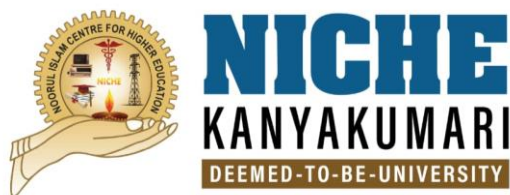


NOORUL ISLAM CENTRE FOR HIGHER EDUCATION

**(Deemed to be University Under Section 3 of the UGC Act, 1956)
Kumaracoil, Thuckalay**

DEPARTMENT OF CIVIL ENGINEERING



B.E. CIVIL ENGINEERING CURRICULUM AND SYLLABI

REGULATION 2021

NOORUL ISLAM CENTRE FOR HIGHER EDUCATION, Kumaracoil

Regulation: 2021

Curriculum and Syllabi

B.E Programme

DEPARTMENT OF CIVIL ENGINEERING

B.E. CIVIL ENGINEERING

Vision of the University

To be recognized by the Government and society at large as an institution able to deliver excellence with relevance in the field of higher education and research focusing on the needs of the nation in tune with the technological revolution to cope with the knowledge explosion and global competence.

Mission of the University

To develop the institution as a Centre of Excellence, keeping pace with the advances in the field, so as to provide quality higher education to the students and instill in them high standards of discipline and ethics so that they become enlightened individuals in the service of humanity and to carry out focused research in the frontier areas of science and technology.

Faculty of Civil Engineering

Department of Civil Engineering

Vision of the Department

To become a Centre of Excellence in Civil Engineering Education, Research and Consultancy.

Mission of the Department

- To produce leaders in the field of Civil Engineering along with its subgroups at graduate, post-graduate and doctoral level, so as to be able to serve the society competently, collaboratively and ethically as Planners, designers, constructors and operators of the built environment.
- To excel in Consultancy and R&D in Civil Engineering.
- To generate new knowledge by engaging in cutting edge research and to promote academic growth by offering state of the art undergraduate, post graduate and doctoral programs.

- To identify, based on an informed perception of Indian, regional and global needs, area of specialization upon which the institute can concentrate.
- To undertake collaborative projects which offer opportunities for long-term interaction with academic and industry.
- To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

Description of the programme

Programme Educational Objectives - PEO	
PEO-01	Graduates will be able to apply knowledge of mathematics, science, and engineering principles to solve civil engineering problems.
PEO-02	Graduates will be able to identify, formulate, and solve engineering problems.
PEO-03	Perform investigation for solving Civil Engineering problems by conducting research using modern equipment and software tools.
PEO-04	Become consultants on complex real life Civil Engineering problems related to Infrastructure development especially housing, construction, water supply, sewerage, transport, spatial planning.
PEO-05	Graduates will be able to apply principles of sustainability, ethics, and social responsibility

Graduate Attributes-GA	
GA-1	Innovative Engineering Solutions Develop creative and innovative solutions to complex engineering problems, incorporating the latest technologies and approaches to address current and future challenges.
GA-2	Global Perspective in Engineering Understand and apply engineering solutions in a global context, recognizing the diversity of global issues, standards, and the impact of engineering decisions on different cultures and communities.
GA-3	Sustainable Development and Green Engineering Design and implement engineering solutions that prioritize sustainability, resource efficiency, and environmental protection, contributing to a sustainable future.
GA-4	Social Responsibility and Community Engagement Demonstrate a commitment to social responsibility by engaging with and contributing to local communities, understanding societal needs, and addressing social challenges through engineering practices.
GA-5	Adaptability and Lifelong Learning Exhibit a proactive approach to continuous learning and adaptability, keeping pace with technological advancements and industry changes, and engaging in professional development activities.
GA-6	Entrepreneurship and Innovation Foster an entrepreneurial mindset, identifying opportunities for innovation and creating value through new technologies, products, and processes that meet market needs.
GA-7	Interdisciplinary Collaboration Work effectively in interdisciplinary teams, integrating knowledge from various fields to develop comprehensive solutions to complex engineering problems.
GA-8	Ethical Leadership and Integrity Lead with integrity and ethical principles, ensuring transparency, fairness, and respect in all professional and personal interactions.
GA-9	Digital and Data Literacy Utilize advanced digital tools and data analytics techniques to solve engineering problems, optimize processes, and make informed decisions based on data-driven insights.

GA-10	Safety, Health, and Risk Management Prioritize safety, health, and risk management in engineering practices, ensuring the well-being of individuals and communities while minimizing potential risks and hazards.
GA-11	Effective Communication and Negotiation Skills Communicate ideas, solutions, and technical information effectively to a variety of audiences, and engage in negotiation to resolve conflicts and reach consensus.
GA-12	Impact Assessment and Policy Making Assess the impact of engineering projects on society and the environment, and contribute to policy-making processes that promote sustainable and responsible engineering practices.

Programme Outcome – PO	
PO-A	Engineering Knowledge: Integrate mathematics, sciences, and civil and construction engineering knowledge from all sub-disciplines to the solution of complex civil and construction engineering problems.
PO-B	Problem Analysis: Identify, source information, formulate solutions, analyze options and solve complex civil and construction engineering problems.
PO-C	Design 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 factors.
PO-D	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.
PO-E	Modern tool usage: Create, select, and apply appropriate techniques, resources, and advanced engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO-F	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.
PO-G	Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.
PO-H	Individual and team work: Function effectively as an individual, and as a member or leader in diverse groups, and multidisciplinary settings.
PO-I	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.

PO-J	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO-K	Ethics: Demonstrate ethical practice in the context of civil and construction engineering problems.
PO-L	Usage of Cutting-Edge Technology: Inspiring students and preparing them for successful professional careers using appropriate techniques, resources and modern attitudes and modeling to complex engineering activities and research.
PO-M	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.

Mapping of Graduate Attributes and Programme Educational Objectives (PEO)

GAs PEOs	G A- 01	GA- 02	GA- 03	GA- 04	GA- 05	GA- 06	GA- 07	GA- 08	GA- 09	GA- 10	GA- 11	GA- 12
PEO-01	H	A	H	N	H	H	A	H	H	A	A	N
PEO-02	A	H	A	H	A	A	A	H	A	H	A	H
PEO-03	A	A	A	A	H	H	A	A	A	N	A	A
PEO-04	H	H	A	H	H	A	A	H	A	H	A	H
PEO-05	A	N	H	A	A	H	H	H	A	H	H	A

H- Highly Associated

A- Associated

Not – Not Associated

Mapping of Graduate Attributes and Programme Outcomes (PO)

GAs PEOs	G A- 01	GA- 02	GA- 03	GA- 04	GA- 05	GA- 06	GA- 07	GA- 08	GA- 09	GA- 10	GA- 11	GA- 12
PO-A	H	A	H	A	H	H	A	H	A	H	H	A
PO-B	A	H	A	H	A	A	H	A	H	A	A	A
PO-C	A	A	A	H	A	H	H	A	A	A	H	A

PO-D	A	A	A	A	A	A	A	A	A	A	A	A
PO-E	A	A	H	A	H	A	H	H	A	A	A	H
PO-F	A	A	A	H	A	A	A	A	A	A	A	A
PO-G	H	A	H	H	A	A	H	H	A	H	A	A
PO-H	A	A	H	H	N	H	H	H	A	A	H	N
PO-I	A	H	H	A	H	H	H	H	H	A	H	H
PO-J	A	A	H	A	A	H	A	H	A	A	H	A
PO-K	A	H	H	A	A	H	H	H	H	A	H	A
PO-L	A	N	H	H	H	H	A	H	N	A	H	H
PO-M	A	H	A	H	N	H	A	A	H	A	H	N

H- Highly Associated

A- Associated

Not – Not Associated

Mapping of Programme Educational Objective (PEOs) and Programme Outcomes (POs)

PEO PO	PEO-01	PEO-02	PEO-03	PEO-04	PEO-05
PO-A	H	A	H	A	H
PO-B	A	H	A	H	A
PO-C	A	A	A	H	A
PO-D	A	A	A	A	A
PO-E	H	H	N	A	H
PO-F	A	A	A	H	A
PO-G	H	A	H	H	A

PO-H	H	A	A	H	N
PO-I	H	H	A	A	H
PO-J	H	A	A	A	A
PO-K	H	H	A	A	A
PO-L	H	N	A	H	H
PO-M	A	H	A	H	N

H- Highly Associated

A- Associated

Not – Not Associated

Duration of the programme: 4Years/8 Semesters

Total credit: 162

CURRICULUM & SYLLABI**SEMESTER I**

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	EG3101	Technical English	3	1	0	4
2.	MA3101	Engineering Mathematics – I	3	1	0	4
3.	BS3101	Engineering Physics	3	0	0	3
4.	BS3102	Engineering Chemistry	3	0	0	3
5.	CS3101	Fundamentals of Computing and Python Programming	3	0	0	3
PRACTICAL						
6.	CS3171	Fundamentals of Computing and Python Programming Laboratory	0	0	4	2
7.	BS3171	Physics and Chemistry Laboratory	0	0	4	2
TOTAL			15	2	8	21

SEMESTER II

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	EG3102	Communicative English	3	0	0	3
2.	MA3102	Engineering Mathematics – II	3	1	0	4
3.	BS3103	Environmental Science	3	0	0	3
4.	ME3201	Engineering Mechanics	3	0	0	3
5.	CV3101	Basic Civil Engineering	3	0	0	3
6.	CV3102	Surveying for Construction	3	0	0	3
PRACTICAL						
7.	CV3171	Civil Engineering Practice	0	0	2	1
8.	CV3172	Engineering Graphics Laboratory	0	0	2	1
TOTAL			18	1	4	21

SEMESTER III

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	MA3201	Engineering Mathematics - III	3	1	0	4
2.	CV3201	Advanced Surveying	3	0	0	3
3.	CV3202	Concrete Technology	3	0	0	3
4.	CV3203	Engineering Geology	3	0	0	3
5.	CV3204	Fluid Mechanics	3	0	0	3
6.	CV3205	Strength of Materials - I	3	0	0	3
PRACTICAL						
7.	CV3271	Strength of Materials Laboratory - I	0	0	2	1
8.	CV3272	Survey Practical	0	0	2	1
TOTAL			18	1	4	21

SEMESTER IV

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	MA3203	Numerical Methods	3	0	0	3
2.	CV3206	Hydraulics and Hydraulic Machines	3	0	0	3
3.	CV3207	Soil Mechanics	3	0	0	3
4.	CV3208	Strength of Materials - II	3	0	0	3
5.	CV3209	Transportation Engineering - I	3	0	0	3
6.	CV32 10	Structural Analysis - I	3	0	0	3
PRACTICAL						
7.	CV3273	Soil Mechanics Lab	0	0	2	1
8.	CV3274	Hydraulics Lab	0	0	2	1
TOTAL			18	0	4	20

SEMESTER V

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	MS3201	Professional and Business Ethics	2	0	0	2
2.	CV3211	Structural Analysis – II	3	0	0	3
3.	CV3212	Irrigation Engineering	3	0	0	3
4.	CV3213	Foundation Engineering	3	0	0	3
5.	CV3214	Design of Reinforced Concrete Elements	3	0	0	3
6.	CV3215	Transportation Engineering II	3	0	0	3
PRACTICAL						
7.	CV3275	Computer Aided Drafting Laboratory	0	0	2	1
8.	CV3276	Irrigation Engineering Design and Drawing	0	0	2	1
TOTAL			17	0	4	19

SEMESTER VI

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CS32D1	Fundamentals of Artificial Intelligence	3	0	0	3
2.	CV3216	Advanced Design of Structure	3	0	0	3
3.	CV3217	Design of Steel Structures	3	0	0	3
4.	CV3218	Environmental Engineering	3	0	0	3
5.	*****	Elective – I	3	0	0	3
6.	*****	Elective – II	3	0	0	3
PRACTICAL						
7.	CV3277	Environmental Engineering Laboratory	0	0	2	1
8.	CV3278	Concrete Laboratory	0	0	2	1
9.	CV3279	Summer Internship	0	0	2	2
TOTAL			18	0	6	22

SEMESTER VII

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	MS3202	Principles of Management	2	0	0	2
2.	CV3219	Repair and Rehabilitation of Structures	3	0	0	3
3.	CV3220	Estimation and Quantity Surveying	3	0	0	3
4.	CV3221	Fundamentals of Remote Sensing	3	0	0	3
5.	CV32**	Elective – III	3	0	0	3
6.	CV32**	Elective – IV	3	0	0	3
PRACTICAL						
7.	CV32P2	Creative and Innovative Project	0	0	6	3
TOTAL			17	0	6	20

SEMESTER VIII

SL. NO.	Course Code	COURSE TITLE	L	T	P	C
THEORY						
1.	CV32**	Elective V	3	0	0	3
2.	CV32**	Elective VI	3	0	0	3
PRACTICAL						
3.	CV32P3	Internship	0	0	2	2
4	CV32P5	Project Work	0	0	20	10
TOTAL			6	0	22	18

LIST OF ELECTIVES

SI. NO	COURSECODE	COURSE TITLE	L	T	P	C
1.	CV32A1	Traffic Engineering and Management	3	0	0	3
2.	CV32A2	Building Construction Materials & Methods	3	0	0	3
3.	CV32A3	Construction Techniques and Practice	3	0	0	3
4.	CV32A4	Tunneling Engineering	3	0	0	3
5.	CV32A5	Environmental Management	3	0	0	3
6.	CV32A6	Environmental Safety	3	0	0	3
7.	CV32A7	Project Planning and Management	3	0	0	3
8.	CV32A8	Geographical Information System	3	0	0	3
9.	CV32A9	Ground Improvement Techniques	3	0	0	3
10.	CV32B1	Groundwater Engineering	3	0	0	3
11.	CV32B2	Hydrology	3	0	0	3
12.	CV32B3	Industrial Waste Management	3	0	0	3
13.	CV32B4	Pavement Engineering	3	0	0	3
14.	CV32B5	Pre-stressed Concrete Structures	3	0	0	3

OPEN ELECTIVES

SI. NO	COURSECODE	COURSE TITLE	L	T	P	C
1.	CV32D1	Air Pollution Management	3	0	0	3
2.	CV32D2	Energy Efficient & Green Buildings	3	0	0	3
3.	CV32D3	Building Fire Safety	3	0	0	3

SEMESTER – I

EG3101	TECHNICAL ENGLISH	L	T	P	C
		3	1	0	4

OBJECTIVES

- To develop the linguistic, communicative and critical thinking competencies of First Year Engineering students
- To enhance the understanding of the complex grammatical structures of the English language to students
- To improve the language proficiency of students in English with emphasis on Vocabulary, Grammar, Listening, Speaking, Reading, and Writing skills
- To introduce the students to the basic phonetics of English and make them grasp the various sounds of the English language to improve their pronunciation

Course Outcomes		Cognitive Skill
CO-01	The students will be able to improve their vocabulary relating to Engineering Technology and use articles and prepositions effectively in sentences.	R
CO-02	The students will be able to learn grammatical items like tense, voice, compound nouns etc. and thereby enhance their linguistic competence.	U
CO-03	The students will be able to learn definitions of technical terms, relative pronouns etc. which will develop their language competence.	A
CO-04	The students will be able to acquire the essentials of writing skills relating to CV, resume, Formal and Business Letters.	U
CO-05	The students will be able to learn English phonemes such as Vowels, Diphthongs and Consonants which will be instrumental in improving their pronunciation and speaking skills.	R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcomes with Programme Outcomes

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	S	S	M	S	S	N	N	N	N	N
CO-02	M	S	M	M	S	S	M	S	N	N	N	N	N
CO-03	S	M	M	S	M	M	S	M	N	N	N	N	N
CO-04	M	S	M	M	S	M	S	M	N	N	N	N	N
CO-05	S	M	S	S	M	S	M	S	N	N	N	N	N

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I:

9

Word formation with prefixes and suffixes – Articles – Conjunctions – Prepositions – Expansion of Abbreviations and Acronyms – Writing Checklists – Writing Instructions.

Unit II:**9**

Tense – Voice – Punctuation – Expansion of Compound Nouns – Writing Recommendations – Paragraph Writing – Types, Structures and Features of a Paragraph – Creating Coherence – Organizing Principles of Paragraphs in Documents.

Unit III:**9**

Discourse Markers – Gerunds and Present Participles – Relative Pronouns – Conditional Clauses – Definitions of Technical Terms – Transcoding: Bar Chart - Flow Chart - Pie Chart - Tree Diagram - Tabular Column.

Unit IV:**9**

Concord – Clauses – Phrases – Numerical Adjectives – CV/Resume Writing – Virtual Communication: E-Mail Writing – Essay Writing: Basic Format of an Essay - Types – Examples.

Unit V:**9**

Basic Phonetics: Phonemes – Vowels, Diphthongs and Consonants – Classification: Pure Vowels/Monophthongs – Vowel Glides /Diphthongs.

L: 45 + T: 15, TOTAL: 60 HOURS**EXTENSIVE READING:**

Shiv Khera, You Can Win, Milan, Delhi, 2004

NOTE:

The book given under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

MA3101	Engineering Mathematics – I	L	T	P	C
		3	1	0	4

AIM:

To impart the fundamental knowledge of Engineering Mathematics to the students in order to achieve a well-founded knowledge about the principles of Mathematics

OBJECTIVE:

The course objective is to develop the required skill of the students in the area of Engineering Mathematics with special emphasis on the characteristic equation of matrices, differential calculus, Beta and Gamma functions and to develop basic knowledge to the students in double and triple integration.

Subject Code: MA3101 Subject Name: Engineering Mathematics I	
Course Outcome – Cos	Cognitive Skill
CO-01	Understand the characteristic equation and find eigen values and Eigen vector of a real matrix. Compute the eigen value and eigen vector using properties. Verify Cayley Hamilton theorem and its applications. Apply orthogonal transformation of a symmetric matrix.
CO-02	Define the definitions and formula for curvature, radius of curvature, circle of curvature. Apply the formula and solve problems using the required formulas also find the evolute of the curves.
CO-03	Know about the differentiation formulae and apply on partial derivatives total derivatives and Jacobians. Verify the functions be maximum or minimum and Lagrange's multiplier method. Express the Taylor's expansion for two variables.
CO-04	Know the Fundamental concepts of improper integrals, Beta and gamma function and their properties. Develop the skill in the relation between Beta and Gamma Functions. Calculate definite integral values using Beta and Gamma Functions.
CO-05	Evaluate the double and multiple integrals and can apply these concepts to find areas of regions on a plane or in space. Graph Cartesian and polar equations. Convert Cartesian coordinates into polar coordinates.

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	M	S	S	S	S	M	S	S	M	N
CO-02	S	M	M	M	S	S	M	S	M	M	M	M	N
CO-03	S	M	M	M	S	S	M	M	M	S	S	M	N
CO-04	S	M	S	M	S	M	S	S	M	S	S	M	N
CO-05	S	M	S	M	S	M	S	S	M	S	S	M	N

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I: Matrices

9

Characteristic equation - Eigen values and Eigen vectors of a real matrix - Properties of eigen values and eigen vectors (without proof)- Cayley Hamilton theorem (statement only), verification and its applications - Orthogonal and Symmetric matrices and their properties (excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form.

UNIT II: Differential Calculus

9

Curvature - Cartesian co-ordinates and parametric form -Centre and radius of curvature,

Circle of curvature - Evolutes.

UNIT III: Functions Of Several Variables

9

Partial derivatives - Total derivatives - Jacobians - Properties - Maxima and minima for functions of two variables - Lagrange Multiplier method- Taylor's expansion.

Unit IV: Improper Integrals

9

Evaluation of improper integrals- Beta and Gamma functions - Properties - Relation between Beta and Gamma functions - Evaluation of integrals using Beta and Gamma functions.

Unit V: Multiple Integrals

9

Evaluation of double and triple integrals - Area enclosed by plane curves as double integral in cartesian and polar co-ordinates - Change of order of integration- Transformation of Cartesian coordinates into polar coordinates.

L: 45 + T: 15, TOTAL: 60 HOURS

OUTCOMES:

At the end of the course, the students will be familiar with various concepts of calculus which are essential for engineering. They also become acquainted with the basic ideas of multiple integrals and their usage.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics"- 40th Edition, Khanna Pub-lishers, Delhi 2007

REFERENCES:

1. M.Immaculate Mary, K.Uma Samundesvari, "Engineering Mathematics - I" Revised Edition, R.K Publishers, 2016.
2. Veerarajan T, "Engineering Mathematics (for first year)", Fourth Edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Seventh Edition, Wiley India, 2007.
4. P.Kandasamy, K.Thilagavathy, K.Gunavathy "Engineering Mathematics" Vol,1, S.Chand & Company Ltd.2002.
5. B.V. Ramana, "Higher Engineering Mathematics" Second Edition Tata McGraw- Hill, Publishing Company Ltd., New Delhi, 2006.

BS3101	Engineering Physics	L	T	P	C
		3	0	0	3

OBJECTIVES

The course objective is to provide basic ideas about the principles of physics related to properties of matter, wave optics, heat, quantum concepts and materials. engineering problems.

Subject Code: BS3101		Subject Name: Engineering Physics	
Course Outcome		Cognitive Skill	
CO-01	Students will be able to understand and apply knowledge about the properties of materials.	R, U, A	
CO-02	Students will be able to understand the types of oscillations and the wave nature of light in interference, diffraction and polarization phenomenon.	R, U, A, E	
CO-03	Students will be able to state and explain the various laws of thermodynamics, understand entropy and its application.	R, U, A, An, E	

CO-04	Students gain basic knowledge about quantum mechanics and will be able to solve time dependent and time independent Schrodinger equation for simple potentials.	R, U, A, E, S
CO-05	Students will be able to know the different types of crystal structures and also gain basic knowledge about nano materials and biomaterials.	R, U, A, E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate,
S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	N	N	N	N	N	N	N	N	N
CO-02	S	S	S	M	N	N	N	N	N	N	N	N	N
CO-03	S	S	S	S	N	N	N	N	N	N	N	N	N
CO-04	S	M	S	S	N	N	N	N	N	N	N	N	N
CO-05	S	S	M	M	N	N	N	N	N	N	N	N	N

S-Strong, M-Medium, L-Low, N-Not Relevant

Unit I: Properties of Matter

9

Elasticity – Poisson's ratio – Stress-strain diagram – factors affecting elasticity – bending of beams – cantilever depression – Young's Modulus- theory and experiment of Young's modulus determination (uniform and non-uniform bending) –Shear Modulus – twisting couple – hollow cylinder – torsion pendulum – determination of rigidity modulus - Bulk Modulus - applications of elastic behaviours of materials.

Unit II: Oscillations and Wave optics

9

Oscillations - Rectilinear motion - Oscillations or Vibrations - Simple Harmonic Motion - Damped Harmonic motion - Real oscillatory system - Forced or Driven oscillation. Wave optics -Interference of light – Photons - Young's Double Slit Experiment - Huygens's Principle - Diffraction - Diffraction Grating - Polarization.

Unit III: Thermal Physics

9

Transfer of heat energy (conduction, convection and radiation) - thermal expansion of solids and liquids – expansion joints – bimetallic strips-Thermal conductivity- Forbe's and Lee's disc methods (theory and experiment)- thermal insulation in buildings -Laws of thermodynamics- heat exchanger -solar power- applications of solar power (solar water heater, photo voltaic cell).

Unit IV: Quantum Physics

9

Matter waves- de-Broglie wavelength - Schrodinger's wave equation-time independent and time dependent equations- physical significance of wave function- uncertainty principle and its application- energy and momentum operators-particle in a one-dimensional box- scanning electron microscope- transmission electron microscope-scanning tunnelling microscope.

Unit V: Material Physics

9

Single crystalline, polycrystalline and amorphous materials- Single crystals: unit cell, crystal

systems, Bravais lattices, directions and planes in a crystal, miller indices – inter planar distances. Introduction and applications of Metallic glasses, Shape Memory Alloys (SMA), Nanomaterials, Biomaterials.

TOTAL: 45 HOURS

TEXT BOOKS

1. Engineering Physics I by Bindhu B, Sagi Rani C, Meenadevi V N, Ganapathi Raman R, RK Publishers 2015.
2. Engineering Physics II by Bindhu B, GeethaKumari R, SugirthaSunil N Y, RK Publishers 2016.
3. Engineering Physics by R K Gaur and S L Gupta, Dhanpat Rai Publications 2011.
4. A Text Book Oscillations, Waves & Acoustics by Dr. M. Gosh, Dr. D. Battacharya, S. Chand, Revised Edition.

REFERENCES:

1. Engineering Physics by Rajendran V, McGraw-Hill, New Delhi, 2013
2. Engineering Physics by Arumugam M, Anuradha Publications, 2014.
3. Principles of Physics by Halliday D, Resnick R and Walker J, Wiley 2015.
4. Physics for scientist and Engineers by Serway R A and Jewett J W, Cengage Learning 2010.
5. Engineering Physics by Bhattacharya D K and Poonam T, Oxford University Press 2015.
6. Engineering Physics by Pandey B K and Chaturvedi, Cengage Learning India

BS3102	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES

To make the students conversant with the principles of the following topics:

- (i) Use of free energy in chemical equilibria (ii) Water chemistry (iii) Periodic properties (iv) Spectroscopic techniques and applications and (v) Organic reactions and synthesis of a drug molecule.

