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SENGUNTHAR ENGINEERING COLLEGE
(AUTONOMOUS)
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Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956
NAAC Accredited with 'A' Grade
TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

CURRICULUM AND SYLLABI
FOR B.E. / B.Tech. DEGREE PROGRAMMES
(For the Students admitted in the Academic Year 2019 – 2020 onwards)

B.E. CIVIL ENGINEERING – FIRST SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
19HST101	Communicative Techno English – I	HS	3	0	0	3	40	60	100
19MAT101	Engineering Mathematics – I	BS	3	1	0	4	40	60	100
19CYE101	Engineering Chemistry	BS	3	0	2	4	40	60	100
19PHE101	Engineering Physics	BS	3	0	2	4	40	60	100
19GET101	Engineering Graphics	ES	3	0	0	3	40	60	100
19GEE101	Computer Fundamentals and Python Programming	ES	3	0	2	4	40	60	100
19EEC101	Life Skills for Engineers	EEC	0	0	2	0	100	–	100
19MDC101	Induction Program (2 Weeks)	MC	–	–	–	–	–	–	–
TOTAL CREDITS IN SEMESTER – I						22			

HS : Humanities and Social Sciences

BS : Basic Sciences

ES : Engineering Sciences

PC : Professional Core

PE : Professional Elective

OE : Open Elective

EEC : Employability Enhancement Courses

MC : Mandatory Courses

L : Lecture

T : Tutorial

P : Practical

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CIA : Continuous Internal Assessment

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B.E. CIVIL ENGINEERING – SECOND SEMESTER

Course Code	Name of the Subject	Category	L	T	P	C	CIA	ESE	TOT
19HST201	Communicative Techno English – II	HS	3	0	0	3	40	60	100
19CYT201	Environmental Science and Engineering	HS	3	0	0	3	40	60	100
19MAT201	Engineering Mathematics – II	BS	3	1	0	4	40	60	100
19PHT201	Physics of Materials	BS	3	0	0	3	40	60	100
19GEE202	Basic Electrical and Electronics Engineering	ES	3	0	2	4	40	60	100
19MET201	Engineering Mechanics	PC	3	1	0	4	40	60	100
19EEC201	Technical Skill (AutoCAD)	EEC	0	0	2	0	100	–	100
19MDC201	NSS / YRC /RRC	MC	–	–	–	–	100	–	100
TOTAL CREDITS IN SEMESTER – II			21						

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B.E. CIVIL ENGINEERING – THIRD SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
19MAT301	Transforms and Partial Differential Equations	BS	3	1	0	4	40	60	100
19CET302	Applied Geology	ES	3	0	0	3	40	60	100
19CET303	Construction Materials	PC	3	0	0	3	40	60	100
19CET304	Solid Mechanics	PC	3	1	0	4	40	60	100
19CEE301	Engineering Survey	PC	3	0	2	4	40	60	100
19CEE302	Fluid Mechanics & Flow measurements	PC	3	0	2	4	40	60	100
19EEC302	Entrepreneurship Development Activity	EEC	0	0	2	0	100	–	100
19MDC301	Leadership Enhancement programme	MC	1	0	0	0	100	–	100
TOTAL CREDITS IN SEMESTER – III			22						

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B.E. CIVIL ENGINEERING – FOURTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
19MAT403	Numerical Methods	BS	3	1	0	4	40	60	100
19CET402	Construction Techniques, Equipments and Practices	PC	3	0	0	3	40	60	100
19CET403	Applied Hydraulics Engineering	PC	3	1	0	4	40	60	100
19CET404	Highway Engineering	PC	3	1	0	4	40	60	100
19CEE401	Strength of Materials	PC	3	0	2	4	40	60	100
19CEE402	Soil Mechanics	PC	3	0	2	4	40	60	100
19EEC301	Communication Skills	EEC	0	0	2	0	100	–	100
19MDC401	Value Added Course – I	MC	0	0	2	0	100	–	100
TOTAL CREDITS IN SEMESTER – IV			23						

