions.*
- ✓ *Measures shear strength parameters of soil at different drainage conditions.*

MODULE – 2

UNIT-1 **14L+0T+0P = 14 Hours**

STRESS DISTRIBUTION & CONSOLIDATION OF SOIL

Introduction, Boussin equation, Vertical stress distribution diagrams, Vertical Stress beneath loaded areas, Newmark‘s influence chart, approximate stress distribution method for loaded areas, Westergaard‘s equation. Consolidation: Introduction, Time rate of consolidation, Consolidation test, Computation of settlement.

UNIT- 2 **10L+0T+16P = 26 Hours**

SHALLOW FOUNDATION & SETTLEMENT ANALYSIS

Types of foundations and their applicability, General Requirements of foundations, Location and depth of foundation, Terminology relating to bearing capacity, bearing capacity of shallow foundations, Terzaghi‘s bearing capacity theory, Skempton‘s bearing capacity analysis for clay soils, IS code recommendations for bearing capacity. Settlement Analysis: Settlement of shallow foundation, Types, Methods to reduce differential settlements, Allowable bearing pressure, immediate settlement, Terzaghi‘s Method,

PRACTICES:

- Find unconfined compression test for a soil sample.
- Determine direct shear test.
- Determine Vane shear test.
- Examine Triaxial test by
  - Unconsolidated Undrained.
  - Consolidated Undrained.
  - Consolidated Drained.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the index properties and classification of soil along with the basic concepts of geotechnical engineering.	Apply	1	1
2	Analyze the compressibility, consolidation and shear strength parameters.	Analyzing	2	1, 2
3	Assess the basic properties of soil.	Evaluating	1	1, 2
4	Determine the permeability and seepage analysis.	Evaluating	1, 2	1, 2, 5
5	Compute the settlement in shallow foundation.	Creating	2	1, 2

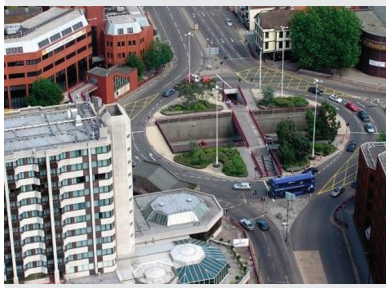
TEXT BOOKS:

1. Arora. K. R, —Soil Mechanics and Foundation Engineering‖, Standard Publishers and Distributors, Delhi, 7th re-print edition, 2020.
2. Venkatramaiah. C, —Geotechnical Engineering‖, New Age International Pvt. Ltd., New Delhi, 5th edition, 2017.

REFERENCE BOOKS:

1. Venkatramaiah. C, —Geotechnical Engineering‖, New Age International Pvt. Ltd., New Delhi, 5th edition, 2017.
2. Manoj Datta, S. Gulhati, —Geotechnical Engineering‖, Tata McGraw Hill Education Ltd., 1st edition, 2008.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, —Soil Mechanics and Foundation‖, Laxmi Publications Pvt. Ltd., New Delhi, 16th edition, 2005.
4. Gopal Ranjan and A. S. R. Rao, —Basic and Applied Soil Mechanics‖, New Age International Pvt. Ltd., New Delhi, 2nd edition, 2004.

22CE303 TRANSPORTATION ENGINEERING



SourceLink:https://www.hochschuletrier.de/fileadmin/_processed_/d/5/csm_Knoten_4280b5618a.png

Hours Per Week :

L	T	P	C
3	-	2	4

PRE-REQUISITE KNOWLEDGE: NIL.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers an introduction to transportation and characteristics of road transport, History of highway development, surveys and classification of roads. The main objective of the course to give knowledge to study on geometric design of highways, to study about traffic Characteristics and design of intersections and to know about the pavement materials and design.

MODULE - 1

UNIT -1 **15L+0T+0P = 15 Hours**

HIGHWAY DEVELOPMEN

Planning and Alignment: Highway Planning in India and its Alignment, Engineering surveys, Drawing and Report.

Materials: IS Soil classification, CBR tests, Plate bearing tests, Tests on Stone aggregates, Tests on Binder materials – Tar , Bitumen, Paving mixes, Marshall Mix.

Geometric Elements: Highway Cross section Elements, Sight Distance and its types, super elevation.

Pavements: Flexible and Rigid Pavement, Elements, IRC Recommendations, Westergard's stress equation for wheel loads, Group index method, CBR method.

UNIT -2 **09L+0T+16P = 25 Hours**

PAVEMENT DESIGN

Alignment: Design of Horizontal and Vertical Alignment.

Materials: Marshal Mix Design.

Pavement: Design of Flexible and Rigid Pavement.

PRACTICES:

- Specific Gravity Test on Bitumen and Aggregate.
- Shape Tests on Aggregate.
- Impact and Crushing value test on Aggregate.
- Loss Angeles Abrasion and Attrition Test on Aggregates.
- California Bearing Ratio Test on soil.
- Penetration and softening point test on bitumen.
- Ductility, Flash and Fire point Test on Bitumen.
- Marshall Mix Design and stability test.

MODULE - 2

UNIT -1 **15L+0T+0P = 15 Hours**

TRAFFIC REGULATION AND MANAGEMENT

Regulations: Road Traffic Signs, Types and specifications, Road markings, Need for road markings, Types of road markings, Webster method, IRC method.

SKILLS:

- ✓ *Capable of conducting different types of surveys for Road Construction.*
- ✓ *Able to identify different failures of pavements.*
- ✓ *Proficiency in mix design of pavements according to IRC.*
- ✓ *Mastery of traffic signals design.*

Traffic Data Elements: Basic parameters of traffic volume, Speed and density, Parking studies and parking characteristics, Road accidents, Causes and Preventive measures.

Intersection: Types of Intersections, Conflict at Intersections, Channelization and Traffic Island.

UNIT-2 **09L+0T+16P = 25 Hours**

TRAFFIC DESIGN ELEMENTS

Design of traffic signals, Traffic volume and Speed Studies Data Collection and Presentation, Accident data recording, Condition diagram and collision diagrams.

PRACTICES:

- Manual method of Traffic volume study.
- Spot Speed Study using Radar/ Speed Gun.
- Parking Study By In-Out Survey.
- Intersection Volume Study.
- Traffic Signal Design.
- Origin Destination Study.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Interpret the Surveys, drawings, materials, pavement elements and its types for Highway Development.	Apply	1	1,2,8,12
2	Illustrate the Traffic rules, Data Elements and Intersection.	Analyze	2	1,4,6,7
3	Design the required Alignment, mix and Pavements according to IRC.	Create	1	1,2,3,4,5,8, 9,10,11,12
4	Determine channelization, Traffic signals and different studies required for traffic management.	Create	2	2,3,5,9, 10,11,12

TEXT BOOKS:

1. Khanna S. K, Justo C E G, —Highway Engineering‖, NEM Chand and Sons Publications, 10th edition, 2018.
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Publishers 2019.

REFERENCE BOOKS:

1. Nicholas J Garber, Traffic and Highway Engineering, Cengage Learning 5th Edition 2019.
2. Partha Chakroborty and Aminesh Das —Principles of Transportation Engineering‖, Prentice Hall of India, New Delhi. 2017.

22TP302 QUANTITATIVE APTITUDE & LOGICAL REASONING

Source: https://images.app.goo.gl/kvtVgA8TkvDCqLhj7

Hours Per Week :

L	T	P	C
1	2	-	2

PREREQUISITE KNOWLEDGE: Basic Logical Thinking and Problem Solving Ability.

COURSE DESCRIPTION AND OBJECTIVES:

The Students will be introduced to various Arithmetic and Reasoning Problems. The students will have acquaintance with various problems like Time & Work, Time & distance, Percentages, Profit & Loss etc. besides solving puzzles and Critical Reasoning.

MODULE-1

UNIT-1 **4L+8T+0P=12 Hours**

Number system, LCM & HCF of numbers, Percentage, Ratio and proportion, Profit, loss and discount, Average & Mixtures, Simple Interest & Compound interest.

UNIT-2 **4L+8T+0P=12 Hours**

Time and work, Time & distance, Problems on trains, Problems on ages, Permutation & Combinations, Probability.

PRACTICES:

- Each concept would be taught in detail in the class followed by 10 problems solved in the class. Students would have to solve 10 additional problems as homework assignment in each concept.

MODULE-2

UNIT-1 **4L+8T+0P=12 Hours**

Number series, Letter series, Analogy, Odd man out, Coding and decoding, Syllogisms- Statement & Conclusions, Puzzle test.

UNIT-2 **4L+8T+0P=12 Hours**

Blood relations, Direction sense test, Order & Ranking, Seating Arrangements, Calendar & Clocks.

PRACTICES:

- Each concept would be taught in detail in the class followed by 10 problems solved in the class. Students would have to solve 10 additional problems as home work assignment in each concept.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Meet the demands of current job market besides equipping them higher studies like CAT, GMAT etc.	Apply	1	2, 5
2	Solve Arithmetic and Reasoning Problems within shortest possible time without paper work.	Apply	1	2, 5
3	Exhibit better analytical skills and aptitude skills.	Analyse	2	2, 4
4	Develop interpretational skills.	Evaluation	2	2, 4

SKILLS:

- ✓ *Helps in developing and improving problem solving skills*
- ✓ *Allow students to develop critical thinking skills*

TEXT BOOKS:

1. R. S. Aggarwal- Quantitative Aptitude for Competitive Examinations- S. CHAND Publications- Revised Edition-2017.
2. ARIHANT- A New Approach To Verbal & Non-Verbal Reasoning- Arihant Publication- Revised Edition-2021.

REFERENCE BOOKS:

1. Trishna Knowledge Systems- Quantitative Aptitude for Competitive Examinations- Pearson Publication- First Edition- 2013.
2. R. S. Aggarwal- A Modern Approach to Verbal & Non-Verbal Reasoning-S. CHAND Publications- Revised Edition-2018.

22CE306 DESIGN OF STEEL STRUCTURES

Source Link: https://havitsteelstructure.com/design-steel-structure-workshop/

Hours Per Week :

L	T	P	C
3	2	-	4

PREREQUISITE KNOWLEDGE: Structural Analysis and Design of Reinforced Concrete Structures.

COURSE DESCRIPTION AND OBJECTIVES:

The course offers introduction to the limit state method of structural steel design. The objective this course to provide the students with the knowledge of design of beams, columns, tension and compression members, bolted and welded connections according to IS 800 (LSM) specifications.

MODULE – 1

UNIT -1 **10L+6T+0P = 16 Hours**

TENSION & COMPRESSION MEMBERS

design, Partial safety factor, Types of bolts and bolted joints. Types of beam connections.

Tension members: Introduction, Types of tension members, Net sectional area, Effective net area, Types of failures, Design procedure.

Compression members: Introduction, Effective length, Slenderness ratio, Types of sections, Types of buckling, Column formula.

UNIT -2 **10L+14T+0P=24 Hours**

DESIGN OF TENSION & COMPRESSION MEMBERS

Design of Tension Members: Design strength of tension members, Tension member splices, Lug angles, Gusset plate.

Design of Compression Members: Design of axially loaded compression members, Design of built-up columns (latticed columns), Design of laced and battened columns, Design of column splices.

Design of Beam-to-Beam Connections: Design of framed connections using bolt, Design of unstiffened and stiffened connections, Design of moment resistant connections. (Bolting and Welding)

PRACTICES

- Field Work to collect different types of Bolts and Nuts.
- Design of Tension Members and practice in analytical software.
- Design of Compression member and practice in analytical software.
- Design of Beam to beam and beam to column connections.
- Design of Moment Resistant Connections.

MODULE - 2

UNIT-1 **10L+6T+0P=16 Hours**

BEAMS & PLATE GIRDER

Plastic analysis, Plastic moment carrying capacity of a section, Types of sections.

Plate Girder: Elements of plate girder, General considerations, Shear strength of web, Proportion of web and flanges, Stiffeners and their connections, Web splice, Design procedure up to main section.

SKILLS:

- ✓ *Fabricate simple bolt/weld connections and examine practically using UTM.*
- ✓ *Analysis the failures of Tension and Compression Member Using Softwares like Ansys, Abaqus, Tekla etc.,*
- ✓ *Fabricate small scale flexural members and test under loading frame/UTM with Laterally supported and unsupported conditions.*
- ✓ *Fabricate Small Scale Plate Girder and Roof Truss and Check the deflection experimentally as well as analytically.*

UNIT-2 **10L+14T+0P=24 Hours**

DESIGN OF BEAMS & PLATE GIRDERS

Design of simple beams based on strength and stiffness as per IS code, Design of built-up beams and curtailment of flange plates, Design of Welded Plate Girder.

PRACTICES:

- Analysis of Plastic Moment Carrying Capacity of Beam.
- Design of Supported Beams.
- Design of Unsupported Beams.
- Design of Plate Girders with stiffeners.
- Design of Plate Girders without stiffeners.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the different failure modes of bolted and welded connections and determine their design.	Analyze	1	1, 2, 3
2	Evaluate the most suitable section shape and size for tension and compression members and beams according to specific design criteria.	Evaluating	1	1, 2, 3
3	Design the strength of steel tension and compression members and beams.	Create	1	1, 2, 3, 4, 12
4	Create the structural steel components for Girders and industrial building.	Create	2	1, 2, 3, 12

TEXT BOOKS:

1. Ramamrutham. S, —Design of Steel Structures‖, Dhanpat Rai Publishing, Reprint 2nd edition, 2020.
2. Duggal. S. K, —Limit State Design of Steel Structures‖, Tata McGraw-Hill Education Publishers, 3rd edition, 2017.

REFERENCE BOOKS:

1. Chandrasekaran S, —Advanced Steel Design of Structures‖, Taylor & Francis Ltd, 2020 edition.
2. Libin Wang, Farhad Dehghan, —Design of Steel Structures‖, 2019 edition, Scitus Academics.
3. Alfredo Boracchini, —Design and Analysis of Connections in Steel Structures: Fundamentals and Examples‖, 2018 edition, Ernst & Sohn.

22CE307 WATER RESOURCES ENGINEERING

Source Link: https://www.mcgill.ca/civil/undergrad/areas/wate

Hours Per Week :

L	T	P	C
2	-	2	3

PRE-REQUISITE KNOWLEDGE: Fluid Mechanics and Hydraulic Machines.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers an introduction to essential concepts, theories and design aspects of Hydrology, Ground water and Irrigation engineering. This course also imparts knowledge of various cross drainage works and their design. This course discusses various types of dams, their stability and design, types of spillways and their suitability.

MODULE - 1

UNIT –1 **8L+0T+8P =16 Hours**

INTRODUCTION TO HYDROLOGY AND GROUND WATER

Precipitation - forms of precipitation, rain gauge network, Evaporation, transpiration, Measurements of evapo -transpiration, Infiltration capacity Curve- Field measurements and Infiltration indices. RUN OFF - Factors effecting, SCS-CN Method, Flow duration Curve, Flow-Mass curve, Hydrograph components of hydrograph, base flow separation, Unit hydrograph –S Hydro graph. Aquifer, Aquicludes, Aquifuge, Types of aquifers, Well hydraulics, Dupuit‘s theory for confined and unconfined aquifers, Yield of an open well - Constant level pumping test, Recuperation test.

UNIT- 2 **8L+0T+8P = 20 Hours**

APPLICATION ON HYDROLOGICAL STUDIES

Analyse hydro-meteorological data by IS code using rain gauges etc. Estimate abstractions from precipitation from evaporimeters and Lysimeters. Compute runoff from surface and subsurface basin by various techniques. Develop rainfall-runoff models. Determination of yield from confined and unconfined aquifer analytically, Calculate yield of an open well by Recuperation tests.

PRACTICES:

- Calculate rainfall from rain gauges by methods available.
- Determine the rain gauge density for a catchment.
- Analyse the infiltration rate by Infiltrometer.
- Generate hydrograph for particular basin analytically and experimentally.
- Find the diameter of an open well by Dupit‘s theory.
- Calculate the discharge from an open well by recuperation test/V-Notch test.

MODULE - 2

UNIT-1 **8L+0T+8P = 16Hours**

IRRIGATION ENGINEERING

Water Requirement of Crops, Depth and frequency of irrigation, Duty and Delta, Base period, Relation between Duty and Delta, Factors affecting Duty, Methods of Applying Water Irrigation Channels - Silt Theories & Design Procedure, Dams in General: Introduction, Classification, Gravity dams- forces on gravity dams, causes of failure, Earth dams and rock fill dams -forces on ECR dams.

SKILLS:

- ✓ *Measure precipitation, Infiltration and Rainfall- Runoff correlation by using various methods.*
- ✓ *Study about various methods of yield of an open well.*
- ✓ *Design of a channel and cross drainage works.*
- ✓ *Study about various types of dams.*
- ✓ *Perform stability analysis of gravity dams.*

UNIT -2 **8L+0T+8P = 16 Hours**

ANALYSIS AND DESIGN OF DAMS

Determine the duty and delta for an Irrigation system, design an irrigation channel based on methods explained above, Plan an Irrigation System and Design irrigation canals and canal network, Plan and design diversion head works, Design irrigation canal structures viz Weir and Analyse gravity and earth dams.

PRACTICES:

- Determine the Duty and Delta and frequency of irrigation.
- Design a most economical Irrigation channel analytically.
- Design Channel based on Regimes theory.
- Design a gravity dam analytically.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Calculate hydro-meteorological data by IS code and rainfall runoff model studies.	Apply	1	1, 2, 12
2	Determine the duty and delta for an Irrigation system.	Apply	1, 2	1, 2, 12
3	Analyse yield of an open well.	Analyse	1, 2	2, 5, 12
4	Design gravity dam and compute various forces acting on the dam.	Create	1, 2	2, 3, 4, 5, 12

TEXT BOOKS:

1. B. C. Punmia and P. B. B. Lal, —Irrigation and Water Power Engineering‖, Laxmi Publications Pvt. Ltd., 17th edition, New Delhi, 2021.
2. Arora, K. L., —Irrigation Water Resources Engineering‖, Standard Book Publishing Company, New Delhi, 2019.

REFERENCE BOOKS:

1. Chow, V. T., Maidment and Mays, L. A., —Applied Hydrology‖, Tata Mc Graw Hill Pub. Co., New York, 2017.
2. Modi, P. M., 2019, —Irrigation Water Resources and Hydropower Engineering‖, Standard Book Publishing Company, New Delhi 10th Edition, 2019.

IV
YEAR

CIVIL ENGINEERING

B.Tech.

I SEMESTER

22EE402	-	Engineering Economics, Estimation and Costing
22EE401	-	Engineering Geology
	-	Department Elective – 5
	-	Department Elective – 6
	-	Department Elective – 7
	-	Department Elective – 8
	-	Minor / Honors – 4

II SEMESTER

22CE403	-	Internship / Project Work
	-	Minor / Honors – 5 (for Project)

COURSE CONTENTS

I SEM & II SEM

22CE401 ENGINEERING ECONOMICS, ESTIMATION AND COSTING

Source Link: https://www.indiamart.com/proddetail/inventory-valuation-21197462230.html

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Building Materials & Concrete Technology.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers an understanding and practice on various types of estimates under different conditions, rate analysis and bill preparations, specification writing and valuation of land and buildings. The objective of this course is to learn different methods and tools to perform estimates and enhance the technical definition of a project for a comprehensive cost estimate.

MODULE - 1

UNIT- 1 **14L+0T+0P = 14 Hours**

INDIAN ECONOMY

Indian Economy – Brief overview of post-Independence period, Demand/Supply – elasticity – Policies and Application, Demand Fore Casting Techniques, Theory of the Firm and Market Structure, Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve.

UNIT-2 **10L+0T+16P= 26 Hours**

COST ANALYSIS

Cost and Cost Control techniques, Type of Costs, Break even Analysis, Investment Analysis- NPV, ROI, IRR, Payback Period.

PRACTICES

- Cost Analysis of any real time building or structures.
- Apply different types of Cost Analysis in any buildings or structures.
- Analysis the NPV, ROI, IRR, Payback Period of any real time building or structures.

MODULE - 2

UNIT-1 **14L+0T+0P = 14 Hours**

BUILDING ESTIMATION AND METHODS

Methods of estimating, Main items of work, Deduction for openings, Degree of accuracy, Units of measurement, Methods of building estimates, Individual wall method, Centre line method, Arch masonry calculation, Estimate of steps.

Estimate of RCC Works: Standard hooks and cranks, Estimate of RCC slab, RCC beam, RCC T–beam slab and RCC column with foundation. Road estimate: Estimate of earthwork, estimate of pitching of slopes, estimate of earthwork of road from longitudinal sections, Estimate of earthwork in hill roads.

Canal Estimate: Earthwork in canals–different cases, Estimate of earthwork in irrigation channels.

UNI -2 **10L+0T+16P=26 Hours**

SPECIFICATIONS AND TENDER

Purpose and methodof writing specifications, General specifications, Detailed Specifications for Brick work, RCC, Plastering, Mosaic Flooring, R. R. Stone Masonry. Analysis of rates: Task or out – turn work,

SKILLS:

- ✓ *Estimate quantities of various items of a residential building.*
- ✓ *Estimate the earth work required in roads and canals.*
- ✓ *Calculate rates of various items of work.*
- ✓ *Perform building valuation and rent fixation.*

Labour and materials required for different works, Rates of materials and labour, Preparing analysis of rates for the following items of work. i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) CC flooring vi) White washing.

Tender: Preparation of tender documents, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids - Bid Price build-up: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management.