Course Outcome		Cognitive Skill
CO-01	Students will be able to understand the estimation of free energy and entropy	U,A,An
CO-02	Students will be able to apply the different techniques in water technology	R,A
CO-03	Students will be able to analyze the properties of periodic tables.	E,A,E
CO-04	Students will be able to describe the different types of spectroscopic techniques.	An,U
CO-05	Students will be able to predict the structure of organic molecules.	S,U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	S	L	S	N	N	N	N	N	N	N	N
CO-02	M	S	L	S	S	N	N	N	N	N	N	N	N
CO-03	S	S	S	M	S	N	N	N	N	N	N	N	N
CO-04	S	M	S	S	S	N	N	N	N	N	N	N	N
CO-05	S	L	M	S	S	N	N	N	N	N	N	N	N

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Use Of Free Energy in Chemical Equilibria**9**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

UNIT II: Water Chemistry**9**

Water as a universal solvent – hard and soft water – reasons for hardness – disadvantages of hard water in washing and industrial purposes - estimation of hardness by EDTA method, problems; boiler feed water – characteristics- softening methods - external conditioning – demineralization (ion exchange) process, desalination by reverse osmosis method- internal conditioning (phosphate, calgon and carbonate conditioning methods); stages in domestic water treatment – disinfection by chlorination, ozone and UV treatments.

UNIT III: Periodic Properties**9**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

UNIT IV: Spectroscopic Techniques and Applications**9**

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

UNIT V: Organic Reactions and Synthesis of a Drug Molecule**9**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

TOTAL: 45 HOURS**Suggested Text Books**

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.

CS3101	FUNDAMENTALS OF COMPUTING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

Course Outcome – Cos		Cognitive Skill
CO-01	Understand the basics of algorithmic problem solving.	R,U

CO-02	Ability to analyze various techniques for read and write simple Python programs.	A
CO-03	Introduce Python programs with conditionals and loops.	An
CO-04	Evaluate and Define Python functions, call them and use Python data structures – lists, tuples, dictionaries.	E
CO-05	Apply input/output with files in Python.	A

R - Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO- I	PO- J	PO- K	PO- L	PO- M
CO-01	N	M	S	L	M	M	L	N	N	N	N	N	N
CO-02	N	S	L	L	M	S	S	N	N	N	N	N	N
CO-03	M	L	S	M	L	L	M	N	N	N	N	N	N
CO-04	M	L	L	S	M	M	L	N	N	N	N	N	N
CO-05	M	L	L	L	M	S	L	N	N	N	N	N	N

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I Algorithmic problem solving

9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II Data, Expressions, Statements

9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III Control flow, Functions

9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV Lists, Tuples, Dictionaries

9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuples return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V Files, Modules, Packages

9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 HOURS

CO-04	S	M	S	S	N	N	N	N	N	N	N	N	N
CO-05	S	S	M	M	N	N	N	N	N	N	N	N	N

S- Strong, M- Medium, L-Low, N- Not Relevant

List of experiments: Physics Laboratory (Any Five Experiments)

Determination of velocity of ultrasonic waves and compressibility of the given liquid by Ultrasonic interferometer. (Real and Virtual Lab)

1. Determination of rigidity modulus by Torsional pendulum. (Real and Virtual Lab)
2. Determination of coefficient of viscosity by Poiseuille's method.
3. Determination of Young's modulus by non-uniform bending method. (Real and Virtual Lab)
4. Determination of LASER parameters using LASER diode. (Real and Virtual Lab)
5. Determination of band gap of the semi-conductor. (Real and Virtual Lab)
6. Determination of wavelength of mercury spectrum by diffraction grating. (Real and virtual lab)
7. Determination of wavelength of light by Newton's rings. (Real and Virtual Lab)
8. Determination of angle of the prism using spectrometer. (Real and Virtual Lab)

CHEMISTRY LAB (Any FIVE experiments)

Aim

The objective of the course is to develop the interest among the students regarding chemistry and their applications in engineering.

Course Outcomes

The student at the end of the course will

CO1	learn and apply basic techniques used in chemistry laboratory for small/large scale water analyses/purification.
CO2	be able estimate the ions/metal ions present in domestic/industry waste water.
CO3	utilize the fundamental laboratory techniques for analyses such as titrations, separation/purification and spectroscopy.
CO4	able to analyze and gain experimental skill.

List of Experiments

1. Determination of conductance of solutions
2. Potentiometry - determination of redox potentials and emfs
3. Synthesis of drug
4. Determination of Chloride content
5. Determination of hardness of water sample
6. Determination of Alkalinity of water sample
7. Virtual lab experiments

CS3171	FUNDAMENTALS OF COMPUTING AND PYTHON PROGRAMMING LAB	L	T	P	C
		0	0	4	2

OBJECTIVES:

- ✓ To write, test, and debug simple Python programs.
- ✓ To implement Python programs with conditionals and loops.
- ✓ Use functions for structuring Python programs.
- ✓ Represent compound data using Python lists, tuples, dictionaries.
- ✓ Read and write data from/to files in Python.

Course Outcome – Cos		Cognitive Skill
CO-01	Understand the basic syntax of python	U

CO-02	Understand the problem-solving techniques	An,U
CO-03	Analyze data structure concept in python	U
CO-04	Understand all tools of python	An
CO-05	Understand pygame with simulation	E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	L	S	M	L	L	S	N	N	N	N	N	N
CO-02	L	L	M	M	S	M	L	N	N	N	N	N	N
CO-03	M	M	L	L	M	S	L	N	N	N	N	N	N
CO-04	S	L	L	M	M	M	L	N	N	N	N	N	N
CO-05	L	L	L	S	L	L	S	N	N	N	N	N	N

S- Strong, M- Medium, L-Low, N- Not Relevant

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton 's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (wordcount)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Py game
13. Simulate bouncing ball using Py game

Platform Needed: Python 3 interpreter for Windows/Linux

TOTAL: 45 HOURS

SEMESTER – II

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	EG3102	Communicative English	3	0	0	3
2.	MA3102	Engineering Mathematics – II	3	1	0	4
3.	BS3103	Environmental Science	3	0	0	3
4.	ME3201	Engineering Mechanics	3	0	0	3
5.	CV3101	Basic Civil Engineering	3	0	0	3
6.	CV3102	Surveying for Construction	3	0	0	3
PRACTICAL						
7.	CV3171	Civil Engineering Practice	0	0	2	1
8.	CV3172	Engineering Graphics Laboratory	0	0	2	1
TOTAL			18	1	4	21

EG3102	COMMUNICATIVE ENGLISH	L	T	P	C
		3	0	0	3

OBJECTIVES

- To widen and expand students' knowledge of English vocabulary
- To develop skills of students in the areas of vocabulary, grammar, listening, speaking, reading, and writing
- To develop the knowledge, skills and strategies the student must possess to become proficient readers
- To make the students learn the importance and purpose of communication skills and overcome the communication barriers by gaining confidence
- To make the students understand how to apply technical information and knowledge in practical documents

Course Outcomes		Cognitive Skill
CO-01	The students will be able to understand the basic vocabulary items, sentence structures and error detection and correction which will expand their knowledge of the English language.	R
CO-02	The students will be able to grasp the LSRW Skills and gain exposure to assimilate comprehension and Note-making.	U
CO-03	The students will get real time practice in speaking through oral presentation, small talk, role play, debate, Group Discussion etc.	A

CO-04	The students will be able to develop writing skills through exposure to Report Writing and Letter Writing.	U
CO-05	The students will be able to learn the Theory of Communication, the importance of communication, and will be introduced to the various facets of Verbal and Nonverbal Communication.	R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcomes with Programme Outcomes

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	S	S	M	S	S	N	N	N	N	N
CO-02	M	S	M	M	S	S	M	S	N	N	N	N	N
CO-03	S	M	M	S	M	M	S	M	N	N	N	N	N
CO-04	M	S	M	M	S	M	S	M	N	N	N	N	N
CO-05	S	M	S	S	M	S	M	S	N	N	N	N	N

S-Strong, M-Medium, L-Low, N-Not relevant

Unit – I – Vocabulary and Grammar

9

Parts of Speech – Sentence Structures – Technical Vocabulary – Synonyms – Antonyms – Homonyms – Homophones – Misspelled Words – One-word Substitutes – Odd Words Out – Changing words from one form to another – Common Errors in English – Correction of Errors in Sentences.

Unit – II – Listening and Reading

9

Reading Comprehension – Skimming – Scanning – Predicting the Content – Comprehension Questions – Inductive Reading – Close Reading – Note Making – Précis Writing.

Unit – III – Speaking

9

Introducing Oneself – Exchanging Personal Information – Small Talk: Family, Friends, Studies, Profession – Speaking: Greeting, Taking Leave – Product Description – Completing information – Gap Exercises – Presentation / Public Speaking Skills – Group Discussion – Debate – Role Play.

UNIT – IV- Technical Writing

9

Report Writing – Characteristics of a Report – Categories of Reports – Letter Writing (Formal Letters) : Job Application Letter with Resume – Letter Seeking Permission – Letter of Invitation – Letter Declining an Invitation – Letter of Complaint – Letter of Requisition.

Unit – V- Technical Communication

9

The Theory of Communication – Definition and Scope – Nature, Importance and Types – Different Communication Models – Barriers to Communication – Effective Communication (Verbal / Non-verbal).

TOTAL: 45 HOURS

EXTENSIVE READING:

CanField Jack, Chicken Soup for the Soul, Westland, Chennai, 1999.

NOTE:

The book given under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

REFERENCE BOOKS:

1. Communication Skills. Oxford University Press.
2. Wood, F. T. (2007). Remedial English Grammar. Macmillan.
3. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
4. The Four Skills for Communication – Josh Sreedharan – Foundation Books
5. Communicative English – E. Sureshkumar and P. Sreehari – Orient Blackswan

MA3102	ENGINEERING MATHEMATICS – II	L	T	P	C
		3	1	0	4

OBJECTIVE:

To develop basic knowledge to the students in differential equations and vector calculus. This subject is further broadened to the functions of complex variables and complex integration. A thorough knowledge about Laplace transforms is also covered to aid the students solve the differential equations.

Subject Code: MA3102 Subject Name: ENGINEERING MATHEMATICS -II		
Course Outcome – Cos		Cognitive Skill
CO-01	The students will be able to solve ordinary differential equations	An , E , S
CO-02	The students will be able to solve complex variables	E
CO-03	The students will be able to synthesize complex integration	S
CO-04	The students will be able to solve Vector Calculus	E , S
CO-05	The students will be able to Synthesize Laplace transforms	S

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO -A	PO -B	PO -C	PO -D	PO -E	PO -F	PO- G	PO- H	PO- I	PO - J	PO-k	PO- L	PO-M
CO-01	M	S	M	S	S	N	M	M	S	S	M	M	M
CO-02	S	M	L	N	L	M	S	L	L	S	M	M	S
CO-03	S	L	S	S	L	L	S	S	M	M	S	S	M
CO-04	S	L	M	S	N	L	S	S	M	S	S	M	S
CO-05	S	L	M	M	M	L	N	S	M	M	M	S	N

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I Ordinary Differential Equations**9**

Linear differential equations of second order with constant and variable coefficients- Cauchy's and Legendre's linear equations – Method of variation of parameters.

UNIT II: Complex Variables**9**

Functions of a complex variable – Analytic function – Necessary conditions- Cauchy-

Riemann equations in cartesian and polar co-ordinates - Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic and its conjugate – Construction of analytic function by Milne Thomson method – Conformal mappings $w = z + c$, cz , $1/z$ and Bilinear transformation.

UNIT III: Complex Integration

9

Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Laurent's expansion – Singular points – Residues – Cauchy's Residue theorem – Evaluation of real definite integral using contour integration (excluding poles on the real axis) -

$$\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta \text{ and } \int_{-\infty}^{\infty} \frac{f(x)}{g(x)} dx$$

UNIT IV: Vector Calculus

9

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT V: Laplace Transforms

9

Laplace transform –Existence condition– Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Transform of Periodic functions. Inverse Laplace transform – Convolution, Initial and Final value theorems (statement only) – Solutions of linear ordinary differential equation of second order with constant coefficients using Laplace transform techniques.

L: 45 + T: 15 = TOTAL 60 HOURS

Outcomes:

At the end of the course, the students will be familiar to solve differential equations using Laplace Transform method, which is easier to handle the problems that is being investigated. They'll also become acquainted with the basic ideas of complex variable theory so as to enable the students to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics"- 40th Edition, Khanna Publishers, Delhi 2007.

REFERENCES:

2. M.Immaculate Mary, K.Uma Samundesvari, Engineering Mathematics – II" First Edition, Anuradha Publications, ,2013.
3. Erwin Kreyszig, "Advanced engineering Mathematics", Seventh Edition, WileyIndia, 2007.
4. Veerarajan T, "Engineering Mathematics (for first year)", Tata McGraw-Hill Publishing Company Ltd.,New Delhi,2007.
5. P.Kandasamy , K.Thilagavathy , K.Gunavathy" Engineering Mathematics" S.Chand & Company Ltd.2002.
6. B.V. Ramana,"Higher Engineering Mathematics" Second Edition Tata McGraw-Hill, Publishing Company Ltd.,New Delhi, 2006.

BS3103	Environmental Science	L	T	P	C
		3	0	0	3

OBJECTIVES

- To provide the students about general aspirants of environment and ecology, the environment pollution and the current social issues.

Course Outcome		Cognitive Skill
CO-01	Embrace lifelong learning and environmental responsibility.	U, A
CO-02	Understand the scientific method and environmental research.	U, E
CO-03	Identify and analyze environmental issues (e.g., climate change, pollution, conservation).	U, An
CO-04	Understand the role of science in environmental decision-making.	U, A, E
CO-05	Communicate environmental information effectively.	An, E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

CO \ PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J
CO-01	S	M	S	M	L	S	S	M	S	N
CO-02	L	N	N	M	M	L	L	N	L	N
CO-03	S	S	L	N	S	N	S	L	L	N
CO-04	M	M	N	S	L	M	L	M	S	M
CO-05	S	L	M	L	S	S	M	M	L	L

S-Strong, M-Medium, L-Low, N-Not relevant

UNIT I: Nature Of Environment Studies and Natural Resources

9

Environment studies- definition- multi disciplinary nature – scope and importance- need for public awareness- Natural resources- Forest resources- energy resources- food Resources- water resources – land resources - mineral resources.

UNIT II: Eco Systems and Bio-Diversity

9

Concept and component of eco systems- producer, consumer, decomposer- structure and function of eco system- food chain and food web- energy flow model- aquatic eco system- forest eco system- desert eco system- pyramid of biomass- ocean eco system- grass land eco system- Bio diversity in India- value of bio diversity- biodiversity threatens- biodiversity protection- In-situ and Ex-situ conservation.

UNIT III: Environmental Pollution

9

Meaning Of Environmental pollution- air pollution- acid rain – global warming- water pollution- water pollution control- soil pollution- urban waste and soil pollution- marine pollution- noise pollution- thermal pollution- solid and hazardous waste management- waste disposal methods- solid waste and India- natural disaster and disaster management. Low carbon perspectives, Energy savings, Safety and Security

UNIT IV: Social Issues and The Environment**9**

Unsustainable to sustainable development- sustainable development in India- water conservation, watershed management and water harvesting- environmental ethics- role of engineer in environmental protection- economic aspects of environment.

UNIT V: Human Population and Environment**9**

Population Growth- distribution of population- factors affecting variation in population- theories of population- future of human population- family welfare programme- HIV and AIDS- environment and human health- human rights- value education- women and child welfare.

TOTAL: 45 HOURS**TEXT BOOKS**

- i. Cunnigham & saigo: 'Environmental science :A global concern' 4th Ed.W.c. Brown Publishers. USA. 1997
- ii. Chauhan A.S, 'Environmental studies' 2nd revised ed.2004, Jain Brother publishers, New Delhi

REFERENCE BOOKS

- i. Benny Joseph : 'Environmental Science and Engineering', 2006, Tata McGraw- Hill Publication.
- ii. Siddique K.A. : Elements of Ecology and Environmental Pollution, 1st Ed. 2002, Kushal Publication, Varanasi.

ME3201	Engineering Mechanics	L	T	P	C
		3	0	0	3

OBJECTIVE:

This is a basic engineering course common to all branches to inculcate in the students, problem solving abilities and to enhance their analytical abilities.

Course Outcome		Cognitive Skill
CO-01	Determine the Equilibrium of System of Forces, Equilibrium of System of Forces	E
CO-02	Solve Equilibrium in three dimensions; Method of Sections; Method of Joints, to determine if a member is in tension or compression	S
CO-03	Apply various methods of Area moment of inertia, Moment of inertia of plane sections from first principles, Theorems of moment of inertia.	A
CO-04	Determine Virtual displacements, principle of virtual work for particle and ideal system.	An
CO-05	Apply various methods of Area moment of inertia, Moment of inertia of plane sections from first principles, Theorems of moment of inertia.	U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	L	S	M	S	L	L	M	M	M	M	M	M	S
CO-02	M	M	S	M	M	L	L	L	N	L	L	S	M
CO-03	L	M	L	L	L	M	S	S	N	M	S	M	L
CO-04	L	S	S	L	L	L	M	L	N	N	M	M	L
CO-05	M	M	M	M	M	N	N	N	S	M	N	S	M

Unit I - Statics of Particles

10

Statics –Basics Concepts, Fundamental principles & concepts: Vector algebra, Newton's laws, gravitation, force (external and internal, transmissibility), couple, moment (about point and about axis), Varignon's theorem, resultant of concurrent and non-concurrent coplanar forces, static equilibrium, free body diagram, reactions. Problem formulation concept; 2-D statics, two and three force members, alternate equilibrium equations, constraints and static determinacy; 3-D statics.

Unit II - Application of Statics & Friction

9

Analysis of Structures- Trusses: Assumptions, rigid and non-rigid trusses; Simple truss (plane and space), analysis by method of joints. Analysis of simple truss by method of sections; **FRICTION:** Friction- Coulomb dry friction laws, simple surface contact problems, friction angles, types of problems, wedges. Sliding friction and rolling resistance

Unit III - Centroid, Centre of Gravity and Moment of Inertia

8

Moment of Inertia- First moment of mass and center of mass, centroids of lines, areas, volumes, composite bodies. Area moments- and products- of inertia, radius of gyration, transfer of axes, composite areas. Rotation of axes, principal area-moments-of-inertia, Second moment of mass, Mass moments- and products- of inertia, radius of gyration, transfer of axes, flat plates (relation between area- and mass- moments- and products- of inertia), composite bodies. Rotation of axes, principal mass-moments-of-inertia.

Unit IV - Particle Dynamics

8

Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

Unit V Kinematics & Kinetics of Rigid Bodies:

10

Plane kinematics of rigid bodies- Rotation; Parametric motion. Relative velocity, instantaneous center of rotation. Relative acceleration, rotating reference frames. Rotating reference frames, 3-part velocity and 5-part acceleration relations, Coriolis acceleration. Plane kinetics of rigid bodies- Kinetics of system of particles and derivation of moment equation. Translation. Fixed axis rotation; General planar motion.

TOTAL: 45 HOURS

TEXT BOOKS:

1. Beer F P and Johnson E R, “Vector Mechanics for Engineers, Statics and Dynamics”, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi, 2006.
2. Tayal A K, “Engineering Mechanics- Statics and Dynamics” , Umesh Publications, Delhi, 2004
3. Irving H. Shames, Engineering Mechanics, Prentice Hall, New Delhi 1997.

REFERENCES:

1. Bansal R K, “Engineering Mechanics”, Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Bhavikatti S S, “Engineering Mechanics”, New Age International Pvt. Ltd., New Delhi, 2003.
3. Young D H and Timashenko S, “Engineering Mechanics”, Tata Mcgraw-Hill, Fourth Edition, 2006.
4. JivanKhachane, RuchiShrivastava, “Engineering Mechanics: Statics and Dynamics”, ANE Books, 2006.
5. Rajasekaran S and Sankarasubramanian G, “Engineering Mechanics-Statics and Dynamics”, Vikas Publishing House Pvt. Ltd., New Delhi, 2006.
6. NPTEL courses: <http://nptel.iitm.ac.in/courses.php>, web and video resources on Engineering Mechanics.

CV3101	Basic Civil Engineering	L	T	P	C
		3	0	0	3

OBJECTIVE

To give the students an illustration of the use and properties of various construction materials and explain the civil engineering construction aspects.

Subject Code: CV3101		Subject Name: Basic Civil Engineering	
Course Outcome – Cos			Cognitive Skill
CO-01	To Know about the importance of Engineering		A
CO-02	To Know about different materials and their properties		E
CO-03	To know about the engineering aspects related to buildings		U
CO-04	To know about importance of civil engineering structures		E
CO-05	To know about the importance of interior design		An

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	M	M	L	L	N	N	N	S	M	N	L
CO-02	M	S	N	L	M	L	L	S	N	L	S	S	M
CO-03	M	S	N	L	M	L	L	S	N	L	S	S	M
CO-04	L	N	N	L	N	L	S	L	M	S	L	N	M
CO-05	L	N	N	L	N	L	S	L	M	S	L	N	M

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I Introduction to Civil Engineering**8**

Civil Engineering: Introduction to civil engineering – History– Civil Engineering Branches– Relevance of civil engineering in the overall development of the country- Introduction to types of buildings as per NBC; Selection of site for buildings, Components of a residential building and their functions, introduction to industrial buildings – office/factory/software development office/power house

UNIT II Construction Materials**10**

Cement – Basic Ingredients – Manufacturing process – Types - Grades – Properties – Tests Specifications – Uses. Steel: - Steel sections and steel reinforcements, types and uses. Modern construction materials: - (brief discussion only)

UNIT III Properties of Materials**9**

Sand– Classification – Bulking of sand – Properties – Tests – Uses–Stones – Classification of rocks – Qualities of good building stones – Quarrying – Dressing – Tests – Specifications Uses of common building stones – Bricks – Composition of good brick earth – Classification – Qualities of good bricks – Field and laboratory tests – Specifications – Aggregates – Fine and coarse aggregate – properties – Uses – Tests. Cement concrete: - Constituent materials, properties and types.

UNIT IV Building Components**9**

Substructure: Foundations – Purpose – Bearing Capacity – Requirements for a good foundation – Methods to improve the Bearing Capacity – Superstructure: Masonry–Stone Masonry – Brick Masonry – Bonds–Types of bonds–Roofs and roof coverings–Different types of roofs – Suitability – Types and selection of roofing materials – Plastering – Doors and Windows – Beams – Columns – Slabs – Lintels. Floors – functions, types; flooring materials

UNIT V Civil Engineering Structures**9**

General introduction –Roads – Ideal cross section classification of roads – Types of roads – Bridges – Necessity – Selection of bridge site – Components – Classification of bridges – Types of bridges – Dams – Purpose of a dam- Catchment area –Command area – Dam terminology –Classification of dams – Rain water harvesting system. Green buildings:-(brief discussion only)

TOTAL: 45 HOURS**TEXT BOOKS**

- 1) Shanmugam, G., and Palanichamy, M.S., Basic Civil and Mechanical Engineering, Tata McGraw Hill Publishing Co., New Delhi, 1996.
- 2) Theraja, B.L., Electrical Technology Vol I & II, S. Chand & Co., New Delhi, 2005.
- 3) Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).

REFERENCES

- 1) Rangwala, S. C. And Dalal, K. B., Engineering Materials, Charotar Publishing house, 1996.
- 2) Sushil Kumar, Building Construction, Standard Publishers Distributors, 2001.
- 3) Salivahanan, S., Suresh Kumar. N and Vallavaraj, A., Electronic Devices and Circuits,Tata Mc Graw Hill ,New Delhi, 1998.
- 4) Nagpal, G.R, “Power plant Engineering”, Khanna Publishers, 2004.
- 5) Rai. G. D., Non-Conventional Energy Sources, Khanna Publishers, Delhi, 2006.
- 6) Mc Kay, W. B. And Mc Kay, J. K., Building Construction Volumes 1 to 4, Pearson India Educatin Services.

CV3102	Surveying for Construction	L	T	P	C
		3	0	0	3

OBJECTIVE

1. Conduct site surveys and layout construction projects.
2. Use surveying software (e.g., AutoCAD, Civil 3D) for data processing and design.
3. Perform calculations for horizontal and vertical curves.
4. Develop problem-solving skills in surveying and layout.

Subject Code: CV3102		Subject Name: Surveying for Construction	
Course Outcome – Cos			Cognitive Skill
CO-01	To Know about the Equipment and accessories for ranging and chaining		A
CO-02	To Know about Plane table instruments and accessories - Merits and demerits		E
CO-03	To know about the engineering aspects related to buildings		U
CO-04	To know about importance of civil engineering structures		E
CO-05	To know about the importance of interior design		An

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	M	M	L	L	N	N	N	S	M	N	L
CO-02	M	S	N	L	M	L	L	S	N	L	S	S	M
CO-03	M	S	N	L	M	L	L	S	N	L	S	S	M
CO-04	L	N	N	L	N	L	S	L	M	S	L	N	M
CO-05	L	N	N	L	N	L	S	L	M	S	L	N	M

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I Introduction and Chain Surveying

9

Definition- Classifications – Basic principles- Conventional signs - Field book and office work - Equipment and accessories for ranging and chaining – Methods of ranging – well conditioned triangles – Errors in linear measurement and their corrections – Obstacles – Traversing – Plotting – applications- Areas enclosed by straight line irregular figures.