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B.E. CIVIL ENGINEERING – FIFTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
19CET501	Structural Analysis I	PC	3	1	0	4	40	60	100
19CET502	Design of Reinforced Concrete Elements	PC	3	1	0	4	40	60	100
19CET503	Foundation Engineering	PC	3	0	0	3	40	60	100
19CEE501	Water Supply Engineering	PC	3	0	2	4	40	60	100
19CEE502	Concrete Technology and Testing of concrete	PC	3	0	2	4	40	60	100
	Professional Elective – I	PE	3	0	0	3	40	60	100
19EEC501	Quantitative Aptitude Learning	EEC	0	2	0	0	100	–	100
19MDC501	Value Added Course – II	MC	0	0	2	0	100	–	100
19MDC502	Survey Camp	MC	0	0	2	0	100	–	100
TOTAL CREDITS IN SEMESTER – V			22						

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B.E. CIVIL ENGINEERING – SIXTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
19CET601	Design of Steel Structures	PC	3	1	0	4	40	60	100
19CET602	Structural Analysis II	PC	3	1	0	4	40	60	100
19CET603	Design of Reinforced Concrete and Masonry structures	PC	3	0	0	3	40	60	100
19CEE601	Waste Water Engineering	PC	3	0	2	4	40	60	100
	Professional Elective – II	PE	3	0	0	3	40	60	100
	Open Elective – I	OE	3	0	0	3	40	60	100
19CEJ601	Design Project	EEC	0	0	2	1	40	60	100
19MDC601	Constitution of India	MC	3	0	0	0	100	–	100
TOTAL CREDITS IN SEMESTER – VI						22			

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B.E. CIVIL ENGINEERING – SEVENTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
19CET701	Pre-Stressed Concrete Structures	PC	2	2	0	3	40	60	100
19CET702	Construction Resource Planning and Management	PC	3	0	0	3	40	60	100
19CEE701	Estimation Costing and Valuation	PC	3	0	2	4	40	60	100
	Professional Elective – III	PE	3	0	0	3	40	60	100
	Open Elective – II	OE	3	0	0	3	40	60	100
19CEJ701	Project Work (Phase – I)	EEC	0	0	2	0	100	–	100
19MDC701	Industrial Training	MC	0	0	0	1	100	–	100
TOTAL CREDITS IN SEMESTER – VII			17						

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PE   :   Professional Elective

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B.E. CIVIL ENGINEERING – EIGHTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
	Professional Elective – IV	PE	3	0	0	3	40	60	100
	Professional Elective – V	PE	3	0	0	3	40	60	100
19CEJ801	Project Work (Phase – II)	EEC	0	0	20	10	40	60	100
TOTAL CREDITS IN SEMESTER – VIII			16						

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LIST OF PROFESSIONAL CORE (PC) COURSES

Course Code	Name of the Subject	Category	Periods / Week				Credit	Maximum Marks		
			L	T	P	C		CIA	ESE	TOT
19MET201	Engineering Mechanics	PC	3	1	0	4		40	60	100
19CET303	Construction Materials	PC	3	0	0	3		40	60	100
19CET304	Solid Mechanics	PC	3	1	0	4		40	60	100
19CEE301	Engineering Survey	PC	3	0	2	4		40	60	100
19CEE302	Fluid Mechanics & Flow Measurements	PC	3	0	2	4		40	60	100
19CET402	Construction Techniques, Equipments and Practices	PC	3	0	0	3		40	60	100
19CET403	Applied Hydraulics Engineering	PC	3	1	0	4		40	60	100
19CET404	Highway Engineering	PC	3	1	0	4		40	60	100
19CEE401	Strength of Materials	PC	3	0	2	4		40	60	100
19CEE402	Soil Mechanics	PC	3	0	2	4		40	60	100
19CET501	Structural Analysis I	PC	3	1	0	4		40	60	100
19CET502	Design of Reinforced Concrete Elements	PC	3	1	0	4		40	60	100
19CET503	Foundation Engineering	PC	3	0	0	3		40	60	100
19CEE501	Water Supply Engineering	PC	3	0	2	4		40	60	100
19CEE502	Concrete Technology and Testing of Concrete	PC	3	0	2	4		40	60	100
19CET601	Design of Steel Structures	PC	3	1	0	4		40	60	100
19CET602	Structural Analysis II	PC	3	1	0	4		40	60	100
19CET603	Design of Reinforced Concrete and Masonry Structures	PC	3	0	0	3		40	60	100
19CEE601	Waste Water Engineering	PC	3	0	2	4		40	60	100
19CET701	Pre-Stressed Concrete Structures	PC	2	2	0	3		40	60	100
19CET702	Construction Resource Planning and Management	PC	3	0	0	3		40	60	100
19CEE701	Estimation Costing and Valuation	PC	3	0	2	4		40	60	100