PRACTICES:

- Quantity estimation of a single storey residential building. (different items)
- Cost estimation of a single storey residential building.
- Quantity estimation of a B. T. Road. (different items)
- Cost estimation of a B. T. Road.
- Quantity estimation of a Canal. (different items)
- Cost estimation of a Canal.
- Find out labour requirement and prepare the Rate Analysis for different items of work.
  - C.C
  - R.C.C
  - Brick work
  - Flooring
- Preparation of Model Tender Document, Bills, and Bids.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the elements of business economics with emphasis on Indian Economy.	Apply	1	1, 2, 3, 4, 12
2	Analysis basic principles, methodology of economics and public sector economics.	Analyze	1	1, 2, 3,12
3	Estimate the construction elements of building by individual wall method and centre line method.	Evaluate	2	1, 2, 3
4	Estimate the RCC works, roads and Canals.	Evaluate	2	1, 2, 3, 12
5	Create the general specifications and preparation of tender.	Create	2	1, 2, 3, 12

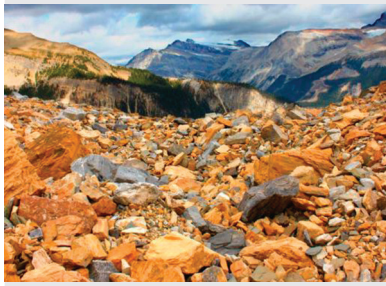
TEXT BOOKS:

1. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia.
2. B. N. Dutta, ―Estimating and Costing in Civil Engineering‖, U.B.S. Publishers and Distributors, New Delhi, 22nd edition, 2001.

REFERENCE BOOK:

1. V. Mote, S. Paul, G. Gupta (2004), Managerial Economics, Tata McGraw Hill.
2. 2. S. C. Rangwala, ―Valuation of Real Properties‖, Charotar Publishing House, Anand, 12th edition , 2002.

22CE402 ENGINEERING GEOLOGY



Source Link: https://guardian.ng/opinion/on-engineering-geology/

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE KNOWLEDGE: NIL

COURSE DESCRIPTION AND OBJECTIVES:

The course offers knowledge of Geology for Civil Engineering applications and explaining the geological agents and their role in constantly molding the surface of the earth. The objective of this course is to introduce the basic geology to Civil engineering students and to inspire them to think clearly and critically the solution to Civil engineering problems using the knowledge of geology.

MODULE - 1

UNI -1 **14L+0T+0P = 14 Hours**

INTRODUCTION, PHYSICAL GEOLOGY AND SEISMIC HAZARDS

Introduction: Importance of geology from Civil engineering point of view.

Physical Geology: Introduction; Weathering Process, types of weathering and its importance in civil engineering; Soil formation, Soil profile, soil conservation measures; Geological action of Rivers, stages in a river system, features of river erosion and deposition. Earthquakes and Seismic Hazards: Terminology; Classification, Causes and effects of earthquakes; seismic waves, measuring instruments, seismic zones of India, Seismic belts, seismic hazards in India ; Civil Engineering considerations in seismic areas. A step towards urban earthquake vulnerability reduction.

Land Slides: Classification; Causes and effects of Landslides; Preventive measures of Landslides.

UNIT - 2 **10L+0T+16P=26 Hours**

MINERALOGY AND ENGINEERING PROPERTIES OF ROCKS

Mineralogy: Definition of mineral; physical properties of minerals. Study of common rock forming minerals - Quartz, Feldspar, Muscovite, Asbestos calcite, Talc, Kaolin.

Petrology: Introduction; Rock Cycle, major rock types, formation of Igneous rocks; Structures of Igneous rocks. Formation of Sedimentary rocks; Structures of Sedimentary Rocks. agents of metamorphism, Structures of Metamorphic rocks, distinguisition of major rock types, Engineering Properties of Rocks: Different Engineering propertiesy of rocks. Description of some important Rocks – Granite - Basalt – Dolerite – Sand Stone – Lime Stone – Shale – Laterite - Granite gneiss – schist– Marble – Khondalite – Charnockite.

PRACTICES:

- Study of Survey of Indian Topographical maps.
- Preparation of Drainage Map using Topographical map.
- Preparation of slope and base Map using Topographical map.
- Study of Minerals Physical Properties.
- Identification of Physical Properties of Minerals in hand specimens.
- Study of Physical Properties of Rocks.
- Identification of Physical Properties of Rocks in hand specimens.
- Ground water potential identification using Electrical Resistivity method.
- Interpretation of geological maps.

SKILLS:

- ✓ *Distinguish geological formations.*
- ✓ *Identify topographical features and geological formations.*
- ✓ *Identify minerals by using physical properties.*
- ✓ *Identify rocks by using physical properties.*
- ✓ *Understand various secondary structures.*

MODULE - 2

UNIT -1 **14L+0T+0P = 14 Hours**

STRUCTURAL GEOLOGY AND SITE INVESTIGATIONS

Structural Geology: Introduction; Strike and Dip; Outcrop. Parts and classification of Folds; Faults; Joints; and their importance in Civil Engineering constructions.

Site Investigation Techniques For Civil Engineering Projects: Introduction, Different stages of site investigation, toposheets/topographic maps; Geological maps and their interpretation in site investigation; Geophysics in civil engineering, electrical resistivity investigations, seismic survey, remote sensing , Geographical information systems and their application.

UNIT- 2 **10L+0T+16P=26 Hours**

GEOLOGY OF WATER, DAMS AND TUNNELS

GROUND WATER: sources of ground water, factors controlling ground water, water bearing properties of rocks and soils, types of aquifers, exploration of ground water DAMS: Suitable foundations for different types of dams, guidelines for major dam and reservoir investigations, water tightness and influence factors, case studies. TUNNELS: terminology, Tunnels and underground excavations, methods of site selection, tunnel excavation in rocks and soft ground, case studies.

PRACTICES:

- Watershed delineation and Morphometric analysis.
- Study of Satellite Imageries.
- Preparation of Land use and Land cover map using Satellite Imageries.
- Determination of Strike and Dip.
- Determination of Thickness of beds.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Make use of the significance of geological processes that modify the surface of the earth, earthquakes, landslides.	Apply	1	5, 6, 10
2	Analyze the minerals and rocks, geological structures exhibited by rocks and their influence.	Analyze	1, 2	1, 2, 12
3	Assess the geological conditions to identify potential sites for groundwater, sites for dam and reservoir and tunnels.	Evaluating	1, 2	1, 12
4	Adapt for suitability of the site for a major civil engineering project.	Creating	2	1, 2, 5, 12

TEXT BOOKS:

1. Engineering Geology by D.Venkat Reddy; Vikas Publishing House Pvt.Ltd., Noida1st edition, 2020.
2. Engineering and General Geology by Parbin Singh; S. K. Kataria & Sons, New Delhi, 8th Edition. 2019.

REFERENCE BOOKS:

1. A text Book of Engineering Geology by N. Chennakesavulu; Macmillan India Ltd., Delhi, 2nd edition, 2018.
2. Principles of Engineering Geology by K.M. Bangar, Standard Publications Distributors, 1705-B, Nai sarak, New Delhi, 2nd edition, 2017.
3. Engineering geology by Subinoy Gangopadhyay: Oxford University Press, 1st edition, 2015.
4. Engineering Geology and Geo techniques by Krynine and Judd, Mc Graw – Hill Book Company, 1st edition.2010.

DEPT. ELECTIVES

B.Tech.

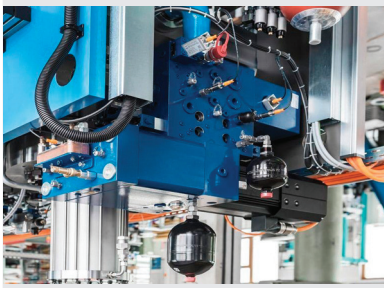
CIVIL ENGINEERING

22CE801	-	Advanced Hydraulics.
22CE802	-	Disaster Management.
22CE803	-	Ground Improvement Techniques.
22CE804	-	Repair & Rehabilitation of Structures.
22CE805	-	Traffic Engineering & Management.
22CE806	-	Bridge Engineering.
22CE807	-	Remote Sensing & Geographical Information System
22CE808	-	Design & Analysis of Algorithms for Civil Engineering.
22CE809	-	Pre-Stressed Concrete.
22CE810	-	Advanced Remote Sensing.
22CE811	-	Finite Element Analysis.
22CE812	-	Advanced Reinforced Concrete Design.
22CE813	-	Construction Planning and Management.
22CE814	-	Earthquake Resistant Design of Structures.
22CE815	-	Seismic Evaluation & Retrofitting of Structures.
22CE816		Sustainable Construction Methods.
22CE817		Engineering Seismology.
22CE818		Environmental Pollution & Control.
22CE819		Advanced Concrete Technology.
22CE820		Ecological Engineering.
22CE821		Structural Dynamics.
22CE822		Railway & Airport Engineering.
22CE823		EIA for Building Technology
22CE824		Soil Dynamics & Machine Foundation.

COURSE CONTENTS

I SEM & II SEM

22CE801 ADVANCED HYDRAULICS



Source Link: https://www.shutterstock.com/search/open-channel

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Fluid Mechanics and Hydraulic Machines.

COURSE DESCRIPTION AND OBJECTIVES:

The main objective of this course is to make the student aware of advanced topic of Advanced Fluid Mechanics. It will give them the wisdom required to choose design open channels of various cross sections. It will help the students to understand and analyse buoyancy and fluid kinematics.

MODULE - 1

UNIT-I **8L+4T+0P = 12 Hours**

OPEN CHANNEL HYDRAULICS

Introduction, Classification of flows, Types of channels, Chezy, Manning's, Bazin, Kutter's Equations, Hydraulically efficient channel sections, Rectangular, Trapezoidal and circular channels, Velocity distribution, Energy and
momentum correction factors, Pressure distribution. GRADUALLY VARIED FLOW: Dynamic equation, Surface Profiles.

UNIT- 2 **8L+12T+0P = 20 Hours**

ANALYSIS OF OPEN CAHNNEELS

Rapidly Varied Flow: Hydraulic jump, Expression to find Hydraulic Jump. Stream Gauging: Necessity, Selection of gauging sites, Methods of discharge measurement, Area-Velocity method, Measurement of velocity – Floats, Surface floats, Sub–surface float or Double float, Twin float, Velocity rod or Rod float, Pitot tube, Current meter, Measurement of area of flow.

PRACTICES:

- To design most economical channel sections
- Draw surface profiles of open channel for various operation conditions.
- To find the depth of hydraulic jump .
- Calculate the stream velocity by method of mid sections.
- Use current meter to calculate stream velocity

MODULE - 2

UNIT- 1 **10L+2T+0P = 12 Hours**

BUYONCY AND FLUID KINEMATICS

Buoyancy: Conditions of equilibrium for floating bodies, Archimedes' Principle, Meta- centre and meta-centric height, Experimental and analytical determination of meta-centric height.

Fluid Kinematics: Types of Flows, Steady and unsteady flows, Uniform and non-uniform flows, Stream lines, path lines, Stream tubes, Principles of conservation of mass.

UNIT 2: **8L+12T+0P = 20 Hours**

APPLICATION OF MOMENTUM PRINCIPLES

Equation of continuity, Acceleration of fluid particles, local and convective, Rotational and irrotational

SKILLS:

- ✓ *Study different flow conditions in open channels.*
- ✓ *Analyse critical and sub-critical flow in open channel.*
- ✓ *Analyse gradually and rapidly varied flow in open channel.*
- ✓ *Study various stable conditions of Buoyancy and floatation.*
- ✓ *Determine metacentric height of a floating body*

motions, Free and forced vortex, Velocity potential and stream function, Flow net.

Momentum Equation and Its Application: Development of momentum equation by control volume concept, Momentum correction factor, Applications, Forces on pipe bend.

PRACTICES:

- Prove the Archimedes principle.
- Determine the stability of floating bodies.
- Find out metacentric height.
- Find velocity and stream potential functions.
- Determine forces on pipe bends by using momentum principles.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Design most economical channel sections.	Apply	1	2, 12
2	Calculate the meta centric height of the floating bodies.	Apply	1, 2	1, 2, 12
3	To design the open channels by using Chezy's formulae and to determine the discharge at a gauging site.	Analyse	1, 2	1,2, 5, 12
4	Perform analyse the meta centric height by analytically or experimentally.	Creating	1, 2	2, 5, 12

TEXT BOOKS:

1. F M White, Fluid Mechanics, Tata McGraw Hill Publication 2017.
2. Subramnaya, K., Flow in Open Channel, Tata McGraw Hill Publications, New Delhi, 2019.

REFERENCE BOOKS:

1. P. N. Modi and S. N. Seth, —Hydraulics and Fluid Mechanics‖, 20th edition, Standard book house, New Delhi, 2019 (22nd Edition).
2. R. K. Bansal, —Fluid Mechanics and Hydraulic Machines‖, 9th edition, Laxmi Publications, New Delhi, 2015.
3. Chow V.T. Open Channel Hydraulics, Blackburn Press, 2009
4. Streeter V.L., Benjamin Wylie, Fluid Mechanics, McGraw Hill Book Co., New Delhi, 1999.

22CE802 DISASTER MANAGEMENT

Source Link: https://www.rivernetwork.org/river-water-conservation-organizations-role-disaster-management/

Hours Per Week :

L	T	P	C
2	2	-	3

PREREQUISITE KNOWLEDGE: Environmental Studies and Environmental Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

This course is intended to provide fundamental understanding of different aspects of Disaster Management. It will expose the students to the concept and functions of Disaster Management and to build competencies of Disaster Management professionals and development practitioners for effective supporting environment as put by the government in legislative manner. It would also provide basic knowledge, skills pertaining to Planning, Organizing and Decision making process for Disaster Risk Reduction.

MODULE - 1

UNIT -1 **10L+ 2T +0P =12 Hours**

DISASTERS : Introduction and Concept of disasters and hazards related to Tsunami, Volcanic eruption, Cyclones, Floods, Drought, Forest fires, Avalanches and Pest infestation.

LANDSLIDE: Introduction, causes, prevention and correction. EARTHQUAKE: Introduction, Intensityand magnitude of earthquakes;

FLOODS: Causes, nature and of frequency flooding.

UNIT -2 **8L+12T+ 0P =20 Hours**

MITIGATION METHODS

Prediction and perception of hazards and adjustments to hazardous activities; Landslide hazard mitigation; Geographic distribution of earthquake zones; seismic waves, travel-time and location of epicentre; Protection from earthquake hazards; nature and extent of flood hazard; urban floods, environmental effects of flooding; flood mitigation methods.

PRACTICES

- Prediction and mitigation of various hazards.
- Mitigation of Landslide hazard.
- Study of geographic distribution of seismic zones.
- Precautionary measures in seismic areas.
- Mitigation of floods.

MODULE - 2

UNIT -1 **10L+ 2T +0P =12 Hours**

CYCLONES AND DROUGHT

Tropical cyclone- formation and consequences. Coastal erosion; sea level changes and its impact on coastal areas. Nature of drought and effect on plant and animal systems; Study of pattern of forest fires; Disaster management: Capability- Vulnerability; Disaster management Act and Policy.

SKILLS:

- ✓ *Able to reduce disaster Risk.*
- ✓ *Able to plan for prevention, mitigation the impact of hazards.*
- ✓ *Assess the impact of upcoming projects.*
- ✓ *Able to understand hazard and vulnerability profile of India.*

UNIT -2 **8L+12T+ 0P =20 Hours**

DISASTER MANAGEMENT

Mitigation of forest fires; Geological and environmental investigations for the construction of dams, bridges, highways and tunnels; Risk- preparedness and mitigation- Disaster management cycle; Disaster Management case studies.

PRACTICES:

- Precautionary measures during/after cyclones.
- Mitigation of Coastal erosion.
- Mitigation of forestfires.
- Geological and environmental investigations for the construction of dams, bridges, highways and tunnels.
- Disaster Management case studies.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Make use of the basic concepts of disaster and hazard.	Apply	1	1,2
2	Analyze preventive measures and mitigation of land slide, earthquake and floods.	Analyze	1	1,2
3	Analyze preventive measures and mitigation of cyclones, drought.	Analyze	2	1,2
4	Design to reduce risk factors of disaster.	Create	2	1,2,5,12

TEXT BOOKS:

1. K. Smith, and N.P. David, - Environmental Hazards‖ Routledge, London, 5th edition, 2009.
2. F.G. Bell, —Geological Hazards‖ Routledge, London,1999.

REFERENCE BOOKS:

1. E. Bryant, —Natural Hazards‖, Cambridge University Press, London, 1985.
2. D.S. Krynine, and W.R. Judd, —Principles of Engineering Geology‖, CBS, New Delhi, 1998.

22CE803 GROUND IMPROVEMENT TECHNIQUES

Source Link: https://theconstructor.org/geotechnical/ground-improvement-techniques-soil-stabilization/1836/

Hours Per Week :

L	T	P	C
2	2	-	3

PREREQUISITE KNOWLEDGE: Geotechnical Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

This course gives an overview of engineering properties of soil and the problems associated with weak soils/deposit. It helps the student to understand the need for ground improvement and various soil stabilization techniques. This course familiarizes a student in recent ground improvement techniques with respect to soil reinforcement techniques and geo-synthetics.

MODULE - 1

UNIT-I **8L+4T+0P = 12 Hours**

GROUND IMPROVEMENT IN COHESIONLESS AND COHESIVE SOIL

Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement. Shallow and deep compaction requirements, Principles and methods of soil compaction, Shallow compaction and methods. Properties of compacted soil and compaction control, Deep compaction and Vibratory methods dynamic compaction.

UNIT- 2 **8L+12T+0P = 20 Hours**

APPLICATION IN INSITU FIELD

Drainage and Dewatering-Drainage techniques - Well points - Vacuum and electro osmotic methods. Preloading with and without vertical drains. Compressibility, vertical and radial consolidation, preloading methods. Types of Drains, Design of vertical Drains, Construction techniques. Stone Column: Function Design principles, load carrying capacity, construction techniques, settlement of stone column foundation.

PRACTICES:

- Performa the laboratory compaction test by Modified proctor test.
- Field procedure for constructing compacted fill.
- Moisture content and In-situ measurements.
- Mention the seepage control measures.
- Explain methods of dewatering systems.

MODULE - 2

UNIT-I **8L+4T+0P = 12 Hours**

REINFORCED EARTH AND GEOTEXTILES

Principles, components of reinforced earth, governing design of reinforced earth walls, design principles of reinforced earth walls. Geotextiles-Introduction, types of Geotextiles, functions and their applications, tests for Geotextiles, Geogrids and their functions. In situ soil treatment methods -Soil nailing, rock anchoring, micro-piles, construction techniques.

UNIT-2 **8L+12T+0P = 20 Hours**

APPLICATION IN CHEMICAL STABILIZATION

Cement Stabilization-Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization-Type o f

SKILLS:

- ✓ *Diagnose problems associated with problematic soils.*
- ✓ *Suggest a suitable ground improvement technique based on soil conditions.*
- ✓ *Design stone columns and reinforced earth walls.*
- ✓ *Design mix for various cement, lime and bitumen stabilization techniques.*
- ✓ *Analysis the behavior of geo synthetics, geo membranes.*

admixtures, mechanism, factors affecting, design of mixtures, construction Methods-Grouting Techniques-Types of grouts –Grouting equipment and Machinery-Injection methods – Grout monitoring–Stabilization with cement, lime and chemicals -Stabilization of expansive soils.

PRACTICES:

- Requirements of soil stabilization viz. Mechanical Stabilization and Proportioning.
- Chemical stabilization by using various additives.
- Types of geo synthetics and raw materials used.
- Properties of Geo synthetics.
- Common types of Geo membranes and its applications.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the engineering properties of soil and problems associated with weak deposit.	Apply	1	1, 2, 12
2	Apply the principles of soil reinforcement and confinement in engineering.	Apply	1, 2	2, 12
3	Design and assess the degree of Improvement	Analyze	1, 2	1, 5, 12
4	Design reinforced soil structures.	Create	1, 2	2, 12

TEXT BOOKS:

1. Craig, R.F., —Soil Mechanics‖, 3rd ed., Van Nostrant Reinhold Co.,New York, 2018.
2. Koerner R.M., —Construction and Geotechnical Methodsin Foundation Engineering‖, 3rded., McGraw Hill, 2020.

REFERENCE BOOKS:

1. MoseleyM.P., —Ground Improvement Block I.e. Academic and Professional‖, 2nd ed., Chapman and Hall, Glasgow, 2020.
2. Purushothama Raj. P, —Ground Improvement Techniques‖, 2nd ed., Laxmi Publications (p) Ltd., New Delhi, 2015.
3. Jones J.E.P., —Earth Reinforcement and Soil Structure‖, 3rd ed., Butterworths, 2015.

22CE804 REPAIR AND REHABILITATION OF STRUCTURES

Source Link: https://nptel.ac.in/courses/105/106/105106202/

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Strength of Materials, Concrete Technology.

COURSE DESCRIPTION AND OBJECTIVES:

The course seeks to recognize the mechanisms of degradation of concrete structures, provide the students with the knowledge of available techniques and their application for strengthening or upgrading existing structural systems. It also provides how to conduct field monitoring and non-destructive evaluation of concrete structures.

MODULE - 1

UNIT-1 **8L+4T+0P = 12 Hours**

INTRODUCTION TO DETERIORATION OF STRUCTURES

Deterioration of structures with aging; Need for rehabilitation. Effects due to climate, temperature, chemicals, wear and erosion, design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, Method of corrosion production., corrosion inhibitors, corrosion resistant steels, coatings, cathodic production Distress in concrete /steel structures Types of damages; Sources or causes for damages; effects of damages; Case studies.

UNIT-2 **8L+12T+0P = 20 Hours**

DIAGNOSIS AND ASSESMENT OF DISTRESS

Visual inspection – Non-destructive tests – ultrasonic pulse velocity method – rebound hammer technique – ASTM classifications – pullout tests – Bremor test – Windsor probe test – crack detection techniques.

An overview of Structural Health Monitoring, Structural Health Monitoring and Smart Materials, Structural Health Monitoring versus Non-Destructive Testing, A broad overview of smart materials, Overview of Application potential of SHM. Case studies – buildings - heritage buildings - high rise buildings - water tanks – bridges and other structures.

PRACTICES:

- Concept of Structural Health Monitoring.
- Applying NDT methods on structure in distress.
- Presenting a case study on deteriorated structure reporting the cause for distress.
- Survey on the Structural health of concrete structures.