UNIT II Compass Surveying and Plane Table Surveying

9

Prismatic compass - Surveyor's compass - Bearing - Application of Compass & Plane table Surveying- Local attraction - Magnetic declination - Dip - Traversing - Plotting - Adjustment of error - Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing.

UNIT III Levelling

9

Level line - Horizontal line - Levels and Staves - Spirit level - Bench marks - Types of levelling instrument-Temporary and permanent adjustments - Fly and check levelling - Curvature and refraction -Stadia Constants - Reciprocal levelling - Longitudinal and cross sections.

UNIT IV Theodolite Surveying**9**

Theodolite - Description and uses - Temporary and permanent adjustments of vernier transit - Tangential and Stadia Tacheometry - Horizontal angles - Vertical angles - Heights and distances - Traversing - Subtense method, Anallactic lens -Closing error and distribution

UNIT V Contouring**9**

Longitudinal and Cross-section-Plotting – Contouring – Methods – Characteristics and uses of contours – Plan and map --Methods of interpolating contours – Tacheometric contouring - Contour gradient - Computations of cross-sectional areas and volumes – Earthwork calculations – Capacity of reservoirs.

TOTAL: 45 HOURS**TEXT BOOK:**

- 1) Surveying and Levelling by N. N. Basak , Tata McGraw Hill
- 2) Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain , Laxmi Publications
- 3) Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill.

REFERENCE BOOK:

- 1) Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni , Pune Vidyarthi Griha Prakashan.
- 2) Surveying Vol. I & II by Dr. K. R. Arora , Standard Book House.
- 3) Surveying: Theory and Practice by James M. Anderson, Edward M. Mikhail, Tata McGraw Hill.

CV3171	Civil Engineering Practice	L	T	P	C
		0	0	2	1

OBJECTIVE

To provide the students with hands on experience on different trades of engineeringlike fitting, carpentry, plumbing and wiring.

Subject Code: CV3171		Subject Name: Civil Engineering Practice	
Course Outcome – Cos			CognitiveSkill
CO-01	To Understand the principles of civil engineering practice		A
CO-02	To Know about different materials and their properties		E
CO-03	To know about the engineering aspects related to buildings		U
CO-04	To understand Knowledge of construction methods and materials.		E
CO-05	To know about the importance of interior design work.		U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	M	M	M	L	L	N	N	N	S	M	N	L
CO-02	M	S	N	L	M	L	L	S	N	L	S	S	M
CO-03	M	S	N	L	M	L	N	S	N	L	S	S	M
CO-04	L	N	N	L	N	L	S	L	M	S	L	N	M
CO-05	L	N	N	L	N	L	S	L	M	S	L	N	L

S- Strong, M- Medium, L-Low, N- Not Relevant

LIST OF EXPERIMENTS

1. Study of plumbing tools
2. Preparation of plumbing line sketches for water supply and sewage works
3. Hands on exercises on basic pipe connections
4. Hands on exercises on pipe connections with different joining components
5. Demonstration of Plumbing requirements of high-rise buildings
6. Study of carpentry tools
7. Carpentry – Planning
8. Various joint in carpentry – T- Lap joint, Cross Lap joint, V- joint
9. One way and two-way wiring
10. Stair case wiring and lighting
11. Fluorescent Tube Light Wiring

TOTAL: 30 HOURS

CV3172	Engineering Graphics Laboratory	L	T	P	C
		0	0	2	1

OBJECTIVE

1. Understand fundamental concepts of engineering graphics.
2. Familiarize with graphical representation techniques.
3. Learn CAD software (e.g., AutoCAD, SolidWorks).
4. Understand dimensioning and tolerancing standards.

Course Outcome – Cos		Cognitive Skill
CO-01	Students should know the fundamental principles of geometric and machinedrawing.	A
CO-02	Students should be able to visualize the objects.	A
CO-03	They should be able to understand and read drawing and able to present the same.	A
CO-04	To develop the manual drawing skill.	A
CO-05	Able to draw development of surfaces and orthographic projection.	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	P0-A	P0-B	P0-C	P0-D	P0-E	P0-F	P0-G	P0-H	P0-I	P0-J	P0-K	P0-L
CO-01	N	N	N	N	N	N	S	N	N	N	N	N
CO-02	N	N	N	N	N	N	S	N	N	N	N	N
CO-03	N	N	N	N	N	N	S	N	N	N	N	N
CO-04	N	N	N	N	N	N	S	N	N	N	N	N
CO-05	N	N	N	N	N	N	S	N	N	N	N	N

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I Introduction:**9**

Introduction to drawing instruments, Sheet layout, scaling, Concept of reference planes and quadrants, orthographic drawing and allied concepts, projection systems (first angle and third angle), types of lines.

Unit II Projections of points and lines:**9**

Projections of points in various quadrants with all possible positions, projections of lines inclined to horizontal plane, vertical plane and both planes, traces of line, use of traces in obtaining projections, finding true length and true inclinations.

Unit III Projections of planes:**9**

Projections of planes inclined to horizontal plane, vertical plane and both planes by reference and auxiliary plane method, (Regular and composite planes).

Unit IV Projections of solids:**9**

Introduction of solids (cube, tetrahedron, prism, pyramid, cylinder, cone), projections of solids with axis inclined to both the reference planes. (Composite solids and spheres need not be dealt).

Unit V Orthographic and Isometric Projection:**9**

Orthographic principles – missing view – free hand sketching in first angle projection from pictorial views. Principles of isometric projection – isometric view and projections of simple solids.

TEXT BOOKS:

1. N.D. Bhatt and V.M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotar Publishing House, Anand.
2. P. J. Shah, A text book of Engineering Drawing, S. Chand and Co. New Delhi.
3. M.L. Dabhade, Engineering Graphics-I, Vision Publications, Pune.

REFERENCE BOOKS:

1. N.D. Bhatt and V.M. Panchal, Machine Drawing, Charotar Publishing House, Anand.
2. Dhanajay A Jolhe, Engineering Drawing with an Introduction to AutoCAD, Tata McGraw Hill Publications, New Delhi.
3. K. VenuGopal, Engineering Drawing with Graphics, New Age International Publications
4. W.J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall India, New Delhi
5. N.B. Shaha and B.C. Rana, Engineering Drawing, Pearson Education Amar Phatak, Engineering Drawing, Dreamtech Press, Mumbai.

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MA3201	Engineering Mathematics – III	3	1	0	4
2.	CV3201	Advanced Surveying	3	0	0	3
3.	CV3202	Concrete Technology	3	0	0	3
4.	CV3203	Engineering Geology	3	0	0	3
5.	CV3204	Fluid Mechanics	3	0	0	3
6.	CV3205	Strength of Materials - I	3	0	0	3
PRACTICAL						
7.	CV3271	Strength of Materials Laboratory - I	0	0	2	1
8.	CV3272	Survey Practical	0	0	2	1
TOTAL			18	1	4	21

MA3201	ENGINEERING MATHEMATICS- III	L	T	P	C
		3	1	0	4

AIM:

To impart the fundamental knowledge of Engineering Mathematics to the students in order to achieve a well-founded knowledge about the principles of Mathematics.

OBJECTIVE:

To develop the skill of the students in the areas of boundary value problems and Transform techniques. This will be necessary for their effective studies in a large number of Engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. This course will also serve as a prerequisite for post graduate and specialized studies and research.

Course Outcomes		Cognitive Skills
CO-01	Recognize a Partial Differential Equation and formulate a Partial Differential Equation from a given equation. Solve linear Partial Differential Equation of both first and second order using various methods.	R,U,A,An, E, S
CO-02	Derive a Fourier series expansion for a given periodic function by evaluating Fourier coefficient and expand Fourier cosine and Sine series for given function. Also find the Fourier series expansion for a given set of numerical values by applying harmonic analysis.	R,U,A,An, E, S

CO-03	Classify the second order Partial Differential Equation and solve second order Partial Differential Equations such as wave equation, heat equation and Laplace equation with boundary and initial conditions applying Fourier series expansion.	R,U,A,An, E, S
CO-04	Know fundamental and mathematical properties of Fourier transform. Calculate the Fourier transform of a given function and inverse Fourier transform of function. Know the applications of Parseval's and convolution theorem.	R,U,A,An, E, S
CO-05	Understand the characteristics and properties of Z-transform. Compute Z-transform of simple functions and inverse z transform of given functions and apply Z-transform for solving difference equations.	R,U,A,An, E, S

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO -A	PO -B	PO -C	PO -D	PO -E	PO -F	PO- G	PO- H	PO- I	PO - J	PO-k	PO- L	PO-M
CO-01	M	S	M	S	S	N	M	M	S	S	M	M	M
CO-02	S	M	L	N	L	M	S	L	L	S	M	M	S
CO-03	S	L	S	S	L	L	S	S	M	M	S	S	M
CO-04	S	L	M	S	N	L	S	S	M	S	S	M	S
CO-05	S	L	M	M	M	L	N	S	M	M	M	S	N

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I : Partial Differential Equations

12

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of Clairaut's equations – Lagrange's linear equation –Homogeneous linear partial differential equations of second order with constant coefficients.

UNIT II: Fourier Series

12

Dirichlet's conditions – Fourier series – Change of interval - Odd and Even functions – Half range sine and cosine series – Parseval's identity – Harmonic Analysis.

UNIT III: Boundary Value Problems

12

Classification of second order linear partial differential equations – One dimensional wave and heat equations – Assumptions – Fourier series solution – Steady state solution of two-dimensional heat equation (insulated edges excluded) – Fourier series solution in Cartesian co-ordinates.

UNIT IV: Fourier Transforms

12

Statement and meaning of Fourier integral theorem – Fourier transform — Properties - Inverse Fourier transform – Fourier Sine and Cosine transforms – Inverse sine and cosine transforms – Properties -Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V: Z-Transforms**12**

Z- transform – Elementary properties – convolution theorem-Inverse Z-transform –Partial fraction Method, Inversion integral method and Convolution – Initial and Final value theorems –Formation of difference equations – Solution of difference equations using Z-transform

L: 45 + T: 15, TOTAL: 60 HOURS**Text Book**

1.Grewal B.S., “Higher Engineering Mathematics” – 40th Edition, Khanna Publishers, Delhi 2011.

References

- 1.Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, John Wiley & Sons, Inc., USA, 2011
2. Kandasamy P, Thilagavathy K, and Gunavathy K., “Engineering Mathematics Volume III”, First Edition, S.Chand & Company Ltd., New Delhi.
3. Veerarajan T., “Engineering Mathematics (for Semester III), Third Edition, Tata McGraw – Hill Publishing Company Limited, New Delhi 2007.
- 4.Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Seventh Edition, Lakshmi Publications Pvt. Ltd., New Delhi, 2009.

CV3201	Advanced Surveying	L	T	P	C
		3	0	0	3

OBJECTIVES

- This subject deals with electronic surveying over conventional surveying methods.
- The student is also exposed to the advanced technology in the field of surveying.

Course Outcome		Cognitive Skill
CO-01	Understand the advantage of electronic surveying over conventional surveying methods	U
CO-02	Understand various remote sensing processing techniques used in the field of surveying	An
CO-03	Understand the cross-sectional area of river and airports, docks and harbors.	U
CO-04	Understand the adjustment of simple triangulation networks.	An
CO-05	Understand the working principles of total station, GPS and its components.	A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	N	M	M	L	M	M	N	N	N	L	N	N
CO-02	M	N	N	M	N	M	N	N	M	N	N	N	N
CO-03	S	S	N	M	N	M	N	N	M	N	N	N	N
CO-04	S	S	N	M	N	M	N	N	S	N	N	N	N
CO-05	S	S	N	M	N	M	L	N	S	N	N	N	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Tacheometric Surveying

9

Systems of tachometry – Different systems of tachometric measurements- Tangential, Stadia and substance methods, Stadia systems – Horizontal and inclined sights – Vertical and normal staff – Fixed and movable hair – Stadia constants - Analytic lens – Use of substance bar.

Unit II: Surveying Adjustments and Theory of Errors

9

Classification of errors – True and most probable value – Weighted observations – Method of equal shifts – Adjustments – Triangulation, Angle, Station, Figure. -Distribution of Errors in Field measurement - Adjustment of simple triangulation networks – Principle of least square – Adjustment of chain of triangles and two connected triangles- Level nets- Normal equation correlates.

Unit III: Hydrographic And Project Survey

9

Introduction– Sounding methods – shore line survey– Marine survey– Project survey–Mass diagram– Railway project survey–Road projects–Water supply scheme–Docks and harbors– Airport–Tunneling–Project on township.

Unit IV: Remote Sensing Techniques

9

Introduction – Physics of remote sensing—Electromagnetic spectrum – Active and passive remote sensing–Remote sensing satellites – Types – wave length regions and their application– Ground data collection – Equipment required for digital analysis – Along track scanning – Across track scanning – Digital elevation model–Applications in surveying.

Unit V: Gps and Total Station

9

Introduction – Basic concepts of GPS, applications and comparison with conventional surveying - GPS System–Satellite configuration–GPS Surveying methods: Static - Fast Static - Semi Kinematic - Kinematic - Accuracy - Field Survey Procedure–Basic Principles of Total Station–Electro optical system – Micro wave system - measuring principle–working principle– Comparison between Electro–optical and microwave system–Care and maintenance of Total station instruments.

Text Books:

1. Punmia B.C., Surveying, Vols. II and III, Laxmi Publications, 2014.
2. Kanetkar, T.P., and Kulkarni, S.L., Surveying and Leveling Part I and II, Pune Vidhyarthi Griha Prakashan (2006).
3. SatheeshGopi, R. Sathishkumar, N. Madhu, "Advanced Surveying, Total Station, GPS and Remote Sensing" Pearson education, 2007.
4. Sabins, F. F. Remote Sensing: Principles and Interpretation, W. H. Freemanand Company, San Francisco

References:

1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition, 2004.
2. GuochengXu, "GPS Theory, Algorithms and Applications", Springer - Berlin, 2003.
3. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.

CV3202	Concrete Technology	L	T	P	C
		3	0	0	3

OBJECTIVES

The course begins with an outline of what concrete is, what are the processes involved in formation of concrete, various materials that are used in concrete formation, properties of each ingredient of concrete, standard tests to be applied to concrete and concrete ingredients. The course then moves on to design-mix, special concretes, etc.

Course Outcome		Cognitive Skill
CO-01	The knowledge of what concrete is, how it is formed, what materials are involved and properties and requirements of each concrete ingredient	R
CO-02	Ability to perform various tests on concrete ingredients and also on concrete (Fresh and Hardened) concrete.	U
CO-03	Ability to design the mix ratio by various methods.	S
CO-04	Ability to analyze various special concrete	An
CO-05	Ability to apply the various concreting methods.	A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO													
	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	L	M	M	L	L	M	N	N	S
CO-02	M	M	N	S	S	S	M	N	N	L	L	S	L
CO-03	S	S	M	S	L	M	M	S	M	L	M	L	M
CO-04	S	M	L	L	M	N	N	S	M	L	M	M	N

CO-05	S	M	M	M	L	M	S	M	M	M	L	N	N
-------	---	---	---	---	---	---	---	---	---	---	---	---	---

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Concrete Making Materials

9

Aggregates – classification - IS Specifications – Properties – Grading -Methods of combining aggregates - specified gradings - Testing of aggregates. Cement - Grade of cement - Chemical composition - Testing of concrete - Hydration of cement - Structure of hydrated cement - Special cements. Water Chemical admixtures, Mineral admixture.

Unit II: Tests on Concrete

9

Properties of fresh concrete - Hardened concrete – Strength - Elastic properties - Creep and shrinkage – Durability of concrete.

Unit III: Mix Design

9

Principles of concrete mix design - Methods of concrete mix design - IS Method - ACI Method - DOE Method – Statistical quality control – Sampling and acceptance criteria.

Unit IV: Special Concrete

9

Light weight concrete - Fly ash concrete -Fibre 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.

Unit V: Concreting Methods

9

Process of manufacturing of concrete -Methods of transportation -Placing and curing- Extreme weather concreting -Special concreting methods - Vacuum dewatering -UnderwaterConcrete.

Total: 45 Hours

Text Books

1. Gupta.B.L., Amit Gupta, “Concrete Technology, Jain Book Agency, 2010.
2. Neville, A.M., “Properties of Concrete”, Prentice Hall, 1995, London.
3. Santhakumar.A.R.,“Concrete Technology”,Oxford University Press,2007.
4. Shetty M.S., “Concrete Technology”, S.Chand and Company Ltd. Delhi, 2003.

References:

1. M L Gambhir, “Concrete Technology Theory and Practice”, McGraw-Hill Education.
2. J Thomas, “Concrete Technology”, Cengage Learning.
3. S.S. Bhavikatti, “Concrete Technology”, IK International

CV3203	Engineering Geology	L	T	P	C
		3	0	0	3

OBJECTIVES

At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundations.

Course Outcome		Cognitive Skill
CO-01	To study and identify different types natural materials like rocks & minerals and soil.	U,R
CO-02	To understand the various natural dynamic processes their influence on the surficial features, natural material and their consequences.	E,U
CO-03	To know the physical properties of rocks & minerals	An
CO-04	To know the importance of geological maps and language helpful for Civil Engineering projects	U,R
CO-05	To understand the different geological structures and their impact on civil engineering structure	A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	L	S	M	S	M	S	M	M	M	S	M	S
CO-02	M	S	M	M	S	S	M	S	S	S	L	S	M
CO-03	M	S	S	S	S	M	S	M	M	S	L	S	M
CO-04	S	M	M	M	S	S	M	L	S	L	S	M	M
CO-05	S	S	S	L	S	M	S	M	S	M	S	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction And Geomorphology

9

Geology in civil engineering – branches of geology – structure of earth and its composition– Surface geologic processes in: Hilly terrains, Plains, Deserts and Coastal regions; physiographic forms and drainage patterns.

Unit II: Mineralogy

9

Physical properties of minerals – Quartz group, Feldspar group, Pyroxene - hypersthene and augite, Amphibole – hornblende, Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals and their engineering significance. Reactivity of alkaline minerals with cement and sand.

Unit III: Petrology

9

Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks-Description, occurrence, engineering properties, distribution and use of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist-weathering (process and grades)

Unit IV: Structural Geology and Geophysical Methods

9

Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations. Applications for sub-surface investigation and groundwater exploration.

9

Total: 45 Hours

- 1.Chenna Kesavulu N. "Textbook of Engineering Geology", Macmillan India Ltd., 2009.
- 2.Parbin Singh. A "Text book of Engineering and General Geology", Katson publishinghouse, Ludhiana 2009.
- 3.Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of IndiaLearning Private Limited, New Delhi, 2012.
- 4.Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010.

4. Muthiayya, V.D. "A Text of Geology", Oxford IBH Publications, Calcutta, 1969.
5. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.
6. Bell F.G... "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.

OBJECTIVES

Course Outcome		Cognitive Skill
CO-01	Students will be able to understand the properties of fluids.	U
CO-02	Students will evaluate the pressure intensity and to formulate the problems on buoyancy.	E
CO-03	Students will be able to apply Bernoulli principle and compute pressure drop in flow systems.	A
CO-04	Students will be able to apply appropriate equations and principles to analyze pipe flow problems.	A
CO-05	Students will be able to analyze the discharge measurement principles.	An

Mapping of Course Outcome with Programme Outcome

PO													
CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M

CO-01	M	M	L	M	S	N	M	S	N	N	M	L	M
CO-02	S	L	N	S	N	N	L	N	M	S	S	N	S
CO-03	M	L	L	N	M	L	S	N	L	N	L	M	M
CO-04	M	N	M	N	L	N	M	N	N	L	L	N	L
CO-05	S	L	M	S	N	M	N	N	M	N	S	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Fluid Properties

9

Fluid description - Importance and application of fluid mechanics -continuum concept of system - open and closed system - control section - control volume - classification of fluids- fluid properties - mass density - specific weight - specific gravity - specific volume - viscosity - compressibility - bulk modulus - surface tension - capillary rise and fall.

Unit II: Fluid Statics

9

Pressure - pressure intensity - Pascal's law - hydrostatic equation - pressure forms - atmospheric- absolute – gauge – vacuum – barometric - Pressure measurement - reference datum - pressure diagram and properties - principle of manometers-various forms of manometers – construction - function and equations - Hydrostatic pressure on plane vertical and horizontal surface only - total pressure on lock gates - Archimedes principle - law of floatation - buoyancy - metacentric height – fluid mass under relative equilibrium.

Unit III: Fluid Kinematics

9

Fluid domain - stream line - streak line - path line - stream tube - fluid flow and forms - steady and unsteady - uniform and non-uniform - laminar and turbulent - rotational and irrotational - dimensional - compressible and incompressible - free and forced vortex flow - Continuity equation - fluid particle velocity, acceleration and components - velocity potential and stream function - flow net construction, properties and applications.

Unit IV: Fluid Dynamics

9

Euler and Bernoulli's equation - practical use of Bernoulli's equation – Venturi meter - Orifice meter - pitot tube - Head losses (various minor losses and major losses) – Reynold's experiment -Darcy Weisbach equation - representation of datum - C.B.L - pipe centre line -H.G.L. and T.E.L - pipe systems (long, parallel, series, equivalent) - siphon system - water hammer in pipes - Moody diagram - Boundary layer separation and control, Dimensional Analysis.

Unit V: Hydrometry

9

Discharge measurement principles - historical review of hydrometry - current meter - slope area method - area velocity method - pitot tube - float technique - rotameter - salt velocity method - tracer technique - moving boat method - ultrasonic flow meter - laser Doppler anemometer - hot wire anemometer - thrupps ripple method.

Total: 45 Hours

Text Books

1. Modi, P.N., and Seth, S.M., Hydraulics and Fluid Mechanics including Fluid Machines, Standard Book House, New Delhi, 2000.
2. Madan Mohan Das., Fluid Mechanics and Turbo machines, PHI Learning Private Limited, New Delhi, 1st edition, Reprint, 2009.
3. Irving H. Shames, Mechanics of fluids, McGraw-Hill, 1992.
4. Kumar K.L., Engineering Fluid Mechanics, Eurasia Publishing House Private Ltd., New Delhi, 1995.

References

1. Streeter V.L and E.B Waylie, Fluid Mechanics, MCGraw-Hill, New York, 1983.
2. Arora, K.R., Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers and Distributors, New Delhi, 9th Edition, 2005.
3. Garde,R.J. and Mirajgaoker, A.G., Engineering Fluid Mechanics, Nem Chand Brothers., Roorkee.

CV3205	Strength Of Materials –I	L	T	P	C
		3	0	0	3

OBJECTIVES

To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders and know the mechanism of load transfer in beams, the induced stress resultants and deformation.

Course Outcome		Cognitive Skill
CO-01	Students are able to understand the behavior of material under different loading	R
CO-02	Students are able to understand and calculate the different type of stress like, simple stress, shear stress, direct stress and bending stress in the material	U,R
CO-03	Students are able to understand and calculate the shear force and bending moment for beam of different loading	A
CO-04	Students are able to calculate the deflection of beam for different loading	E
CO-05	Students are able to calculate the force acting on bodies	S

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
	CO-01	S	L	S	M	S	M	S	M	M	M	S	M

CO-02	M	S	M	M	S	S	M	S	S	S	L	S	M
CO-03	M	S	S	S	S	M	S	M	M	S	L	S	M
CO-04	S	M	M	M	S	S	M	L	S	L	S	M	M
CO-05	S	S	S	L	S	M	S	M	S	M	S	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Stress And Strain

9

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram- Principal Stresses and Principal Planes - Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses - Resilience – Stresses due to impact and Suddenly Applied Load

Unit II: Shear and Bending in Beams

9

Beams and Bending- Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a cross section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions

Unit III: Cylinder

9

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lamé's theorem- Compound cylinders

Unit IV: Torsion

9

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – combined bending moment and torsion of shafts – Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – Leaf Springs – Springs in series and parallel – Design of buffer springs.

Unit V: Analysis of Trusses

9

Determinate and indeterminate trusses- Analysis of plane trusses - method of joints - method of sections and tension coefficient - Analysis of Space trusses by tension coefficient method

TOTAL: 45 HOURS

Text Books

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.
2. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi 1997.
3. Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.
4. Ferdinand Beer and E. Johnston, "Mechanics of Materials", McGraw Hill.

References:

1. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

2. Timoshenko.S.B. and Gere.J.M, “Mechanics of Materials”, Van Nos Reinbhold, New Delhi 1995.
3. Ugural. A.C., "Mechanics of Materials", Wiley India Pvt. Ltd., New Delhi, 2013.

CV3271	Strength Of Materials Lab	L	T	P	C
		0	0	2	1

OBJECTIVE:

The experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains. Relating these quantities, the student should be able to obtain the strength of the material and stiffness properties of structural elements.