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LIST OF PROFESSIONAL ELECTIVE (PE) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
PROFESSIONAL ELECTIVE – I									
19CEPX01	Architecture and Town Planning	PE	3	0	0	3	40	60	100
19CEPX02	Construction Planning and Scheduling	PE	3	0	0	3	40	60	100
19CEPX03	Advanced Surveying	PE	3	0	0	3	40	60	100
19CEPX04	Environmental Health Engineering	PE	3	0	0	3	40	60	100
19CEPX05	Digital Cadastre	PE	3	0	0	3	40	60	100

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
PROFESSIONAL ELECTIVE – II									
19CEPX06	Design of Machine Foundation	PE	3	0	0	3	40	60	100
19CEPX07	Industrial Pollution Prevention and Cleaner Production	PE	3	0	0	3	40	60	100
19CEPX08	Traffic Engineering and Management	PE	3	0	0	3	40	60	100
19CEPX09	Housing Planning and Management	PE	3	0	0	3	40	60	100
19CEPX10	Railways, Airports and Harbour Engineering	PE	3	0	0	3	40	60	100

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Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
PROFESSIONAL ELECTIVE – III									
19CEPX11	Design of Industrial Structures	PE	3	0	0	3	40	60	100
19CEPX12	Environmental Impact Assessment	PE	3	0	0	3	40	60	100
19CEPX13	Dynamics and Aseismic Design	PE	3	0	0	3	40	60	100
19CEPX14	Ground Improvement Techniques	PE	3	0	0	3	40	60	100
19CEPX15	Air Quality Monitoring and Modelling	PE	3	0	0	3	40	60	100

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
PROFESSIONAL ELECTIVE – IV									
19CEPX16	Repair and Rehabilitation of Structures	PE	3	0	0	3	40	60	100
19CEPX17	Tall Buildings	PE	3	0	0	3	40	60	100
19CEPX18	Bridge Engineering	PE	2	2	0	3	40	60	100
19CEPX19	Design of Special Structures	PE	3	0	0	3	40	60	100
19CEPX20	Design of Multistoried Buildings	PE	2	2	0	3	40	60	100

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
PROFESSIONAL ELECTIVE – V									
19CEPX21	Prefabricated Structures	PE	3	0	0	3	40	60	100
19CEPX22	Advanced RCC Design	PE	3	0	0	3	40	60	100
19CEPX23	Ground Water Contamination and Quality Monitoring and Modeling	PE	3	0	0	3	40	60	100
19CEPX24	Computer Aided Design of Structures	PE	3	0	0	3	40	60	100
19CEPX25	Pavement Engineering	PE	3	0	0	3	40	60	100

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LIST OF OPEN ELECTIVE (OE) COURSE FOR OTHER BRANCHES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
OPEN ELECTIVE – I									
19CEOX01	Soil Chemistry and its Impact	OE	3	0	0	3	40	60	100
19CEOX02	Water Pollution and its Management	OE	3	0	0	3	40	60	100
19CEOX03	Industrial Pollution Prevention and Cleaner Production	OE	3	0	0	3	40	60	100
19CEOX04	Renewable Energy Resources	OE	3	0	0	3	40	60	100
19CEOX05	Air and Noise Pollution Control	OE	3	0	0	3	40	60	100