MODULE - 2

UNIT-1 **8L+4T+0P = 12 Hours**

MATERIALS, METHODS OF REPAIR AND REPAIR STRATEGIES

Maintenance, Repair, Rehabilitation, Facets of Maintenance, Preventive measures on various aspects, Selection of repair materials for concrete, Essential parameters for repair materials - Strength and durability aspects, cost and suitability aspects. Materials for repair - Special concrete and mortar, concrete chemicals, Ferro cement, fibre reinforced concrete, Premixed cement concrete and mortars, polymer modified mortars and concrete. Shotcreting, Grouting, Jacketing, Epoxy cement mortar injection, crack ceiling.

SKILLS:

- ✓ *Assess strength and material deficiency in concrete structures.*
- ✓ *Suggest methods and techniques used in repairing / strengthening.*
- ✓ *Apply Non-Destructive testing techniques to field problems.*
- ✓ *Estimate appropriate retrofitting strategies to seismic strengthening.*

UNIT-2 **10L+10T+0P = 20 Hours**

SEISMIC RETROFITTING

Considerations in retrofitting of structures, sources of weakness in RC frame building – structural damage due to the discontinuous load path, structural damage due to lack of deformation, quality of workmanship and materials. Classification of retrofitting techniques –Retrofitting strategies for RC buildings, Structural level (Global) retrofit methods, Member level (Local) retrofit methods, comparative analysis of methods of retrofitting.

PRACTICES:

- Suggesting repair strategy for Real time structural problem.
- Comparison through demonstrative model for efficient retrofitting strategy.
- Report on structure failed due to seismic loading and suggesting alternative strategies
- Estimate the strength enhancement through retrofitting.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply Non Destructive technique .	Apply	1,2	1, 2
2	Apply the concepts of retrofitting for Seismic strengthening.	Apply	2	1, 2,12
3	Analyze the maintenance failures and suggest appropriate repair strategy.	Analyze	2	1, 2
4	Asses the cause for deterioration of structure.	Evaluate	1	1,2

TEXT BOOKS:

1. Concrete Structures-Repair, Rehabilitation and Retrofitting, B.Bhattacharjee, CRS Publishers and Distributors, 2017.
2. Concrete Structures-Protection, Repair and Rehabilitation, R.Dodge Woodson, Elsevier, 2009.

REFERENCE BOOKS:

1. Shen-En Chen, R. Janardhanam, C. Natarajan, Ryan Schmidt, Ino-U.S. Forensic Practices - Investigation Techniques and Technology, ASCE, U.S.A., 2010
2. Santhakumar A.R., ―Concrete Technology‖ Oxford University Press, New Delhi, 2007.
3. Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrikhande, Prentice – Hall of India, 2006.

22CE805 TRAFFIC ENGINEERING AND MANAGEMENT

Source Link: https://leverageedu.com/blog/traffic-engineering/

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Transportation Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to understand the importance of traffic management and to give an overview of traffic Engineering, Traffic regulations, Traffic Management and Traffic Safety with integrated approach in Traffic Planning.

MODULE - 1

UNIT-1 **8L+4T+0P = 12 Hours**

TRAFFIC MANAGEMENT AND CHARACTERISTICS

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.

UNIT-2 **8L+12T+0P = 20 Hours**

TRAFFIC SURVEYS

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including no motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.

PRACTICES:

- Concept of Traffic characteristics and management.
- Traffic surveys.
- Analysis of Survey methods.
- Comparative study on various survey methods.
- Statistical applications in traffic studies and traffic forecasting.

MODULE - 2

UNIT-1 **8L+4T+0P = 12 Hours**

DESIGN FOR TRAFFIC MANAGEMENT

Intersection Design – channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation – Traffic signs including VMS and road markings – Significant roles of traffic control personnel – Networking pedestrian facilities & cycle tracks.

UNIT-2 **8L+12T+0P = 20 Hours**

TRAFFIC SAFETY AND MANAGEMENT

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public

SKILLS:

- ✓ *Applies concepts of Traffic Engineering and Management in societal problems.*
- ✓ *Analyses the traffic problems.*
- ✓ *Provides solutions for traffic issues.*
- ✓ *Design the Traffic signals, intersections and channels.*

transportation – Promotion of non-motorized transport. Area Traffic Management System – Traffic System Management (TSM) with IRC standards –- Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

PRACTICES:

- Concept of Traffic Management and safety.
- Analysis on Road accidents.
- Analysis of Traffic System Management with IRC methods.
- Methods for travel demand management. (TDM).
- Intelligent Traffic Systems for Traffic Management.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Build the concepts of Traffic Engineering and Management.	Apply	1	1, 2
2	Analyse the Traffic Problems and plan for traffic systems	Analyse	1	1, 2
3	Design Traffic Signals, intersections, Channels and Parking arrangements.	Create	2	1, 2
4	Develop Traffic Management system.	Create	2	1, 2, 5, 12

TEXT BOOKS:

1. Kadiyali.L.R. —TrafficEngineering andTransportPlanning‖, KhannaPublishers, Delhi, 2013.
2. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engi neering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011

REFERENCE BOOKS:

1. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management
2. SP:43-1994, IRC Specification, —Guidelines on Low-cost Traffic Management Techniques‖ for Urban Areas, 1994.
3. Garber and Hoel, —Principles of Traffic and Highway Engineering‖, CENGAGE Learning, New Delhi, 2010.

22CE806 BRIDGE ENGINEERING

Source Link: https://www.aboutcivil.org/Materials%20used%20in%20bridges.html

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Design of Reinforced Concrete Structures & Design of Steel Structures.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to understand the various types of bridges, codal provisions for loading and design standards of bridges, design the superstructure of bridge using different methods and loading conditions and to understand the design of bearings.

MODULE - 1

UNIT -1 **8L+4T+0P = 12 Hours**

BRIDGE ENGINEERING

Introduction - Classification – Investigation for bridges - Economic span length- Loading standards – IRC and Railway loads – Impact.

UNIT-2 **8L+12T+0P = 20 Hours**

BRIDGE SUB & SUPER STRUCTURE

Evaluation of sub structures – Pier and abutments caps – Design of pier– Abutments – Type of foundations. Super Structure: Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- box culvert.

PRACTICES:

- IRC loadings & standards.
- Design of pier.
- Types of foundation for bridges.
- Design of super structure.
- Case study on design of bridge.

MODULE - 2

UNIT -1 **8L+4T+0P = 12 Hours**

DESIGN OF T-BEAM BRIDGE

Design of T beam bridge- Pigeaud‘s method- design of longitudinal girders- Guyon- Messonet method- Hendry Jaegar method- Courbon‘s theory. (Ref: IRC-21).

UNIT 2: **8L+12T+0P = 20 Hours**

DESIGN OF PRESTRESSED CONCRETE

Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges – Electrometric bearing – Joints – Expansion joints. Understand the complexities in design of bridges.

PRACTICES:

- Pigeaud‘s Method for design of T-Beam bridge.
- Design of longitudinal girders.

SKILLS:

- ✓ *Identify the type of bridge suitable for different soil and environmental conditions.*
- ✓ *Design the bridge under primary and secondary loading conditions.*
- ✓ *Determination of suitability of bridge to the site condition.*

- Study on IRC 21.
- Bearings for bridges.
- Case study on complexities in bridge design.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the codal provisions and concept in the design of bridges.	Apply	1, 2	1, 2, 6
2	Identify the suitability of bearings for bridges.	Apply	2	1, 2
3	Analysis of sub and superstructure of bridge.	Analyzing	1	1, 2, 4
4	Design of T-Beam bridge and Prestressed Concrete members.	Creating	2	1, 2, 6

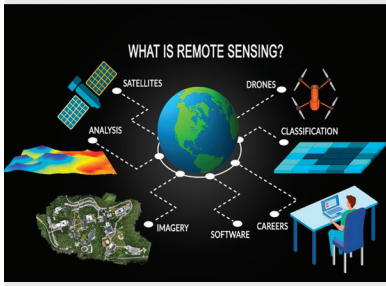
TEXT BOOKS:

1. Jagadeesh T. R., Jayaram M. A, Design of bridge structures, PHI learning, 3rd edition, 2021.
2. S. Ponnuswamy, ―Bridge Engineering‖, Tata Mc Graw - Hill Publishing Company Limited, New Delhi, 3rd edition, 2017.

REFERENCE BOOKS:

1. ―Structural design manual‖, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., ―Knowledge based process planning for construction and manufacturing‖, Academic Press Inc., 1994.
3. Indian Road Congress IRC: 21 – 2000.

22CE807 REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM



Source link: https://www.kpstructures.in/2021/05/remote-sensing-gis-and-its-applications.html

Hours Per Week :

L	T	P	C
2	-	2	3

PRE-REQUISITE KNOWLEDGE: Surveying

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an introduction to Geographic Information Systems - a set of hardware, software, and methods for the capture, storage, management, manipulation, analysis, modelling, and display of geographic information, used to solve complex spatial planning problems. Specific GIS methods are covered for use in a variety of applications areas and disciplines, including cartography, demographics, site selection, marketing analysis ,transportation studies, land use applications, spatial statistics, and environmental applications. Industry standard GIS software tools are used to apply these methods.

MODULE - 1

UNIT-1 **12L+0T+0P = 12 Hours**

Remote sensing basic definition and process, Passive and active remote sensing. Electromagnetic Spectrum, Resolution, Characteristics of Various sensors and satellites, Fundamentals of Image Processing. Map as a model, Spatial elements and terminology, Map scale, Spatial referencing system, Computers in map production, General software‘s in map production.

UNIT-2 **4L+0T+16P=20 Hours**

Types of data products; Image interpretation strategy, Levels of interpretation keys; Topography, Types of Drainage Pattern and Texture, Erosion, ; Basic elements of image interpretation. Overview on visual image interpretation equipment.

PRACTICES:

- Study of toposheet and base map preparation.
- Preparation of Road network map from toposheet and satellite image.
- Preparation of Drainage map from toposheet and satellite image.
- Preparation of Watershed map from toposheet and satellite image.
- Preparation of slope map from toposheet and satellite image.

MODULE - 2

UNIT-1 **12L+0T+0P = 12 Hours**

A brief history of GIS, GIS architecture, Components of a GIS, GIS workflow, Theoretical models of GIS: Functional elements, Fundamental operations, Theoretical framework, GIS categories, Levels/scales of measurement. The data stream, Data input methods: Keyboard entry, Manual digitizing, Scanning and automatic digitizing. Stages of GIS data modeling; Raster and Vector data representation, Spatial data models; Data editing, Detecting and correcting errors, Data reduction and generalization Edge matching and Rubber sheeting, Components of data quality,Sources of error in GIS.

UNIT-2 **4L+0T+16P=20 Hours**

Land use /Land cover studies, slope mapping, preparation of structures map, Ground water prospects mapping, Watershed management and Action plan, Water quality modeling, Salt Water intrusion models, pipeline alignment studies, Solid and hazardous waste disposal site selection, Landslides mapping, Urban planning and Management, GPS applications.

SKILLS:

- ✓ *Image Interpretation technique.*
- ✓ *Identify the outcome from aerial photographs.*
- ✓ *Identify the differences between roads and water bodies from satellite images.*
- ✓ *Develop different Application using images.*
- ✓ *Develop various Information systems using GIS software.*

PRACTICES:

- Preparation of Landuse/Land cover map from toposheet and satellite image.
- Preparation of Geomorphology map from toposheet and satellite image.
- Scanning and digitization of maps using Autocad,Autocad Map, Microstation and other digitizing software.
- Demonstration of GIS software and its applications – ARC/INFO, Arc View, SPANS etc.,
- Data editing, manipulation and analysis using ARC/INFO GIS software or open source GIS.
- Map Composition and Output Generation using Arc View GIS software or open source GIS.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the data quality of GIS and apply different applications of remote Sensing and	Apply	2	1, 2, 5, 12
2	Analyze basic concepts of remote sensing and maps.	Analyze	1	5, 6, 10
3	Examine the elements of image interepretation.	Analyze	1,2	1, 2, 12
4	Assess the basic components and data type of GIS.	Evaluating	1,2	1, 12

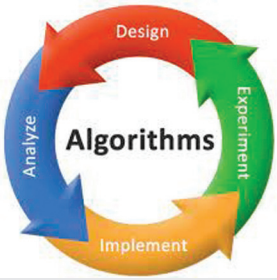
TEXT BOOKS:

1 Remote Sensing and Image Interpretation- by Lillesand, Kiefer and Chipman, Published by John Wiley and Sons, Inc, New York, 5th Edition, 2007.
2. Text book of Remote sensing and GIS by M. Anji Reddy, BS Publications, Hyderabad, 3rd Edition, 2020.

REFERENCE BOOKS:

1. Geoinformatics for Environmental managementll by M. Anji Reddy, B.S Publications, Hyderabad.
3. Remote Sensing and GIS- by B. Bhatia Published by Oxford University Press, 2019.

22CE808 DESIGN AND ANALYSIS OF ALGORITHMS FOR CIVIL ENGINEERING



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Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Programming in C.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides a basic understanding and application of programming and algorithms to solve problems in Structural, Water Resource, Environmental and Geotechnical aspects of Civil Engineering.

MODULE - 1

UNIT-1 **08L+0T+0P = 08 Hours**

ALGORITHMS AND PROGRAMMING IN PYTHON

Python: Introduction to Python, downloading and installation of python, Assignments, lists, functions, loops, arrays, numpy, pandas, matplot lib.

Algorithms: Algorithms, types, searching and sorting, Flowchart and Algorithms to mathematical Problems, greedy algorithms. (Djikshtra)

UNIT- 2 **08L+16T+0P = 24 Hours**

STRUCTURAL COMPUTATION

Computation of Shear force and Bending Moment Diagrams, calculating sectional properties of steel beam, Deflection, slopes of beam and basic concrete design.

PRACTICES:

- Calculate shear force and bending moment.
- Function to calculate deflection of beam.
- Sectional Properties of steel beam.
- Design of concrete beam.

MODULE - 2

UNIT-1 **08L+0T+0P = 08 Hours**

HYDROLOGICAL AND ENVIRONMENTAL APPLICATION

Rainfall, Water Vapour, Precipitation, Evaporation, Evapotranspiration Unit Hydrograph, Muskingham Routing Method Design of sewage treatment plant, calculation of chlorine dosage and calculation of water requirement for city.

UNIT 2: **08L+16T+0P = 24 Hours**

TRANSPORTATION AND GEOTECHNICAL ENGINEERING APPLICATIONS

Determination of points for setting out of a curve; Plot the Soil Gradation Curve; Determination of Bearing Capacity; Determination of Index Properties and Engineering Properties of soil. Determination of capacity and demand of a rotary junction; Calculation of SSD, OSD.

SKILLS:

- ✓ *Gaining the knowledge of algorithms used for different applications.*
- ✓ *Application of basic python programming skills for structural analysis.*
- ✓ *Discerning the different algorithms used for Network analysis.*
- ✓ *Identify suitable algorithm for water quality analysis.*

PRACTICES:

- Generating unit hydrograph by programming.
- Design of Sewage Treatment Plant using programming.
- Plotting gradation curve.
- Design of concrete beam.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understanding the basics of Algorithms, types of algorithms and analysis of algorithms.	Apply	1	1,4
2	Computing a simple algorithm for structures.	Create	2	2, 3, 5, 6, 7, 8, 9, 10, 11, 12
3	Computing an algorithm for water resource and Environment applications.	Create	1	1,4,6,7
4	Computing an simple algorithm for Transportation and Geotechnical Engineering applications.	Create	2	2, 3, 5, 8, 9, 10, 11, 12

TEXTBOOKS:

1. Anany Levitin, — Introduction to Design and analysis of algorithms‖, Pearson, 3rd edition, 2018.
2. Alfred V. Aho, John E. Hopcroft, — The Design and analysis of computer algorithms‖, 3rd edition, Pearson 2017.

REFERENCE BOOKS:

1. Thomas H. Cormen, —Introduction to Algorithms‖, 4th edition, MIT Press 2022.

22CE809 PRESTRESSED CONCRETE

Source Link: https://www.designingbuildings.co.uk/wiki/Prestressed_concrete

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Design of Reinforced Concrete Structures.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to develop an advanced understanding of the behaviour, analysis and design of pre-stressed concrete members and connections. By the end of the course, students should be able to calculate pre-stress losses and design a post-tensioned continuous beam for transfer, serviceability and strength.

MODULE - 1

UNIT-1 **8L+4T+0P = 12 Hours**

FUNDAMENTAL OF PRESTRESSED CONCRETE & LOSSES IN PRESTRESSING SYSTEM

Basic concepts of pre-stressing; Historical development; Advantages and Types of Prestressing, Pre-tensioning Systems and Devices, Post-tensioning Systems and Devices, Need for High strength steel and High strength concrete; Losses of Prestress: Nature of losses of pre-stress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.

UNIT-2 **8L+12T+0P = 20 Hours**

ANALYSIS OF PRESTRESSED CONCRETE

Analysis of Members under Axial Load: Analysis at Transfer, Analysis at Service, Analysis for Ultimate Strength, Analysis of Member under Flexure:, Cracking Moment, Kern Point, Pressure Line, Analysis for Ultimate Strength, design loads and strength, Calculation of Crack Width, Variation of Stress in Steel, Analysis of a Rectangular Section, Analysis of a Flanged Section.

PRACTICES:

- Concept of Prestressed Concrete & its systems.
- Losses of prestress.
- Analysis of Prestressed Concrete (PSC) at different stages.
- Stress variations in steel.
- Analysis of PSC Flange members.

MODULE - 2

UNIT- 1 **10L+2T+0P = 12 Hours**

DEFLECTION, SHEAR & TORSION OF PRESTRESSED CONCRETE MEMBERS

Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members. Long term deflection of cracked member; Transmission of Pre-Stress: Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre –tensioned and post –tensioned grouted beams, stress distribution in end block, Anchorage zone reinforcements. Shear And Torsion Resistance of Prestressed Concrete Member Shear and Principal Stresses; Design of shear reinforcement, pre-stressed concrete members in torsion, Design of reinforcements for torsion, shear and bending.

SKILLS:

- ✓ *The prestressing steel material properties.*
- ✓ *Analysis of prestressing, and practical performance.*
- ✓ *Design of prestressed concrete structures in the service and ultimate limit states.*
- ✓ *General performance of concrete element structures.*

UNIT-2 **8L+12T+0P = 20 Hours**

DESIGN OF PRESTRESSED CONCRETE

Design of sections for flexure, Design of Sections for Axial Tension, Design of Sections for compression and bending, design of pre-stressed section for shear and torsion. Dimensioning of flexural member, design for pre-tensioning member, and design of post-tensioning members.

PRACTICES:

- Deflection of PSC members.
- Stress transmission & End zone reinforcement in PSC members
- Flexure, Shear & Torsion of PSC members.
- Design of PSC members under axial, Compression & Bending.
- Design of PSC members i.e., Pre-tensioned & Post-tensioned.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Make use of the basic concepts of prestressed concrete.	Apply	1	1, 2
2	Analyze the prestressed concrete members.	Analyze	1	1, 2
3	Determine the deflection, shear & torsion for pre-stressed concrete structures.	Evaluating	2	1, 2
4	Design of prestressed concrete members.	Creating	2	1, 2, 5, 12

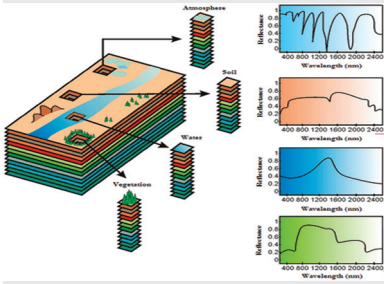
TEXT BOOKS:

1. Krishna Raju. N, —Prestressed Concrete‖, Tata Mc Graw - Hill Publishing Company Limited, New Delhi, 6th edition, 2018.
2. Dr. Y.R.M. Rao, J.P. Annie & P. Easwary, —Prestressed concrete Analysis and Design‖
3. S.K. Kataria & Sons, 1st edition, 2017.

REFERENCE BOOKS:

1. Rajagopalan. N, —Prestressed concrete‖, Narosa Publishing House, 2nd edition, 2005.
2. Nilson. A, —Design of Prestressed Concrete‖, John Willey & Sons, 2nd edition, 1987.
3. IS 1343:2012, Prestressed Concrete code book.

22CE810 ADVANCE REMOTE SENSING



Source Link: https://www.researchgate.net/profile/Javier-Plaza- 2/publication/223133738/figure/fig9/AS:669581953732609@1536652186019/The-concept-of-hyperspectral-imaging-illustrated-using-NASAs-AVIRIS-sensor.ppm

Hours Per Week :

L	T	P	C
2	-	2	3

PRE-REQUISITE KNOWLEDGE: Remote Sensing

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with observing and monitoring the earth surface features in narrow bands and microwave bands of electromagnetic spectrum. Interpreting, analysing these data for better management of Earth resources.

MODULE – 1

UNIT -1 **8L+0T+0P = 08 Hours**

HYPER SPECTRAL REMOTE SENSING

Electromagnetic Spectrum, Multi vs Hyper Spectrum, Spectral Signature, Hyper spectral Sensors: Hysis, PRISMA, ENMAP, HYPERION, HISUI, PROBA, EO.

UNIT-2 **8L+16T+0P = 24 Hours**

APPLICATIONS

Data Acquisition, Data Pre-processing, End Member Selection, Spectral Mixture Analysis, Classification, Agriculture, Urban, Water, Geological Applicactions.

PRACTISES:

- Basic editing, manipulation of hyper spectral data.
- Radiometric calibration.
- Atmospheric correction.
- Band Ratios and Band Math.
- Unsupervised and Supervised Classification.

MODULE - 2

UNIT-1 **8L+0T+0P = 08 Hours**

MICRO WAVE REMOTE SENSING

Basics of Radar, Image Acquisition, Synthetic Aperture Systems, Characteristics of Radar Sensors.

UNIT-2 **8L+16T+0P = 24 Hours**

APPLICATIONS

Data Acquisition, Data processing, Interferometry, Polari metric, Agriculture, Urban, Water, Geological Applications.

PRACTICES:

- Application of Orbit File.
- Debursting of SAR data.
- Multi looking of satellite Images.
- Speckle Filtering.
- Image Focusing using Python.