Course Outcome – Cos		Cognitive Skill
CO-01	The experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains.	U,A
CO-02	The student should learn the use torsion to obtain the torque vs. angle of twist	A, An
CO-03	Students will understand the Analyze and design structural members subjected to flexure	A,R, An
CO-04	Students can utilize appropriate materials in design considering engineering properties like Springs and hardness	A, An
CO-05	Students can utilize appropriate materials in design considering engineering properties like shear and impact resistance.	A, An

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-02	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-03	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-04	S	M	S	S	M	M	M	L	L	S	N	N	L
CO-05	S	M	S	S	M	M	L	L	S	N	N	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

List of Experiments

1. Test involving axial compression to obtain the stress – strain curve
2. Test involving axial tension to obtain the stress – strain curve and the strength
3. Test involving torsion to obtain the torque vs. angle of twist and hence the stiffness
4. Test involving flexure to obtain the load deflection curve and hence the stiffness
5. Tests on springs

6. Hardness tests
7. Shear test
8. Test for impact resistance

TOTAL: 45 HOURS

CV 3272	Survey Practical	L	T	P	C
		0	0	2	1

OBJECTIVE

At the end of the course the student will possess knowledge about survey field techniques.

Course Outcome - COs		CognitiveSkill
CO-01	Evaluate to draw plans & maps to determine the areas before taking up any Civil engineering works.	E
CO-02	Compute areas and volumes using chain surveying	An
CO-03	Apply the basic principles of engineering surveying and for linear and angular measurements.	A
CO-04	Understand the field procedures required for a professional surveyor.	U
CO-05	Apply techniques, skills and conventional surveying instruments necessary for engineering practice.	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-02	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-03	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-04	S	M	S	S	M	M	M	L	L	S	N	N	L
CO-05	S	M	S	S	M	M	L	L	S	N	N	L	S

List Of Experiments:

1. Study of chains and its accessories.
2. Aligning, Ranging and Chaining.
3. Chain Traversing
4. Compass Traversing
5. Plane table surveying: Radiation and Intersection
6. Plane table surveying: Traversing
7. Plane table surveying: Resection –Three-point problem
8. Plane table surveying: Resection –Two-point problem
9. Study of levels and leveling staff
10. Fly leveling using Dumpy level

11. Check leveling
12. LS and CS
13. Contouring
14. Study of theodolite

TOTAL: 45 PERIODS

SEMESTER IV

Sl. No.	Course Code	Course Title	L	T	P	C
Theory						
1.	MA3203	Numerical Methods	3	0	0	3
2.	CV3206	Hydraulics and Hydraulic Machines	3	0	0	3
3.	CV3207	Soil Mechanics	3	0	0	3
4.	CV3208	Strength of Materials - II	3	0	0	3
5.	CV3209	Transportation Engineering - I	3	0	0	3
6.	CV3210	Structural Analysis - I	3	0	0	3
Practical						
7.	CV3273	Soil Mechanics Lab	0	0	2	1
8.	CV3274	Hydraulics Lab	0	0	2	1
Total			18	0	4	20

MA3203	Numerical Methods	L	T	P	C
		2	1	0	3

AIM:

With the present development of Computer Technology, it is necessary to develop efficient algorithms for solving problems in science, Engineering and Technology. This course gives a complete procedure for solving different kinds of problems in engineering numerically

OBJECTIVE:

To have the basic concepts in numerical methods and find the solutions of large system of linear equations where analytical methods fail to give solution. To gain the ability to solve engineering problems characterized in the form of non-linear ordinary differential equation or partial differential equation.

Course Outcomes		Cognitive Skills
At the end of the course students should be able to		
CO-01	Understand the fundamental theorem and compute the solution of nonlinear equations using Newton's method and fixed point iteration method. To solve the linear equations using direct and indirect methods.	CO-01
CO-02	Apply interpolation for equal intervals using Newton's forward and backward formula and using Newton's divided difference formula for unequal intervals and Lagrange's formula.	CO-02
CO-03	Discuss about numerical differentiation and integration. To apply Newton's forward and backward formula, Lagrange's formula and divided difference formula. To evaluate the integrals by using Trapezoidal rule and Simpson's rule.	CO-03
CO-04	Understand the first order differential equation. To solve the first order differential equation by using single step method. To apply	CO-04

	multi step method to find the solution of first order differential equation.	
CO-05	To study about classification of partial differential equations. To find the finite difference solution of one-dimensional heat equation and wave equation. To solve the two-dimensional Laplace and Poisson equations.	CO-05

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO -A	PO -B	PO -C	PO -D	PO -E	PO -F	PO- G	PO- H	PO- I	PO - J	PO-k	PO- L	PO-M
CO-01	M	S	M	S	S	N	M	M	S	S	M	M	M
CO-02	S	M	L	N	L	M	S	L	L	S	M	M	S
CO-03	S	L	S	S	L	L	S	S	M	M	S	S	M
CO-04	S	L	M	S	N	L	S	S	M	S	S	M	S
CO-05	S	L	M	M	M	L	N	S	M	M	M	S	N

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Solution of Equations

9

Solution of non-linear equations–Newton Raphson method, Fixed point iteration method – Solution of linear system of Equations-Direct methods: Gaussian elimination and Gauss-Jordan methods – Iterative methods: Gauss Jacobi and Gauss – Seidel methods.

Unit II: Interpolation

9

Forward and Backward Differences – Interpolation for equal intervals- Newton’s forward and Backward formula- Interpolation for unequal intervals-Newton’s divided difference and Lagrange’s formula.

Unit III: Numerical Differentiation and Integration

9

Numerical differentiation using Newton’s Forward, Backward, Newton’s divided difference and Lagrange’s formula – Numerical integration by Trapezoidal, Simpson’s 1/3 and 3/8 rules– Gaussian Quadrature -Two- and three-point formulae.

Unit IV: Initial Value Problems for Ordinary Differential Equation

9

Solution of first order differential equations -Single step Methods: Taylor Series, Euler, Modified Euler methods and Fourth order Runge-Kutta method. Multi-step methods: Milne’s and Adam’s Predictor and Corrector methods.

Unit V: Numerical Solution of Boundary Value Problems

9

Classification of partial differential equation- Finite difference solution of one-dimensional heat equation by implicit and explicit methods – One dimensional wave equation and two-dimensional Laplace and Poisson equations.

TOTAL: 30L+15T 45 HOURS

Text Book

1. Venkatraman M.K, “Numerical Methods” Fifth Edition, National Pub. Company, Chennai 2005.

References

1. Kandasamy, P.Thilakavathy, K and Gunavathy, K. “Numerical Methods” Second Edition, 2008 S.Chand and Co. New Delhi.
2. Scarborough, James B, “Numerical Mathematical Analysis” Oxford Book Company 1930
3. Balagurusamy, E., “Numerical Methods”, First Edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi. 2009
4. Gerald, C.F, and Wheatley, P.O, “Applied Numerical Analysis”, Sixth Edition, Pearson Education Asia, New Delhi, 2006.

CV3206	Hydraulics And Hydraulic Machines	L	T	P	C
		3	0	0	3

OBJECTIVES

To introduce the importance of study of open channel flow, to give brief description on different types of flows and channels, to learn the fundamentals of Uniform and Non-Uniform flow in open channels, to understand about the concepts of specific energy, critical flow and their applications, to give an idea about the gradually varied flow and rapidly varied flow and their equations and computations and to impart the knowledge on pumps and turbines.

Course Outcome		Cognitive Skill
CO-01	Ability to classify the channel, flow and understand velocity distribution and critical depth, critical velocity concepts.	R
CO-02	Ability to understand uniform flow, roughness coefficient, design a most economical section and characteristics of various flow.	U
CO-03	Ability to understand gradually varied flow, flow profile and hydraulic jump	E
CO-04	Ability to classify the turbines and design of turbines such as Pelton, Francis, Kaplan turbine	An
CO-05	Ability to know centrifugal pump, reciprocating pump and fluid machines.	S

R-Remember-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	M	N	M	L	L	L	N	N	S	S
CO-02	S	S	M	M	N	M	M	M	L	L	L	S	S
CO-03	S	S	S	L	L	L	M	L	L	N	M	S	S

CO-04	S	S	S	L	L	L	M	L	M	L	L	S	S
CO-05	S	S	M	M	L	L	M	M	M	M	M	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Open Channel Flow

9

Difference between open channel flow and pipe flow - Classification of channel - Classification of open channel flow - Velocity distribution in open channel - Specific energy diagram - Conditions for occurrence of critical flow - Froude's number - Critical depth - Critical velocity

Unit II: Uniform Flow

9

Characteristics and establishment of uniform flow - Manning's and Chezy's formula - Determination of roughness coefficients - Determination of normal depth and velocity - Most economical rectangular section and trapezoidal section

Unit III: Varied Flow

9

Dynamic equation of gradually varied flow – Assumptions - Characteristics of flow profiles - Types of flow profiles with examples - Drawdown and backwater curves - Profile determination - Hydraulic jump - Types - Energy dissipation.

Unit IV: Hydraulic Turbines

9

Classifications of turbines - Velocity triangle diagram for Pelton, Francis and Kaplan Turbine - Specific speed- Draft tube - Selection of Turbines

Unit V: Hydraulic Pumps and Fluid System

9

Centrifugal pump – Components - Work done - Head and efficiency - Specific speed of centrifugal pump - Priming – Cavitation - Reciprocating pump - Negative slip - Hydraulic ram, Hydraulic lift, Hydraulic crane.

TOTAL: 45 HOURS

Text Books

1. Subramanya K., "Flow in Open channels", Tata McGraw-Hill Publishing Company, 1994.
2. Modi, P.N, and Seth S.M., "Hydraulic and Fluid Mechanics", Standard Book House, 2000.
3. Bansal R.K., "Fluid mechanics & Hydraulic machines", Laxmi Publishing Pvt Ltd, New Delhi-2007.
4. Jain A.K., "Fluid Mechanics (including Hydraulic Machines)", Khanna Publishers, 8th edition, 1995.

References:

7. Jagdish Lal, "Fluid Mechanics and Hydraulics"; Delhi Metropolitan Book Co. Pvt Ltd.
8. Khurmi R.S. "Hydraulics and Hydraulics Machines"; S Chand and Co., Delhi.
9. Madan Mohan Das, Mimi Das Saikia, Bhargab Mohan Das, "Hydraulics and Hydraulic Machines" PHILearning, 1st edition, 2013.

CV3207	Soil Mechanics	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on behavior and the performance of saturated soil. At the end of this course student attains adequate knowledge in assessing both physical and engineering behavior of soils, mechanism of stress transfer in two-phase systems and stability analysis of slopes.

Course Outcome - COs		Cognitive Skill
CO-01	Knowledge of site-specific field investigation including collection of soil samples for testing.	U,A
CO-02	Be able to identify and classify soil based on standard geotechnical	U,A
CO-03	Be able to perform laboratory compaction and in-place density.	U,A
CO-04	Ability to the soil based on their shear strength.	U, A ,An
CO-05	To analysis for stability of a finite slope	U, A, An

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	L	L	N	M	L	L	M	M	L	M	N
CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	S	L	M	N	M	M	M	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction

9

Definition of soil and soil mechanics – Formation of soil – types of soil – Three phase system of soil and their relationships – Specific gravity – Definition – Determination – Field density - sand replacement and core cutter method.

Unit II: Index Properties

9

Classification of soil – Grain size analysis – Stoke's law and hydrometer analysis – Consistency of soils – Atterberg's limit - Liquid limit, Plastic limit and Shrinkage limit – Determination - plasticity index, liquidity index, consistency index, shrinkage ratio, flow index and toughness

index – Classification of coarse grained and fine-grained soil as per BIS.

Unit III: Permeability and Seepage

9

Permeability –Definition – Assumption - one dimensional flow through soil – Darcy’s law – Limitations - Discharge velocity and seepage velocity – factors affecting the permeability – permeability determination - lab and field methods – permeability in stratified soil deposits – Introduction of flow net and its properties - application of flow net.

Unit IV: Compaction and Consolidation

9

Compaction – field and lab methods – Proctor’s test – factors affecting the compaction – California Bearing Ratio (CBR) test – effect of compaction in soil properties – Consolidation – Terzaghi’s theory of one-dimensional consolidation - partial differential equation (no analytical solution) – Lab method - coefficient of consolidation – Determination - $\sqrt{t}$ and log t methods.

Unit V: Stress Distribution and Shear Strength

9

Introduction – stresses in soil – concept of effective and neutral stresses – stress distribution in soil media – Boussinesq and Westergaard’s analysis – Point load, uniformly distributed load, line load – rectangular load pressure bulb – Newmark’s chart – Introduction. Shear strength – shear strength of cohesive and cohesion less soils – Mohr coulomb’s theory –Direct shear, Triaxial, unconfined shear strength – Lab and field vane shear test-factors affecting the shear strength.

Text Books

1. Raju .K.V.B .and Ravichandran .P.T, “Mechanics of Soils”, Ayyappa Publications, 2000.
2. Punmia .B.C, “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd., 2005.
3. Gopal Ranjan and Rao .A.S.R, “Basic and Applied Soil Mechanics”, New age International(p) Ltd.,2007.116 CE-Engg&Tech-SRM-2013

References

1. Terzaghi .K and Peck .R.B, “Soil Mechanics in Engineering Practice”, John Wiley Ltd., 1996.
2. Lambe .T.W, Whitman, “Soil Mechanics”, John Wiley Ltd., 1979.
3. Arora .K.R, “Soil Mechanics and Foundation Engineering”, Standard Publication Distributors, 2011

CV3208	Strength Of Materials II	L	T	P	C
		3	0	0	3

OBJECTIVES

- To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analyzing indeterminate beam.
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.

Course Outcome		Cognitive Skill
CO-01	Students are able to understand the behavior of material under different loading	U,R

CO-02	Student are able to understand and calculate the different type of stress like, simple stress, shear stress, direct stress and bending stress in the material	E,U
CO-03	Students are students are able to understand and calculate the shear force and bending moment for beam of different loading	An
CO-04	Students are able to calculate the deflection of beam for different loading	U,R
CO-05	Student are able to calculate the force acting on bodies	A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	L	S	M	S	M	S	M	M	M	S	M	S
CO-02	M	S	M	M	S	S	M	S	S	S	L	S	M
CO-03	M	S	S	S	S	M	S	M	M	S	L	S	M
CO-04	S	M	M	M	S	S	M	L	S	L	S	M	M
CO-05	S	S	S	L	S	M	S	M	S	M	S	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Energy Principles

9

Strain energy and strain energy density – strain energy due to axial load, shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorems – Principle of virtual work – application of energy theorems for computing deflections in beams and trusses -Williot Mohr's Diagram.

Unit II: Indeterminate Beams

9

Concept of Analysis - Propped cantilever and fixed beams-fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

Unit III: Columns

9

Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Effective length – limitations - Rankine-Gordon formula for eccentrically loaded columns – Eccentrically loaded short columns – middle third rule.

Unit IV: State of Stress in Three Dimensions

9

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes – Volumetric strain – Theories of failure – Principal stress - Principal strain – shear stress – Strain energy and distortion energy theories – application in analysis of stress, load carrying capacity.

Unit V: Advanced Topics in Bending of Beams**9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams –Winkler Bach formula.

TOTAL: 45 HOURS**Text Books**

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2010.
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012

References:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2010.
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012
3. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2012.
4. Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010.

CV3209	Transportation Engineering – I	L	T	P	C
		3	0	0	3

OBJECTIVES:

To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.

Course Outcome – Cos		Cognitive Skill
CO-01	Understand basic information, prepare a horizontal and vertical alignment, including super elevation, which complies with AASHTO standards.	U
CO-02	To understand the principles of Highway geometrics design as per IRC Standards	U
CO-03	Synthesis to apply standards to design of alignments when considering topography and environmental concerns	S
CO-04	To understand Types of pavements & Materials required for highway construction.	U
CO-05	To understand maintenance procedure for different type of pavements	U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO -A	PO -B	PO -C	PO -D	PO -E	PO-F	PO -G	PO -H	PO -I	PO -J	PO-k	PO -L	PO -M
CO-01	S	M	L	L	N	M	L	L	M	M	L	M	L

CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	M	L	L	N	M	L	L	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Highway Planning and Alignment

8

Significance of highway planning - History of road development in India – Classification of highways – Typical cross sections of Urban and Rural roads - Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Engineering surveys for alignment, objectives, conventional and modern methods.

Unit II: Geometric Design of Highways

12

Cross sectional elements - Sight distances –Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves, Sag Curve & Summit Curves-Gradients, Special consideration for hill roads - Hairpinbends- Lateral and vertical clearance at underpasses.

Unit III: Design of Flexible and Rigid Pavements

9

Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) – Embankments. - Problems in Flexible & Rigid pavement design – Highway Drainage.

Unit IV: Highway Construction Materials and Practice

8

Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Construction practice including modern materials and methods, Bituminous and Concrete Road construction, Polymer modified bitumen- Test on Bituminous mixes

Unit V: Maintenance of Pavements

8

Pavement distress in flexible and rigid pavements – Pavement Management Systems -Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Types of maintenance – Highway Project formulation.

TOTAL: 45 HOURS

Textbooks:

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemch and Publishers, 2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Sci tech Publications(India), Chennai, 2010
3. Fred L. Mannering, Scott S. Washburn and Walter P.Kilaeski, "Principles of Highway Engineering andTraffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011.

References:

1. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technica lPublications, 8thedition Delhi, 2013.
2. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression,

SouthAsia, 2012

3. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, 1st Edition, USA, 2011

CV3210	Structural Analysis – I	L	T	P	C
		3	0	0	3

OBJECTIVES

To introduce the students to basic theory and concepts of structural analysis, analysis of suspension bridges and strain energy methods.

Course Outcome		Cognitive Skill
CO-01	Ability to analyse indeterminate trusses and frames obtain internal loading.	U, An
CO-02	Ability to obtain the influence line for statically determinate and indeterminate structures.	An
CO-03	Ability to analyse Arch structures	An
CO-04	Ability to analyse cable and stiffening girder.	U, A
CO-05	Ability to analyse the strain energy and beams curved in plan.	U, An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	L	S	L	S	L	S	M	S	L	M
CO-02	M	S	S	S	M	L	M	S	L	S	L	M	L
CO-03	S	S	M	M	S	M	S	L	M	L	S	M	S
CO-04	S	L	S	M	L	M	S	M	S	L	M	M	S
CO-05	S	S	M	M	S	M	S	M	S	L	S	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Indeterminate Frames

9

Degree of static and kinematic indeterminacies for plane frames - analysis of indeterminate pin-jointed frames-rigid frames (Degree of statical indeterminacy up to two) - Energy and consistent deformation methods.

Unit II: Moving Loads and Influence Lines**9**

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames–Beggs deformeter.

Unit III: Arches**9**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

UNIT IV: Cables And Suspension Bridges**9**

Cables – Ropeways and Bridges – components and their function –Suspension cables– Effect of temperature in suspension cables –Stiffening girder – necessity and types – cables with two and three hinged stiffening girders. Influence lines for three hinged stiffening girders.

UNIT V: Strain Energy Methods and Beam Curved in Plan**9**

Strain energy – Strain energy under axial load, bending, transverse shear and torsion – Castigliano's theorem for determinate and indeterminate structures (restricted to two unknowns) – Beams curved in plan – Ring beams.

TOTAL: 45 PERIODS**Text Books:**

1. Bhavikatti, S.S, Structural Analysis, Vol.1 & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.
2. Punmia, B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications, 2004.
3. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications Pvt. Ltd, New Delhi, 2003.
3. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.

References:

1. L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.
2. Punmia, B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004. Bhavikatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008.

CV3273	Soil Mechanics Lab	L	T	P	C
		3	0	0	1

OBJECTIVE

To provide hands on training in determination of Engineering and Index properties of soils, applied in field problems.

Course Outcome – Cos		Cognitive Skill
CO-01	To develop skills to test the soils for their index properties.	R,U
CO-02	To develop skills to test the soils for their engineering properties and to characterize the soil based on their properties.	A,An
CO-03	determination of insitu density and compaction characteristics	E
CO-04	Determination Grain size distribution – Sieve analysis	An
CO-05	Determination Shrinkage limit and Differential free swell tests	R,U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-02	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-03	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-04	S	M	S	S	M	M	M	L	L	S	N	N	L
CO-05	S	M	S	S	M	M	L	L	S	N	N	L	S

LIST OF EXPERIMENTS

Grain size distribution - Sieve analysis

Grain size distribution - Hydrometer analysis

Specific gravity of soil grains

Relative density of sands

Atterberg limits test

Determination of moisture - Density relationship using standard Proctor test.

Permeability determination (constant head and falling head methods)

Determination of shear strength parameters.

Direct shear test on cohesionless soil

Unconfined compression test on cohesive soil

Triaxial compression test

One dimensional consolidation test (Determination of co-efficient of consolidation only)

Field density test (Core cutter and sand replacement methods)

Load bearing capacity on wooden piles

TOTAL: 45 PERIODS

CV3274	Hydraulics Lab	L	T	P	C
		0	0	2	1

OBJECTIVE

Learn the fundamental principles of fluid mechanics through experimentation and to demonstrate hydraulic principles used in engineering design with hands-on physical devices

Course Outcome – Cos		Cognitive Skill
CO-01	Able to Calibrate flow measuring devices used in pipes, channels and tanks and find the discharge	R, U
CO-02	Able to determine frictional losses in pipes.	A, An
CO-03	Able to have an idea about regulating the water supply system.	E
CO-04	Ability to analyze the characteristics of pumps and turbines.	An
CO-05	Able to study about parameters in floating bodies.	R,U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-02	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-03	S	M	S	S	M	M	M	L	L	S	N	N	S
CO-04	S	M	S	S	M	M	M	L	L	S	N	N	L
CO-05	S	M	S	S	M	M	L	L	S	N	N	L	S

LIST OF EXPERIMENTS

1. Determination of co-efficient of discharge for orifice.
2. Determination of co-efficient of discharge for notches.
3. Determination of co-efficient of discharge for venturi meter.
4. Determination of co-efficient of discharge for orifice meter.
5. Determination of buoyancy and metacentric height.
6. Study of impact of jet on flat plate (normal / inclined).
7. Study of friction losses in pipes.
8. Study of minor losses in pipes.
9. Study on performance characteristics of Pelton turbine.
10. Study on performance characteristics of Francis turbine.
11. Study on performance characteristics of Kaplan turbine.
12. Study on performance characteristics and usages of Centrifugal pumps (Constant speed / variable speed).
13. Study on performance characteristics of reciprocating pump.

TOTAL: 45 PERIODS

SEMESTER V

Sl. No.	Course Code	Course Title	L	T	P	C
Theory						
1.	MS3201	Professional and Business Ethics	2	0	0	2
2.	CV3211	Structural Analysis – II	3	0	0	3
3.	CV3212	Irrigation Engineering	3	0	0	3
4.	CV3213	Foundation Engineering	3	0	0	3
5.	CV3214	Design of Reinforced Concrete Elements	3	0	0	3
6.	CV3215	Transportation Engineering II	3	0	0	3
Practical						
7.	CV3275	Computer Aided Drafting Laboratory	0	0	2	1
8.	CV3276	Irrigation Engineering Design and Drawing	0	0	2	1
TOTAL			17	0	4	19

MS3201	Professional And Business Ethics	L	T	P	C
		2	0	0	2

COURSE DESCRIPTION

The course on Professional and Business Ethics is designed to cultivate ethical awareness and moral and social values in BE students. It aims to help students recognize legal and ethical issues in business decision-making, enhance analytical problem-solving skills, and foster ethical decision-making abilities.

OBJECTIVES

1. To Recognize legal and ethical issues in business decision-making.
2. To Understand and apply ethical rules and constraints.
3. To Enhance analytical problem-solving skills and ethical decision-making abilities.

Course Outcome		Cognitive Skill
CO-01	Explain the connection between ethics, morals, and values in the workplace.	U
CO-02	Assess the ethical implications of business activities and competing demands on businesses.	An
CO-03	Critically analyze real-world contexts and conduct research projects on topics related to business ethics.	An
CO-04	Embrace lifelong learning and continuous improvement in ethical decision-making.	U
CO-05	Develop and implement ethical policies and procedures.	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	M	S	M	L	S	M	M	S	N	N	N	N
CO-02	S	L	N	M	M	S	L	N	L	M	N	N	N
CO-03	M	S	S	N	L	N	S	M	S	N	N	N	N
CO-04	S	M	N	S	L	M	L	N	S	M	N	N	N
CO-05	S	L	S	L	M	S	M	M	L	L	N	N	N

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Human Values

6

Morals, Values, and Ethics - Integrity and Work Ethic - Caring, Sharing, and Honesty - Commitment, Empathy, and Self-Confidence.

Unit II: Engineering Ethics**6**

Senses of 'Engineering Ethics' and Moral Issues -Moral Autonomy and Ethical Theories - Models of Professional Roles.

Unit III: Engineering As Social Experimentation**6**

Engineering as Experimentation - Engineers as Responsible Experimenters - Codes of Ethics and Legal Perspectives.