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
OPEN ELECTIVE – II									
19CEOX06	Green Buildings	OE	3	0	0	3	40	60	100
19CEOX07	Smart Measuring Devices	OE	3	0	0	3	40	60	100
19CEOX08	Geographical Information Systems	OE	3	0	0	3	40	60	100
19CEOX09	Remote Sensing and Its Applications	OE	3	0	0	3	40	60	100
19CEOX10	Air Quality Monitoring and Modelling	OE	3	0	0	3	40	60	100

SCHEME FOR SYLLABI

B.E. -Civil

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SEMESTER I

19HST101   **COMMUNICATIVE TECHNO ENGLISH – I**   **L T P C**
(Common to Civil, CSE, ECE, EEE & Mechanical)   **3 0 0 3**

OBJECTIVES

To enable students to:

- Understand the basics of the English Language in a graded manner.
- Enrich vocabulary for the development of all the four language skills (LSRW).
- Develop speaking skills through self introduction and delivering speeches.
- Write e-mails, informal letters.
- Improve writing skills to express thoughts freely.

UNIT I: VOCABULARY   8

Synonyms and Antonyms – Single Word Substitutes – Use of Abbreviations and Acronyms – Homonyms and Homophones – Business Vocabulary – Commonly Confused Words – Collocation – British and American Vocabulary– Word formation.

Activity: Grammar worksheets on the given topics.

UNIT II: GRAMMAR   10

Parts of speech – Comparative Adjectives – Numerical Adjectives – Be, Have and Do verbs – modal verbs – Types of Questions – Tenses – Impersonal Passive Voice – Direct and Indirect Speech – Gerunds and Infinitives – Same Word Used as Different Parts of Speech.

Activity: Grammar worksheets on the given topics.

UNIT III: INFORMAL WRITING   9

Letter Writing – Informal Letters – e-mail Writing – Informal Dialogues – Essay Writing – Informal Essays – Movie Reviews – Writing Instructions.

Activity: Giving topic and ask the students to write informal letters, e-mail.

UNIT IV: LANGUAGE ENHANCEMENT THROUGH SPEAKING   9

Self Introduction – (exchanging personal information) personal information, hobbies, strengths and weaknesses, likes and dislikes special features of home town. Narrating Personal Experiences and Incidents – Two minute talk – Debate discussion.

Activity: Ask the students to speak about the above given topics.

UNIT V: READING SKILLS   9

Reading Comprehension – reading techniques, pre – reading, post – reading, comprehension questions (multiple choice questions or short questions) – Short comprehension passages, practice skimming – scanning and predicting – Reading the passage and taking (Note making) Notes – Scan and understand main contents of the passage.

Activity: Giving topic and ask the students to find out answers for given passage

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

- Learn to acquire usage of English.
- Use a wide range of vocabulary in oral and written communication.
- Give short informal presentations and participate in classroom discussions.
- Write informal letters and other communications.
- Frame grammatically correct sentences.

TEXT BOOKS

1. Board of Editors. Using English A Course book for Under graduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book – 2 New Delhi: CUP, 2015.

REFERENCES

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", 1st Edition, Orient Black Swan, Chennai, 2012.
2. Title: Developing Communication Skills. Publisher: MacMillan. Author: Krishna Mohan, Meera Banerji. Edition: Paperback, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/109/106/109106094/(Introduction to Vocabulory)
2. https://nptel.ac.in/courses/109/106/109106129/(Reading Comprehension)

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JAS-ANZ
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19MAT101   **ENGINEERING MATHEMATICS – I**   **L T P C**
(Common to Civil, CSE, ECE, EEE & Mechanical)   **3 1 0 4**

OBJECTIVES

To enable students to:

- Develop the use of matrix algebra techniques that is needed by engineering for practical applications.
- Introduce the basic concepts of functions, limit of function, continuity, derivaties and extreme values.
- Provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
- Make the basic concepts of definite, indefinite, improper integrals and Bernoulli's formula.
- Acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I: MATRICES   **9+3**

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley – Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II: DIFFERENTIAL CALCULUS   **9+3**

Representation of function – Limit of a function – Continuity – Derivatives – Differentiation rule – Maximum and Minimum values – absolute Maximum and Minimum – local Maximum and Minimum.