SKILLS:

- ✓ *Getting to know sources of hyper spectral data.*
- ✓ *Prepro-cessing of hyperspectral data.*
- ✓ *Getting to know sources of radar data.*
- ✓ *Preproccess-ing of radar data.*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the Hyper spectral data of different sensors.	Apply	1	1,2,3,4
2	Analyze the characteristics of Microwave data.	Analyze	2	1,2,3,4
3	Build the data for Geology, water, urban and Agri-culture resource management.	Create	2	4,5,6,7,9,12
4	Design the Hyper spectral Data.	Create	1	4,5,6,7,9,12

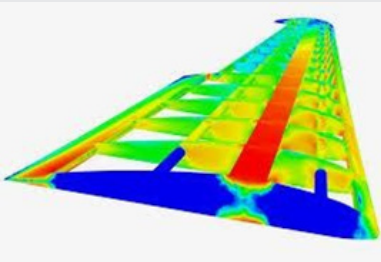
TEXT BOOKS:

1. LilleSand , — Remote Sensing and Image Interpretation‖, 7th edition, Wiley Publishing, 2015.
2. Richards J. A —Remote Sensing Digital Image Analysis‖, 5th edition, Springer Publication, 2013

REFERENCE BOOKS:

1. Jhon R Jensen —Introductory Remote Sensing‖ 4th edition, Wiley Publishing, 2017.
2. Campbel J, —Introduction to Remote Sensing‖ 5th edition, Guileford Press, 2011.

22CE811 FINITE ELEMENT ANALYSIS



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Hours Per Week :

L	T	P	C
2	-	2	3

PRE-REQUISITE KNOWLEDGE: Advance Structural Analysis.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understanding and application of taking measurements on earth surface using conventional and nonconventional methods. The objective of this course is to provide basic knowledge about taking measurements on earth surface using different methods instruments like chain, tape, auto level, theodolite, total station, GPS.

MODULE - 1

UNIT -1 **08L+0T+0P = 08Hours**

METHODS AND GOVERNING EQUATIONS

Historical Background – Mathematical Modeling of field problems in Engineering – Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems– Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

UNIT -2 **08L+0T+16P = 24 Hours**

ONE DIMENSIONAL PROBLEMS

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors- Assembly of Matrices – Solution of problems from solid mechanics and heat transfer. Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation – Transverse deflections and Natural frequencies of beam.

PRACTICES:

- Analysis of Beams with UDL Loads and different boundary conditions.
- Analysis of Beams with multiple loads.
- Analysis of 2D Trusses.
- Non Linear analysis of cantilever beams.
- Analysis of plate with/ without central hole.

MODULE - 2

UNIT-1 **08L+0T+0P = 08 Hours**

TWO DIMENSIONAL PROBLEMS

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors- Assembly of Matrices – Solution of problems from solid mechanics and heat transfer. Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation –Transverse deflections and Natural frequencies of beams.

UNIT-2 **08L+0T+16P = 24 Hours**

ISOPARAMETRIC FORMULATION

Natural co-ordinate systems – Isoparametric elements – Shape functions for iso parametric elements – One and two dimensions – Serendipity elements – Numerical integration and application to plane stress

SKILLS:

- ✓ *Ability to identify different types of structure and their indeterminacy.*
- ✓ *Proficiency in computing unknown reactions at supports.*
- ✓ *Capable of apply different methods to structures.*
- ✓ *Mastery of simple programs to compute stresses and deflections.*

problems – Matrix solution techniques – Solutions Techniques to Dynamic problems – Introduction to Analysis Software.

PRACTICES:

- Direct stiffness approach by MATLAB.
- Design of RCC and Steel by programs in Excel.
- Structural Modeling- Analysis for vertical and horizontal loading.
- Plane stresses and Strain problems.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the Finite element analysis to structural elements.	Apply	1	1, 2, 8, 12
2	Use commercial finite element software and understand its structure.	Create	1	1, 2, 3, 4, 5, 8, 9, 10, 11, 12
3	Use finite element method to design engineering components and solve engineering problems.	Create	2	1, 4, 6, 7
4	Perform finite element formulations for simple engineering problems.	Create	2	2, 3, 5, 9, 10, 11, 12

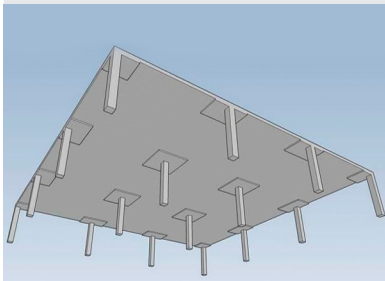
TEXT BOOKS:

1. Reddy. J.N., —An Introduction to the Finite Element Methodǁ, Tata McGraw-Hill, 4th Edition, 2019.
2. Seshu, P, —Text Book of Finite Element Analysisǁ, Prentice-Hall of India Pvt. Ltd., New Delhi, 2013.

REFERENCE BOOKS:

1. Rao, S.S., —The Finite Element Method in Engineeringǁ, 3rd Edition, Butterworth Heinemann, 2004.
2. Logan, D.L., —A first course in Finite Element Methodǁ, Thomson Asia Pvt. Ltd., 5th Edition 2012.

22CE812 ADVANCED REINFORCED CONCRETE STRUCTURES



Source Link: https://www.gettyimages.in/detail/photo/aerial-view-on-construction-building-construction-royalty-free-image/936986712?adppopup=true

Hours Per Week :

L	T	P	C
2	-	2	3

PRE-REQUISITE COURSE: Design of Reinforced Concrete Structures.

COURSE DESCRIPTION AND OBJECTIVES:

To give an exposure to the design of continuous beams, slabs, staircases, walls and brick masonry structures and to introduce yield line theory. Reinforced concrete members are designed according to the existing codes of practice [IS456-2000, SP16(456-1978), and IS875. (Part I to V)

MODULE - 1

UNIT -1 **10L+0T+0P = 10 Hours**

RETAINING WALLS

Design of Cantilever and Counterfort Retaining walls.

UNIT - 2 **6L+0T+16P = 22 Hours**

WATER TANKS RESTING (WORKING STRESS METHOD)

Design of rectangular and circular water tanks both below and above ground level.

PRACTICES (Design by excel sheet and detailing by AutoCAD)

- Design and detailing of
  - Cantilever
  - Counterfort Retaining walls.
- Design and detailing of
  - Rectangular water tanks
  - Circular water tanks

MODULE - 2

UNIT -1 **10L+0T+0P = 10 Hours**

FLAT SLABS

Design of flat slabs – Principles of design of mat foundation, box culvert and road bridges.

UNIT-2 **6L+0T+16P = 22 Hours**

YIELD LINE THEORY

Assumptions - Characteristics of yield line - Determination of collapse load / plastic moment - Application of virtual work method - square, rectangular, circular and triangular slabs - Design problems.

PRACTICES (Design by excel sheet and detailing by AutoCAD):

- Design and detailing of
  - Flat slabs
  - Mat foundation.
- Design and detailing of footings
  - Box culvert
  - Road bridges

SKILLS:

- ✓ *Design of reinforced concrete beam.*
- ✓ *Design of reinforced concrete slab.*
- ✓ *Analysis and design the multi-storey building and Industrial building.*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyses the yield line theory.	Analyze	2	1, 2, 3, 4, 5, 6, 7, 8, 10, 12
2	Design the retaining walls.	Create	1	1, 2, 3, 4, 5, 6, 7, 8, 10, 12
3	Design the water tanks.	Create	1	1, 2, 3, 4, 5, 6, 7, 8, 10, 12
4	Design and detail flat slab and foundations using IS code provisions.	Create	2	1, 2, 3, 4, 5, 6, 7, 8, 10, 12

TEXT BOOKS:

1. Punmia, B.C. Limit State Design of Reinforced Concrete, Laxmi Publications, 2016.
2. Gambhir.M.L., “Design of Reinforced Concrete Structures”, Prentice Hall of India Private Limited, 2012.

REFERENCE BOOKS:

1. Krishnaraju, N. Design of Reinforced Concrete Structures, Fourth Edition, CBS Publishers & Distributors Pvt. Ltd., New Delhi. 2019.
2. Subramanian, N. Design of Reinforced Concrete Structures, Oxford University Press, New Delhi, 2014.
3. Ramachandra, Limit state Design of Concrete Structures, Standard Book House, New Delhi. 2014.
4. Varghese,P.C. Limit State Design of Reinforced Concrete, 2nd Edition, PHI, 2009.
5. Unnikrishna Pillai, S., Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill Education, 2003.
6. IS 456:2000, IS 3370(Part-IV), BIS 2000; SP16 (IS 456-1978)

22CE813 CONSTRUCTION PLANNING AND MANAGEMENT

Source Link: https://www.bdcmagazine.com/files/uploads/2020/08/ttt.jpg

Hours Per Week :

L	T	P	C
2	-	2	3

PRE-REQUISITE KNOWLEDGE: Construction Materials, Resource Management.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with construction processes of building components such as foundation, walls, beams and columns. This course also covers planning of construction and principles of planning. The objective of this course is to provide knowledge of planning and construction of residential, industrial and public buildings.

MODULE - 1

UNIT -1 **10L+2T+0P = 12 Hours**

WALLS, ROOFS AND STAIRCASES

Technical Terms of Walls, Roofs and Staircases, design considerations, dampness, scaffolding, centering.

An Approach to planning, Principles of Planning, Aspect, prospect, Privacy, Roominess, Furniture requirements, Grouping, Circulation, Orientation, Flexibility, Sanitation, Lighting, Ventilation, Elegance and economy, Climatic considerations, Flow diagram and line plan, Space for equipment for air–conditioning, Space for machinery.

UNIT-2 **6L+14T+0P = 20 Hours**

BUILDING RULES, ELEMENTS AND BYELAWS

RULES AND BYELAWS: Zoning regulations, Regulations regarding layouts or subdivisions, Building regulations, Rules for special type of buildings, Calculation of plinth, Floor and carpet area, Floor space index.

BUILDING ELEMENTS: Conventional signs, Guidelines for staircase planning, Guidelines for selecting doors and windows, Terms used in the construction of door and window, Specifications for the drawing of door and window.

PRACTICES:

- Flow diagram and Line Plan.
- Building Bye Laws and Regulations.
- Calculation of Plinth, Floor and Carpet area.
- Guidelines for staircase, doors and windows.
- Specifications for drawing of door and window.

MODULE - 2

UNIT 1: **10L+2T+0P = 12 Hours**

RESIDENTIAL AND PUBLIC BUILDINGS

RESIDENTIAL BUILDINGS: Minimum standards for various parts of buildings, Requirements of different rooms and their grouping, characteristics of various types of residential buildings.

SKILLS:

- ✓ *Finding out different properties of walls, roofs and staircase.*
- ✓ *Application of different building byelaws in construction and planning.*
- ✓ *Draw a basic floor plan and line plan for Residential buildings, hospitals.*
- ✓ *Preparing and assigning a plan, resources for construction of building.*

PUBLIC BUILDINGS: Planning of educational institutions, Hospitals, Dispensaries, Office buildings, Banks, Industrial buildings, Hotels and motels, Buildings for recreation.

UNIT 2: **6L+14T+0P = 20 Hours**

PROJECT PLANNING AND MANAGEMENT

Importance of Project Management, Role of Project manager, Stakeholders in construction project, Different types of projects, similarities & dissimilarities in projects., Knowledge areas & Processes involved in construction projects, WBS of a major work, with examples, Planning, monitoring & executing, Planning, sequencing, scheduling, Bar Charts, Networks, CPM, PERT, Upgrading, Cash flow diagram, resource levelling & resource allocation, Crashing of project, Cost Optimization, Invoicing.

PRACTICES:

- Building Standards and characteristics.
- Planning various types of public buildings.
- Projects and Project Management.
- CPM and PERT.
- Resource allocation and cost optimization.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Describe about technical aspects of walls, roofs and Staircase.	Apply	1	1,4,5,6,7
2	Explain the minimum standards of residential and Public building.	Analyze	2	1,4,5,6,7
3	Explain the principles of planning, building rules and bye–laws.	Create	1	1, 2, 3, 4, 7, 10, 11, 12
4	Analyse project planning and scheduling using CPM, PERT and BAR Charts.	Create	2	1, 2, 3, 4, 5, 6, 8, 7, 8, 9, 10, 11, 12

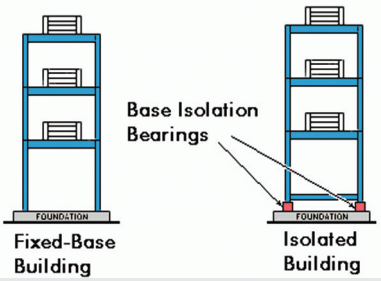
TEXT BOOKS:

1. Chitkara K K , — Construction Project Management‖, McGraw Hill Publishing, 4th edition, 2019.
2. Kumaraswamy N, —Building Planning and Drawing‖, Charotar Publishing House, 9th edition, 2019

REFERENCE BOOKS:

1. Shah M G, Kale C M and Patki S Y, —Building Drawing‖, Tata McGraw Hill, New Delhi, 5th edition, 2017.
2. Kumar Neeraj Jha, ‖Construction Project Management‖, Pearson Publication, 2nd Edition, 2015.
3. McKay, —Building Construction‖, Vol. I, II, III and IV, Orient Long Man, 4th edition, 2004.

22CE814 EARTHQUAKE RESISTANT DESIGN OF STRUCTURES



Source Link: https://theconstructor.org/earthquake/earthquake-resistant-techniques/5607/

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Earthquake Engineering, Structural Dynamics.

COURSE DESCRIPTION AND OBJECTIVES:

The aim of this course is to impart the knowledge on origin and effects of earthquakes on structures and design according to that. The objective of this course is to make students familiar with dynamics of structures during earthquakes and calculation of additional loads according to IS Code Methods. This course also discusses varied types of Seismic Control Methods.

MODULE – 1

UNIT-1 **8L+4T+0P = 12 Hours**

EARTHQUAKES, GROUND MOTION AND DYNAMICS OF STRUCTURES

Introduction, Classification of Earthquakes Effects and Consequences of Earthquake, Measurements of Earthquakes, Ground Motion Characteristics, Response of Structure to Ground Motion, Case Study on Past Earthquake Disasters, Modelling of Structures, Equations of Motion, Single Degree of Freedom Systems, Free vibration response and Forced Vibration Response including Damping effects, Response Spectrum, Multi Degree of Freedom Systems.

UNIT-2 **8L+12T+0P = 20 Hours**

CODE-BASED ANALYSIS METHODS AND DESIGN APPROACHES

Seismic Design Requirements, Importance of Ductility, Role of Response Reduction Factor, Seismic Methods of Analysis, Factors in Seismic Analysis, Design Guidelines and Calculation of Seismic Base Shear according to Equivalent Static Method (Linear Static) and Response Spectrum Method (Linear Dynamic) as per IS: 1893:2016.

PRACTICES:

- Measurements of Earthquakes and Ground Motions.
- Cast studies on Past Natural Disasters.
- Calculate the Vibration Response with and without damping.
- Calculate Seismic Base Shear using different methods.

MODULE - 2

UNIT-1 **10L+2T+0P = 12 Hours**

DUCTILITY CONSIDERATIONS IN EARTHQUAKE RESISTANT DESIGN OF RC STRUCTURES

Introduction, Impact of Ductility, Types and Factors effecting ductility, Assessment of Ductility, Ductile Detailing considerations of Structural Elements as per IS13920:2016, Earthquake Resisting Design of Four-Story Building as per IS 13920:2016, Earthquake Resisting, Design of Shear wall as per IS 13920:2016.

UNIT- 2 **8L+12T+0P = 20 Hours**

SEISMIC PROTECTION OF STRUCTURES

Introduction; Considerations for seismic isolation; Basic elements of seismic isolation; seismic-isolation design principle; Feasibility of seismic isolation; Seismic isolation configurations-Seismic dampers - Types

SKILLS:

- ✓ *Understand the effects of earthquakes on engineering structures and its measurement.*
- ✓ *Apply dynamic loads on various structures.*
- ✓ *Design buildings for earthquake loads as per IS codes.*
- ✓ *Understand and implement the concept of ductility in Earthquake Resistant Design.*
- ✓ *Suggest various seismic control techniques to minimize the vibration effects.*

of Dampers: Viscous, Friction, Yielding dampers – Seismic vibration control-Seismic Strengthening Measures.

SKILLS:

✓ *A*

PRACTICES:

- Assessment of ductile detailing of structural Elements.
- Design of Earthquake Resistant Structures.
- Design of Seismic Isolation techniques.
- Measures to be taken for strengthening of Seismic Structures.
- Study about different types of Dampers and its Applications.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the Basic Principles of Conceptual Design for Earthquake Resistant Buildings	Apply	1	1, 2, 3
2	Analyse the measurement of earthquakes and their effect on engineering structures	Analyze	1	1, 2, 3
3	Analyze the free and forced vibration response of single-degree and multidegree of freedom and continuous systems	Analyze	1	1, 2, 3
4	Evaluate the concepts and implementation of IS codes in relation to earthquake design	Evaluate	2	1, 2, 3, 12
5	Create the various seismic control methods	Create	2	1, 2, 3, 12

TEXT BOOKS:

1. Mario Paz and leigh, —Structural Dynamics‖,5th edition, CBS Publishers, 2018.
2. Duggal S.K, —Earthquake Resistant Design of Structures‖, Oxford; 2nd edition, 2013.

REFERENCE BOOKS:

1. Chopra A.K, —Dynamics of Structures‖ Prentice-Hall of India Limited, New Delhi,5th Edition, 2017.
2. Pankaj Agarwal and Manish Shrikhande, —Earthquake Resistant Design of Structures‖, 1st edition, PHI Learning Pvt Ltd, 2006.
3. Paulay T and Priestley M.J.N. —Seismic Design of Reinforced Concrete and Masonry Buildings‖, John Wiley & Sons, 1992.

22CE815 SEISMIC EVALUATION & RETROFITTING OF STRUCTURES

Source Link: https://seismosoft.com/webinar-seismic-assessment-retrofitting-of-existing-rc-structures-march-2020/

Hours Per Week :

L	T	P	C
2	2	-	3

PREREQUISITE KNOWLEDGE: Rehabilitation of structures.

COURSE DESCRIPTION AND OBJECTIVES:

To impart the knowledge for improve with the performance of buildings not designedas per seismic code of practice.

MODULE - 1

UNIT-1 **6L+6T+0P = 12 Hours**

INTRODUCTION AND QUALITATIVE METHODS OF SEISMIC EVALUATION

Terminology, Basic principles of seismic evaluation and retrofitting. Types and Methods of Seismic evaluation. Rapid visual screening procedure (RVSP) and simplified evaluation of buildings; Visual inspection method and Non-destructive testing (NDT) method.

UNIT- 2 **10L+10T+0P = 20 Hours**

QUANTITATIVE METHODS OF SEISMIC EVALUATION

Performance based method using Nonliear static push-over analysis (NSP) and nonlinear dynamic method of Analysis (NDP); Estimation of seismic capacity (strength and ductility).Seismic Safety of equipments and Accessories: Retrofitting solutions against sliding and overturning of equipments and accessories.

PRACTICES:

- Case study on seismic evaluation.
- Methods of seismic evaluation.
- Non-Destructive testing.
- Non-linear analysis.
- Case study on retrofitting solutions of a structure.

MODULE – 2

UNIT-1 **8L+4T+0P = 12 Hours**

RE-EVALUATION OF BUILDINGS WITH RETROFITTING ELEMENTS

System Completion; Strengthening of existing components; RC, Steel and FRP Jacketing; Addition of new components – frames, shear walls and braced frames; Introduction to supplemental energy dissipation and base isolation. Linear and Non-linear Modelling; Modelling of soil and foundations.

UNIT- 2 **8L+12T+0P = 20 Hours**

SEISMIC REPAIR AND RETROFITTING OF EARTHQUAKE DAMAGED RC BUILDINGS AND CASE STUDIES

Schemes of temporary shuttering damages; Methods of repair and retrofitting, Seismic evaluation and retrofitting techniques for reinforced concrete bridges. Case studies RC buildings, masonry buildings, bridges, water tanks and gravity dams.

SKILLS:

- ✓ *Identify and define all the terms and concepts associated with deterioration of concrete structures.*
- ✓ *Describe and apply the importance of quality control in concrete construction and significance of protection and maintenance of structures.*

PRACTICES:

- Study on Retrofitting elements and its applications based on its use.
- Methods of repair and retrofitting.
- Case study on RC buildings.
- Case study on Masonry buildings.
- Case study on Bridges/Water tanks/Gravity.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the qualitative methods of seismic evaluation.	Apply	1	1, 2
2	Examine the seismic evaluation method based on repair.	Analyze	1	1, 2, 4
3	Determine repairs in structures not designed as per code.	Evaluating	2	1, 2, 5
4	Adapt the retrofitting techniques to the structures.	Creating	2	1, 2, 3, 5, 6

TEXT BOOKS:

1. —Seismic Evaluation and retrofit of concrete building – Vol. I & II‖, Applied Technology Council, California, ATC 40.
2. M.J.N., Seible, F. and Calvi, G.M —Seismic Design and Retrofit of Bridges‖, John-Wiley & Sons.

REFERENCE BOOKS:

1. Maintenance, Repair and Rehabilitation and minor works of buildings – P.C.Varghese, PHI Publication.
2. —Rapid Visual Screening of Buildings for Potential Seismic Hazards‖, Federal Emergency Management Agency, Building Seismic Safety Council, Washington, D.C., FEMA 154/155.
3. Evaluating the Seismic Resistance of Existing Building‖ ATC -14 project, Applied Technology Council, California.

22CE816 SUSTAINABLE CONSTRUCTION METHODS

Source Link: https://www.engg.dypvp.edu.in/blogs/sustainable-construction-methods- benefits-and-challenges

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Concrete Technology.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to expose the students to the concepts functional design of building for thermal aspects and energy efficiency; especially in tropical climates i.e. in Indian context. Further objective is to make the student capable of performing fenestration design for natural ventilation and day lighting & design of space for external and internal noise control.

MODULE - 1

UNIT -1 **8L+4T+0P = 12 Hours**

ENVIRONMENTAL FACTORS AND HUMAN RESPONSE

Factors and their representation, tropical environments and site environments, etc. Factors affecting human comfort, Human response to thermal environment, noise, visual environment etc.; Comfort indices.