Unit IV: Safety, Responsibilities, And Rights**6**

Safety, Risk, and Risk Assessment - Collegiality, Loyalty, and Respect for Authority - Professional and Employee Rights.

Unit V: Global Issues**6**

Multinational Corporations and Environmental Ethics - Engineers as Managers, Consultants, and Expert Witnesses.

TOTAL: 30 HOURS**Textbooks:**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering," McGraw-Hill, New York, Latest edition: 4th edition (2022).
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics," Prentice Hall of India, New Delhi, Latest edition: 2nd edition (2021).

References:

1. Charles D. Fleddermann, "Engineering Ethics," Pearson Education/Prentice Hall, New Jersey, Latest edition: 4th edition (2022).
2. Charles E Harris, Michael S. Protchard, and Michael J Rabins, "Engineering Ethics - Concepts and Cases," Wadsworth Thompson Learning, United States, Latest edition: 2nd edition (2023).
3. John R Boatright, "Ethics and the Conduct of Business," Pearson Education, New Delhi, Latest edition: 8th edition (2021).
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers," Oxford University Press, Oxford, Latest edition: 2nd edition (2022).

CV3211	Structural Analysis - II	L	T	P	C
		3	0	0	3

OBJECTIVE:

This course is in continuation of Structural Analysis Classical Methods. Here in advanced method of analysis like Matrix method and Plastic Analysis are covered.

Course Outcome- Cos		Cognitive Skill
CO-01	Ability to solve statically indeterminate structures using Flexibility Methods	An

CO-02	Ability to solve statically indeterminate structures using Stiffness Matrix Methods	An
CO-03	Ability to solve statically indeterminate structures using Finite Element Methods	An
CO-04	Ability to analyze Plastic Analysis of Structures	An
CO-05	Ability to analyze cable and space structures	An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

CO \ PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	L	N	M	L	L	M	M	L	M	L
CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	M	L	L	N	M	L	L	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N- Not Relevant

Unit I : Slope Deflection Method

9

Slope deflection equations - Equilibrium conditions - Analysis of continuous beams and rigid frames - Rigid frames with inclined members - Support settlements- symmetric frames with symmetric and skew-symmetric loadings –practical applications.

Unit II: Moment Distribution Method

9

Stiffness and carry over factors- Distribution and carry over of moments-Analysis of continuous Beams-Plane rigid frames with and without sway - Support settlement - symmetric frames with symmetric and skew-symmetric loadings –practical applications.

Unit III: Flexibility Method

9

Primary structures-Compatibility conditions- Formation flexibility matrices-Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach-practical applications.

Unit IV: Matrix Stiffness Method

9

Restrained structure - Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method – practical applications.

Unit V: Plastic Analysis of Structures**9**

Plastic theory - Statically indeterminate structures - Plastic moment of resistance - Plastic modulus - Shape factor - Load factor - Plastic hinge and mechanism- collapse load – Static and kinematic methods - Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames – practical applications.

TOTAL:45 HOURS**Textbook:**

1. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis- Vol.1& Vol.2", Laxmi Publications, New Delhi, 2003.
2. Punmia B.C., Theory of Structures (SMTS) Vol II Laxmi Publishing Pvt Ltd, New Delhi, 2004.
3. Bhavaikatti, S.S, Structural Analysis- Vol.1& Vol.2, Vikas Publishing Pvt Ltd., New Delhi, 2008

References:

1. L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003.
2. Analysis of Indeterminate Structures - C.K. Wang, Tata McGraw-Hill, 1992.

CV3212	Irrigation Engineering	L	T	P	C
		3	0	0	3

OBJECTIVES

At the end of the semester, the student shall understand different methods in irrigation. Further they will be imparted required knowledge on irrigation water storage, distribution canal system and irrigation management.

Course Outcome		Cognitive Skill
CO-01	Recognize the importance of irrigation, knowledge of consumptive use of water and irrigation efficiency.	R
CO-02	Knowledge of the basic principles and design parameter of irrigation methods.	U
CO-03	Select the appropriate method to design an irrigation structure based on specific condition.	An
CO-04	Apply techniques for economic optimization of the irrigation network.	A
CO-05	Determine the required data, apply adequate method and find efficient solution for irrigation management	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Out comes with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO- I	PO- J	PO- k	PO- L	PO- M
CO-01	S	S	S	S	M	M	L	L	S	S	M	M	L
CO-02	S	S	S	M	M	L	L	L	L	M	M	L	M
CO-03	S	S	M	M	L	M	M	M	L	L	L	L	L
CO-04	S	M	M	S	M	L	L	M	M	L	L	M	M
CO-05	S	S	M	S	M	L	L	L	M	L	M	M	M

S-Strong, M-Medium, L-Low, N-Notrelevant

Unit I: Introduction

9

Irrigation - Need and mode of irrigation - Role of Irrigation, Merits and demerits of irrigation - Irrigation Development- Crop and crop seasons - consumptive use of water - Duty – Factors affecting duty-Irrigation efficiencies.

Unit II: Irrigation Methods

9

Canal irrigation-Tank Irrigation-Flooding Methods-Sprinkler Irrigation-Drip Irrigation-Subsurface dripirrigation-Merits and demerits-Case studies

Unit III: Diversion And Impounding Structures

9

Weirs - elementary profile of a weir -Types of impounding structures - Gravity dams – Earth dams - Spillways - Factors affecting location and type of dams- Forces on a dam - Causes of failure of dams and it remedies-Case studies.

Unit IV: Canal Irrigation

9

Alignment of canals - Classification of canals - Canal drops - Cross drainage works – Canal Head works-Canal regulators-canal automation for irrigation system

Unit V: Irrigation Water Management

9

Need for optimization of water use-Minimizing irrigation water losses-Remote sensing technologies to enhance water management- On farm development works-Percolation ponds – Participatory irrigation management-Water users associations–Performance evaluation- Case studies

TOTAL:45HOURS

Textbook:

1. Garg,S.K., "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, NewDelhi,2004.

2. Asawa,G.L., "Irrigation Engineering", New Age International Publishers,2000
3. PunimaB.C. & Pande B.B.Lal Irrigation and Water Power Engineering, Laxmi Publishing, NewDelhi2007

References:

1. Basak,N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co.New Delhi,1999
2. SharmaR.K.. "Irrigation Engineering", S.Chand & Co.2007.
3. Michael,A.M, Irrigation Theory and Practical, Vikas PublishingPvtLtd,2006
4. Gupta,B.L, & Amir Gupta, "Irrigation Engineering" ,Satya Prahesan,NewDelhi.

CV3213	Foundation Engineering	L	T	P	C
		3	0	0	3

OBJECTIVE:

At the end of this course student acquires the capacity to investigate the soil condition and to design suitable foundation

Course Outcome-COs		Cognitive Skill
CO-01	To analyze the settlement of the footing	U,A
CO-02	To understand the bearing capacity of footing by different methods	U,A
CO-03	Ability to calculate the load bearing capacity of different piles	U,A
CO-04	To understand the techniques in design of foundation in BC soil	U,A, An
CO-05	To know concepts of soil reinforcement and geo-synthetics material in soil structure	U,A, An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	L	M	M	L	L	M	M	L	M	N
CO-02	M	M	L	S	N	M	L	L	S	M	L	S	L
CO-03	S	S	L	M	N	M	M	M	L	M	M	M	L
CO-04	L	M	S	L	N	S	S	L	L	S	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	N

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Site Investigation and Selection of Foundation

9

Site investigation - Selection of foundation based on soil condition-Types of Soil-Sampling -

Types of tests (Bore Hole Test)-Water boring and rotatory drilling - Depth of boring - Split spoon sampler, thin tube sampler, Stationary piston sampler-Bore log report-Penetration tests (SPT and SCPT).

Unit II: Shallow Foundation

9

Introduction - Types of foundation - Location and depth of foundation - codal provisions – bearing capacity of shallow foundation on homogeneous deposits - Terzaghis formula and BIS formula – factors affecting bearing capacity - problems - Bearing Capacity from in situ tests - Allowable bearing pressure, Settlement - Components of settlement - Determination of settlement of foundations on granular and clay deposits - Allowable settlements - Codal provision - Methods of minimizing settlement, differential settlement - Types of footings - Contact pressure distribution below footings & raft - Isolated and raft footings.

Unit III: Earth Pressure and Retaining Wall

9

Earth pressure and retaining walls - States of plastic equilibrium - Rankine and coulomb theories - Application to the retaining walls of simple configuration - Stability considerations.

Unit IV: Piles

9

Types of piles and their function - Factors influencing the selection of pile - Carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering news and Hileys) - Negative skin friction - uplift capacity - Group capacity by different methods (Felds rule, Converse Labarra formula and block failure criterion) - Settlement of pile groups - Interpretation of pile load test - Forces on pile caps - under reamed piles- Racker piles - Capacity under compression and uplift.

Unit V: Special Foundation

9

Well foundation – Cofferdams - Shell foundation – Vee and eel girder foundation. - Introduction to machine foundation-Annular Foundation-Transmission tower.

TOTAL:45HOURS

Textbook:

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, New Delhi, 1999.
2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi (India), 2003.
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi publications pvt.Ltd., New Delhi, 1995.

References:

1. Das, B.M. "Principles of Foundation Engineering (Fifth edition), Thomson Books COLE, 2003.
2. Swamisaran, "Analysis and Design of Structures-Limit state Design", Oxford

IBHPublishingCo-Pvt.Ltd., NewDelhi,1998.

3. Kaniraj,S.R, ”Design aids in Soil Mechanics and Foundation Engineering”, Tata McGraw Hillpublishing company Ltd., New Delhi, 2002.

4. BowlesJ.E,” Foundation analysis and design”, McGraw-Hill,1994

CV3214	Design Of Reinforced Cement Concrete	L	T	P	C
		3	0	0	3

OBJECTIVES

To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

Course Outcome		Cognitive Skill
CO-01	Understand the various design methodologies for the design of RC elements.	U,A &An
CO-02	Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion	R,U, An
CO-03	Design the various types of slabs	R,U, An
CO-04	Design columns for axial, uniaxial and biaxial eccentric loadings	U, A & An
CO-05	Design of footing by limit state method.	U, A & An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	M	L	M	M	L	L	M	M	S	S
CO-02	S	S	M	M	L	M	M	M	L	M	L	S	S
CO-03	S	S	M	M	L	M	M	M	L	M	L	S	S
CO-04	S	S	M	M	L	M	M	M	L	M	L	S	S
CO-05	S	S	S	M	L	M	M	M	L	M	L	M	L

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction To R.C Structures

9

Objective of structural design- Role of structural engineer in structural design - Elements of structures - Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practice - concept of working stress method, ultimate load design and limit state design methods for RCC -Properties of concrete and reinforcing steel methods of

design - Advantages of Limit State Method over other methods- Limit State philosophy as detailed in IS code-Practical applications in structural elements.

Unit II: Design Of Slabs

9

Slab - Types - Methods of slab analysis - Practical applications in Slab - Limit state method: Analysis and design of one way simply supported and continuous slabs and supporting beams- Two-way slab- Design of simply supported and continuous slabs using IS code coefficients- Cantilever slab - Detailing of reinforcement.

Unit III: Design Of Beams

9

Beam - Types - Behaviour of reinforced concrete Beams under loads - Assumptions - Practical applications in beam-Limit state method: Analysis and design of Singly and Doubly reinforced beams - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Detailing of reinforcement- Design of RC members for combined bending

Unit IV: Design Of Columns

9

Types of columns-Practical applications in Column-Design of rectangular, square and circular columns- Design of short columns for Uniaxial and Biaxial bending - Design of Slender columns - Detailing of reinforcement.

Unit V: Design Of Footings

9

Limit state method: Concepts of Proportioning footings and foundations based on soil properties- Practical applications in footing-Isolated rectangular footing with axial and eccentric loading -Design of square footing- Design of Combined Rectangular footing - Detailing of reinforcement.

TOTAL:45HOURS

Text Books:

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
2. Gambhir, M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
3. Subramanian, N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
4. Krishna Raju, N. "Design of Reinforced Concrete Structures", CBS Publishers & Distributors Pvt.Ltd., New Delhi.
5. Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi

References:

1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Rourkee.

2. Sinha ,S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., NewDelhi.
3. Unni Krishna Pillai, S. , DevadasMenon, "Reinforced Concrete Design" ,Tata McGraw-HillPublishing Company Ltd., New Delhi.
4. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of ReinforcedConcrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.
5. Bandyopadhyay. J.N., "Design of Concrete Structures", Prentice Hall of India Pvt. Ltd., NewDelhi, 2008.
6. Gambhir. M.L., " Fundamentals of Reinforced Concrete Design", Prentice Hall of India PrivateLimited, New Delhi, 2006.

CV3215	Transportation Engineering – II	L	T	P	C
		3	0	0	3

OBJECTIVES:

To expose the students to Railway planning, design, construction and maintenance and planning and design principles of Airports and Harbors.

Subject Code: CV3215		Subject Name: TRANSPORTATION ENGINEERING–II	
Course Outcome-Cos			Cognitive Skill
CO- 01	Understand the methods of route alignment and design elements inRailway planning and construction.		U,A
CO-02	Understand the construction techniques and maintenance of track Laying and railway station.		U,A
CO-03	Gain the knowledge about tunnel engineering.		U,A
CO-04	Analyses and design the elements for orientation of runways andPassenger facility system.		U,A,An
CO-05	Students should also be able to know planning and design of Harbors, components and environment concern of port operation.		U,A,An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	S	S	M	M	S	L	M	L	L
CO-02	S	S	S	S	S	S	M	M	S	L	M	L	L
CO-03	S	S	S	S	S	S	M	M	S	L	M	L	L

CO-04	S	S	S	S	S	S	M	M	S	L	M	L	L
CO-05	S	S	S	S	S	S	M	M	S	L	M	L	L

S-Strong,M-Medium,L-Low,N-NotRelevant

Unit I: Railway Planning

10

Significance of Road, Rail, Air and Water transports - Coordination of all modes to achieve sustainability -Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, -Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- - Soil suitability analysis - Geometric design of railways, gradient, super elevation, widening of gauge on curves-Points and Crossings.

Unit II: Rail Way Construction and Maintenance

9

Earthwork–Stabilization of track on poor soil–Tunneling Methods, drainage and ventilation– Calculation of Materials required for track laying- Construction and maintenance of tracks– Modern methods of construction & maintenance - Railway stations and yards and passenger amenities- Urban rail.

Unit III: Tunneling

9

Detail Classification –Open cut Vs. Tunnels, method of transfer of alignment-problems in tunneling, tunneling methods (Shield, cut and cover, compressed air, drill and blast methods), linings – necessity and types, drilling–types, explosives- types TBM, mucking.

Unit IV: Airport Planning

8

Air transport characteristics- airport classification-airport planning: objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport sites election, Typical, airport layouts, Orientation, Wind Rose Diagram, Runway length.

Unit V: Harbour Engineering

10

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbors: Requirements, Classification, Location and Design Principles–Harbor Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins

and Floating Landing Stage– Inland Water Transport–Wave action on Coastal Structures and Coastal Protection Works–Environmental concern of Port Operations–Coastal Regulation Zone.

TOTAL:45HOURS

Text Books:

1. Saxena Subhash C and Satyapal Arora," A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2003.

2. Satish Chandra and Agarwal M.M, "Railway Engineering",2nd Edition, Oxford University Press,NewDelhi,2013.
3. Khanna SK,Arora MG and JainSS, "Airport Planning and Design", Nemchand and Brothers,Roorkee,2012.
4. BindraSP,"A Course in Docks and Harbour Engineering",Dhanpat Rai andSons, NewDelhi,2013.

References:

1. Rangwala, "Railway Engineering", Charotar Publishing House,2013.
2. Rangwala," Airport Engineering", Charotar Publishing House,2013.
3. Rangwala,"Harbor Engineering", Charotar Publishing House,2013.
4. Oza.H.P.andOza.G.H.,“AcourseinDocks&HarbourEngineering”.CharotarPublishingCo., 2013,

CV3275	Computer Aided Drafting Laboratory	L	T	P	C
		0	0	2	1

OBJECTIVE:

At the end of this course the student should be able to draft on computer building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following.

Course Outcome		Cognitive Skill
CO-01	The students will be able to draft the plan, elevation and sectional views of the buildings using computer softwares.	R
CO-02	The students will be able to draft the plan, elevation and sectional views of the industrial structure's computer softwares.	U
CO-03	The students will be able to draft the plan, elevation and sectional views of the framed buildings using computer softwares.	An
CO-04	The students will be able to draft the plan, elevation and sectional views of the Trusses using computer softwares.	A
CO-05	The students will be able to draft the Structural detailing drawing buildings using computer softwares.	S

R-Remember, U-Understand,A-Apply,An-Analyze,E-Evaluate,S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	L	M	M	S	L	M	L	M	L	M

CO-02	S	S	L	M	L	L	L	L	M	L	L	M	L
CO-03	S	S	M	S	L	L	M	M	L	L	M	M	L
CO-04	S	S	L	M	M	L	L	M	L	M	L	L	M
CO-05	S	S	L	M	M	M	M	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

List Of Experiments:

1. Introduction of all basic commands required for drafting
2. Buildings with load bearing walls (Flat and pitched roof)-Including details of doors and windows.
3. RCC framed structures
4. Industrial buildings-Trusses
5. Drendering of one- and two-story buildings
6. Structural detailing drawing (Beam, column, roof slab, retaining wall)

TOTAL: 45 HOURS

Text Book:

1. Sikka V.B., A Course in Civil Engineering Drawing, 4th Edition, S.K. Kataria and Sons, 1998.
2. George Omura, "Mastering in AUTOCAD 2002", BPB Publications, 2002

References:

1. Shah M.G., Kale C.M. and Patki S.Y., "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Publishers Limited, 2004.
2. Verma B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 1989.
3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2008.
4. A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons Inc., 2008.

List Of equipment

(For a batch of 30 students)

Sl. No.	Description of Equipment	Quantity
1	Computer (Window 7 or equivalent)	1 for each student
2	Licensed version of drafting software Auto CADD	1 copy for a set of 3 Students

CV3276	Irrigation Engineering Design and Drawing	L	T	P	C
		0	0	2	1

OBJECTIVES

At the end of the semester, the student understands the irrigation engineering structural design and draws the irrigation engineering structures in detail showing the plan, elevation and sections.

Course Outcome		Cognitive Skill
CO-01	The student will get the knowledge about concepts in design of irrigation structures	R
CO-02	The student will be able to understand about the dimensioning of irrigation structures	U
CO-03	The student will be able to analyse the forces acting on various irrigation structures	An
CO-04	The student will be able to draw the irrigation structures	A
CO-05	The student will be able to design new irrigation structures	S

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with ProgrammeOutcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	L	M	M	S	L	M	L	M	L	M
CO-02	S	S	L	M	L	L	L	L	M	L	L	M	L
CO-03	S	S	M	S	L	L	M	M	L	L	M	M	L
CO-04	S	S	L	M	M	L	L	M	L	M	L	L	M
CO-05	S	S	L	M	M	M	M	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

List Of Experiments:

- Design of Tank surplus weirs.
- Drawings showing foundation details, plan and elevation Tank surplus weirs.
- Design of Tank sluices with tower head.
- Drawings showing foundation details plan and elevation of Tank sluices with tower head.
- Design of Canal drop Notch type.
- Drawings showing foundation details, plan and elevation of Canal drop Notch type.
- Design of Syphon well drop
- Drawings showing foundation details, plan and elevation of Syphon well drop.

9. Design of Aqueduct.
10. Drawings showing foundation details, plan and elevation of Aqueduct

TOTAL: 45 HOURS

Text Book:

1. Garg, S.K, "Irrigation Engineering and Design of Structures", Khanna Publishers, New Delhi, 2004.
2. Satyanarayana Murthy, "Irrigation Design and Drawing", Published by Mrs. L. Banumathi, Tuni, East Godavari District, A.P. 1998.
3. Sharma R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 2002

SEMESTER VI

Sl. No.	Course Code	Course Title	L	T	P	C
Theory						
1.	CS32D1	Fundamentals of Artificial Intelligence	3	0	0	3
2.	CV3216	Advanced Design of Structure	3	0	0	3
3.	CV3217	Design of Steel Structures	3	0	0	3
4.	CV3218	Environmental Engineering	3	0	0	3
5.	CV3219	Elective – I	3	0	0	3
6.	CV3220	Elective – II	3	0	0	3
Practical						
7.	CV3277	Environmental Engineering Laboratory	0	0	2	1
8.	CV3278	Concrete Laboratory	0	0	2	1
	CV3279	Summer Internship	0	0	2	2
TOTAL			18	0	4	22

CS32D1	Fundamentals Of Artificial Intelligence	L	T	P	C
--------	---	---	---	---	---

OBJECTIVES

- Understand the basic concepts of intelligent agents.
- Develop general-purpose problem-solving agents, logical reasoning agents, and agents that reason under uncertainty.
- Employ AI techniques to solve some of today's real-world problems.

Course Outcome – COs		Cognitive Skill
CO-01	Explain autonomous agents that make effective decisions in fully informed, partially observable, and adversarial settings.	U
CO-02	Choose appropriate algorithms for solving given AI problems	A
CO-03	Design and implement logical reasoning agents	R, A
CO-04	Design and implement agents that can reason under uncertainty	R, A
CO-05	Understand the basic areas of artificial intelligence including problem solving, knowledge representation, reasoning, decision making, planning, perception and action.	U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	L	L	L	M	L	M	M	N	N	N	N	N	N
CO-02	M	M	S	M	M	M	L	N	N	N	N	N	N
CO-03	M	M	M	M	M	S	S	N	N	N	N	N	N
CO-04	S	M	S	L	L	M	S	N	N	N	N	N	N
CO-05	M	M	L	L	M	M	S	N	N	N	N	N	N

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Ai Agents

9

Introduction to AI – Agents and Environments – Concept of rationality – Nature of environments – Structure of agents – Problemsolvingagents–Searchalgorithms–Uninformedsearchstrategies.

Unit II: Problem Solving

9

Heuristic search strategies–heuristic functions - Local search and optimization problems – Local search in continuous space – Search with non-deterministic actions – Search in partially observable environments – Online search agents and unknown environments.

Unit III: Theory Of Game Playing

9

Game theory – Optimal decisions in games – Alpha-beta search – Monte-Carlo tree search – Stochastic games– Partially observable games. Constraint Satisfaction Problems – Constraint propagation – Backtracking search for CSP – Local searchfor CSP– Structure of CSP.

Unit IV: Knowledge Based Logical Agents

9

Knowledge-based agents – Propositional logic – Propositional theorem proving – Propositional model checking– Agent’s based on pro positional logic. First-order logic – Syntax and semantics – Knowledge representation and engineering – Inferences in first-order logic– Forward chaining– Backward chaining–Resolution.

Unit V: Knowledge Representation

9

On to logical engineering–O bjects and categories–Events–Mental objects and Modal logic– Reasoning systems for categories – Reasoning with default information. Classicalplanning– Algorithmsforclassicalplanning–Heuristicsforplanning–Hierarchicalplanning–Non- deterministic domains–Time, Schedule, and Resources–Analysis.

TOTAL: 45 PERIODS

Text Books

1. Stuart Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Fourth Edition, Pearson Education, 2020.

References

1. Dan W. Patterson, “Introduction to A and ES”, Pearson Education, 2007.
2. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008.
3. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006.
4. Artificial Intelligence by Example: Develop machine intelligence forms crutch using relativities intelligence use cases -by Dennis Rothman, 2018.

CV 3216	Advanced Design of Structures	L	T	P	C
		3	0	0	3

OBJECTIVES

This course aims the students understand the principles of structural engineering design. Students will be developed knowledge of retaining walls, water tanks, Stair case and industrial structures. To give an exposure to introduce yield line theory.

Course Outcome		Cognitive Skill
CO-01	To design the different types of retaining wall	U
CO-02	Design the water tank	A & An
CO-03	Study yield line theory	E
CO-04	Design the staircase	U & A
CO-05	Design the bridge structure	A & An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J _k	PO-L	PO-M	
CO-01	S	L	M	L	M	L	N	L	S	L	S	S	S

CO-02	S	L	M	M	M	M	L	M	S	M	S	S	S
CO-03	S	S	L	L	S	M	L	M	M	M	M	M	L
CO-04	S	S	L	M	S	M	L	M	M	M	M	M	L
CO-05	S	S	L	M	S	M	L	M	M	M	M	L	L

S-Strong, M-Medium, L-Low ,N-Not relevant

Unit I: Retaining Walls

9

Retaining walls – different Types of retaining wall - Proportioning the retaining walls and determining the Lateral earth pressure on Retaining walls- Effects of surcharge - Stability requirements - Cantilever type retaining walls – Counter fort type retaining walls - Detailing of reinforcement.

Unit II: Water Tanks

9

Design of rectangular and circular water tanks both below and above ground level-Details of IS 3370 -Methods of design of water tanks - Design of circular Slab. Design of base slab and side wall

Unit III: Yield Line Theory

9

Assumptions – Characteristics of yield line -Concept Yield line patterns -Yield Moments - Determination of collapse load / plastic moment - Application of virtual work method - square, rectangular and circular - Design problems

Unit IV: Design Of Staircase

9

Essential Requirements - Types of Staircases - code requirements - Effective span of Stair - Distribution of loading on Stairs -Design requirements of Stair - Design of Dog- Legged Stair.