UNIT III: FUNCTIONS OF SEVERAL VARIABLES   **9+3**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV: INTEGRAL CALCULUS   **9+3**

Definite and Indefinite integral – Substitution rule – Integration by parts – Trigoniometric substitutions – Integration of rational function by partial fraction – Improper integrals – Bernoulli's formula.

UNIT V: MULTIPLE INTEGRALS   **9+3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Understanding of the ideas of matrix and its nature.
- Apply differentiation to solve maxima and minima problems.
- Understanding the concept of Partial differentiation and Total derivative.
- Evaluate integrals using techniques of integration such as substitution, partial fractions and integration by parts.
- Apply integration to compute multiple integrals, area, volume, integrals in polar co– ordinates, in addition to change of order and change of variables.

TEXT BOOKS

1. Grewal B.S., – Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.

REFERENCES

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., – Advanced Engineering Mathematics, Narosa Publications, New Delhi, 3rd Edition, 2007.

E-RESOURCES

1. https://nptel.ac.in/courses/111/105/111105121/(Rolle`s Theorem)
2. https://nptel.ac.in/courses/111/105/111105035/(Linear Algebra)

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19CYE101	**ENGINEERING CHEMISTRY**	**L T P C**
	(Lab Embedded Theory Course)	**3 0 2 4**
	(Common to Civil, CSE, ECE, EEE & Mechanical)	

OBJECTIVES

To enable students to:

- Classify the impurities of water and know the treatment and the conditioning methods for domestic and industrial uses.

- Develop an understanding about fundamentals of polymers.

- Be familiar with the types of corrosion and control measures and working of batteries.

- Gain knowledge about the phase rule and its applications to engineering field.

- Explain the basics of Nanochemistry, synthesis, properties and applications of Nano materials.

- Acquire practical skills in the determination of water quality parameters, molecular weight of polymer, rate corrosion through volumetric and instrumental analysis.

UNIT I: WATER TECHNOLOGY 9

Introduction – Characteristics – hardness – estimation of hardness by EDTA method – alkalinity and its estimation – Boiler feed water – requirements –Boilers troubles (Scale and Sludge) – Internal conditioning (colloidal – phosphate – calgon and carbonate conditioning methods) – External conditioning – zeolite process, demineralization process – Desalination of brackish water by reverse osmosis – Municipality water treatment – Break point chlorination.

UNIT II: POLYMER CHEMISTRY 9

Introduction – Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types of polymerization: Addition condensation and copolymerization, Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Preparation, properties and uses of PVC, Nylon 6,6, Polyethylene – Rubbers – types – vulcanization of rubber – Plastics – Moulding constituents of plastics – Moulding of plastics – compression, injection and blow moulding – Biodegradable polymers – Conducting polymers.

UNIT III: CORROSION AND BATTERY TECHNOLOGY 9

Corrosion – Types – Chemical Corrosion – Electrochemical Corrosion (galvanic and Differential aeration) – Factors influencing corrosion – Material selection and design aspects – control methods of corrosion – Sacrificial anodic and impressed current cathodic protection – Protective coatings – paints– constituents and their functions – electroplating of Copper – electroless plating of Nickel. Batteries: Definition, Types – example, Lead acid battery, Lithium ion battery – H_2 – O_2 fuel cell– solar cell.