UNIT- 2 **[8L+12T+0P = 20 Hours]**

RESPONSE OF BUILDING TO THERMAL ENVIRONMENT

Processes of heat exchange of building with environment; Effect of solar radiation; Thermal properties of material and sections and their influence. Heat transfer - Steady and periodic heat transfer in buildings, Heat flow computations: Transmission matrix, Admittance method, etc. Structural control and design for energy efficiency: Selection of envelope elements, orientations, shape, Glasses and shading devices.

PRACTICES:

- Study on environmental factors affecting comfort.
- Concept of Heat transfer.
- Heat flow computations.
- Design of energy efficient building.

MODULE - 2

UNIT- 1 **8L+4T+0P = 12 Hours**

NATURAL VENTILATION

Purpose of ventilation, Mechanisms, Fenestration Design for natural ventilation.

UNIT-2 **10L+10T+0P = 20 Hours**

DAY LIGHTING, NOISE AND BUILDING

Basic acoustics and noise, Planning, Sound in free field, protection against external noise, Internal noise sources, protection against air borne and structure borne noise. Lighting principles and fundamentals Sky, Indian sky, daylight prediction and design of fenestration.

PRACTICES:

- Design of Fenestration.
- Strategies against protection of various noises.

SKILLS:

- ✓ *Selection of material for enhanced thermal environment.*
- ✓ *Design for natural ventilation.*
- ✓ *Design the acoustics of a building.*

- Self sufficient Day light system design for a building.
- Acoustic design of a studio cum residential building.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Construct the human response to various environmental factors.	Apply	1	1,2
2	Identify the building materials response to thermal Environment.	Apply	1	1, 2
3	Asses the Heat transfer and its efficiency of the building.	Evaluate	2	1, 2
4	Design the building response to Noise and lighting.	Create	2	1, 2,12

TEXT BOOKS:

1. Bureau of Indian Standards, —Hand Book Of Functional Requirements of Buildings, (SP- 41 & SP- 32)‖, BIS 1987 and 1989.
2. Koenighsberger, O.H. et al, —Manual of Tropical Housing and Building Part-I Climatic Design‖, Orient Longman. 1973.

REFERENCE BOOKS:

1. GRIHA Manl Volume -1 Introduction to Rating System-GRIHA published by Ministry of New and Renewable Energy, Government of India, and TERI, the Energy and Resource Institute, New Delhi (2010).
2. Soni Suresh Kumar, Pandey Mukesh, Bataria V N,‖An overview of Green Building Control Strategies‖ (2013) International conference on Renewable Energy Research and Applications, IEEE, Madrid, Spain pp 662-666.

22CE817 ENGINEERING SEISMOLOGY

Source Link: https://www.pngegg.com/en/png-cslqg

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Earthquake, Vibration.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on fundamental aspects of earthquakes and faulting, terminology for characterisation of earthquake faults, locating earthquakes, frequency of earthquake occurrence, strong ground motion recording and analysis, characterisation of strong ground motion in terms of intensity measures and empirical prediction models. The objective of this course is for the students to develop an understanding of seismicity and earthquake-induced ground motions, and engineering approaches for modelling them for the purpose of seismic design.

MODULE - 1

UNIT- 1 **8L+4T+0P = 12 Hours**

INTRODUCTION & CAUSES OF TECTONIC EARTHQUAKES

Importance of science of earthquakes for engineers, Impact of historical and recent earthquake hazards on the built environment, Including lifelines and infrastructure, Relevant seismological glossary, Classification of earthquakes.

Internal structure of the earth; Faults, Folds, Thrusts, Shear zones and lineaments; Plate margins – Creative, Destructive, and conservative, Triple junction, Characteristics of earthquakes at various margins, Causes of plate motion, Anthropogenic seismicity.

UNIT- 2 **8L+12T+0P = 20 Hours**

SEISMICITY

Global seismicity belts – Circum Pacific, Alpine Himalayan, Mid oceanic ridges, Earthquakes and major topographic features in oceans and continents – Ridge, Trench, Rift, Mountain ranges, Major global and Indian earthquake disasters – inter and intra plate earthquakes.

PRACTICES:

- Case study on recent earthquakes.
- Causes of earthquakes.
- Basic terminology of earthquake & classification.
- Topographic features in oceans and continents.
- Case study on Indian earthquake disasters.

MODULE - 2

UNIT -1 **8L+4T+0P = 12 Hours**

GROUND MOTION

Principles of elasticity, Equations and laws governing seismic wave propagation; Characteristics of ground motion - Duration, Frequency and amplitude, Factors affecting characteristics of ground motion – source, Path, Site, Attenuation relationships, Relation between characteristics of ground motion and damage to civil structures.

SKILLS:

- ✓ *Make detailed analysis and report on of earthquake disasters.*
- ✓ *Find the intensity and magnitude of the earthquake using amplitude measurements.*
- ✓ *Analyse early warning systems.*
- ✓ *Conduct the seismic tests on the ground to check the seismic capacity of the structures.*

UNIT -2 **8L+12T+0P = 20 Hours**

EARTHQUAKE RECORDING, PARAMETERS AND QUANTIFICATION

Seismic recording, Estimation of earthquake parameters – epicenter, Focal depth, Origin time, Magnitude, Intensity mapping based on earthquake effects on ground, Seismic response of built environment and human perception, Seismic zoning.

PRACTICES:

- Ground vibration intensities in our campus using accelerometer anddrawseismogram.
- Seismic tests on the ground to check the seismic capacity of the structures.
- Estimation of earthquake parameters.
- Seismic response & zoning.
- Case study on recent earthquake, its recordings, parameters and quantification.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Utilize the terminology of earthquakes.	Apply	1	1, 2
2	Identify pre and post-earthquake measures.	Apply	1	1, 2, 6
3	Analyze seismic zoning of a country/place.	Analyzing	1, 2	1, 2
4	Record and analyze ground motion characteristics.	Analyzing	2	1, 2
5	Estimate the quantify earthquakes with respect to intensity and magnitude.	Creating	2	1, 2, 5, 6

TEXT BOOKS:

1. Amitha Sinvhal, —Understanding Earthquake Disasters‖, Tata McGraw Hill, New Delhi, 1st edition, 2010.
2. Richter C. F., —Elementary Seismology‖, W. H. Freeman and Co., San Francisco, Indian, 2nd edition, 2008.

REFERENCE BOOKS:

1. K. E. Bullen and B. A. Bolt, —An Introduction to the Theory of Seismology‖, Earthquake Hazard Analysis Issues and Insights, Cambridge University Press, Cambridge 4th edition.
2. McGuire R. K., —Seismic Hazard and Risk Analysis‖, Monograph MNO-10, Earthquake Engineering Research Institute, 4th edition, 2003.

22CE818 ENVIRONMENTAL POLLUTION AND CONTROL

Source Link: https://byjus.com/chemistry/strategies-to-control-pollution-and-reduce-waste/

Hours Per Week :

L	T	P	C
2	-	2	3

PRE-REQUISITE COURSE: Environmental Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

The course has been designed to analyse about different pollution levels and control strategies and the skills of application of remediation techniques to combat pollution in four environmental compartments i.e. air, water, noise and soil. The course will also be dealing about the sources of pollution in air, soil, water, solid-waste and noise and the impacts these sources on the environment and health. In addition, the students will be given the training to develop the particular skills required in pollution related structured research.

MODULE - 1

UNIT-1 **10L+2T+0P= 12Hours**

ENVIRONMENTAL POLLUTION

Definition and sources of pollution; Types of Pollutants and their classification. Different types of pollution and their global, regional and local aspects. Air Pollution: Types and sources of air pollutants; Effects of pollutants on human beings, plants, animals and materials. Water Pollution: Sources of pollution of surface and ground water, Water pollution parameters – physical, chemical and biological; Types of water pollutants; Effects of water pollution on water bodies - eutrophication, aquatic life, vegetation and human health; Control of water pollution.

UNIT-2 **06L+14T+0P=20Hours**

SOIL POLLUTION AND SWM

Sources, effects and control of soil pollution. Pollution and residual toxicity from the application of insecticides, pesticides and fertilizers. Municipal solid waste Definition - Sources and types of solid waste-composition and its determinants of Solid waste-factors influencing generation- quantity assessment of solid wastes-methods of sampling and characterization. Collection transfer, control and management of Municipal Solid Waste.

PRACTICES:

- Concept of levels of pollution.
- Effects of pollution on humans.
- Analysis of pollution at different zones.
- Stress variations in steel.
- Effects of pollution on environment.
- Control measures of pllution.

MODULE - 2

UNIT-1 **10L+2T+0P= 12Hours**

NOISE POLLUTION

Noise pollution – source, measurement, effects and control; Thermal pollution: Definition and sources, Chemical and biological effects of thermal pollution, Effect on marine life, bacteria and water quality and other aquatic biota; Thermal pollution from power plants and their control.

SKILLS:

- ✓ *The properties and compositions of elements in pollution.*
- ✓ *Analysis of different pollution levels.*
- ✓ *General control of pollution.*
- ✓ *Design of pollution related structured research.*

UNIT-2 **06L+14T+0P=20Hours**

ELECTRONIC WASTE (E-WASTE) & RADIATION POLLUTION

Sources and types, constituents of E-wastes, recycling of e-waste and its environmental consequences, Management of e-wastes, Basel convention. Radioactive decay; Interaction of radiation with matter; Biological impact and health hazards associated with radiation, Protection against ionizing isotopes; Radioactive waste disposal.

PRACTICES:

- Effects of aquatic ecosystem due to thermal pollution.
- Sources & cause of noise.
- Effects on marine life.
- Control of thermal pollution.
- Protection of environment.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Recognize and evaluate the factors in environment that cause health and hazards.	Apply	1	1, 2,7,12
2	Estimate the quality standards on pollution.	Analyze	1, 2	2, 5,7,12
3	Analyze the technologies to access the environmental management systems.	Analyze	1, 2	1, 2,7,12
4	Find out control Measures of Pollution.	Create	1, 2	2, 3, 5,7,12

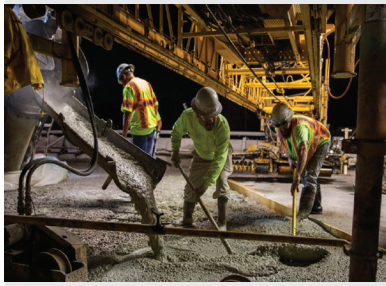
TEXT BOOKS:

1. Prakash Guptha, —Environmental Pollution Control Engineering‖ 1st Edition, Khanna Publishing, 2019.
2. C S Rao, —Environmental Pollution Control‖, 3rd Edition, New Age International Pvt. Ltd., Publishers, 2018.

REFERENCE BOOKS:

1. Kishor R P, —Environmental Science‖ S. C. Santra, 1st Edition, Nirali Prakashan, 2018.
2. C. S. Rao, Wiley Eastern Ltd, —Environmental Pollution Control Engineering‖, New Age International Ltd, 2010.
3. P R Trivedi, —Environmental Pollution and Control‖, 2nd Edition, Ashish publishing House, APH, 2004
4. Ehilrs and ST, —Text book of Municipal and Rural Sanitation‖, 8th Edition, M.S Hill, 1998.

22CE819 ADVANCE CONCRETE TECHNOLOGY



Source Link: https://asapkerala.gov.in/course/concrete-technology/

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Concrete Technology.

COURSE DESCRIPTION AND OBJECTIVES:

Study the properties of concrete making materials. Understand the use of various Chemical, Mineral Admixtures & Polymers in concrete. By the end of course, student should able to do mix design, and to be familiarize with the methods of concrete. To study the advance tests on concrete.

MODULE – 1

UNIT-1 **10L+2T+0P = 12 Hours**

INTRODUCTION AND CHEMICAL ADMIXTURES

Aggregates classification, IS Specifications, Properties, Grading, Methods of combining aggregates, specified grading, Testing of aggregates. Cement, Grade of cement, Chemical composition, Testing of concrete, Hydration of cement, Structure of hydrated cement, special cements. Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh Cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, and new generation super plasticizer.

UNIT -2 **6L+14T+0P = 20 Hours**

MINERAL ADMIXTURE AND MIX DESIGN & SPECIAL CONCRETE

Principles of concrete mix design, Methods of concrete mix design, IS Method, ACI Method. Special Concrete: Light weight concrete, Fly ash concrete, Fiber reinforced concrete, Sulphur impregnated concrete, Polymer Concrete – High performance concrete. High performance fiber reinforced concrete, Self- Compacting-Concrete, Geo Polymer Concrete, Waste material based concrete – Ready mixed concrete, Bacterial concrete – Nano-concrete.

PRACTICES:

- Grade of cement and chemical composition.
- Special cements.
- Methods of concrete mix design, IS Method, ACI Method.
- High performance concrete.
- Self- Compacting-Concrete, and Geo Polymer Concrete.

MODULE - 2

UNIT -1 **10L+0T+0P = 10 Hours**

CONCRETING METHODS

Process of manufacturing of concrete, methods of transportation, placing and curing. Extreme weather concreting, special concreting methods. Vacuum dewatering – Underwater Concrete.

UNIT- 2 **6L+16T+0P = 22 Hours**

TESTS ON CONCRETE

Destructive, semi-destructive & Non-destructive testing methodology - Rebound hammer test – Ultrasonic Pulse Velocity (UPV) Test - Penetration resistance test - Pull-out Test - Pull-off Method - Break-off test

SKILLS:

- ✓ *Correlate the NDT test results to the strength of concrete.*
- ✓ *Identify the effect of mineral and chemical admixtures on the strength of concrete.*
- ✓ *Select the good material for the preparation of green concrete for the sustainable construction.*

- Cover Measurement - Core Sampling and Testing - Half-cell electrical potential method - Resistivity Mapping Problems faced during Non-destructive evaluation - Microscopic Analysis – XRD, SEM, TEM Analysis.

PRACTICES:

- Process of manufacturing of concrete.
- Vacuum dewatering – Underwater Concrete.
- Destructive, semi-destructive & Non-destructive testing methodology.
- Rebound hammer test and Ultrasonic Pulse Velocity (UPV) Test.
- Microscopic Analysis – XRD, SEM, TEM Analysis.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify properties of concrete making materials.	Apply	1	1, 2, 4, 6, 7, 8, 10, 12
2	Identify the influence and compatibility of Chemical, Mineral Admixtures in concrete.	Analyze	1, 2	1, 2, 4, 6, 7, 8, 10, 12
3	Update the knowledge on recent advances in special concretes.	Evaluating	1,2	1, 2, 4, 6, 7, 8, 9, 12
4	To know about various methods of concrete.	Evaluating	2	1, 2, 4, 6, 7, 8

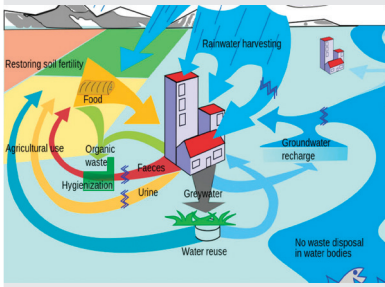
TEXT BOOKS:

1. Shetty M.S., —Concrete Technology‖, S.Chand and Company Ltd. Delhi, 2013.
2. Gambhir.M.L., —Concrete Technology‖, Tata McGraw Hill, Publishing Co. Ltd New Delhi, 2013.

REFERENCE BOOKS:

1. Rajagopalan, N. —Prestressed concrete‖, Narosa Publishing House.2nd edition, 2005.
2. Arthur H. Nilson, —Design of Prestressed Concrete‖, John Wiley and Sons Inc, New York, 2004.
3. Lin. T. Y and Burns. H —Design of Prestressed Concrete Structures‖, John Wiley and Sons Inc, New York, 2009.
4. Santhakumar, A.R.‖Concrete Technology‖ Oxford University Press, 2006.

22CE820 ECOLOGICAL ENGINEERING



Source Link: https://www.hisour.com/ecological-engineering-39387/

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE COURSE: Environmental Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

Principles of ecological engineering and design of sustainable ecosystems that integrate human society with its natural environment for the benefit of both. Particular emphasis is placed on application of ecological engineering in the restoration of streams and rivers, lakes and reservoirs, wetlands, and coastal ecosystems, as well as treatment wetlands and mined land reclamation.

MODULE - 1

UNIT-1 **10L+2T+0P= 12Hours**

ECOLOGICAL ENGINEERING DESIGN

Ecosystem Services, Energy and Mass Flow Though Ecosystems, Estimation of NPP, Defining Biomes, Eco Regions and Watershed, Defining The Place: Site, Soils as Living Organisms.

UNIT-2 **06L+14T+0P=20Hours**

DESIGNING COMMUNITY STRUCTURE

Types of Restoration Design, Biotic Interactions, Regional Processes, Environmental and Habitat Impacts. Ecosystem Control and Feedback Systems: Population Control processes, community control processes, Feedback processes, designing ecosystem complexity.

PRACTICES:

- Concept of Ecosystem Services.
- Estimation of NPP.
- Analysis of Energy and Mass Flow Though Ecosystems.
- Types of Restoration Design.
- community control processes.

MODULE - 2

UNIT-1 **10L+2T+0P= 12Hours**

TREATMENT WETLANDS

Non-Point Source Management of wastes in Engineered Ecosystems, Fundamentals of non- point source pollution including quantification of environmental impact and ecosystem management related to contaminants and nutrients and to planning and design of ecological systems, Biodiversity and Treatment Wetlands, Wetland creation and restoration, Case studies.

UNIT-2 **06L+14T+0P=20Hours**

RESTORATION ECOLOGY

Restoration concepts, how to Restore an Ecosystem, Procedures and Policies, Case Studies of lake and river restoration Stream Restoration Design: Hydrology, sedimentology, geomorphology, habitat, connectivity, riparian corridor.

SKILLS:

- ✓ *Importance of Eco.*
- ✓ *Application of ecological engineering in the restoration.*
- ✓ *Human society with its natural environment.*
- ✓ *General performance of treatments.*
- ✓ *Design of different types of systems.*

PRACTICES:

- Non-Point Source Management of wastes.
- Environmental impact and ecosystem management.
- Planning and design of ecological systems.
- Biodiversity and Treatment Wetlands Design.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Evaluate the factors in environment that cause disturbances in ecosystems.	Apply	1	1, 2,7,12
2	Distinguish the levels of ecosystems.	Analyze	1, 2	2, 5,7,12
3	Analysis the importance of ecosystems.	Analyze	1, 2	1, 2,7,12
4	Identifying the ecological engineering in restorations organisms.	Creating	1, 2	2, 3,7,12

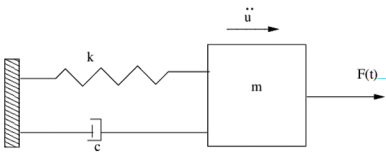
TEXT BOOKS:

1 Vaishali A, —Environment and Ecology‖, McGraw Hill, Michel J.G., 1st Edition, 2020.
2. Marty D. Matlock, Robert A. Morgan, —Ecological Engineering Design Restoring and conserving ecosystem services‖ 2nd Edition, Wiley, 2016.

REFERENCE BOOKS:

1. Sven Erik Jorgensen, —Applications in Ecological Engineering‖, Academic Press, 2009.
2. Ecological Engineering and Ecosystem Restoration, William J. Mitch, Sven Erik Jorgensen, 2003.
3. Patrick K, —Ecological Engineering Principles and Practices‖, 1st Edition, Lewis Publishers, 2003.
4. William J. Mitch, —Ecological Engineering and Ecosystem Restoration‖, 1st Edition, Wiley, 2003.

22CE821 STRUCTURAL DYNAMICS



Source Link: https://www.semanticscholar.org/paper/Single-Degree-of-Freedom-(SDOF)-System-Sinha/89f05ec9c7fa3e6218ebd7618d7ea030d0bcff10

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Earthquake, Seismic forces.

COURSE DESCRIPTION AND OBJECTIVES:

The objective is to provide the fundamental understanding of the structural dynamics. The problem-solving ability for dynamic response in civil engineering design, analysis and research. Introduce students to analytical and numerical methods in structural dynamics with emphasis on vibration. To provide opportunities to optimize system for desired dynamic response. To provide the basic framework for studying time-dependent response of mechanical.

MODULE - 1

UNIT - 1 **8L+4T+0P = 12 Hours**

SINGLE DEGREE OF FREEDOM SYSTEMS

Introduction, Mathematical modelling, Equation of Motions, Solution methods of single degree of freedom systems (SDOF), Springs combination- series, parallel, inclined, Natural Frequency and Time Period.

UNIT- 2 **8L+12T+0P = 20 Hours**

FREE AND FORCED VIBRATION OF SDOF SYSTEM

Free vibration of undamped and damped system, Forced vibration of damped and undamped System – Response to harmonic forces- Half Power Bandwidth and periodic forces - Fourier Series, Duhamel Integrals.

PRACTICES:

- Calculate the stiffness of springs in parallel and in series.
- Calculate the Natural Frequency and Time Period.
- Calculate the Free and Forced Vibrations of SDOF Systems.
- Determine the response spectrum Analysis.
- Determine the Half Power Bandwidth and Periodic Forces.

MODULE - 2

UNIT-1 **10L+2T+0P = 12 Hours**

TWO DEGREES OF FREEDOM SYSTEMS

Introduction, Concept of Shear Building, Free Vibrations of damped and undamped system, Forced Vibrations of damped and undamped system, Natural Frequencies and Mode Shapes.

UNIT-2 **8L+12T+0P = 20 Hours**

MULTI DEGREE OF FREEDOM SYSTEMS

Introduction, free vibration analysis and forced vibration analysis, undamped systems, damped systems, Natural Frequencies and Normal Modes.