Unit V: Design Of Bridges

9

Introduction: Classification of bridges -Selection of Bridges-Materials of construction-Codes of practice (Railway and Highway Bridges) - Aesthetics - Loading standards (IRC, RDSO, AASHTO)-Recent developments box girder bridges-Historical bridges (in India and over seas). Planning and layout of bridges - Practical application of bridges - Geological and geotechnical considerations - Reinforcement details.

TOTAL: 45 PERIODS

Text Books:

1. Punmia B.C, Ashok Kumar Jain, Arun K. Jain, "R.C.C. Designs Reinforced Concrete Structures",
Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Varghese .P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India Pvt.
Ltd., New Delhi, 2012

References:

1. Krishna Raju, N. , "Design of RC Structures" ,CBS Publishers and Distributors, New Delhi,

2006.

2. Gambhir .M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited,2012.
3. Ram Chandra.N and Virendra Gehlot,"Limit State Design", Standard BookHouse,2004.
4. Subramanian. N., "Design of Reinforced Concrete Structures", Oxford University, New Delhi, 2013.
5. Krishna Raju ,N. "Design of Bridges", Oxford & IBH-Pubs Company, New Delhi,2008.
6. T.R.JagadeeshandM.A.Jayaram,"DesignofBridgeStructures,"Prentice-HallofIndia, New Delhi, 2006.
7. IS456:2000, Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, NewDelhi, 2007.
8. IS1892(1979):Code of Practice for subsurface Investigation for Foundations .Bureau of Indian Standards, New Delhi
9. IS 14458 (Part 1): 1998 "Retaining Wall for Hill Area - Guidelines, Selection of Type of Wall",Bureau of Indian Standards, New Delhi.
10. IS14458(Part2):1998 "Retaining Wall for Hill Area-Guide lines, Design of Retaining/Breast Walls",Bureau of Indian Standards, New Delhi.
11. IS 14458 (Part 3): 1998"Retaining Wall for Hill Area - Guidelines, Construction of Dry StoneWalls", Bureau of Indian Standards, New Delhi.
12. IRC 6-2014: Standard Specifications and Code of Practice for Road Bridges, Section: II Loads andStresses.
13. IRC78-2014: Standard Specification sand Code of Practice for Road Bridges, Section:VII Foundations and Substructure.

CV3217	Design Of Steel Structures	L	T	P	C
		3	0	0	3

OBJECTIVES

- To provide a coherent development to the students for the courses in sector of Designing of the SteelStructures.
- To present the foundations of many basic Engineering concepts related Design of Steel Structures.
- To give an experience in the implementation of engineering concepts which are applied in field ofSteel Structures.
- To involve the application of scientific and technological principles of planning, analysis, design ofbuildings.

Course Outcome		Cognitive Skill
CO-01	The students will gain an experience in the implementation of Design of Steel Structures on engineering concepts which are applied in field Structural Engineering.	An & A
CO-02	Understand the Concept of design tension splice-Concept of shear lag.	An & A
CO-03	Understand the Concept of Design of compression members and column base design	U
CO-04	Understand the Concept of Design of beam column, laterally supported and unsupported beams, plate girders riveted and columns splices.	U
CO-05	Understand the Concept of Design of roof truss, purlin and gantry girder	U,A &An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	M	L	M	M	L	L	M	M	S	S
CO-02	S	S	M	M	L	M	M	M	L	M	L	S	S
CO-03	S	S	M	M	L	M	M	M	L	M	L	S	S
CO-04	S	S	M	M	L	M	M	M	L	M	L	S	S
CO-05	S	S	S	M	L	M	M	M	L	M	L	M	L

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction

9

Introduction to steel and steel structures- Properties of steel- Metal joining methods using welding, bolting - Design of bolted, welded joints - Eccentric connections - Efficiency of joints - High Tension bolt.

Unit II: Tension Members

9

Tension members- Types of sections - Net area - Net effective sections for angles and Tee in tension - Design of connections in tension members-Use of lug angles-Design of tension splice-Concept of shear lag.

Unit III: Compression Members

9

Types of compression members - Theory of columns - Basis of current code provision for compression member design-Effective length- Slenderness ratio -Design of single section and compound section compression members-Design of built up laced and battened type columns-Design of column bases- Gusseted base for axially loaded column.

Unit IV: Beams

9

Design of laterally supported and unsupported beams - Built up beams – simple and compound beams - Beams subjected to biaxial bending-Design of plate girders riveted and welded-Intermediate and bearing stiffeners-Web Splices-Design of beam columns.

Unit V: Roof Trusses And Industrial Structures

9

Roof trusses – design of roof trusses- types-Roof and side coverings - Design loads, design of purlin and elements of truss; end bearing – Design of gantry girder.

TOTAL: 45 PERIODS

Text Books:

1. Dayaratnam .P., "Design of Steel Structures", Second edition, S.Chand &Company, 2003
2. N. Subramaniam., "Design of Steel Structures - Third edition, Oxford University Press, New Delhi, 2009

References

1. S. S. Bhavikatti., ' Design of Steel Structures', I.K International Publishing house pvt. Ltd, 2009.
2. S .K .Duggal,' Limit State design of steel structures', McGraw Hill Companies, 2010.
3. Dr. Ram Chandra., 'Design o of Steel Structures", Rajas Publications Pvt. Ltd, 10th edition, 2011.
4. IS800:2007-General Construction in Steel.
5. SP 38 - Hand book of typified design for structures with steel roof trusses (Based on IS codes)
6. IS875(Part3)-Code of practice for design loads.
7. SP6(1):1964-Handbook for Structural Engineers.

CV3218	Environmental Engineering	L	T	P	C
		3	0	0	3

OBJECTIVE

1. Understand fundamental principles of environmental engineering.
2. Familiarize with environmental laws and regulations.
3. Learn water and wastewater treatment processes.
4. Understand air and noise pollution control.

Course Outcome - COs		Cognitive Skill
CO-01	The students completing the course will have an insight into the structure of drinking water supply systems, including water transport, treatment and distribution	U,A
CO-02	The understanding of water quality criteria and standards, and their relation to public health	U,A
CO-03	The students completing the course will have An ability to estimate sewage generation and design sewer system including sewage pumping stations	U,A
CO-04	The required understanding on the characteristics and composition of sewage, self-purification of streams	U,A, An
CO-05	Understand the standard methods for disposal of sewage.	U,A, An

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO- - I	PO- J	PO- k	PO- -L	PO- M
CO-01	S	M	L	L	N	M	L	L	M	M	L	M	N
CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	S	L	M	N	M	M	M	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Water Supply Systems-Source, Conveyance & Distribution

6

Objectives - Population forecasting - Design period - Water demand characteristics - Sources of water –Source Selection-Water quality parameters & significance -Standards-Intake structures-Conveyance- Hydraulics- Laying, jointing& testing of pipes- Pump selection appurtenances Requirements- Components-Service reservoir design-Analysis of distribution network.

Unit II: Design Principle Soft water Treatment Treatment

10

Objectives - Selection of unit operations and processes - Principles of flocculation, sedimentation, filtration, disinfection - Design principles of flash mixer, flocculator, clarifiers, filters- Disinfection devices - Softening- De mineralization - Aeration - Iron removal- De fluoridation - Operation and Maintenance Aspects-Residue Management.

Unit III: Sewerage System: Collection & Transmission

10

Sources of waste water – Quantity of sanitary sewage – Storm runoff estimation-Waste water characteristics and significance – Effluent disposal stand over – Design of sewers-Computer Applications-Laying, jointing and testing of sewers- Sewer appurtenances –Pump selection.

Unit IV: Sewage Treatment & Design Principles

10

Objectives - Selection of unit operation and process- Design principles of primary and secondary treatment, screen chamber, grit chamber, primary sedimentation tanks, activated sludge process- Aeration tank & oxidation ditch - Trickling filter - Stabilization ponds - Septic tanks with soak pits -Sludge: treatment and disposal- Bio gas recovery –Sewage farming.

Unit V: Disposal Of Sewage

9

Disposal on land - Disposal into water bodies - Oxygen sag curve - Streeter Phelps model – Wastewater reclamation techniques

TOTAL: 45HOURS

Text Book:

1. Garg,S.K.,”Environmental Engineering I&II”, Khanna Publishers, NewDelhi.
2. Modi,P.N., ”Environmental Engineering I&II”, StandardBookHouse,Delhi-6.

References:

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993.
3. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
4. Metcalf and Eddy, M.C., "Waste water Engineering- Treatment & Reuse", Tata McGraw-Hill Publications, New Delhi, 2003.

CV3277	Environmental Engineering Laboratory	L	T	P	C
		0	0	2	1

OBJECTIVE:

This subject includes the list of experiments to be conducted for characterization of water and Municipal sewage.

Course Outcome-COs		Cognitive Skill
CO-01	To analyze & generate experimental skills.	R, A
CO-02	To learn and apply basic techniques used in environmental engineering laboratory for preparation, purification and identification	U, A
CO-03	To learn safety rules in the practice of laboratory investigations.	R, An
CO-04	To employ the basic techniques used in environmental engineering laboratory for analyses such as sulphates and sulphides in water	U, A, An
CO-05	To know concepts of available chlorine in bleaching powder and the chlorine dose required to treat the given water sample	U, A, An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	L	N	M	L	L	M	M	L	M	N
CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	S	L	M	N	M	M	M	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not Relevant

List Of Experiments:

- Determination of total solids in water
- Determination of turbidity
- Determination of alkalinity

- Determination of pH of water
- Determination of hardness and chlorides in water
- Determination of iron in water
- Determination of manganese in water
- Determination of sulphates and sulphides in water
- Determination of D.O and B.O.D of waste water
- Determination of available chloride in bleaching powder and the chlorine dose required to treat the given water sample

TOTAL:60 HOURS

References:

Standard method for the examination of water and wastewater, 1985, APHA,AWWA,WPCF Publication.

CV3278	Concrete Technology Lab	L	T	P	C
		0	0	2	1

OBJECTIVE

1. Understand properties and characteristics of concrete materials.
2. Familiarize with concrete testing methods and standards.
3. Learn concrete mix design principles.
4. Understand durability and sustainability of concrete.

Subject Code: CV3278		Subject Name: CONCRETE TECHNOLOGY LAB											
Course Outcome-Cos											Cognitive Skill		
CO-01	Outline the importance of testing of cement and its properties										An		
CO-02	Assess the different properties of aggregate										An		
CO-03	Summaries the concept of workability and testing of concrete										S		
CO-04	Describe the preparation of green concrete										E		
CO-05	escribe the properties of hardened concrete										E		

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	M	S	M	M	M	L	M	L	L
CO-02	S	M	S	S	M	S	M	M	M	L	M	L	L
CO-03	S	M	S	S	M	S	M	M	M	L	M	L	L
CO-04	S	M	S	S	M	S	M	M	M	L	M	L	L
CO-05	S	M	S	S	M	S	M	M	M	L	M	L	L

S-Strong, M-Medium, L-Low, N-Not Relevant

Tests On Cement

1. Determination of Fineness of Cement.
2. Determination of Specific Gravity of Cement.
3. Determination of Normal Consistency of Cement.
4. Determination of Initial and Final Setting time of Cement.
5. Determination of Soundness of Cement.
6. Determination of Compressive Strength of Cement.

Tests On Aggregate

7. Determination of Fineness Modulus of Sand.
8. Determination of Fineness Modulus of Coarse Aggregate.
9. Determination of Bulk Density of Fine Aggregate.

Tests On Concrete

11. Test on Fresh concrete
12. Test on Hardened concrete

References:

1. Shetty M.S., “Concrete Technology”, S.Chand and Company Ltd. Delhi, 2003.
2. Santhakumar.A.R., “Concrete Technology”, Oxford University Press, 2007.

CV3279	SUMMER INTERNSHIP	L	T	P	C
		0	0	2	2

OBJECTIVE:

To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems.

Course Outcome		Cognitive Skill
CO-01	Develop a centre line for different building components.	U, A
CO-02	Study the properties of construction materials.	U, E
CO-03	Construct and demonstrate electrical wiring circuits.	U, An
CO-04	Understand the plumbing requirements and construct the basic pipe connections for water supply.	U, A, E
CO-05	Identify the building components from building drawing.	An, E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

CO PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J
CO-01	S	M	S	M	L	S	S	M	S	N
CO-02	L	N	N	M	M	L	L	N	L	N
CO-03	S	S	L	N	S	N	S	L	L	N
CO-04	M	M	N	S	L	M	L	M	S	M
CO-05	S	L	M	L	S	S	M	M	L	L

S-Strong, M-Medium,L-Low,N-Not relevant

STRATEGY

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

SEMESTER VII

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	MS3202	Principles of Management	2	0	0	2
2.	CV3219	Repair and Rehabilitation of Structures	3	0	0	3
3.	CV3220	Estimation and Quantity Surveying	3	0	0	3
4.	CV3221	Fundamentals of Remote Sensing	3	0	0	3
5.	CV32**	Elective – III	3	0	0	3
6.	CV32**	Elective – IV	3	0	0	3
PRACTICAL						
7.	CV32P2	Creative and Innovative Project	0	0	6	3
TOTAL			17	0	6	20

MS3202	Principles of Management	L	T	P	C
		2	0	0	2

OBJECTIVE:

- To introduce students to the basic concepts and functions of management.
- To understand the role and responsibilities of managers in various organizational settings.
- To develop an understanding of the planning, organizing, leading, and controlling functions of management.
- To examine the impact of management theories and practices on organizational performance.
- To equip students with the skills necessary to manage people and processes effectively in a technical environment.

Course Outcome - COs		Cognitive Skill
CO-01	Define and explain the key concepts and functions of management.	R
CO-02	Analyze the roles and responsibilities of managers in different organizational contexts.	An
CO-03	Apply planning, organizing, leading, and controlling principles to real-world scenarios.	U

CO-04	Evaluate the effectiveness of different management theories and practices.	A
CO-05	Demonstrate management skills necessary for leading teams and projects in a technical environment.	S

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	M	M	L	L	S	S	M	S	S
CO-02	S	M	S	M	M	L	L	L	L	M	M	S	S
CO-03	M	S	M	M	L	M	M	M	L	L	L	S	S
CO-04	S	M	M	S	M	L	L	M	M	L	L	S	M
CO-05	S	S	M	S	M	L	L	L	M	L	M	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction to Management

7

Definition, nature, and importance of management - Functions of management: Planning, Organizing, Leading, Controlling - Roles and skills of managers - Evolution of management thought: Classical, Behavioral, and Modern theories - Scientific Management (Taylor) - Administrative Theory (Fayol) - Human Relations Movement (Mayo) - Contemporary approaches (Systems Theory, Contingency Theory)

Unit II: Planning

5

Nature and purpose of planning - Types of plans: Strategic, Tactical, Operational - Planning process and techniques - SWOT Analysis, SMART Goals, Scenario Planning - Decision making: Process, types, and tools- Rational Decision-Making Model - Bounded Rationality - Group Decision-Making Techniques (Brainstorming, Delphi Technique)

Unit III: Organizing

5

Organizational structure and design - Types of organizational structures: Functional, Divisional, Matrix, Network - Authority, responsibility, and delegation - Coordination and communication within organizations - Formal and Informal Communication Channels - Role of Technology in Organizational Communication (Emails, Video Conferencing, Collaborative Tools)

Unit IV: Leading

7

Leadership theories and styles - Trait Theory - Behavioral Theories (Ohio State Studies, Michigan Studies) - Contingency Theories (Fiedler's Model, Path-Goal Theory) - Transformational vs. Transactional Leadership - Motivation theories and practices, Maslow's Hierarchy of Needs, Herzberg's Two-Factor Theory, McClelland's Theory of Needs, Modern Approaches (Self-Determination Theory) -Group dynamics and team management - Stages of Team Development (Forming, Storming, Norming, Performing) - Managing Virtual Teams

Nature and purpose of control - Control process and techniques, Establishing Standards, Measuring Performance, Correcting Deviations - Types of control: Feed forward, Concurrent, Feedback - Quality control and management, Total Quality Management (TQM), Six Sigma, Lean Management, Use of Data Analytics in Quality Control

Recommended Textbooks (Latest Editions)

1. Robbins, S. P., Coulter, M., & DeCenzo, D. A. (2020). Fundamentals of Management (11th ed.). Pearson.
2. Griffin, R. W. (2022). Management: Principles and Practices (12th ed.). Cengage Learning.
3. Jones, G. R., & George, J. M. (2021). Essentials of Contemporary Management (9th ed.). McGraw-Hill Education.

Reference Books (Latest Editions)

1. Daft, R. L. (2021). Management (14th ed.). Cengage Learning.
2. Bateman, T. S., & Snell, S. A. (2020). Management: Leading & Collaborating in a Competitive World (14th ed.). McGraw-Hill Education.
3. Schermerhorn, J. R. (2021). Management (14th ed.). Wiley.
4. Hill, C. W. L., Schilling, M. A., & Jones, G. R. (2020). Strategic Management: Theory & Cases (13th ed.). Cengage Learning.
5. Kinicki, A., & Williams, B. K. (2021). Management: A Practical Introduction (10th ed.). McGraw-Hill Education.

CV3219	Repair and Rehabilitation of Structures	L	T	P	C
		3	0	0	3

OBJECTIVE:

To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

Subject Code: CV3219		Subject Name: Repair and Rehabilitation of Structures	
Course Outcome - COs			Cognitive Skill
CO-01	To study the importance of maintenance and assessment method of distressed structures.		R
CO-02	To study the strength and durability properties, their effects due to climate and temperature		U
CO-03	To study the recent development in concrete		U
CO-04	To study the techniques for repair and protection methods		U
CO-05	To study the Repair, rehabilitation and retrofitting of structures and demolition methods.		S

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO- I	PO- J	PO- k	PO- L	PO- M
CO-01	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-02	S	S	L	M	M	S	L	S	M	S	S	M	M
CO-03	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-04	S	M	L	S	L	S	S	S	M	S	M	L	S
CO-05	S	M	L	M	L	M	S	S	M	L	M	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

UNIT I MAINTENANCE AND REPAIR STRATEGIES

9

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration-NDT techniques – Rebound Hammer & UPV test

UNIT II DISTRESS AND ITS CAUSES

9

Distress monitoring - Causes for deterioration: Structural causes and Non-Structural causes - Symptom, prevention and remedy - Classification of cracks - Visual examination of cracks - Evaluation of cracks - Distress in sub structure - Distress in super structure.

Influence on Serviceability and Durability: Effect on strength, permeability, thermal properties - Effects due to climate, temperature, chemicals and dampness - Effects of cover thickness - Error in design, construction and fabrication - Defects in joints in steel structures

UNIT III MATERIALS AND TECHNIQUES FOR REPAIR

9

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning.

UNIT IV REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES

9

Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating and cathodic protection – Repairs to strengthen structural elements Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure

UNIT V DEMOLITION TECHNIQUES

9

Demolition of Structure- study of structural system and structural drawings-need and importance for demolition- outline of various demolition methods and their evaluation- partial and controlled demolition-role of safety measures - temporary support structures in demolition- Recycling of demolished materials- contracts

TOTAL: 45 HOURS

TEXT BOOKS:

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, Repair of Concrete structures, Blakie and Sons, UK, 1987.

REFERENCES:

1. M.S.Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.
2. Santha kumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, “RHDC – NBO” Anna University, July 1992.
3. Raikar, R., Learning from failures – Deficiencies in Design, Construction and Service – R & D centre (SDCPL), Raikar Bhavan, Bombay, 1987.
4. N. Palaniappan, Estate Management, Anna Institute of Management, Chennai, 1992.
5. Lakshmipathy, M. et al. Lecture notes of Workshop on “Repairs and Rehabilitation of Structures”, 29 -30th October 1999.

CV3220	ESTIMATION AND QUANTITY SURVEYING	L	T	P	C
		3	0	0	3

OBJECTIVE

This subject covers the various aspects of estimating of quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works. This also covers the rate analysis, valuation of properties and preparation of reports for estimation of various terms. At the end of this course the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student should also be able to prepare value estimates

Subject Code: CV3220		Subject Name: ESTIMATION AND QUANTITY SURVEYING	
Course Outcome - COs			Cognitive Skill
CO-01	Students understand the fundamentals of quantity survey and valuation and they learn to prepare the rate analysis. They get to know the concepts and ideas in quantity surveying with respect to the estimation of any construction and to understand the basis of valuation of building or construction.		R, U, A
CO-02	Students will learn the preparation of detailed estimates and abstracts for RCC single story buildings, preparation of specification for common material of construction.		R, U
CO-03	Students learn to prepare estimation of some important structures like septic tank, soak pit, water supply pipe line, estimates of irrigation works.		R, U, E

CO-04	Basic knowledge of specification which includes the building components, construction method main items of works, social consideration for specification is obtained by the students.	R, U
CO-05	Students understand the basic principles, methods and requirements of valuation of real property. They get an idea of different types of depreciation and calculation, and how to use them in valuation process. Also, a better understanding of rent fixation procedure for public and private buildings is obtained.	U, E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	N	M	L	L	M	S	L	M	M
CO-02	S	S	M	L	N	M	L	M	S	M	L	S	L
CO-03	S	M	S	L	N	S	M	L	L	S	M	S	L
CO-04	L	M	S	M	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	M	L	L	M	M	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I ESTIMATE OF BUILDINGS

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

Unit II ESTIMATE OF OTHER STRUCTURES

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipeline – sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall

Unit III SPECIFICATION REPORTS AND TENDERS

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders, E-tendering- e NOI – e NOT -Digital signature certificates – Encrypting -Decrypting – Reverse auctions.

Unit IV VALUATION

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease Various types of valuations – Valuation methods – Necessity – Year's purchase-sinking fund

Unit V REPORT PREPARATION

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

Reference Book

1. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2003
2. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & Company Ltd., 2004.

CV3221	Fundamentals of Remote Sensing	L	T	P	C
		3	0	0	3

OBJECTIVE

1. Understand principles of remote sensing.
2. Familiarize with types of remote sensing technologies (optical, radar, lidar).
3. Learn data acquisition methods (satellite, aerial, ground-based).
4. Understand data processing and analysis techniques.

Course Outcome-COs		Cognitive Skill
CO-01	Analyse the principles and components of photo-grammetry and remote sensing.	R, U
CO-02	Describe the pr of data acquisition of satellite images and their characteristics	R, U
CO-03	Explain the concepts and fundamentals of Satellites.	R, U
CO-04	Compute an image visually and digitally with digital image processing techniques.	R, A
CO-05	Computeknowledgeofremotesensingindifferentcivilengineeringapplications.	U, An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	N	L	M	N	N	L	L	M	S	L	M	N
CO-02	M	N	M	N	M	M	L	N	S	M	L	S	L
CO-03	M	M	S	L	N	S	M	L	L	S	M	N	M
CO-04	L	M	S	M	L	M	L	L	L	M	M	M	N
CO-05	S	M	M	L	N	M	M	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not Relevant

Unit I: Introduction

9

Definition - Satellites - Various band used in Satellites - Physics of remote sensing - electromagnetic radiation (EMR) –Advantages of Remote Sensing - interaction of EMR with

atmosphere, earth surface, soils, water and vegetation - platform and sensors – image interpretations.

Unit II: Land Use Studies

9

Definition of land use - land use / land cover classification - schemes and levels of classification systems with RS data - land use mapping - change detection - urban land use planning, site suitability analysis, transportation planning.

Unit III: Water Resources

9

Areal assessment of surface water bodies - Capacity survey of water bodies - mapping of snow-covered areas - flood risk zone mapping - identification of groundwater potential zones, recharge areas - droughts, definition, drought assessment and management.

Unit IV: Agriculture, Soil and Forestry

9

Crop inventory mapping - production estimation - command area monitoring - soil mapping - crop stress detection - estimation of soil erosion - forest types and density mapping - forest fire risk zone mapping.

Unit V: Earth Science

9

Lithology - lithological mapping – structural mapping - Geomorphology - nature and type of landforms - identification - use of remote sensing data for landslides - targeting mineral resources.

TOTAL: 45 HOURS

Text Book:

1. Sabins, F.F.Jr. Remote sensing principles and interpretation, W.H. Freeman & Co., 1978.
2. Lillesand, T.M and Kitter R.W. Remote Sensing and Image interpretation. John Wiley and Sons, inc. New York, 2002.