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UNIT IV: PHASE RULE AND ALLOYS 9

Phase rule – explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead – silver system only). Alloys: Introduction – definition – properties of alloys – significance of alloying, functions and effect of alloying elements – ferrous alloys – nichrome and stainless steel – heat treatment of steel, non – ferrous alloys – brass and bronze.

UNIT V: CHEMISTRY OF NANO MATERIALS 9

Nano chemistry – Basics (Surface area to volume ratio – Quantum confinement – (0D, 1D, 2D & 3D) – Distinction between Molecules, Nanoparticles and Bulk Materials – Characterisation of nano materials using XRD and SEM. Synthesis of nano materials: Top down approach – Ball milling – Bottom up approach – Sol– gel method, Chemical vapour deposition – Properties of nanomaterials and Applications of Nanomaterials (Nano products of today).

LIST OF EXPERIMENTS

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Estimation of sodium and potassium present in water using flame photometer.
7. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
8. Conductometric titration of strong acid vs strong base.
9. Corrosion experiment– weight loss method.
10. Estimation of copper content in the brass by Iodometry.

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

- Identify the method of removal of impurities from water for domestic and industrial purpose.
- Identify the different types of polymers, polymerisation processes and some special properties and applications of polymers.
- Analyze the causes of corrosion and discuss the control measures and discuss the functions of batteries.
- Apply of phase rule to alloy making for various engineering applications.
- Discuss the fundamentals of the nano materials and nano products of today.
- Outfitted with hands– on knowledge in the quantitative chemical analysis of water quality related parameters.

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TEXT BOOKS

1. Jain P.C and Monika Jain, "Engineering Chemistry", Dhanpet Rai Publishing Company (P) Ltd.,New Delhi, 2013.

2. Viswanathan B, "Nanomaterials" Alpha Science International Ltd, 2009.

REFERENCES

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.

2. Sivasankar B., "Engineering Chemistry", Tata McGraw– Hill Publishing Company Ltd, New Delhi, 2012.

E-RESOURCES

1. https://nptel.ac.in/downloads/122101001/(Corrosion)

2. https://nptel.ac.in/courses/122/101/122101001/ (Atomic Structure)

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19PHE101   **ENGINEERING PHYSICS**   **L T P C**
(Lab Embedded Theory Course)   **3 0 2 4**
(Common to Civil, CSE, ECE, EEE & Mechanical)

OBJECTIVES

The main objective of this course is to:

- Recognize different lattices and crystal structures.

- Be aware of the basic concepts of stress and strain.

- Know the basics of photonics and its applications.

- Make known the principles of quantum theory.

- Understand the applications of acoustics and ultrasonics in industry.

- Demonstrate experiments to understand basic of Engineering Physics concepts to be applied in optics, thermal physics, properties of matter and liquids.

UNIT I: STRUCTURE OF SOLIDS   9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d – Spacing in Cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal Growth Techniques – Solution, melt (Bridgman and Czochralski) and Vapour growth techniques(qualitative).

UNIT II: ELASTICITY   9

Elasticity – Stress– Strain diagram and its uses – Factors affecting elastic modulus and tensile strength – Torsional stress and deformations – Twisting couple – Torsion pendulum: theory and experiment – Bending of beams :Bending moment – Cantilever: Theory and Experiment – Uniform and Non-uniform bending: Theory and experiment – I-Shaped girders.

UNIT III: PHOTONICS   9

Introduction to interaction of radiation with matter – Spontaneous and Stimulated emission – Population Inversion – Derivation of Einstein's A and B coefficients – Principle and working of Laser – Nd:YAG laser – Direct bandgap and indirect bandgap semiconductors – Semiconductor diode Laser – Principle and propagation light in optical fibres – Derivation of Numerical aperture and Acceptance angle – Fibre optic communication system.

UNIT IV: QUANTUM PHYSICS   9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – Wave particle duality – Electron diffraction – Concept of wave function and its Physical significance – Schrödinger's wave equation: Time independent and time dependent equations – Particle in a one– dimensional rigid box – Qunatum Tunnelling – Tunnelling Electron Microscope.