SKILLS:

- ✓ *Determine vibration characteristics of structures like frequency, amplitude, impedance, and time period.*
- ✓ *Differentiate the response of single and multi-degree of freedom systems.*
- ✓ *Determine the response of structures for pulse excitation like blast load.*

PRACTICES:

- Calculate Free vibrations of damped and Undamped System for MDOF.
- Calculate Forced Vibrations of damped and Undamped system for MDOF.
- Calculate the Natural Frequencies of Two and MDOF Systems.
- Calculate the Modes of Different Systems.
- Calculate the Mode Shapes of Different Systems.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the equation of motion for single degree of freedom systems.	Apply	1	1, 2, 3
2	Analyse the concepts of Springs combination.	Analyze	1	1, 2, 3
3	Evaluate the impact of damping on characteristics of vibrating system.	Evaluate	1	1, 2, 3
4	Evaluate the dynamic behaviour of Multi degree of freedom.	Evaluate	2	1, 2, 3, 12
5	Create the dynamic system with various degree of freedom.	Create	2	1, 2, 3, 12

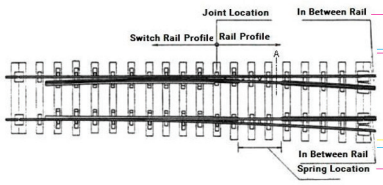
TEXT BOOKS:

1. Mario Paz and leigh; —Structural dynamics‖, CBS Publishers, 5th edition 2018.
2. Anil K Chopra, —Dynamics of structures‖; Prentice-Hall of India Limited, New Delhi.5th edition 2017.

REFERENCE BOOKS:

1. S.R Damodarasamy and S.Kavitha, —Basics of Structural Dynamics and Aseismic Design‖ PHI Learning 2018.
2. G. C. Hart & K. Wang; —Structural Dynamics for Structural Engineers‖, John Wiley & Sons.1st edition 1991.
3. R.W. Clough and P.E. Penzien, —Dynamics of Structures‖, McGraw-Hill. 1st edition, 1975.

22CE822 RAILWAY AND AIRPORT ENGINEERING



Source Link: https://www.brainkart.com/article/Railway-Engineering--Switches_4236/

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE COURSE: Transportation Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

In Railway Engineering, the students are taught various components of permanent way, design of geometric elements of railway track and types of stations and yards and signaling and control systems in railways. In Air transportation the growth of air transport, aircraft characteristics, planning of airports, imaginary surfaces, and the design of runways are dealt.

MODULE - 1

UNIT -1 **8L+4T+0P = 12 Hours**

INTRODUCTION AND RAILWAY TRACK PERMANENT WAY

Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways. Gauges in Railway track, Railway track cross – section; Coning of wheels. Rails & Rail Joints: Functions of rails; Requirements of rails; Types of rails sections; Standard rail sections; Length of rails; Rail failures; Wear on rails, Requirements of an ideal joint; Types of rail joints; Welding of rails. SLEEPERS: Functions of sleepers; Requirements of sleepers; Classification of Sleepers – Timber sleepers, Metal sleepers & Concrete sleepers; Comparison of different types of sleepers.

UNIT- 2 **8L+12T+0P = 20 Hours**

FISH PLATES AND GEOMETRIC DESIGN OF TRACK

Fish plates, section of fish plates, failure of fish plates. Ballast: Functions and requirements of ballast; Types of ballast; Renewal of ballast. Geometric Design of Track: Necessity; Gradients & Grade Compensation; Elements of horizontal alignment; Super elevation; Cant deficiency and Cant excess; Negative Super elevation; Length of Transition Curve, Length of vertical curve. Points and Crossings: Functions of components of turnouts; Crossings. Stations and Yards: Site selection for railway station; Requirements of railway station; Classifications; Station yards; Level crossings. Signaling: Objects of signaling; Classification of signals; Controlling- absolute block system. Standards of inter locking.

PRACTICES:

- Types of rails sections.
- Types of rail joints and functions of sleepers.
- Super elevation.
- Crossings and site selection for railway station.
- Classification and Controlling of signals.

MODULE - 2

UNIT -1 **10L+2T+0P = 12 Hours**

INTRODUCTION TO AIRPORT PLANNING

Development of air transportation system with particular reference to India; Air craft components; Air–craft characteristics. Airport Planning and Layout: Selection of site; Apron; Hangar; Typical airport layouts; Airport markings; Airport lighting; Drainage systems. Airport Obstruction: Zoning laws; Classification of obstructions; imaginary surfaces; Approach zone; Turning zone.

SKILLS:

- ✓ *Design and analyse the railway track system.*
- ✓ *Carryout the geometrical design of the airport infrastructure.*
- ✓ *Prepare structural designs of runway.*

UNIT-2 **8L+12T+0P = 20 Hours**

RUNWAY DESIGN AND SPECIFICATIONS FOR STRUCTURAL DESIGN OF AIRPORT PAVEMENTS

Runway orientation; Basic runway length; Corrections for elevation, temperature andgradient; Runway geometric design. Design factors methods for flexible and rigid pavements; LCN system of pavement design.

PRACTICES:

- Air craft components.
- Selection of site.
- Airport Obstruction.
- Runway orientation.
- Runway geometric design.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Describe elements and role of railway transportation in India.	Analyze	1	1, 2, 3, 4, 6, 7, 8, 12
2	Describe site selection and planning of airport.	Analyze	2	1, 2, 3, 4, 6, 7, 8, 12
3	Design of geometrical and pavements of runway.	Analyze	2	1, 2, 3, 4, 6, 7, 8, 12
4	Design geometric elements of railway.	Create	1	1, 2, 3, 4, 6, 7, 8, 12

TEXT BOOKS:

1. S.C.Saxena and S.Arora, —Railway Engineering‖, DhanpatRai& Sons, 12th edition, 2009.
2. S. K. Khanna & M. G. Arora, —Airport Planning and Design‖, Nemchand & Bros, Roorkee, 16th edition, 2007.

REFERENCE BOOKS:

1. M.M.Agarwal, —Railway Engineering‖ 1st ed., Prabha& Co., New Delhi, 2010.
2. G.V.Rao, —Airport Engineering‖, 2nd ed., Tata Mc Graw Hill, New Delhi, 2000.

22CE823 EIA FOR BUILDING TECHNOLOGY

Source Link: https://www.ecosens.ch/en/environmental-impact-assessment.html

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Environmental Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

To identify and predict the impact of a proposed project on bio geo physio chemical environment and human health so as to recommend appropriate legislative measures, programs and operational procedures to minimise the impact and ensures the potential problems are foreseen and addressed at an early stage in the project planning and management.

MODULE – 1

UNIT- 1 **8L+4T+0P = 12 Hours**

INTRODUCTION TO EIA

Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring.

UNIT-2 **8L+12T+0P = 20 Hours**

PRACTICAL APPROACH FOR EIA

Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements. Identifying the Key Issues: Key Elements of an Initial Project Description and Scoping, Project Location(s), Land Use Impacts, Consideration of Alternatives, Process selection: Construction Phase, Input Requirements, Wastes and Emissions, Air Emissions, Liquid Effluents, Solid Wastes, Risks to Environment and Human, Health, Socio-Economic Impacts, Ecological Impacts.

PRACTICES:

- Concept of EIA.
- Components of EIA.
- Analysis of EIA Process.
- Key Elements in Project for EIA Report.
- Socio Economic Impacts due installation of new project.

MODULE – 2

UNIT-1 **8L+4T+0P = 12 Hours**

EIA METHODOLOGIES

Global Environmental Issues, EIA Methodologies: Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods.

UNIT- 2 **8L+12T+0P = 20 Hours**

PRACTISE ON EIA REPORT

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening,

SKILLS:

- ✓ *To prepare the EIA Report.*
- ✓ *To prepare the EMP report.*

Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

PRACTICES:

- Concept of global environmental issues.
- Indian policies and regulations for EIA.
- EIA Methods.
- List out the projects need environmental clearances.
- List out the composition for Expert committee for EIA.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the facts, classification, grouping, signif-icance and criteria to determine the methods of impact.	Analyze	1	1, 2
2	Predict and analyse the impacts of development projects on air and water quality, their affects and come up with the conceptual approach to address impacts on air and water.	Analyze	1	1, 2, 6
3	Analyze the impacts of development projects using	Analyze	2	1, 2
4	Adapt the development of EIA and its importance.	Create	2	1, 2, 6

TEXT BOOKS:

1. Anjaneyulu.Y., and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007.
2. Canter, L.W., Environmental Impact Assessment, Mc Graw Hill Pub. Co., 1997.

REFERENCE BOOKS:

1. Problems, John Wiley & Sons, 2003.
2. Hosetti, B. B., Kumar Eds, A., Environmental Impact Assessment and Management, Daya, Publishing House, 1998.

22CE824 SOIL DYNAMICS & MACHINE FOUNDATIONS

Hours Per Week :

L	T	P	C
2	2	-	3

PRE-REQUISITE KNOWLEDGE: Geotechnical Engineering, Structural Dynamics.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understand of behaviour of soil under dynamic loads. The objective of this course is the understanding of concepts, theories and procedures of design of foundations subjected to dynamic loads and calculation of the stiffness and damping constants of different types of foundations.

MODULE - 1

UNIT- 1 **8L+4T+0P = 12 Hours**

DYNAMIC SOIL PROPERTIES AND BEHAVIOUR

Dynamic stress, Strain characteristics, Principles of measuring dynamic properties, Laboratory techniques, Field tests, Factors affecting dynamic properties, Typical values, Mechanism of liquefaction, Influencing factors, Evaluation of liquefaction potential, Analysis from SPT test, Dynamic bearing capacity, Dynamic earth pressure.

UNIT 2: **8L+12T+0P = 20 Hours**

FOUNDATIONS OF RECIPROCATING MACHINES

Types of Machines and Foundations, General requirements, Modes of vibration of a rigid foundation, Block method of analysis, Linear Elastic weightless spring method, Elastic half – space method, Analog models, Design of block foundation, Codal Recommendations.

PRACTICES:

- A case study on dynamic soil properties of in and around locations.
- Liquefaction mechanism & Evaluation.
- Foundations and Requirements.
- Analysis of vibration for rigid vibration.
- Design of block foundation.

MODULE - 2

UNIT-1 **8L+4T+0P = 12 Hours**

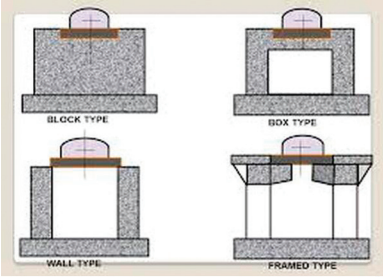
FOUNDATIONS FOR IMPACT AND ROTARY MACHINES

Dynamic analysis of impact type machines, Design of hammer foundations, Use of vibrator absorbers, Design codal recommendation, Special consideration for rotary machines and Design criteria, Loads on T.G. foundation, Method of analysis and design, Dynamic soil – structure – Interaction, Codal recommendations.

UNIT-2 **8L+12T+0P = 20 Hours**

VIBRATION ISOLATION

Force isolation, Motion isolation, Use of spring and damping materials, Vibration control of existing machine foundation, Screening of vibration, Open trenches, Pile Barriers, Salient construction aspects of machine Foundations.



Source Link: http://americangeoservices.com/machine-foundations.html

SKILLS:

- ✓ *Understand Indian code specification for analysis and design of foundations under dynamic conditions.*
- ✓ *Analyze various dynamic forces.*
- ✓ *Demonstrate p r i n c i p l e and concepts of base isolation.*
- ✓ *Design a special foundation for vibrating machinery.*

PRACTICES:

- Study on Impact and Rotary Machines.
- Vibrating absorbers.
- Control of vibration for machine foundations.
- Aspects of machine foundations.
- Case study on foundations & vibration isolation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the dynamic properties of soil.	Apply	1	1, 6
2	Inspect the effect of rotary and impact machines on foundation soil.	Analyzing	1, 2	1, 2, 6
3	Assess the influence of vibration.	Evaluating	2	1
4	Design the selection of remediation methods based on the nature of vibration, properties and behaviour of soil.	Creating	1, 2	1, 2, 6, 12

TEXT BOOKS:

1. Swami Saran, ―Soil Dynamics and Machine Foundation‖, Galgotia publications Pvt. Ltd., New Delhi, 3rd edition, 2016.
2. Prasad.B.B. ―Advance Soil Dynamics and Earthquake Engineering‖, 1st Edition, PHI, 2011.

REFERENCE BOOKS:

1. P. J. Moore, ―Analysis and Design of Foundations for Vibrations‖, Oxford and IBH, 2006.
2. B. M. Das, ―Principles of Soils Dynamics‖, Tata McGraw Hill, 2004.
3. Shamsher Prakash, ―Soil Dynamics‖, 3rd Edition, John Wiley, 2000.

HONOURS

CIVIL ENGINEERING

B.Tech.

Structural Engineering

- 22CE951 - Low Cost Materials & Techniques.
- 22CE952 - Theory of Plates & Shells.
- 22CE953 - Foundation Engineering.
- 22CE954 - Design of Underground Water Structures.
- 22CE955 - Industrial Structures. / Project Work.

Civil Engineering

- 22CE956 - Green Buildings.
- 22CE957 - Solid & Hazardous Waste Management.
- 22CE958 - Advanced Soil Mechanics.
- 22CE959 - Intelligent transportation system
- 22CE960 - Advanced Structural Design. / Project Work.

Construction Technology and Project Management

- 22CE961 - Construction Techniques and Equipments.
- 22CE962 - Quality Control and Assurance in Construction.
- 22CE963 - Resource Management and Control in Construction.
- 22CE964 - Construction & Project Management.
- 22CE965 - Lean Construction Management./ Project Work.

COURSE CONTENTS

I SEM & II SEM

22CE951 LOW COST MATERIALS AND TECHNIQUES

Source Link: https://livinator.com/5-cheap-building-materials-for-a-new-home-on-a-budget/

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Building Materials.

COURSE DESCRIPTION & OBJECTIVES:

This course mainly provides about different low cost materials used in construction and techniques. The main objective of this course is to train the students to have a comprehensive knowledge on low cost materials and easy to use different techniques involved in construction of a structure.

MODULE - 1

UNIT-1 **10L+2T+0P = 12 Hours**

CONCEPTS OF LOW COST MATERIALS

Cost effective materials: Soil, Fly ash, Ferro-cement, Lime, Fibers, Stone Dust, Red mud, Gypsum, Alternate Wood, and Polymer.

UNIT-2 **14L+14T+0P = 28 Hours**

LOW COST BUILDING MATERIAL PRODUCTS

Energy Efficient & Environment friendly building material products: Walls - Stabilized and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferro cement partitions.

Roofs: Pre-cast R.C. Plank & Joists roof, Pre-cast channel roof, Pre-cast L-panel roof, Pre- cast Funicular shells, Ferro cement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

PRACTICES:

- Concept of low cost materials.
- A case study on low cost materials.
- Study on environment friendly material products.
- Concept of different types of roofs based on use.
- Case study on use of different low cost roofs.

MODULE – 2

UNIT-1 **12L+3T+0P = 15 Hours**

COST EFFECTIVE CONSTRUCTION TECHNIQUES AND EQUIPMENTS

Techniques: Rat trap bond construction, Energy Efficient roofing's, Ferro cement technique, Mud Technology.

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

UNIT-2 **12L+13T+0P = 25 Hours**

LOW COST CONSTRUCTION, COST ANALYSIS & COMPARISON

Cost effective sanitation: Waste water disposal system, Cost effective sanitation for rural and urban areas, Ferro cement Drains.

SKILLS:

- ✓ *Identify all the low cost materials & products.*
- ✓ *Assess all the properties of materials.*
- ✓ *Apply suitable techniques and products in construction.*
- ✓ *Analyze the cost analysis.*

Low Cost Road Construction: Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

Cost analysis and comparison: All experimental materials, all experimental techniques.

PRACTICES:

- Use of different equipments in construction.
- Construction techniques.
- Study on cost effective sanitation.
- Low cost road construction.
- An example based on cost analysis and comparision.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify different low cost materials & products used in construction.	Apply	1	1, 2, 12
2	Apply suitable materials & products in construction of a structure.	Apply	1	1, 5, 6
3	Analyze the techniques & equipments in low cost construction.	Analyzing	2	1, 2
4	Determine cost analysis and compare with conventional materials.	Evaluating	2	1, 2, 5, 6

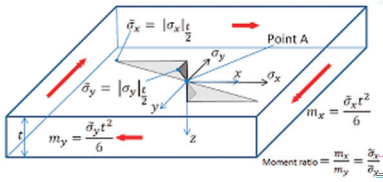
TEXT BOOKS:

1. Alternative Building Materials and Technologies – K S Jagadeesh, B V Venkatta Rama Reddy & K S NanjundaRao – New Age International Publishers.
2. Eugene Eccli- Low Cost, Energy efficient shelter for owner & builder, Rodale Press, 1976.

REFERENCE BOOKS:

1. Hand book of low cost housing - by A. K. Lal – Newage international publishers.
2. Light weight concrete- Academic Kiado- Rudhai. G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. Madhava Rao- D.S. Ramachandra Murthy & G. Annamalai.

22CE952 THEORY OF PLATES AND SHELLS



Source Link: https://www.structuremag.org/wp-content/uploads/2016/06/0716-spr-2.png

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Design of Reinforced Concrete Structures

OURSE DESCRIPTION AND OBJECTIVES:

The aim of this course is to introduce the concept of plate theory, the behaviour and analysis of thin plates, rectangular plates, circular plates and to present the foundations of the classical theory of shells based on the Kirchhoff-Love assumptions. It also aims to study the classification of shell surfaces.

MODULE - 1

UNIT-1 **10L+0T+0P = 10 Hours**

INTRODUCTION TO PLATE THEORY

Thin Plates with small deflection.Laterally loaded thin plates, governing differential equation, various boundary conditions.

UNIT-2 **20L+0T+10P = 30 Hours**

RECTANGULAR AND CIRCULAR PLATES

Rectangular plates. Simply supported rectangular plates, Navier solution and Levy's method, Rectangular plates with various edge conditions, plates on elastic foundation. Differential equation for symmetrical bending of laterally loaded circular plates, Simply supported edges, Clamped edges, Circular plate with a circular hole at the center, Circular plate concentrically loaded.

PRACTICES:

- Testing of I steel section for flexure and shear.
- Testing of steel column of different sections under axial loading.
- Testing of Welded and Bolted steel connections.
- Testing of portal frames.
- Testing of Light-gauge purlins and roof structures.

MODULE-2

UNIT-1 **10L+0T+0P = 10 Hours**

INTRODUCTION TO SHELLS

Structural behavior of shells, classification of shells, translational and rotational shells, ruled surfaces, Gaussian curvature, synclastic and anticlastic surfaces. Principal curvatures and lines of curvature.

UNIT-2 **20L+0T+10P = 30 Hours**

CYLINDRICAL SHELLS

Membrane theory of cylindrical shells; Bending theory of cylindrical shells loaded Symmetrically – Approximate solution by Schorer's method, Beam method of analysis.

PRACTICES:

- Testing of beam column joints.
- Testing of Plastic analysis of steel sections.

SKILLS:

- ✓ *Analyze the plate with different boundary conditions.*
- ✓ *Understand the basis of finite element software.*

- Testing of cold-formed steel sections.
- Analysis and design of steel sections under different loading conditions by using latest software like STAAD Pro, ANSYS etc.
- Analysis and design of multi-story buildings by using latest software like STAAD Pro etc.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Assess the strength of plate panels under point, linearly varying and uniformly distributed loads.	Analyze	1	1, 2, 4, 8, 12
2	Analyze plates under different boundary conditions by various classical methods and approximate methods.	Analyze	1	1, 2, 4, 8, 12
3	Familiar with classification of shells and classical shell theories and apply them in engineering design	Analyze	2	1, 2, 4, 8, 12
4	Exposed to singly curved shells, doubly curved shells and cylindrical shells.	Analyze	2	1, 2, 4, 8, 12

TEXT BOOKS:

1. S.P.Timoshenko and S.Woinowsky-Krieger, ―Theory of plates and shells‖ McGraw- Hill, 1959.
2. A.C.Ugural, ―Stresses in Plates and Shells‖, McGraw-Hill, 1999.
3. Chandrashekahara, K., ―Theory of Plates‖, University Press (India) Ltd., Hyderabad, 2001.

REFERENCE BOOKS:

1. Reddy J N, ―Theory and Analysis of Elastic Plates and Shells‖, McGraw Hill Book company, 2006.
2. Szilard.R, ―Theory and Analysis of Plates – classical and numerical methods‖, Prentice Hall Inc., 2004.
3. T.K.Varadan and K.Bhaskar , ―Analysis of plates‖, Narosa Publishing House, 1999.
4. Flugge. ―Stresses in Shells‖ , Blaisdell Publishing Co, 1966.

22CE953 FOUNDATION ENGINEERING

Source Link: https://www.constrofacilitator.com/an-overview-of-foundation-engineering/

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Geotechnical Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understanding of various engineering properties of materials like cement, fine aggregate and coarse aggregate. The objective of this course is to provide basic knowledge about properties and testing of various building materials used in civil constructions.

MODULE - 1

UNIT-1 **12L+3T+0P = 15 Hours**

SITE INVESTIGATION AND SHALLOW FOUNDATIONS

Various geotechnical field investigations, geotechnical field report. Bearing Capacity Of Shallow Foundations: Introduction, Basic definitions, Principal modes of soil failures, Terzaghi's bearing capacity theory/ equation and its modifications for square, rectangular and circular foundation, Skempton's bearing capacity analysis for clays, Meyerhof's analysis, Hansen's bearing capacity theory, Vesic's bearing capacity theory, IS code recommendations for bearing capacity, Bearing capacity of granular soils based on SPT value and Static cone resistance, Bearing capacity of footings on layered soils, Factors influencing bearing capacity, Allowable bearing pressure. General requirements of foundations, Factors affecting location and depth of foundation, Choice of type of foundations, Steps involved in the proportioning of footings.

UNIT -2 **12L+13T+0P = 25 Hours**

PILE FOUNDATIONS

Use of piles, Types of piles, Construction, Selection of pile type, Types of foundations to suit subsoil conditions, Pile load capacity, Static formulae, Dynamic formulae, Load tests, on piles, Group action of piles, Load carrying capacity of pile groups, Negative skin friction, Piles subjected to uplift loads.

PRACTICES:

- Concept of Shallow foundations.
- Site investigations.
- Analysis of proportionating shallow foundations.
- Concept of pile foundations.
- Analysis of Pile foundations.