References:

1. Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, New York, 1986.
2. Steven, M.D, and Clark, J.A. Application of Remote sensing in Agriculture, Butterworths, London, 1990.
3. Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No. IRS-UP/SAC/FMDD/TN/16/90, 1990, pp-253.
4. Manual of Remote Sensing Vol. II. American Society of Photogrammetry

CV32P2	CREATIVE AND INNOVATIVE PROJECT (Activity Based - Subject Related)	L	T	P	C
		0	0	6	3

OBJECTIVE:

To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

Course Outcome		Cognitive Skill
CO-01	Development of a novel manufacturing process for composite materials.	U
CO-02	Creation of a supply chain optimization model.	R, U

CO-03	Design and implementation of a quality control system.	R, U
CO-04	Apply relevant theories, concepts, and methodologies to solve complex problems.	A
CO-05	Identify and analyze the project's technical and non-technical constraints	U

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	N	L	M	N	N	L	L	M	S	L	M	N
CO-02	M	N	M	N	M	M	L	N	S	M	L	S	L
CO-03	M	M	S	L	N	S	M	L	L	S	M	N	M
CO-04	L	M	S	M	L	M	L	L	L	M	M	M	N
CO-05	S	M	M	L	N	M	M	L	L	M	M	M	M

S-Strong, M-Medium,L-Low,N-Not relevant

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	CV32**	Elective V	3	0	0	3
2.	CV32**	Elective VI	3	0	0	3
PRACTICAL						
3.	CV32P3	Internship	0	0	2	2
4	CV32P5	Project Work	0	0	20	10
TOTAL			6	0	22	18

CV32P3	INTERNSHIP	L	T	P	C
		0	0	2	2

OBJECTIVE:

To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems.

Course Outcome		Cognitive Skill
CO-01	Demonstrate understanding of industry practices, standards, and regulations.	U
CO-02	Apply theoretical concepts to real-world problems.	R, U
CO-03	Familiarize with organization culture and dynamics.	R, U
CO-04	Enhance problem-solving, critical thinking, and analytical skills.	A
CO-05	Apply technical skills in a professional setting.	U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	N	L	M	N	N	L	L	M	S	L	M	N
CO-02	M	N	M	N	M	M	L	N	S	M	L	S	L
CO-03	M	M	S	L	N	S	M	L	L	S	M	N	M
CO-04	L	M	S	M	L	M	L	L	L	M	M	M	N
CO-05	S	M	M	L	N	M	M	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

STRATEGY

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

CV32P5	PROJECT WORK	L	T	P	C
		0	0	20	10

OBJECTIVE:

To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

Course Outcome		Cognitive Skill
CO-01	Identify civil engineering problems reviewing available literature.	U
CO-02	Identify appropriate techniques to analyze complex civil engineering problems.	R, U
CO-03	Apply engineering and management principles through efficient handling of Project have a clear idea of his/her area of work and they are in a position to carry out the work in a systematic way.	R, U
CO-04	Apply relevant theories, concepts, and methodologies to solve complex problems.	A
CO-05	Identify and analyze the project's technical and non-technical constraints	U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	N	L	M	N	N	L	L	M	S	L	M	N
CO-02	M	N	M	N	M	M	L	N	S	M	L	S	L
CO-03	M	M	S	L	N	S	M	L	L	S	M	N	M
CO-04	L	M	S	M	L	M	L	L	L	M	M	M	N
CO-05	S	M	M	L	N	M	M	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

STRATEGY:

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

LIST OF ELECTIVES

SI. NO	COURSECODE	COURSE TITLE	L	T	P	C
1.	CV32A1	Traffic Engineering and Management	3	0	0	3
2.	CV32A2	Building Construction Materials & Methods	3	0	0	3
3.	CV32A3	Construction Techniques and Practice	3	0	0	3
4.	CV32A4	Tunneling Engineering	3	0	0	3
5.	CV32A5	Environmental Management	3	0	0	3
6.	CV32A6	Environmental Safety	3	0	0	3
7.	CV32A7	Project Planning and Management	3	0	0	3
8.	CV32A8	Geographical Information System	3	0	0	3
9.	CV32A9	Ground Improvement Techniques	3	0	0	3
10.	CV32B1	Groundwater Engineering	3	0	0	3
11.	CV32B2	Hydrology	3	0	0	3
12.	CV32B3	Industrial Waste Management	3	0	0	3
13.	CV32B4	Pavement Engineering	3	0	0	3
14.	CV32B5	Pre-stressed Concrete Structures	3	0	0	3

OPEN ELECTIVES

SI. NO	COURSECODE	COURSE TITLE	L	T	P	C
1.	CV32D1	Air Pollution Management	3	0	0	3
2.	CV32D2	Energy Efficient & Green Buildings	3	0	0	3
3.	CV32D3	Building Fire Safety	3	0	0	3

ELECTIVES

CV32A1	Traffic Engineering and Management	L	T	P	C
		3	0	0	3

OBJECTIVES

To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

Course Outcome		Cognitive Skill
CO-01	Understand the various traffic characteristics and fundamental of traffic flow.	U
CO-02	Understand traffic surveys and evaluate traffic data	U
CO-03	Analyse various traffic control measures and design traffic engineering facilities	An
CO-04	Evaluate traffic safety and understand impact of traffic on the environment	E
CO-05	Evaluate the methods of traffic management and understand the role of Intelligent Transportation System	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	M	S	L	M	S	S	M	M	N	M	S	S
CO-02	S	M	S	M	M	S	S	M	M	N	M	S	M
CO-03	M	S	M	L	S	M	S	S	M	L	M	S	S
CO-04	S	M	S	M	M	S	S	M	S	S	M	S	L
CO-05	M	L	S	L	M	S	S	M	M	N	M	M	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Traffic Characteristics

9

Road Characteristics – Classification – Functions and standards – Road user characteristics - PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India.

Unit II: Traffic Surveys

9

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including nonmotorized 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.

Unit III: Traffic Design and Visual Aids

9

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 and cycle tracks.

Unit IV: Traffic Safety And Environment

9

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 transportation – Promotion of non-motorized transport.

Unit V: Traffic Management

9

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.

TOTAL: 45 HOURS

Text Books:

1. Kadiyali.L.R. “Traffic Engineering and Transport Planning”, Khanna Publishers, Delhi, 2013
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
3. Salter. R.I and Hounsell N.B, “Highway Traffic Analysis and design”, Macmillan Press Ltd. 1996.

References:

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, “Principles of Traffic and Highway Engineering”, CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, “Guidelines on Low-cost Traffic Management Techniques” for Urban Areas, 1994
4. John E Tyworth, “Traffic Management Planning, Operations and control”, Addison Wesley Publishing Company, 19965. Hobbs.F.D. “Traffic Planning and Engineering”, University of Birmingham, Peragamon Press Ltd,
6. Taylor MAP and Young W, “Traffic Analysis – New Technology and New Solutions”, Hargreen Publishing Company, 1998.

CV32A2	Building Construction Materials and Methods	L	T	P	C
		3	0	0	3

OBJECTIVES

- To develop the building walls and foundations and how they are useful for buildings.
- In these mainly we know about building arches, roofs, doors, windows and ventilators and how they are given for buildings.
- To develop the form work and finishing work which is used for buildings and to solve the defects of building properties which are able to know with material

Course Outcome		Cognitive Skill
CO-01	Demonstrate the ability to know about different materials such as stones, bricks, Tiles and their classification, manufacture and structural requirements	U
CO-02	Ability to know about the materials used in making of concrete such as cement and admixtures and lab tests and uses of cement and admixtures	R
CO-03	Graduates will demonstrate an understanding of various building components such as lintels, arches, types of roofs and joinery such as doors, windows and the materials used in making and will demonstrate various building services such as plumbing services, sanitary and ventilations.	U
CO-04	Graduates will demonstrate the types of masonry, finishers and form work, requirements, standards	U
CO-05	Graduates should be capable of self-education and clearly understand the value of building planning and principles of building planning, classification of buildings and building bye laws.	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	L	S	S	S	M	L	M	L	S

CO-02	S	S	L	M	M	S	L	S	M	S	S	M	M
CO-03	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-04	S	M	L	S	L	S	S	S	M	S	M	L	S
CO-05	S	M	L	M	L	M	S	S	M	L	M	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Stones And Bricks, Tiles

9

Building stones – classifications and quarrying – properties –structural requirements – dressing. Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties –seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel &aluminum, Plastics.

Unit II: Cement & Admixtures

9

Ingredients of cement – manufacture – Chemical composition –Hydration - field & lab testsAdmixtures – mineral & chemical admixtures – uses.

Unit III: Building Components & Building Services

9

BUILDING COMPONENTS: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed; foundations – types; Damp Proof Course; Joinery – doors – windows – materials – types.

BUILDING SERVICES: Plumbing Services: Water Distribution, Sanitary – Lines &Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning – Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Harzards – Classification of fire-resistant materials and constructions.

Unit IV: Mortars, Masonry and Finishing's mortars

9

Lime and Cement Mortars Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

Unit V: Building Planning

9

Principles of Building Planning, Classification of buildings and building by laws.

TOTAL: 45 HOURS

Text Books

1. Building Materials and construction – Arora & Bindra, Dhanpat Roy Publications.
2. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain (2005), Building Construction, LaxmiPublications (P) ltd., New Delhi, India.

3. Building materials, construction and planning by S. Mahaboob Basha

References

1. Building materials by Duggal, New age Internations.
2. Building construction by PC verghese PHI.
3. Construction technology –vol -1 &2 by R. chuddy, Longman UK.
4. Basics of civil Engg by Subhash chander; Jain brothers

CV32A3	Construction Techniques and Practice	L	T	P	C
		3	0	0	3

OBJECTIVE

On completion of this course the students will be able to know the detailed planning of formwork, designof forms and erection of form work.

CV32A3	Course Outcome	Cognitive Skill
CO-01	To understand the overall and detailed planning of formwork.	U
CO-02	To impart knowledge on formwork materials, accessories, pressures and labour requirement.	R
CO-03	To develop the conceptual understanding of design, construction and erectionof formwork.	U
CO-04	To impart the knowledge about different types of form work used for specialstructures.	U
CO-05	To understand the errors in design and judge the formwork failures through case studies.	R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-02	S	S	L	M	M	S	L	S	M	S	S	M	M
CO-03	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-04	S	M	L	S	L	S	S	S	M	S	M	L	S
CO-05	S	M	L	M	L	M	S	S	M	L	M	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction To Form Work

9

Introduction to Formwork and false work, Temporary work systems, Requirements, Construction planning and site constraints, Selection, and Classification (Types) of Formwork,

General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples - Overall Planning - Detailed planning - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffoldframes - Framed panel formwork.

Unit II: Form Work Materials Assesories & Pressures **9**

Formwork Materials, Accessories and consumables – Application of tools, Reconstituted wood - Steel – Aluminum Plywood - Types and grades Standard units - Corner units – Pass units, Calculation of labour constants - Formwork hours - Labour Requirement. Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Finish - Sheathing boards working stresses - Repetitive member stress Vertical loads for design of slab forms - Uplift on shores - Laterals loadson slabs and walls.

Unit III: Form Work Design **9**

Concepts, Formwork Systems – components, assembly, De-shuttering, safety of work and Design for Tall Structures, Foundation Wall, Column, Slab and Beam formworks. Design of Decks and False works. Effects of various loads. Loading and moment of formwork, IS Code provisions.

Unit IV: Form Work for Special Structures **9**

Formwork for Bridge Structures, Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclear Reactor, Tunnel, Lift Shaft, stairs and Formwork for Precast Concrete. Various climbing system, Table lifting system.

Unit V: Case Studies **9**

Formwork failures: Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping Errors in design – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – failure formwork issues in multi - story building construction – vertical and horizontal elements used in the industry.

TOTAL: 45 HOURS

Text Books

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment andMethods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, DhanpatRai and Sons, 1997.

References:

1. Peurify R.L and Oberlender G.D , Formwork for Concrete Structures, , McGraw Hill Education India ,2015
2. Jha K N, Formwork for Concrete Structures, Tata McGraw Hill Education, 2012. 1. Austin, C.K.,
3. Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996. 3. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996
4. Michael P. Hurst, Construction Press, London and New York, 2003.
5. Christopher Souder , (2014), Temporary Structure Design, Wiley Publications, London.
6. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

CV32A4	Tunneling Engineering	L	T	P	C
		3	0	0	3

OBJECTIVES:

Students mainly focused in visualizing and critically analyzing the behavior of underground structures with reference to various supporting systems under different loading conditions due to induced earth pressure on the underground structures. To give idea about the equipment used in underground excavations.

Course Outcome		Cognitive Skill
CO-01	To Understand need of utilization of underground space for various applications.	U
CO-02	To study various methods of excavations and tunneling methods	U
CO-03	Planning and design process of tunnels	An
CO-04	To identify the suitable method of tunneling	E
CO-05	To study various types of support system and its merit and demerits.	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	M	S	L	M	S	S	M	M	N	M	S	S
CO-02	S	M	S	M	M	S	S	M	M	N	M	S	M
CO-03	M	S	M	L	S	M	S	S	M	L	M	S	S
CO-04	S	M	S	M	M	S	S	M	S	S	M	S	L
CO-05	M	L	S	L	M	S	S	M	M	N	M	M	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Tunnels And Underground Space Application 9

History- caves-tunnels for transport-water, power supply-storage of LPG –nuclear waste disposal defense facilities-submerged tunnels-underground library, museums.

Unit II: Excavation Techniques 9

Types and purpose of tunnels-choice of excavation methods-soft ground tunneling-hard rock tunneling-tunnel drilling-blasting-impact hammers-problems encountered and remedial measures.

Unit III: Planning And Geometric Design of Tunnels 9

Topographical – geological survey-rock sampling - testing-determination of location size shape and alignment-subsidence problem on soft ground –tunneling design in hard rock.

Unit IV: Construction Of Tunnel 9

Advanced drilling techniques –TBM-cutting ability assessment-shield tunneling-advantages-types of shield tunneling-factors affecting selection of shield-twin tunnel-NATM.

Unit V: Design Of Tunnel Supporting Systems and Ventilation 9

Classification of supports-active –passive –permanent - temporary- excavation support-steel supports lining-grouting-ground freezing-environment in underground-various method of ventilation.

References:

1. Underground infrastructure planning design construction-R.K.Goel, Bhavani singh, Jian Zhao, Butterworth heinemunn publishers.
2. Practical tunnel construction, Hemphill G.B 2012 Johnwiley and Son.
3. Introduction to tunnel construction, David chapran, Nicole metse and Alfred stark, Spor press.

CV32A5	Environmental Management	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To provide the engineering graduates (all disciplines) with technical expertise in Environmental Management which will enable them to have a career and professional accomplishment in the public or private sector
- Develop, implement, monitor and maintain environmental strategies, policies, programmes and systems that promote sustainable development
- Oversee the environmental performance including compliance with environmental legislation across the organization, and coordinating all aspects of pollution control, waste management, environmental health and conservation

- Lead the implementation of environmental policies and practices and raise awareness, at all levels of an organization, about the emerging environmental issues

Course Outcome-COs		Cognitive Skill
CO-01	Provide definitions of environment, management, systems and organizations in relation to environmental management	R
CO-02	Describe organizations as systems and their role in environmental management	U
CO-03	Understand the usefulness of systems thinking in relation to environmental management in organizations	An
CO-04	Explain how environmental management can be used as environmental protection and how organizations can define and manage risk.	A
CO-05	To evaluate the effectiveness of systematic EMS monitoring processes.	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	M	M	L	L	S	S	M	M	L
CO-02	S	S	S	M	M	L	L	L	L	M	M	L	M
CO-03	S	S	M	M	L	M	M	M	L	L	L	L	L
CO-04	S	M	M	S	M	L	L	M	M	L	L	M	M
CO-05	S	S	M	S	M	L	L	L	M	L	M	M	M

S-Strong, M-Medium, L-Low, N- Not Relevant

Unit I: Methodology

9

Methodology of environmental management – Review national and international protocols.

Unit II: Fundamentals of Environmental Management

Fundamentals of Environmental Management and ISO 14000 series: Background and development of ISO 14000 series. Environmental management Plans, principles and elements. The ISO 14001- Environmental management systems standard. Environmental law in India: Environmental policy and laws.

Unit III: Eco labeling

9

Principles of effective eco-labelling, Classification Systems, Green claims, green washings, Type I, II, III labels with examples, Eco-labelling in India, Reasons for lack of popularity of Eco Label

Unit IV: Life Cycle Analysis

9

Life cycle analysis, Technology Assessment, LCA steps, Framework and Methodology, Use of

CO-01	S	M	L	L	N	M	L	L	M	M	L	M	L
CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	M	L	L	N	M	L	L	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Air Pollution

9

Classification and properties of air pollutants – Pollution sources – Effects of air pollutants on human beings, Animals, Plants and Materials - automobile pollution-hazards of air pollution-concept of clean coal combustion technology - ultra violet radiation, infrared radiation, radiation from sun-hazards due to depletion of ozone - deforestation-ozone holes-automobile exhausts-chemical factory stack emissions- CFC.

Unit II: Water Pollution

9

Classification of water pollutants-health hazards-sampling and analysis of water-water treatment – different industrial effluents and their treatment and disposal -advanced wastewater treatment - effluent quality standards and laws- chemical industries, tannery, textile effluents-common treatment.

Unit III: Hazardous Waste Management

9

Hazardous waste management in India-waste identification, characterization and classification technological options for collection, treatment and disposal of hazardous waste-selection charts for the treatment of different hazardous wastes-methods of collection and disposal of solid wastes-health hazards-toxic and radioactive wastes-incineration and verification - hazards due to bio-process dilution- standards and restrictions – recycling and reuse.

Unit IV: Environmental Measurement and Control

9

Sampling and analysis – dust monitor – gas analyzer, particle size analyzer – lux meter-pH meter – gas chromatograph – atomic absorption spectrometer. Gravitational settling chambers-cyclone separators- scrubbers - electrostatic precipitator - bag filter – maintenance - control of gaseous emission by adsorption, absorption and combustion methods Pollution Control Board-laws.

Unit V: Pollution Control in Process Industries

9

Pollution control in process industries - cement, paper, petroleum-petroleum products-textile tanneries- thermal power plants – dyeing and pigment industries - eco-friendly energy.

TOTAL:45HOURS

Text Books:

1. E. C Wolfe, Race to Save to Save Planet, Wadsworth Publishing Co., Belmont, CA 2006.
2. G. T Miller, Environmental Science: Working with the Earth, 11th Edition, Wadsworth PublishingCo. Belmont, CA, 2006
3. M.J Hammer, and M.J Hammer, Jr., Water and Wastewater Technology, Pearson Prentice Hall,2006

References:

1. Rao, CS, “Environmental pollution engineering: Wiley Eastern Limited, New Delhi,

1 st January 2018.

2. S. P. Mahajan, "Pollution control in process industries", Tata McGraw Hill Publishing Company, New Delhi, 2006.

3. Varma and Braner, "Air pollution equipment", Springer Publishers, Second Edition.

CV32A7	Project Planning and Management	L	T	P	C
		3	0	0	3

OBJECTIVES:

To make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control and use of project information as decision making tool.

Course Outcome - COs		Cognitive Skill
CO-01	Ability to take responsibilities as construction manager	A
CO-02	Develop an activity list with durations	E
CO-03	Analyze the Cost Control Monitoring and Accounting	An`
CO-04	Understand the Quality Control and Safety During Construction	U
CO-05	Apply the Organization and Use of Project Information	A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	N	M	L	L	M	S	L	M	M
CO-02	S	S	M	L	N	M	L	M	S	M	L	S	L
CO-03	S	M	S	L	N	S	M	L	L	S	M	S	L
CO-04	L	M	S	M	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	M	L	L	M	M	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I INTRODUCTION TO PROJECT PLANNING AND MANAGEMENT 9

Definition of a project, Necessity of project management, Role of project manager. Basic concepts in the development of construction plans-choice of Technology and Construction method - Defining Work Tasks- Definition-Defining Precedence relationships Among activities- Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 9

Relevance of construction schedules-The critical path method (CPM) -Calculations for critical path scheduling- Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity -Resource oriented scheduling-Scheduling with resource constraints and

Precedence's-Use of Advanced Scheduling Techniques.

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem-The project Budget -Forecasting for Activity cost control financial accounting systems and cost accounts-Control of project cash flows-Schedule control- Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Organizing for Quality and Safety- Smart helmets and vests -Drones and autonomous vehicles - Use of Robotics and Automation-Work and Material Specifications-Total Quality Control- Quality control by statistical methods Safety - Predictive Analytics using machine learning.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information-Accuracy and Use of Information-Computerized organization and use of information-Organizing information in databases-relational model of Data Bases-Other conceptual Models of Databases-Centralized databases Management Systems-Databases and application programs-Information transfer and Flow- Use of cloud-based project management.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Chitkara, K.K. " Construction Project Management Planning ", Scheduling and Control, TataMcGraw Hill Publishing Co., New Delhi, 1998.Calin M. Popescu, Chotchai Charoenngam, " Project planning, Scheduling and Control in Construction:An Encyclopedia of Terms and Applications ", Wiley, New York, 1995.

REFERENCES

1. Chris Hendrickson and Tung Au, " Project Management for Construction – Fundamentals Concepts for Owners ", Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Moder.J., C.Phillips and Davis, " Project Management with CPM ", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.
3. Willis., E.M., " Scheduling Construction projects ", John Wiley and Sons 1986.

CV32A8	Geographical Information System	L	T	P	C
		3	0	0	3

OBJECTIVES

At the end of the course the student will possess knowledge about GIS Techniques and its application in the field of Civil Engineering.

Course Outcome		Cognitive Skill
CO-01	Ability to explore mapped data.	R
CO-02	Analyze spatial data, using GIS analysis tools.	An
CO-03	Develop and manage databases	S
CO-04	Create maps, images and apps to communicate spatial data in a meaningful	S
CO-05	Apply Python as a GIS computer language	A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	M	L	L	S	M	S	M	S	S	S	S
CO-02	S	L	M	S	L	M	S	M	S	S	S	S	S
CO-03	S	M	S	S	L	S	S	M	M	M	S	S	S
CO-04	M	M	S	M	L	M	M	S	S	M	S	L	M
CO-05	S	S	M	M	L	S	S	S	M	S	S	M	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: GIS Technique and Data Input

9

MAP – Types of Maps – Development of GIS –Components of GIS – Hardware, software, organization – Types of data – Spatial and non-spatial data – Print, Line and Polygon – Vector and Raster data – Database structures – Files – Vector and Raster data structures. Digitizing tablet, Automatic scanning.

Unit II: Data Analysis and Modelling

9

Data Retrieval – Query – Simple Analysis – Spatial Analysis – Overlay – Vector Data Analysis – RasterData Analysis – Modelling using GIS – Digital Elevation Model – Artificial Intelligence and Machine Learning – Integration with GIS.

Unit III: Data Output and Error Analysis

9

Data Output – Types – Devices used – Raster and Vector Display Devices – Printers – Plotters – Photo write Devices – Sources of Errors – Types of Errors – Elimination – Accuracies - Uncertainty in spatial data

Unit IV: GIS Applications In resource Management

9

Fields of Applications–Natural Resources–Agriculture–Soil–Water Resources– Waste land Management - Cadastral Records – LIS-Strengthening Rural Areas

Unit V: Advanced GIS Application

9

AM/FM – Utility Network Management – Integration with Remote Sensing – Introduction to ObjectOriented Data base Models. CAD/GIS integration - Use Python in Arc GIS applications

TOTAL:45HOURS

Textbooks

1. Burrough PA, Principles of GIS for Land Resources Assessment, Oxford Publication, 2000
2. Michae INDemers, Fundamental sof Geographical Information Systems, Second Edition, John WileyPublications, 2002

References

1. Paul A Longley, Michael F Good child etal, Geographical Information Systems Volume I and II, Second Edition, John Wiley Publications, 1999.

CV32A9	Ground Improvement Techniques	L	T	P	C
		3	0	0	3

OBJECTIVE:

Students will be exposed to various problems associated with soil deposits and methods to evaluate them. The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

Course Outcome-COs		Cognitive Skill
CO-01	Get to know types of grouts and grouting technique.	A, U
CO-02	Understand dewatering techniques and design for simple cases.	R, U
CO-03	Get knowledge on in situ treatment of cohesion less and cohesive soils.	A, An
CO-04	Understand the concept of earth reinforcement and design of reinforced earth.	U, A, An
CO-05	Gain knowledge on method sand selection of ground Improvement techniques.	R, U

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	L	L	S	M	L	L	M	M	L	M	L
CO-02	S	S	L	M	L	M	L	M	S	M	L	M	L
CO-03	S	M	L	L	N	M	M	L	L	M	M	S	L
CO-04	S	S	S	L	S	M	L	L	L	M	M	S	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not Relevant

Unit I: Introduction

9

Role of ground improvement in foundation engineering - methods of ground improvement - Geotechnical problems in alluvial, laterite and black cotton soils - Selection of suitable ground improvement techniques based on soil condition.

Unit II: Drainage And Dewatering

9

Drainage techniques - Well points - Vacuum and electro osmotic methods - Seepage analysis for two- dimensional flow-fully and partially penetrating lots in homogenous deposits (Simple cases only).

Unit III: Insitu Treatment of Cohesionless and Cohesive Soils

9

Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloatation - Sand pile compaction - Preloading with sand drains and fabricdrains - Stone columns - Lime piles - Installation techniques only - relative merits of various methods and their limitations.

Unit IV: Earth Reinforcement

9

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth –use of Geo textiles for filtration, drainage and separation in road and other works.

Unit V: Grout Techniques

9

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals-Stabilisation of expansive soils.

TOTAL:45HOURS

Textbook:

1. PurushothamaRaj.P,” Ground ImprovementTechniques”,Lakshmi Publications,2ndEdition,2016.
2. Koerner,R.M.”ConstructionandGeotechnicalMethods inFoundationEngineering”,McGraw Hill,1994.
3. NiharRanjan Patra, ”Ground Improvement Techniques”,Vikas Publishing House,FirstEdition,2012.

References:

1. Mittal.S,”An Introduction to Ground Improvement Engineering” Med tech Publisher, FirstEdition,2003.
2. Moseley,M.P. ,”Ground Improvement” Blockie Academic and Professional,1992.
3. Moseley, M.P and Kirsch.K., ’Ground Improvement”, Spon Press, Taylor and Francis Group,London ,2nd Edition,2004.
4. JonesC.J.F.P.”Earth Reinforcement and Soil Structure”, Thomas Telford Publishing,1996.
5. Winterkorn, H.F. and Fang, H.Y. ”Foundation Engineering Hand Book”. Van Nostr and Reinhold, 1994.
6. Das,B.M., ”Principles of Foundation Engineering”(seventh edition),Cengage learning, 2010.
7. Coduto,D.P.,”Geotechnical Engineering Principles and Practices” ,Prentice Hall of India Pvt.Ltd. NewDelhi,2011.
8. Koerner,R.M., ”Designing with Geosynthetics” (SixthEdition), Xlibris Corporation,U.S.A,2012.
- 9.IS Code9759:1981 (Reaffirmed1998)” Guidelines for Dewatering During Construction”, Bureau ofIndian Standards, NewDelhi.
- 10.IS Code15284 (Part1):2003” Design and Construction for Ground Improvement-Guidelines” (StoneColumn), Bureau of Indian Standards, New Delhi.

CV32B1	Groundwater Engineering	L	T	P	C
		3	0	0	3

OBJECTIVE

1. Understand groundwater flow and contaminant transport principles.
2. Familiarize with groundwater exploration and assessment methods.
3. Learn well design and construction techniques.
4. Understand groundwater management and policy.

Course Outcome-COs		CognitiveSkill
CO-01	Explain the importance of artificial recharge and ground water quality concepts.	A,U
CO-02	Discuss the design and practical problems of ground water aquifers.	R,U
CO-03	Derive the unsteady flow equation by various method and obtain solutions.	A, An
CO-04	Identify the salinity problems to improve the ground water quality.	U,A, An
CO-05	Explain the basics of ground water and hydraulics of sub surface flows.	R,U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	S	L	L	S	M	L	L	M	M	L	M	N
CO-02	S	M	L	L	M	M	L	M	S	M	L	N	L
CO-03	S	S	L	M	S	M	M	M	L	M	S	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	S	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not Relevant

Unit I: Fundamentals Of Ground Water

9

Introduction - Characteristic of Ground water - Distribution of water - ground water column - Permeability - Darcy's Law - Laboratory permeability test - Types of aquifers - Hydrogeological Cycle - water level fluctuations.

Unit II: Hydraulics Of Flow

9

Storage coefficient - Specific field - Heterogeneity and Anisotropy -Transmissivity - Governing equations of ground water flow - Steady state flow – Velocity potential - Flow nets.

Unit III: Estimation Of Parameters**9**

Transmissivity and Storativity - Pumping test - Unsteady state flow - Image well theory - Effect of partial penetrations of wells - Collectors wells.

Unit IV: Ground Water Development**9**

Geophysical methods – Wenner and Schlumberger Arrangement of Electrodes-Infiltration gallery - Artificial recharge - Yield test - Selection of pumps.

Unit V: Water Quality**9**

Ground water chemistry - Origin, movement and quality – Saltwater Intrusion- Ghyben Herzberg Principle - Water quality standards - Environmental concern.

TOTAL: 45 HOURS**Text Book:**

1. Raghunath H.M., “Ground Water Hydrology”, New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., “Ground Water Hydrology”, John Wiley and Sons, New York, 2000.

References:

1. Fitts R Charles, “Groundwater Science”. Elsevier, Academic Press, 2002.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.
3. L. Harvil and F. G. Bell, Ground Water, New Age International Pvt. Ltd.
4. F. W. Schwartz & H. Zhang, Fundamental of Ground Water, John Willey & Sons.
5. Bear J., Hydraulics of Groundwater, Dover Publications, (2007).

CV32B2	Hydrology	L	T	P	C
		3	0	0	3

OBJECTIVES

To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology.

Course Outcome		Cognitive Skill
CO-01	The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation.	U
CO-02	The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.	R
CO-03	The students will know the basics of Hydrograph	U

CO-04	The students are able to apply the various methods	U
CO-05	The students will know the basics of ground water and hydraulics of subsurface flow	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-02	S	S	L	M	M	S	L	S	M	S	S	M	M
CO-03	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-04	S	M	L	S	L	S	S	S	M	S	M	L	S
CO-05	S	M	L	M	L	M	S	S	M	L	M	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Precipitation

9

Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation.

Unit II: Abstraction From Precipitation

9

Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity - Measurement of infiltration - Infiltration indices - Effective rainfall.

Unit III: Hydrographs

9

Factors affecting Hydrograph – Base flow separation - Unit hydrograph - S curve hydrograph - Unithydrograph of different deviations - Synthetic Unit Hydrograph.

Unit IV: Floods And Flood Routing

9

Flood frequency studies - Recurrence interval - Gumbel's method - Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control.

Unit V: Ground Water Hydrology

9

Types of aquifers - Darcy's law - Dupuit's assumptions - Confined Aquifer - Unconfined Aquifer-Recuperation test - Transmissibility - Specific capacity - Pumping test.

TOTAL: 45 HOURS

Text Book:

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000.
2. Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

References:

1. Chow, V.T. and Maidment” Hydrology for Engineers”, McGraw-Hill Inc., Ltd., 2000.
2. Singh, V.P., ”Hydrology”, McGraw-Hill Inc., Ltd., 2000.
3. Jayarami Reddy. P., Hydrology, Tata Mc Graw Hill, 2008.
4. Madan Mohan das and Mimi Das Saikia, Hydrology, Prentice Hall of India, 2013.

CV32B3	Industrial Waste Management	L	T	P	C
		3	0	0	3

OBJECTIVE:

To impart knowledge on sources and characteristics of various industrial wastes and strategies for its prevention and control

Course Outcome-COs		CognitiveSkill
CO-01	An insight in to the pollution from major industries including the source and pollution.	R,U,A
CO-02	To understand the waste management approach to recycle & reuse by products	R,U
CO-03	Identify the pollution from major industries such as sugar etc.	R,U,E
CO-04	To ability to plan minimization of industrial waste	R,U
CO-05	To ability to design facilities for the processing and reclamation of industrial wastewater	U,E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO -I	PO-J	PO-k	PO -L	PO-M
CO-01	S	M	L	M	N	M	L	L	M	S	L	M	M
CO-02	S	S	M	L	N	M	L	M	S	M	L	S	L
CO-03	S	M	S	L	N	S	M	L	L	S	M	S	L
CO-04	L	M	S	M	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	M	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not Relevant

Unit I: Introduction**9**

Types of industries and industrial pollution - Characteristics of industrial wastes – Population equivalent - Bioassay studies - effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health-Environmental legislations related to prevention and control of industrial effluents and hazardous wastes.

Unit II: Cleaner Production**9**

Waste management Approach - Waste Audit - Volume and strength reduction - Material and process modifications-Recycle, reuse and by product recovery-Applications.

Unit III: Pollution From Major Industries**9**

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steelplants, Refineries, fertilizer, thermal powerplants-Waste water reclamation concepts

Unit IV: Treatment technologies**9**

Equalization -Neutralization -Removal of suspended and dissolved organic solids-Chemical Oxidation-Adsorption-Removal of dissolved inorganics Combined treatment of industrial and municipal wastes -Residue Management-Dewatering-Disposal

Unit V: Hazardous Waste Management**9**

Hazardous wastes - Various types - Physico chemical treatment - solidification - incineration – Secured landfills

TOTAL:45 HOURS**Textbook:**

1. M.N.Rao&A.K.Dutta,"WastewaterTreatment",Oxford-IBHPublication,1995.
2. W.W.EckenfelderJr., "IndustrialWaterPollutionControl",McGraw-HillBookCompany,NewDelhi,2000.

References:

1. T.T.Shen,"IndustrialPollutionPrevention",Springer,1999.
2. R.L.StephensonandJ.B.Blackburn,Jr., "IndustrialWastewaterSystemsHandbook",LewisPublisher,NewYark,1998.
3. H.M.Freeman,"IndustrialPollutionPreventionHandBook",McGraw-HillInc.,NewDelhi,1995.
4. Bishop,P.L., "PollutionPrevention:Fundamental&Practice",McGraw-Hill,2000.

CV32B4	Pavement Engineering	L	T	P	C
		3	0	0	3

OBJECTIVES

Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and evaluate the serviceability conditions of pavements.

Course Outcome-COs		Cognitive Skill
CO-01	Explain concepts and standards adopted in Planning, Design and construction of Pavements.	A
CO-02	Apply the knowledge of science and engineering fundamentals in designing flexible pavement. by adopting various design standards	U
CO-03	Apply the standards adopted in designing rigid pavement.	An
CO-04	select appropriate methods for construction and evaluation of Pavements	R
CO-05	Address the problem statement in construction of pavement and to impart knowledge in stabilization techniques.	R,U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Out comes with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	L	N	M	L	L	M	M	L	M	L
CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	M	L	L	N	M	L	L	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Pavement Types and Stress Distribution

9

Introduction – Pavement as layered structure – Pavement types rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

Unit II: Design Of Flexible Pavements

9

Flexible pavement design Factors influencing design of flexible pavement, Empirical Mechanistic empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

Unit III: Design Of Rigid Pavements

9

Cement concrete pavements Factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

Unit IV: Pavement Construction, Evaluation and Maintenance

9

Construction of pavements – Construction Equipments- Methods of construction. Pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index, - Pavement maintenance (IRC Recommendations only)

Unit V: Stabilization Of Pavements**9**

Stabilization with special reference to highway pavements – Choice of stabilizers – Testing and field control - Stabilization for rural roads in India – Use of Geo synthetics in roads.

TOTAL:45 HOURS**Textbooks:**

1. Khanna, S.K. and Justo C.E.G. and Veeraragavan, A, “Highway Engineering”, New Chand and Brothers, Revised 10th Edition, 2014.
2. Yoder, R.J. and Witchak M.W. “Principles of Pavement Design”, John Wiley 2000.
3. R.Srinivasa Kumar., “Pavement Engineering” Universities Press (India) Private Limited, Hyderabad, 2013.
4. Prithvi Singh Kandhal,” Bituminous Road Construction in India”, PHI Learning Private Limited, New Delhi, 2016.

References:

1. Rajib B. Mallick and Tahar El-Korchi, “Pavement Engineering Principles and Practice”, CRC Press, 2009
2. Kadiyali, L.R., “Principles and Practice of Highway Engineering”, Khanna tech. Publications, New Delhi, 2005
3. Guidelines for the Design of Flexible Pavements, IRC-37–2012, The Indian roads Congress, New Delhi.

CV32B5	Prestressed Concrete Structures	L	T	P	C
		3	0	0	3

OBJECTIVES:

To introduce the need for pre stressing as well as the methods, types and advantages of pre stressing to the students. Students will be introduced to the design of pre stressed concrete structures subjected to flexure and shear.

Course Outcome		Cognitive Skill
CO-01	Understand the behaviour of pre stressed concrete members and able to analyze the pre stressed concrete beams	A
CO-02	Design the pre stressed concrete members for flexure and shear as per the relevant design code (IS 1343)	U
CO-03	Analyze for deflection of pre stressed concrete members and design the anchorage zone.	An
CO-04	Analyze and design of composite beams and continuous beams.	R
CO-05	Design of pre-stressed concrete structures – sleepers, Tanks, pipes and poles.	R, U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	O-B	O-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	M	L	M	M	L	L	L	L	M	M
CO-02	S	S	M	M	L	M	M	L	L	L	L	M	M
CO-03	S	S	S	M	L	M	M	L	L	L	L	M	M
CO-04	S	S	S	M	L	M	M	L	L	L	L	M	M
CO-05	S	S	S	M	L	M	M	L	L	L	L	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction – Theory and Behaviour

9

Basic concepts – Advantages and disadvantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long-term deflections - Losses of pre-stress – Estimation of crack width.

Unit II: Design For Flexure and Shear

9

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

Unit III: Deflection And Design of Anchorage Zone

9

Factors influencing deflections – Short term deflections of un cracked members – Prediction of long-term deflections due to creep and shrinkage – Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

Unit IV: Composite Beams and Continuous Beams

9

Analysis and design of composite beams – Methods of achieving continuity in continuous beams– Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses –Principles of design.

Unit V: Tension And Compression Members

9

Role of pre-stressing in members subjected to Tensile forces and compressive forces - Design of tension and compression members – Tanks, pipes and poles – Partial pre-stressing – Definition, methods of achieving partial pre stressing, merits and demerits of partial pre- stressing.

TOTAL:45 HOURS

Text Books:

1. Krishna Raju N., “Prestressed concrete”, 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta.S.P., “Prestressed Concrete”, CBS Publishers and Distributors Pvt. Ltd, 2012

References:

1. Rajagopalan.N, “Prestressed Concrete”, Narosa Publishing House, 2002.
2. Dayaratnam.P., “Prestressed Concrete Structures”, Oxford and IBH, 2013
3. Lin T.Y. and Ned.H.Burns, “Design of prestressed Concrete Structures”, Third Edition,Wiley India Pvt. Ltd., New Delhi, 2013.
4. IS 1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012
5. IS 3370- Part 4 (2008) Indian standard Code of practice for concrete structures for the storage of liquid- Design tables, code of practice, bureau of Indian standards, New Delhi.

OPEN ELECTIVES

CV32D1	Air pollution Management	L	T	P	C
		3	0	0	3

OBJECTIVES

- To take up the basic concepts of air pollution.
- To introduce students to basic concepts of pollution.
- The contents involved the knowledge of causes of air pollution.
- The contents involved the knowledge of health related to air pollution.
- To develop skills relevant to control of air pollution.

Course Outcome		Cognitive Skill
CO-01	Concepts of air pollution.	A
CO-02	How to estimate the quantity of air pollutant.	U
CO-03	Be able to developed control technologies.	An
CO-04	The contents involved the knowledge of health related to air pollution	R
CO-05	To develop skills relevant to control of air pollution.	R, U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	L	N	M	L	L	M	M	L	M	L
CO-02	M	M	L	L	N	M	L	L	S	M	L	M	L
CO-03	S	M	L	L	N	M	L	L	L	M	M	M	L
CO-04	L	M	S	L	N	M	L	L	L	M	M	M	S
CO-05	S	M	M	L	N	M	L	L	L	M	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS

9

Classification of air pollutants - Particulates and gaseous pollutants - Sources of air pollution - Source inventory - Effects of air pollution on human beings, materials, vegetation, animals -global warming-ozone layer depletion, Sampling and Analysis - Basic Principles of Sampling - Source and ambient sampling - Analysis of pollutants - Principles.

UNIT II DISPERSION OF POLLUTANTS

9

Elements of atmosphere - Meteorological factors - Wind roses - Lapse rate - Atmospheric stability and turbulence - Plume rise - Dispersion of pollutants - Dispersion models - Applications.

UNIT III AIR POLLUTION MONITORING AND REMEDIAL MEASURES: 9

Smoke, smog and ozone-Sampling and meteorology-Ambient air sampling-pollution measurement methods-principles and instruments-Monitoring stations in India-temperature lapse rate and stability-diabatic lapse rate-Wind Rose, Inversion -Wind velocity and turbulence-Plume behavior-Carbon Emission-Monitoring-case studies

UNIT IV AIR QUALITY MANAGEMENT

9

Air quality standards - Air quality monitoring - Preventive measures - Air pollution control efforts -Zoning - Town planning regulation of new industries - Legislation and enforcement - Environmental Impact Assessment and Air quality

UNIT V NOISE POLLUTION AND SOURCES

9

Noise pollution-Sources, classification-Noise act, legislation and regulations-Noise quality management in India. -Natural Sources and their classification-Manmade Sources-Remedial Measures to reduce noise pollution-Noise management in other countries

TOTAL: 45 HOURS

TEXT BOOKS:

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, Repair of Concrete structures, Blakie and Sons, UK, 1987.

Reference Book

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt Ltd, New Delhi, 1993
3. Dr. Y. Anjaneyulu, "Air Pollution and Control Technologies", Allied publishers Pvt. Ltd., 2002.
4. Mukherjee, "Environmental Pollution and Health Hazards", causes and effects, 1986

CV32D2	Energy Efficient Buildings and Green Buildings	L	T	P	C
		3	0	0	3

OBJECTIVES:

To familiarize students with the concept of Energy efficiency, Renewable sources of energy and their effective adaptation in green buildings. To give a fuller understanding of Building Form and Fabric, Infiltration, ventilation, Lighting, cooling and water conservation.

Course Outcome		Cognitive Skill
CO-01	Explain energy Reducing energy consumption on buildings	U
CO-02	Explain the Renewable Energy	R
CO-03	Discuss the various aspects of construction material in a building	U
CO-04	Predict and design building ventilation and heat control for indoor comfort	U
CO-05	discuss the various case studies of green buildings in india	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-02	S	S	L	M	M	S	L	S	M	S	S	M	M
CO-03	S	M	L	M	L	S	S	S	M	L	M	L	S
CO-04	S	M	L	S	L	S	S	S	M	S	M	L	S
CO-05	S	M	L	M	L	M	S	S	M	L	M	L	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Green Buildings, Energy and Environment

9

Green Buildings within the Indian Context, Types of Energy, Energy Efficiency and Pollution, Better Buildings, Reducing energy consumption, Low energy design.

Unit II: Renewable Energy, Site and Climate

9

Renewable Energy sources that can be used in Green Buildings – Solar energy, Passive Solar Heating, Passive Solar collection, Wind and other renewables. A passive solar strategy-

Photovoltaic- Climate and Energy, Macro and Micro climate. Indian Examples.

Unit III: Building Form and Fabric

9

Building Form – Surface area and Fabric Heat Loss, utilizing natural energy, Internal Planning, Grouping of buildings. Building Fabrics- Windows and doors, Floors, Walls, Masonry, Ecological walling systems, Thermal Properties of construction material.

Unit IV: Infiltration, Ventilation, Lighting, Cooling and Water Conservation

9

Infiltration and ventilation, Natural ventilation in commercial buildings, passive cooling, modeling air flow and ventilation, Concepts of daylight factors and day lighting, daylight assessment, artificial lighting, New light sources. Cooling buildings, passive cooling, mechanical cooling. Water conservation- taps, toilets and urinals, novel systems, collection and utilization of rain water.

Unit V: Case Studies of Green Buildings In India And Energy Management

9

Energy awareness, monitoring energy consumption, Building Environmental Assessment - environmental criteria - assessment methods - assessment tools (e.g. LEED). Eco homes, Sustainable architecture and urban design – principles of environmental architecture. Benefits of green buildings – Energy Conservation Building code - NBC -Case Studies – Green Buildings in Auroville and Dakshina Chitra, Tamil Nadu, India.

TOTAL: 45 HOUR

Text Book

1. William T. Meyer., Energy Economics and Building Design., New York: McGraw-Hill, Inc.
2. Dianna Lopez Barnett, William D. Browning, "A Primer on Sustainable Building", Rocky Mountain Green Development Services.

Reference Books

1. Public Technology, Inc. (1996). Sustainable Building Technical Manual: Green Building Design, Construction, and Operations. Public Technology, Inc., Washington, DC.
2. Sim Van Der Ryn, Stuart Cowan, "Ecological Design", Island Press (1996).
3. The HOK Guidebook to Sustainable Design, Sara Mendler and William Odell, John Wiley.
4. David A. Gottfried, Sustainable Building Technical Manual., Public Technology Inc
5. Richard D. Rush, . Building System Integration Handbook., New York: John Wiley & Sons
6. Ben Farmer & Hentie Louw., Companion to Contemporary Architectural Thought, London & New York: Routledge.

7. Peter Noever (ed)., Architecture in Transition: Between Deconstruction and New Modernism., Munich: Prestel.

CV32D3	BUILDING FIRE SAFETY	L	T	P	C
		3	0	0	3

OBJECTIVES

- Basic knowledge about fire safety materials and its properties
- Understand fire resistance ratings and their significance in building codes.
- Knowledge about different types of fire-resistant construction assemblies used
- Learn about fire proof materials and its standards
- knowledge about safety in electrical system installation in buildings

Course Outcome – Cos		Cognitive Skill
CO-01	Knowledge about effect of fire on different materials used for construction	U
CO-02	Learn about the test for non-combustibility and fire resistance	U
CO-03	Ability to select the different structural elements and its dimensions for a particular fire resistance rating of a building	An
CO-04	Understand the design concepts of fire walls, fire screens and fire doors and able to select them appropriately to prevent fire	An
CO-05	To identify the method of fire protection on RCC, steel and wooden structural elements and its repair methods due to fire damage	E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L
CO-01	N	N	N	S	M	N	N	N	M	N	N	L
CO-02	N	N	N	M	M	N	N	N	M	N	N	M
CO-03	N	N	N	S	M	N	N	N	M	N	N	M
CO-04	N	N	N	S	S	N	N	N	M	N	N	L
CO-05	N	N	N	M	S	N	N	N	M	N	N	L

S- Strong, M- Medium, L-Low, N- Not Relevant

UNIT I STRUCTURAL AND NON-STRUCTURAL MATERIALS

9

Effect of temperature on the properties of structural materials- concrete, steel, masonry and wood; Behavior of non-structural materials on fire- plastics, glass, textile fibers, Composites and other house hold materials; Determination of combustibility by fire tube method; Brief description on non- combustibility test and classification of flame spread rate of materials as per relevant standards (BIS). Compartment fire-factors controlling fire severity, ventilation controlled and fuel-controlled fires; Spread of fire in rooms, within building and between buildings.

UNIT II FIRE RESISTANCE

9

Experimental determination of fire resistance – types of furnaces; Approximate methods for calculating the fire resistance of structural elements- Schematic diagrams, influencing factors; Concept of static, thermal engineering and experimental methods for the

calculation of fire resistance; Principle of the calculation of the fire resistance limits of structures-coefficient of fire resistance, fire duration; Approximate calculation of the required fire resistance for a building

UNIT III FIRE AREA

9

Classification of Fire- Fire area- calculation of building fire area, subdivision of fire areas in Industrial, Residential and Public buildings; Fire separation between building-principle of calculation of safe distance. Design principles of fire-resistant walls and ceilings; Fire resistant screens-solid screens and water curtains; Local barriers; Fire stopped areas-in roof, in fire areas and in connecting structures.

UNIT IV FIREPROOF MATERIALS AND ASSESSMENT

9

Fire doors- Low combustible, Noncombustible and Spark-proof doors; suspension of doors; Air-tight sealing of doors; Specification, test and performance criteria of Plate, Metal covered and Rolling type fire doors as per relevant standards (BIS). Fabricated fire proof boards-calcium silicate, Gypsum, Vermiculite, and Perlite boards; Fire protection of structural elements – Wooden, Steel, RCC, and Plastic structures; Reparability of fire damaged structures- Assessment of fire severity, Assessment of damage to concrete, steel, masonry and timber structures.

UNIT V ELECTRICAL SAFETY ASPECTS IN BUILDING

9

Safety during installation of plant and equipment. Safe sequences in installation – risk during installation. Safety during testing and commissioning. Test Railway Engineering on relays – protection and interlock systems for safety. Intrinsically safe and explosion proof electrical apparatus. Electrical fires – hazards of static electricity. Safe procedures for electrical maintenance - Statutory requirements. Safety provisions in Indian Electricity Act & Rules.

TOTAL 45 PERIODS

TEXT BOOKS

E.Gorden Butcher E. G. and Parnell A. C., “Designing of fire safety”, John Wiley and SonsLtd., New York, U.S.A., 1983.

1. Smith E.E. and Harmathy T.Z.(Editors), “Design of Buildings for fire safety”, ASTM Special Publication 685, American Society for Testing and Materials, Boston, U.S.A., 1979.
2. Swan. H.W, “Electrical Safety” TBS ,1959.
3. S. Rao, and H.L. Saluja: Electrical Safety, Fire Engineering and Safety Management, Khanna Publishers, Delhi.,1997

REFERENCES

1. Roytman M.Ya., “Principles of Fire Safety Standards for Building Construction”, Amerind Publishing Co. Pvt. Ltd., New Delhi, 1975
2. Marchant E.W., “A Complete Guide to Fire and Building”, Medical and Technical Publishing Co, 1972
3. Adam and Charles Black, “Fire safety in Buildings”,1972.
4. BIS, “IS-12777- Fire safety-flame-spread of products- Method for classification, Bureau of Indian Standards, New Delhi, 1989.
5. BIS, “IS 3614 (Part-1) – Specification of fire check doors-part 1: Plate, metal covered and rolling type” Bureau of Indian Standards, New Delhi, 1966.
6. BIS, “IS 3614 (Part-2) – Specification of metallic and non-metallic fire check doors-part 2: Resistance test and performance criteria, Bureau of Indian Standards, New Delhi, 1992.