MODULE - 2

UNIT -1 **12L+3T+0P = 15 Hours**

WELL FOUNDATION

Types of wells and caissons, components of well foundation, shapes of wells, depth of a well foundation, forces acting on a well foundation, lateral stability of well foundation, construction and sinking of a well.

UNIT-2 **12L+13T+0P = 25 Hours**

SETTLEMENT ANALYSIS

Consolidation settlement, immediate settlement, Corrections to settlement due to Consolidation,

SKILLS:

- ✓ *Application of bearing capacity of soils at various field conditions.*
- ✓ *Analysis on the settlement analysis for different types of foundation.*
- ✓ *Analyze ground movements due to construction.*

Settlement in different soil types/Settlement from field tests, Allowable settlement, Settlement of pile group. Stability of Slopes: Infinite slopes and translational slides, Definitions of factor of safety, Finite slopes-Forms of slip surface, Limiting equilibrium method and Critical stages in stability, Total stress and effective stress methods of analysis, øu = 0 Analysis (total analysis), cø analysis - method of slices, Location of the most critical circle, Friction circle method, Taylor's stability number.

PRACTICES:

- Concept of Well Foundations.
- Shapes and depth of Well Foundations.
- Analysis of Settlement.
- Settlement analysis and Consolidation concepts.
- Analysis of settlement by any method.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze Bearing capacity of soils at various field conditions.	Apply	1	1, 2
2	Analyze the settlement analysis for different types of foundation	Analyze	1	1, 2
3	Analyze ground movements due to Construction	Analyze	2	1, 2
4	Analyze retaining walls, cuts and excavations and sheet piles, slopes and underground structure.	Analyze	2	1, 2, 5, 12

TEXT BOOKS:

1. Gopal Ranjan and ASR Rao, Basic and Applied Soil Mechanics New Age International Publishers, 2nd edition, 2007.
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, —Soil Mechanics and Foundation‖, Laxmi Publications Pvt. Ltd., New Delhi, 16th edition, 2005.

REFERENCE BOOKS:

1. J.E. Bowles, Foundation Analysis and Design MacGraw Hill, 1996.
2. V. N. S. Murthy, Soil Mechanics and Foundation Engineering CBS Publishers & Distributors, New Delhi.
3. Donald P. Coduto, Man-Chu Ronald Yeung and William A.Kitch, Geotechnical Engineering Principles and Practices PHI Learning Pvt. Ltd., Second Edition.
4. W. C. Teng, Foundation Design Prentice hall.

22CE954 DESIGN OF UNDERGROUND WATER STRUCTURES

Source Link: https://structville.com/2021/11/design-of-underground-rc-circular-water- tanks.html

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Pre-stressed Concrete.

COURSE DESCRIPTION AND OBJECTIVES:

The main objective of this course is to learn the designs of underground water structures. Familiarize students with types & classification of underground openings, methodology & codal provisions. Understand the material properties, deformation analysis using analytical & numerical methods. To carry out the complete design of hydraulic tunnels & shafts. To study about the design based wedge & key block theory. Student must be able to design underground water tanks & retaining walls.

MODULE - 1

UNIT- 1 **12L+2T+0P = 14 Hours**

INTRODUCTION

Types and classification of underground openings, Factors affecting design, Design methodology, Functional aspects, Size and shapes, Support systems. Codal provisions.

UNIT-2 **12L+14T+0P = 26 Hours**

Material Properties & Stresses- deformation analysis of openings - circular, elliptical, spherical, ellipsoidal and galleries with composite lining due to internal pressure, closed form solutions, BEM, FEM. Analysis of Tunnels & shafts using analytical and numerical methods. Design of underground structures using analytical methods, empirical methods based on RSR, RMR, Q systems. Design based on rock support interaction analysis. Observational method NATM, Convergence-confinement method. NATM Hydraulic tunnels, Shafts, Tunnel portals, Metro tunnels.

PRACTICES:

- Deformation analysis of openings.
- Analysis of Tunnels & shafts using analytical and numerical methods.
- Design of underground structures using analytical methods.
- Observational method NATM.
- NATM Hydraulic tunnels.

MODULE - 2

UNIT-1 **12L+2T+0P = 14 Hours**

DESIGN BASED ON WEDGE & KEY BLOCKTHEORY

Design based on Wedge failure and key block analysis. Design of Shafts and hydraulic tunnels. Stability of excavation face and Tunnel portals. Use of appropriate software packages.

UNIT -2 **12L+14T+0P = 26 Hours**

CASE STUDIES

Case Studies using design of underground water tanks – Circular & Rectangular. Analysis & Design of retaining walls, Counterfort retaining walls. Retrofitting of underground Structures.

SKILLS:

- ✓ *Material Properties & Stress deformation analysis using analytical & numerical methods.*
- ✓ *Design of hydraulic tunnels & shafts.*
- ✓ *Design of underground water tanks & retaining walls.*

PRACTICES:

- Design of Shafts and hydraulic tunnels.
- Stability of excavation face and Tunnel portals.
- Design of underground water tanks.
- Analysis & Design of retaining walls.
- Counterfort retaining walls.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Stress deformation analysis.	Analyze	1	1, 2, 3, 4
2	Design methodology & codal provisions for underground structures.	Create	1	1, 2, 3, 4,
3	Design of hydraulic tunnels & shafts.	Create	1	1, 2, 3, 4, 7, 8
4	Design based wedge & key block theory.	Create	2	1, 2, 3, 4, 6, 7, 8
5	Design underground water tanks & retaining walls.	Create	2	1, 2, 3, 4, 6, 7, 8

TEXT BOOKS:

1. R. S. Sinha, —Underground Structures: Design & Construction‖, Elsevier Science, 2nd December, 2012.
2. Rajendra Patel, —Concrete for Underground Structures‖, Scitus Publisher, January, 2017.

REFERENCE BOOKS:

1. Cui, Z.-D., Zhang, Z.-L., Yuan, L., Zhan, Z.-X., Zhang, W.-K, —Design of Underground Structures‖.
2. Punmia,B.C., Ashok Kumar Jain, —Design of reinforced concrete structures‖. Code of practice for liquid retaining structures, IS 3370 – 2009.

22CE955 INDUSTRIAL STRUCTURES

Source Link: https://www.unrealengine.com/marketplace/en-US/product/industrial-structures-vol

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Steel Structures, RCC Structures refabricated Structures.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with some of the special aspects with respect to Civil Engineering structures in industries. At the end of this course the student shall be able to design some of the structures.

MODULE - 1

UNIT-1 **10L+4T+0P = 14 Hours**

PLANNING AND FUNCTIONALREQUIREMENTS

Classification of Industries and Industrial structures - planning for Layout Requirements regarding Lighting, Ventilation and Fire Safety - Protection against noise and vibration - Guidelines of Factories Act.

UNIT-2 **14L+12T+0P = 26 Hours**

INDUSTRIAL BUILDINGS AND POWER PLANT STRUCTURES

Steel and RCC - Gantry Girder, Crane Girders - Design of Corbels and Nibs – Design of Staircase. Types of power plants – Containment structures - Cooling Towers - Bunkers and Silos – Pipe supporting structures.

PRACTICES:

- Identify the types of Industrial Structures.
- Study the Industrial guidelines followed in India compare with foreign countries.
- Design of Crane and Gantry Girders.
- Design of corbels.
- Design of Cooling Towers.

MODULE - 2

UNIT -1 **10L+4T+0P = 14 Hours**

TRANSMISSION LINE STRUCTURES AND CHIMNEYS

Analysis and design of steel monopoles, transmission line towers – Sag and Tension calculations, Methods of tower testing – Design of self-supporting and guyed chimney, Design of Chimney bases.

UNIT-2 **14L+12T+0P = 26 Hours**

FOUNDATION

Design of foundation for Towers, Chimneys and Cooling Towers - Machine Foundation - Design of Turbo Generator Foundation.

SKILLS:

- ✓ *Classification of Industrial Structures and Learning of Factories Act.*
- ✓ *Design of Steel and RCC Industrial Structures.*
- ✓ *Design of Towers, Transmission Lines and Industrial Foundations.*

PRACTICES:

- Design of Steel Monopoles.
- Design of transmission line towers.
- Design of Chimney and cooling towers.
- Design of foundations for Industrial Structures.
- Design of Machine Foundation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Evaluate industrial structures for functional requirements.	Evaluate	1	1, 2, 3
2	Design of gantry girder.	Create	1	1, 2, 6
3	Design various structures such as Bunkers, Silos, Cooling Towers, Chimneys, and Transmission Towers.	Create	2	1, 2, 3, 6
4	Design foundations for various industrial structures.	Create	2	1, 2, 3, 6

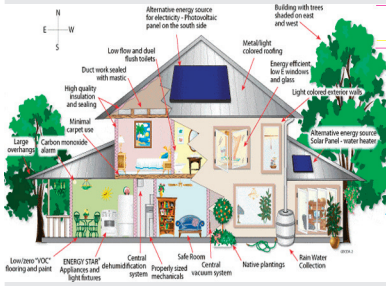
TEXT BOOKS:

1. Subramanian, N., Design of Steel Structures, Oxford University Press, 2008.
2. Varghese.P.C., Advanced Reinforced Concrete Design, PHI, Eastern Economy Editions, Second Edition, 2005.

REFERENCE BOOKS:

1. Ramamrutham.S., Design of Reinforced Concrete Structures, Dhanpat Rai Publishing Company, 2007.
2. Jurgen Axel Adam, Katharria Hausmann, Frank Juttner, Klauss Daniel, Industrial Buildings: A Design Manual, Birkhauser Publishers, 2004.
3. Manohar S.N, Tall Chimneys - Design and Construction, Tata McGraw Hill, 1985
4. Santhakumar A.R. and Murthy S.S., Transmission Line Structures, Tata McGraw Hill,1992.
5. Srinivasulu P and Vaidyanathan.C, Handbook of Machine Foundations, Tata McGraw Hill, 1976.

22CE956 GREEN BUILDINGS



Source Link: https://beeindia.gov.in/sites/default/files/BEE_ECBC%202017.pdf

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Environment & Building Materials.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers fundamental concepts to analyse all structural components for different load conditions. It gives a detailed idea about different methods involved in calculating the deformations in a structure. The objective is to make students understand the influence of loads and forces on determinate structures. In addition to that, provide knowledge about strain energy concepts for analysing determinate and indeterminate structures.

MODULE - 1

UNIT-1 **12L+3T+0P = 15 Hours**

GREEN BUILDINGS

History of Green Building Movement; Environmental Impact and Resource Consumption; Introduction to concept of green buildings; Benefits of Green Building and its Productivity.

UNIT-2 **12L+13T+0P = 25 Hours**

INDOOR BUILT ENVIRONMENT

Problem of Existing Buildings and Built Environment; Energy use in buildings; Greenhouse Gas Emissions and Indoor Air pollution; Building Water Use; Land use and consumption; Construction Materials; Construction, Operation and Demolition Waste.

PRACTICES:

- Concept of Green buildings.
- Environmental Impact Assessment on existing buildings.
- Demolition waste and its management.
- Study on Construction materials.

MODULE - 2

UNIT-1 **12L+3T+0P = 15 Hours**

GREEN BUILDING DESIGN

Passive Design Strategies: Optimum Design, Performing Insulation Solution, Ventilation; Active Strategies: Equipment, Renewable Energy; Retrofitting; Net Zero Building Design; Embodied Energy Estimation; Life Cycle Assessment Analysis.

UNIT-2 **12L+13T+0P = 25 Hours**

GREEN BUILDING ASSESMENT

Green Building Organizations, Green Building Rating Tools, Green building certification procedure.

SKILLS:

- ✓ *Assess the environmental impact of buildings.*
- ✓ *Practice sustainable measures for designing structures.*
- ✓ *Design energy efficient buildings and self-sustainable constructions.*
- ✓ *Understand the use of natural resources efficiently for ventilation and lighting.*

PRACTICES:

- Net Zero building design.
- Analysis of the structures to assess the life time.
- Proposal to get Green building certification for a demo project.
- Energy estimation of a construction project.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Quantify the environmental impact of buildings in terms of energy consumption.	Apply	1	1, 2
2	Integrate design strategies in the construction of green buildings as well as existing buildings.	Analyze	2	1, 2
3	Assimilate environmental impact of Buildings.	Evaluate	1	1,2
4	Comprehend the procedure involved in green building certification.	Application	2	1, 2,12

TEXT BOOKS:

1. Green Building Technology Guide: Volume 1 - Residential, Fred Andreas, Academic Press Inc., 2020, First Edition.
2. Green Building Guidance: The Ultimate Guide for IGBC Accredited Professional Examination, Karthik Karuppu, Notion Press, 2019, First Edition.

REFERENCE BOOKS:

1. Energetics Perspective on the Environmental and Human Impact of Buildings, Teodora Melania Soimosan and Ligia Mihaela Moga, Business Science Reference, 2020.
2. The Idea of Green Building, A. K. Jain, Khanna Publishers, 2014, First Edition.
3. Alternative Energy Systems in Building Design, Peter Gevorkian, McGraw-Hill Education, 2009, First Edition.
4. Sustainable Construction: Green Building Design and Delivery, Charles Kibert, John Wiley & Sons, 2005.

22CE957 SOLID AND HAZARDOUS WASTE MANAGEMENT

Source Link: https://evreka.co/blog/smart-solutions-in-municipal-solid-waste-management/

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Solid waste and Recycling process.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understanding of Solid Waste Management and its current scenario as well as Challenges in Engineered Systems. Not only the analysis on conversion of Solid waste but also Recovery as well as Application of Landfills for Municipal Solid Waste Management.

MODULE - 1

UNIT-1 **[10L+2T+0P = 12 Hours]**

MUNICIPAL SOLID WASTE

Types of solid wastes, Sources of Municipal and Hazardous wastes, Properties of solid wastes -Physical and Chemical composition.

UNIT-2 **[14L+14T+0P = 28 Hours]**

SOLID WASTE MANAGEMENT

An Overview, Introduction – Reduction, Reuse and Recovery, Waste Disposal Options, Current Scenario and Challenges Engineered Systems for Solid Waste Management: Functional Elements, Solid waste generation, On-site handling, Storage and Processing, Collection of solid wastes, Transfer and Transport, Processing of Solid wastes, Ultimate disposal.

PRACTICES:

- Concept of Solid Waste Management.
- Concept of Municipal Solid Waste.
- Analysis of Properties of Solid Waste.
- Sources of Solid Waste & Municipal Solid Waste.
- Analysis of Transfer and Processing of Solid Waste.

MODULE -2

UNIT-1 **10L+2T+0P = 12 Hours**

CONVERSION OF SOLID WASTE AND RECOVERY

Mechanical processing and Material recovery systems. Biological Conversion-Composting, Anaerobic Digestion. Thermal Conversion- Combustion, Incineration, Gasification, Pyrolysis, Refuse Derived Fuel, Energy recovery systems.

UNIT-2 **14L+14T+0P = 28 Hours**

LANDFILLS FOR MUNICIPAL SOLID WASTES

Land Filling of Municipal Solid Wastes, Site selection, Planning, Design and Operation. Landfill Gas-composition, Collection. Leachate environmental effects, Leachate collection systems, Treatment of leachatee, Definition, Sources, Classification, Hazardous wastes rules, and Nuclear waste, Biomedical wastes, Chemical wastes, disposal methods, Waste minimization. Treatment methods, Physico-chemical processes, Biological methods, Stabilization and Solidification, Thermal methods, Disposal methods Land disposal. Remedial technologies.

SKILLS:

- ✓ *Analysis on types of Solid wastes.*
- ✓ *Analyse the Challenges involved in SWM.*
- ✓ *Analyse MSW and recommend Landfills.*

PRACTICES:

- Anaerobic Digestion.
- Thermal Conversion of Solid Waste.
- Biological Conversion of Solid Waste.
- Factors considering for Site Selection of Landfill.
- Hazardous waste Management.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analysis & Application of Land Filling of Municipal Solid Wastes and MoEF rules.	Apply	2	1, 2, 5, 12
2	Analyze the Current Scenario and Challenges Engineered systems for Solid Waste Management.	Analyze	1	1, 2
3	Analyze the Conversion of Solid wastes and Recovery.	Analyze	2	1, 2
4	Assess the sources, types and Properties of solid wastes.	Evaluate	1	1, 2

TEXT BOOKS:

1. Solid and hazardous waste management by M.N.Rao and Razia Sultana, BS Publications, Hyderabad.
2. Venkatappa Rao. G and Sasidhar. R.S. (2009), Solid waste management and Engineered Landfills, Sai Master Geoenvironmental Services Pvt.Ltd, Hyderabad.

REFERENCE BOOKS:

1. Solid waste Engineering by P. Aarne Vesilind, Willium Worrell and Debra Reinhart, (2004), Cengage Learning India Private Limited, New Delhi.
2. MoEF (2000) Municipal Waste Management and Handling Rules, Govt. of India.
3. CPCB (2001) Criteria for Hazardous Waste Landfill(HASWAMS/17/2000-01)
4. Solid and hazardous waste management by M.N. Rao and Razia Sultana, BS Publications, Hyderabad.

22CE958 ADVANCED SOIL MECHANICS

Source Link: https://avantech.in/soil-mechanics-advanced/

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Soil Mechanics / Geotechnical Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understanding of various engineering properties of soil. Objective of this course is to provide analytical knowledge on soil mechanics in civil engineering applications and its importance.

MODULE-1

UNIT-1 **12L+2T+0P = 14 Hours**

SOIL STRUCTURE

Factors influencing nature and formation of soils, Soils as multiphase materials. Complexity of soil nature, Typical soil deposits with special reference to Indian Soils/ Sits. Type of bonds, Important clay minerals, Atomic and symbolic representation, Base exchange capacity, Force fields between soils particles and exchangeable ions, Guoy - Champman diffused double layer theory, Clay structural measurement.

UNIT-2 **12L+14T+0P = 26 Hours**

BEHAVIOUR OF SOILS

General , Effect of compaction on structure ,Swelling pressure, Shrinkage, Shear Strength, Pore Water pressure , Permeability, Comparison of dry of O.M.C & wet of O.M.C. Boussinesq's equation, Westergaard, Burmister Theories, Different conditions of loads, Constitutive relationship for soils.

PRACTICES:

- Concept of Advanced soil mechanics.
- Factors influencing nature and soil formation.
- Type of Bonds and clay minerals.
- Concept of behaviour of soils.
- Analysis of behaviour of soils using different methods.

MODULE - 2

UNIT-1 **12L+2T+0P = 14 Hours**

SHEAR AND STRESS

Shear strength parameters of cohesion less and saturated cohesive soils, Principles of Effective stress condition, Effect of rate of stress on shear parameters , Stress- Strain relationship , Skempton's Pore pressure coefficients, Hvorslev's true shear parameters, Effect of over consolidation on shear parameters.

UNIT-2 **12L+14T+0P = 26 Hours**

CONSOLIDATION AND SETTLEMENT ANALYSIS

Immediate settlement, Methods of determination, Estimation of Preconsolidation pressure. Three dimensional consolidation precompression of clay deposits with and without sand drains. Secondary consolidation factors. Stability analysis of slope-effective vs. total stress analysis, Bishop's rigorous analysis , Short method , Bishop Morgenstem stability coefficients.

SKILLS:

- ✓ *Analysis on soil structure.*
- ✓ *Analysis of soil behaviour.*
- ✓ *Application of shear and stress in construction projects.*
- ✓ *Analyze consolidation and settlement analysis.*

PRACTICES:

- Concept of shear and stress.
- Effect of stress on shear parameters.
- Analysis of stress and strain relationship.
- Analysis of consolidation.
- Settlement Analysis of soil.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the soil structure.	Analyze	1	1, 2
2	Analyze the behaviour of soils in civil engineering applications.	Analyze	1	1, 2
3	Apply shear and stress concepts in civil engineering applications.	Apply	2	1, 2
4	Analyze consolidation and settlement analysis.	Analyse	2	1, 2, 5, 12

TEXT BOOKS:

1. Arora. K. R, —Soil Mechanics and Foundation Engineering‖, Standard Publishers and Distributors, Delhi, 7th re-print edition, 2020.
2. Principles of geotechnical Engineering by BM Das and K. Shobhan, Cengage Publications, 8th edition, 2010.

REFERENCE BOOKS:

1. Venkatramaiah. C, —Geotechnical Engineering‖, New Age International Pvt. Ltd., New Delhi, 5th edition, 2017.
2. Manoj Datta, S. Gulhati, —Geotechnical Engineering‖, Tata McGraw Hill Education Ltd., 1st edition, 2008.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, —Soil Mechanics and Foundation‖, Laxmi Publications Pvt. Ltd., New Delhi, 16th edition, 2005.

22CE959 INTELLIGENT TRANSPORTATION SYSTEM

Source Link: https://encrypted- tbn0.gstatic.com/images?q=tbn:ANd9GcTGGjfWMZOUwIA2BgiV0lXu4EqB3dJSEXkNng&usqp=CAU

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Transportation Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with observing and monitoring the earth surface features in narrow bands and microwave bands of electromagnetic spectrum. Interpreting, analysing these data for better management of Earth resources.

MODULE - 1

UNIT-1 **12L+0T+0P = 12 Hours**

PAVEMENTS

Pavement Types, Design Factors: Definition, Comparison of pavements. Types of pavements based on structural behaviour – Flexible and Rigid Pavements, Comparison, components and their functions, Soil subgrade, sub-base, Base course and wearing course.

UNIT-2 **12L+16T+0P = 28 Hours**

DESIGN

Design of Flexible pavements – AASHTO Method of Flexible Pavement. Design of Air field Pavements – Corps of Engineers method.

Design of Rigid pavements – Design of Joints, Expansion Joints, Contraction Joints, Design of Dowel and Tie bars Design of Airfield Rigid pavements– LCN System of Pavement design.

PRACTICES:

- Structural Behaviour of Pavements.
- AAHTO Method of Design.
- Corps of Engineers method.
- Airfield Pavements.
- LCN System of design.

MODULE - 2

UNIT-1 **12L+0T+0P = 12 Hours**

URBAN TRANSPORTATION

Transport Planning: Introduction, Systems approach, Stages in transport planning, survey and analysis of existing conditions, forecast analysis of future conditions and plan synthesis and Evaluation.

UNIT -2 **12L+16T+0P = 28 Hours**

APPLICATIO

Trip generation: Trip purpose, Multiple Linear Regression Analysis, Category analysis.

Trip Distribution: Uniform factor method, Average factor method, Fratar method, Furness method, Gravity model, Trannar"s model, Opportunity model.

SKILLS:

- ✓ *Capable of identifying a structural behaviour of pavements.*
- ✓ *Proficiency in designing a different types of pavements.*
- ✓ *Able to plan and forecast traffic system in urban areas.*
- ✓ *Mastery of modelling and assigning traffic in urban areas.*

Traffic Assignment: All or Nothing Assignment, Multiple Route Assignment, Capacity Restraint Assignment, Design Curves.

PRACTICES:

- Stages of Planning.
- Trip Generation.
- Trip Method and Models.
- Route Assignment
- Restrain Assignment

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Interpret the cross section elements and structural ehaviour of pavements.	Apply	1	1,2,8,12
2	Planning and Forecasting traffic system in urban areas.	Analyze	2	1,4,6,7
3	Design the Pavements according to AASHTO and LCN systems.	Create	1	1, 2, 3, 4, 5, 8, 9, 10, 11, 12
4	Determine the suitable traffic model for urban areas.	Create	2	2, 3, 5, 9, 10, 11, 12

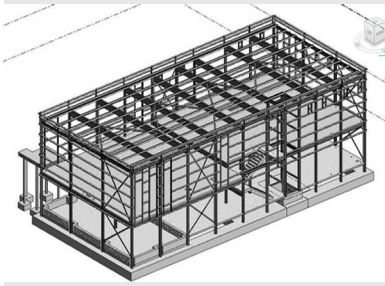
TEXT BOOKS:

1. Khanna S. K, Justo C E G, —Highway Engineering‖, 10th edition, NEM Chand and Sons Publications 2018.
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Publishers 2019.

REFERENCE BOOKS:

1. Kadiyali L R and Lal, —Highway Engineering Design‖, Khanna Publications, 2019.
2. Partha Chakroborty and Aminesh Das —Principles of Transportation Engineering‖, Prentice Hall of India, New Delhi. 2017.
3. Nicholas J Garber, Traffic and Highway Engineering, Cengage Learning 5th Edition 2019.

22CE960 ADVANCED STRUCTURAL DESIGN



Source Link: https://www.indiamart.com/proddetail/road-and-bridge-construction-10497814133.html

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Reinforced Concrete Structures and Steel Structures.

COURSE DESCRIPTION AND OBJECTIVES:

The fundamental design philosophies of concrete and steel structures have been introduced in the basic courses for undergraduate students of civil engineering. This course —Advanced Structural Design‖ deals with the design aspects of a few special structures with a view to simulation of realistic behavior as closely as possible.

MODULE - 1

UNIT-1 **10L+4T+0P = 14 Hours**

BASICS OF RETAINING WALLS AND WATER TANKS

Retaining walls – types, earth pressure diagrams, modes of failure, Water tanks – types.

UNIT- 2 **14L+12T+0P = 26 Hours**

DESIGN OF RETAINING WALLS AND WATER TANKS

Design of cantilever and counterfort retaining walls. Design of ground supported and overhead water tanks –rectangular and circular with flat bottom, flexible and rigid joints, design of staging – columns and bracings.

PRACTICES:

- Concept of retaining walls and water tanks.
- Design of Retaining Walls and Modes of Failures.
- Design of Counter Fort Retaining Wall.
- Design of Overhead Water Tanks.
- Under ground water tanks.

MODULE-2

UNIT-1 **10L+4T+0P = 14 Hours**

BASICS OF ROAD BRIDGES, STEELCHIMNEYS,LIGHT GAUGE STEEL STRUCTURES

Road bridges – Class A and Class AA loading, Steel chimneys – IS Specifications - Light gauge steel structures

UNIT-2 **14L+12T+0P = 26 Hours**

DESIGN OF ROAD BRIDGES, STEEL CHIMNEYS, LIGHT GAUGE STEEL STRUCTURES

Design of slab bridges, T-beam and slab bridges, Box culvert, Bearings. – Design of self- supporting chimneys. Light gauge steel structures – Design of tension members, compression members and beams.

SKILLS:

- ✓ *Retaining wall and Water Tanks design of different types.*
- ✓ *Design of Road Bridges and Steel Chimneys.*
- ✓ *Design of Light weight Structures.*

PRACTICES:

- Study on loadings for bridges according to IRC.
- Design of Road Bridges, T-Beams, Box Culverts.
- Design of Self-Supporting Steel Chimneys.
- Design of Light gauge Steel Structures.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze, design, draw and detailing of critical structural components with a level of accuracy.	Analyze	1,2	1, 2, 3
2	Enhance the capabilities to design the special structural elements as per Indian standard code of practice.	Evaluate	1,2	1, 2, 3
3	Design of retaining walls & Water tanks.	Create	1	1, 2, 5, 6
4	Design of slab bridge, tension members.	Create	2	1, 2, 5, 6

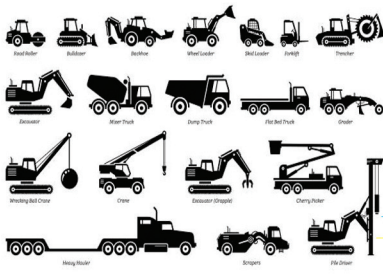
TEXT BOOKS:

1. Punmia, B.C. Limit State Design of Reinforced Concrete, Laxmi Publications, 2016.
2. Chandrasekaran S, —Advanced Steel Design of Structures‖, Taylor & Francis Ltd, 2020 edition.

REFERENCE BOOKS:

1. Krishnaraju, N. Design of Reinforced Concrete Structures, Fourth Edition, CBS Publishers & Distributors Pvt. Ltd., New Delhi. 2019.
2. Duggal. S. K, —Limit State Design of Steel Structures‖, Tata McGraw-Hill Education Publishers, 3rd edition, 2017.

22CE961 CONSTRUCTION TECHNIQUES AND EQUIPMENTS



Source Link: https://www.istockphoto.com/illustrations/construction-equipment

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Building Materials and Concrete Technology.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on the selection, economy, and productivity of common construction equipments and construction procedures for site development for industrial, heavy and civil constructions. The main objective of this course is to make the student aware of the various construction techniques, practices and the equipments needed for different types of construction activities.

MODULE -1

UNIT-1 **9L+6T+0P = 15 Hours**

CONSTRUCTION EQUIPMENT AND MANAGEMENT

Identification – Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment - Depreciation Analysis – Safety Management.

UNIT-2 **15L+10T+0P = 25 Hours**

EQUIPMENT FOR EARTHWORK AND OTHER CONSTRUCTION

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders, Earth Movers.

Equipment for Dredging, Trenching, Tunneling, Drilling, Blasting - Equipment for Compaction - Erection Equipment - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment –Equipment for Demolition.

PRACTICES:

- Study on depreciation analysis.
- Concept/Case study on safety management.
- Earth moving equipment‘s.
- Compaction equipment‘s.
- Demolition equipment‘s.

MODULE - 2

UNIT-1 **9L+6T+0P = 15 Hours**

MATERIALS HANDLING EQUIPMENT

Storage Handling equipment – Engineered Systems – Industrial Trucks – Bulk Material handling – OnRails Transfer Cart –Conveyors - Hauling Equipment – tractors, Trucks, Tipper

UNIT-2 **15L+10T+0P = 25 Hours**

CONSTRUCTION EQUIPMENTS

Crushers – Feeders - Screening Equipment – Pneumatic - Batching plants – Mixers –Concrete Pumps – Transit Mixers – Dumpers – Concrete Placers - Handling Equipment -Hauling, Pouring and Pumping Equipment – Transporters.

SKILLS:

- ✓ *Optimise the time of the construction.*
- ✓ *Demonstrate construction process.*
- ✓ *Identification of equipments for the construction process.*
- ✓ *Understand the construction equipment capacity.*

PRACTICES:

- Study on materials handling equipment.
- Concept of storing materials.
- Study on mixing equipment.
- Material handling, Pouring and Pumping equipment.
- Transporter equipment.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the techniques of erection of construction units.	Analyze	1	1, 2
2	Identify and manage with respect to time and their motion and movements.	Apply	1	1, 2, 6
3	Perform comparative cost analysis for owning and operating heavy equipment.	Evaluate	2	1
4	Show awareness of construction Safety. (OSHA regulations for excavation, inspection and protection)	Analyze	2	1, 2

TEXT BOOKS:

1. Sharma S.C., —Construction Equipment and Management‖, Khanna Publishers, New Delhi, 5 th edition, 2011.
2. Deodhar, S.V., —Construction Equipment and Job Planning‖, Khanna Publishers, New Delhi, 4th edition 2010.

REFERENCE BOOKS:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., —Construction Planning, Equipment and Methods‖, McGraw Hill, Singapore, 2006.
2. Dr.MaheshVarma, —Construction Equipment and its planning and Application‖, Metropolitan Book Company, New Delhi. 1988.

22CE962 QUALITY CONTROL & ASSURANCE IN CONSTRUCTION

Source Link: https://mastercivilengineer.com/quality-control-of-concrete-works/

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Concrete Technology & Construction Techniques.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on quality of materials used in construction and how to assess them and improve the quality of materials for better durability of structure. The main objective of this course is to make the student aware of the various quality checks for different construction materials and improvement techniques.

MODULE -1

UNIT-1 **9L+6T+0P=15 Hours**

FUNDAMENTALS OF QUALITY MANAGEMENT & SYSTEM

Introduction – Definitions and objectives – Factor influencing construction quality - Responsibilities and authority - Quality plan - Quality Management Guidelines – Quality circles.

Project Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

UNIT-2 **15L+10T+0P=25 Hours**

QUALITY PLANNING

Techniques of Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication.

PRACTICES:

- Study on quality in construction.
- Quality system standards and preparing quality system documents.
- Concept of Taguchi's quality.
- Inspection procedures.
- Case study on quality planning and implementation.

MODULE - 2

UNIT-1

QUALITY ASSURANCE AND CONTROL

Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors influencing construction quality - Critical, major failure aspects and failure mode analysis, -Stability methods and tools, optimum design - Reliability testing, reliability coefficient and reliability prediction.

SKILLS:

- ✓ *Study the concepts of and control techniques in construction.*
- ✓ *Study the of design philosophy, design of special elements, flat slabs and yield line based design, and ductile detailing quality assurance.*
- ✓ *Exposed to means of quality control.*

UNIT-2

QUALITY IMPROVEMENT TECHNIQUES

Selection of new materials - Influence of drawings, detailing, specification, standardization - Bid preparation - Construction activity, environmental safety, social and environmental factors - Natural causes and speed of construction - Life cycle costing - Value engineering and value analysis.

PRACTICES:

- Study on QA/QC.
- Factors influencing construction quality.
- Concept of reliability.
- Case study on bid preparation.
- Value analysis.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Assessment of objectives and advantage of quality assurance.	Evaluate	1	1, 2
2	Construct quality planning by using different concepts.	Create	1	1, 6
3	Assess the assurance of quality control systems.	Evaluate	2	1, 2
4	Design the safety programmes and contractual obligations.	Create	2	1, 2, 6

TEXT BOOKS:

1. James, J.O‘ Brian, —Construction Inspection Handbook – Quality Assurance and Quality Control‖, Van Nostrand, New York, 2009.
2. Clarkson H. Oglesby, —Productivity Improvement in Construction‖, McGraw-Hill, 2009.

REFERENCE BOOKS:

1. Kwaku, A., Tena, Jose, M. Guevara, —Fundamentals of Construction Management and Organisation‖, Reston Publishing Co., Inc., Virginia, 2005.
2. Hutchins.G, ISO 9000, Viva Books, New Delhi, 2002.

22CE963 RESOURCE MANAGEMENT AND CONSTRUCTION MAINTENANCE

Source Link: https://www.aboutcivil.org/cost-control-cost-management-techniques.html

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Concrete Technology & Construction Techniques.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on how to control various resources like labour, equipments, materials etc., in construction industry. The main objective is how to plan and manage all the resources in the construction efficiently.

MODULE - 1

UNIT-1 **9L+6T+0P=15 Hours**

INTRODUCTION TO RESOURCE PLANNING & LABOURMANAGEMENT

Definition - Principles - Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time.

Prismatic compass - Surveyor‘s Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour.

UNIT-2 **15L+10T+0P=25 Hours**

MATERIALS AND EQUIPMENTS

Material - Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution. Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.

PRACTICES:

- Study on time schedule and cost control.
- Concept of resources.
- Quantity of materials, sources and transportation.
- Planning and selecting by optimistic choice with respect to cost.
- Case study on materials and equipment‘s.

MODULE - 2

UNIT-1 **9L+6T+0P=15 Hours**

TIME MANAGEMENT

Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects - Cash flow and cost control.

UNIT-2 **15L+10T+0P=25 Hours**

RESOURCE ALLOCATION AND LEVELLING

Time-cost trades off, Computer application - resource leveling, resource list, resource allocation, Resource loading, Cumulative cost - Value Management.

SKILLS:

- ✓ *Study, manage and control the various resources involved in construction industry.*
- ✓ *Study the effect of resource planning, labour management, material and equipment in the construction.*
- ✓ *Plan and manage the resources (men, material, money, machineries) in the construction efficiently.*

PRACTICES:

- Study on time management.
- Cash flow and cost control.
- Study on resource levelling.
- Case study on cumulative cost.
- Case study on resource allocation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Allocate and level the resources in construction.	Analyze	1	1, 6, 11
2	Demonstrate the time management for all kind of projects.	Analyze	1, 2	1, 11
3	Assess the labour costs and schedule in construction.	Evaluate	1, 2	1, 6
4	Evaluate well versed to manage the materials at site.	Evaluate	2	1, 11
5	Incorporate the realities of construction site and respond to changes in project objectives and to track resource utilization.	Evaluate	2	1, 2, 11

TEXT BOOKS:

1. Arnold, ―Introduction To Materials Management‖, Pearson Education India,2009
2. Andrew,D., Szilagg, ―Hand Book of Engineering Management‖, 2nd Edition, 2001.

REFERENCE BOOKS:

1. P. Gopalakrishnan, ―Handbook of Materials Management‖, PHI Learning Pvt. Ltd.2004
2. Harvey, A., Levine, ―Project Management using Micro Computers‖, ObsorneMcGrawHillC.A.Publishing Co., Inc. 1988.

22CE964 CONSTRUCTION PLANNING AND MANAGEMENT

Source Link: https://www.bdcmagazine.com/files/uploads/2020/08/ttt.jpg

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Construction Materials, Resource Management.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with construction processes of building components such as foundation, walls, beams and columns. This course also covers planning of construction and principles of planning. The objective of this course is to provide knowledge of planning and construction of residential, industrial and public buildings.

MODULE - 1

UNIT-1 **12L+0T+0P = 12 Hours**

WALLS, ROOFS AND STAIRCASES

Technical Terms of Walls, Roofs and Staircases, design considerations, dampness, scaffolding, centering.

An Approach to planning, Principles of Planning, Aspect, prospect, Privacy, Roominess, Furniture requirements, Grouping, Circulation, Orientation, Flexibility, Sanitation, Lighting, Ventilation, Elegance and economy, Climatic considerations, Flow diagram and line plan, Space for equipment for air–conditioning, Space for machinery.

UNIT-2 **12L+16T+0P = 28 Hours**

BUILDINGRULES, ELEMENTS AND BYELAWSRULES AND BYELAWS

Zoning regulations, Regulations regarding layouts or subdivisions, Building regulations, Rules for special type of buildings, Calculation of plinth, Floor and carpet area, Floor space index.

BUILDING ELEMENTS: Conventional signs, Guidelines for staircase planning, Guidelines for selecting doors and windows, Terms used in the construction of door and window, Specifications for the drawing of door and window.

PRACTICES:

- Flow diagram and Line Plan.
- Building Bye Laws and Regulations.
- Calculation of Plinth, Floor and Carpet area.
- Guidelines for staircase, doors and windows.
- Specifications for drawing of door and window.

MODULE - 2

UNIT-1 **12L+0T+0P = 12 Hours**

RESIDENTIAL AND PUBLIC BUILDINGS

RESIDENTIAL BUILDINGS: Minimum standards for various parts of buildings, Requirements of different rooms and their grouping, characteristics of various types of residential buildings.

PUBLIC BUILDINGS: Planning of educational institutions, Hospitals, Dispensaries, Office buildings, Banks, Industrial buildings, Hotels and motels, Buildings for recreation.

SKILLS:

- ✓ *Finding out different properties of walls, roofs and staircase.*
- ✓ *Application of different building byelaws in construction and planning.*
- ✓ *Draw a basic floor plan and line plan for Residential buildings, hospitals.*
- ✓ *Preparing and assigning a plan, resources for construction of building.*

UNIT-2 **12L+16T+0P = 28 Hours**

PROJECT PLANNING AND MANAGEMENT

Importance of Project Management, Role of Project manager, Stakeholders in construction project, Different types of projects, similarities & dissimilarities in projects., Knowledge areas & Processes involved in construction projects, WBS of a major work, with examples, Planning, monitoring & executing, Planning, sequencing, scheduling, Bar Charts, Networks, CPM, PERT, Upgrading, Cash flow diagram, resource levelling & resource allocation, Crashing of project, Cost Optimization, Invoicing

PRACTICES:

- Building Standards and characteristics.
- Planning various types of public buildings.
- Projects and Project Management.
- CPM and PERT.
- Resource allocation and cost optimization.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Describe about technical aspects of walls, roofs and Staircase.	Apply	1	1,4,5,6,7
2	Explain the principles of planning, building rules and bye–laws	Create	1	1, 2, 3, 4, 7, 10, 11, 12
3	Explain the minimum standards of residential and Public building	Analyse	2	1,4,5,6,7
4	Analyse project planning and scheduling using CPM, PERT and BAR Charts	Create	2	1, 2, 3, 4, 5, 6, 8, 7, 8, 9, 10, 11, 12

TEXT BOOKS:

1. Chitkara K K , — Construction Project Management‖, McGraw Hill Publishing, 4th edition, 2019.
2. Kumaraswamy N, —Building Planning and Drawing‖, Charotar Publishing House, 9th edition, 2019.

REFERENCE BOOKS:

1. Shah M G, Kale C M and Patki S Y, —Building Drawing‖, Tata McGraw Hill, New Delhi, 5th edition, 2017.
2. Kumar Neeraj Jha, ‖Construction Project Management‖, Pearson Publication, 2nd Edition, 2015.
3. McKay, —Building Construction‖, Vol. I, II, III and IV, Orient Long Man, 4th edition, 2004.

22CE965 LEAN CONSTRUCTION MANAGEMENT

Source Link: https://acropolis-wp-content-uploads.s3.us-west-1.amazonaws.com/lean-hero.png

Hours Per Week :

L	T	P	C
3	2	-	4

PRE-REQUISITE KNOWLEDGE: Construction Techniques.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces students to lean principles and the lean project delivery system (LPDS) applied to the construction industry. Lean construction and lean project delivery embrace concepts and techniques originally conceived in the automobile manufacturing industry and adopted by the construction industry. In the manufacturing sector, lean production has revolutionized product manufacturing, resulting in significant gains in plant productivity, reliability, and reductions in defects.

MODULE - I

UNIT-1 **12L+0T+0P = 12 Hours**

PROGRAM PROJECT AND CONSTRUCTION MANAGEMENT

Construction projects and Industry Characteristics, construction management and project management, Comparison and contrast between construction and manufacturing industries. EAC life cycle, cost of change in EAC life cycle.

UNIT-2 **12L+16T+0P = 28 Hours**

PROJECT DELIVERY

Project Development cycle, contract types, project delivery methods, contract strategy assessment, Alliance contracting and Public private partnership.

PRACTICES:

- Project characteristics and Management.
- EAC Life cycle.
- Contract types and strategies.
- Project delivery methods.

MODULE -2

UNIT-1 **12L+0T+0P = 12 Hours**

LEAN WAY

Theory of Lean, need for productivity measurement and improvement, productivity measurement system, Lean Design Delivery, Lean Design Flow, Work Sampling, Foreman delay survey, value stream/ process mapping.

UNIT -2 **12L+16T+0P = 28 Hours**

LEAN TOOLS

5S (Collaborative planning system/ Last Planner System), Defining BIM, BIM and Lean, Lean Tools in project site.

SKILLS:

- ✓ *Efficiency in project through lean management.*
- ✓ *Ability to deliver project successfully with lean approach.*
- ✓ *Compare push planning and pull planning.*
- ✓ *Able to use lean construction tool and last planner system for collaborative planning.*

PRACTICES:

- Project characteristics and Management.
- EAC Life cycle.
- Contract types and strategies.
- Project delivery methods.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understanding the basic concepts of chaining, ranging, bearings, and traversing, levelling.	Apply	1	1, 4, 5, 6, 7
2	Understanding the basic concepts of EDM, GPS measurements and Errors, Photogrammetric Survey and Remote Sensing.	Analyze	2	1, 4, 5, 6, 7
3	Illustrate the process of using metric chain, tape, compass, Auto level and Theodolite and Computing the linear and vertical measurements.	Create	1	1, 2, 3, 4, 7, 10, 11, 12
4	Illustrating and Computing the scale, positional measurements using Total station, GPS instruments, Drone and Remote sensing Satellites.	Create	2	1, 2, 3, 4, 5, 6, 8, 7, 8, 9, 10, 11, 12

TEXT BOOKS:

1. Lincoln H. Forbes, —Lean Project Delivery And Integrated Practices In Modern Construction 2nd Edition, 2020.
2. Kumaraswamy N, —Building Planning and Drawing‖, 9th edition, Charotar Publishing House, 2019.

REFERENCE BOOKS:

1. Lean Construction Management. The Toyota Way, Springer Nature 2014.
2. Kumar Neeraj Jha, ‖Construction Project Management‖, Pearson Publication, 2nd Edition, 2015.