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UNIT V: ACOUSTICS AND ULTRASONICS 9

Classification of sound – decibel – Weber–Fechner law – Sabine's formula – Derivation using growth and decay method – Absorption Coefficient and its determination – Factors affecting acoustics of buildings and their remedies Introduction – Classification of Sound waves – Production of Ultrasonic's by magnetostriction and piezoelectric methods – Acoustic grating – Cavitation – Applications of Ultrasonics.

LIST OF EXPERIMENTS

1. Laser: Determination of wavelength of laser and particle Size.
2. Fiber Optics: Determination of Numerical Aperture and Acceptance angle.
3. Determination of bandgap of semiconductor.
4. Determination of wavelength of mercury spectrum– Spectrometer.
5. Determination of Youngs modulus – Non-Uniform bending.
6. Determination of Youngs modulus – Uniform bending.
7. Torsional Pendulum: Determination of moment of inertia and rigidity modulus.
8. Determination of velocity of ultrasonic in liquid.
9. Determination of Thickness of a thin wire – Air Wedge.
10. Determination of Viscosity of a liquid – Poiseulle's Method.

TOTAL: 45+15=60 PERIODS

OUTCOMES

At the end of the course, the students will be able to:

- Apply these basic principles of structures of Engineering materials.
- Make use of materials properties using the knowledge of Elasticity.
- Acquire the concepts of light propagation and its applications in lasers and fibre optics.
- Realize advanced physics concepts of quantum theory and its applications.
- Incorporate the Acoustics and ultrasound applications.
- Apply principles of elasticity, optics and acoustic properties in engineering applications.

TEXT BOOKS

1. Avadhanulu M.N & Kshirsagar P.G "Text Book of Engineering Physics". S.Chand, 2006.
2. P.Mani, "Engineering Physics Practicals", Dhanam Publications, 2019.

REFERENCES

1. Raghavan V, "Materials Science and Engineering": A First Course, PHI Publications, 2015.
2. Rajendran V. "Engineering Physics". Tata McGraw Hill Publications, 2012.

E-RESOURCES

1. https://nptel.ac.in/courses/122107035/(Polarization)
2. https://ocw.mit.edu/courses/physics/(Introduction)

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19GET101	**ENGINEERING GRAPHICS**	**L T P C**
	(Common to Civil, CSE, ECE, EEE & Mechanical)	**3 0 0 3**

OBJECTIVES

The main objective of this course is to:

- Understand the principles in graphic skill to communicate the concepts, ideas and design of engineering components.
- Learn projections of points, lines, planes viewed in different positions.
- Learn the projection of solids viewed in different positions.
- Gain the knowledge about the section of solids and development of surfaces of the given solids.
- Expose the international standards of technical drawing.

UNIT I: GENERAL PRINCIPLES OF ORTHOGRAPHIC PROJECTION   9

Graphics significance in engineering applications – Study of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Principle of Letter writing and dimensioning.

Projections of points, lines and planes. Principles of orthographic projection – First angle projection only – Layout of views – Projection of points located in all quadrant – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT II: PROJECTION OF SOLIDS   9

Projections of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT III: SECTION OF SIMPLE SOLIDS   9

Section of solids – Prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.

UNIT IV: DEVELOPMENT OF SURFACES   9

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones with cutout, perpendicular and inclined to the horizontal axis.

UNIT V: ISOMETRIC AND PERSPECTIVE PROJECTIONS   9

Principles of isometric projection – Isometric scale – Isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Conversion of isometric projection into orthographic projection. Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL: 45 PERIODS

OUTCOMES

At the end of the course, the students will be able to:

- Construct multiple views of engineering components.
- Prepare the pictorial drawings as per the standards.
- Develop the projection of solids.

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- Draw the section of solids drawings and development of surfaces of given objects.
- Apply free hand sketching and concept of isometric in engineering practice.

TEXT BOOKS

1. Venugopal K. and Prabhu Raja V., – "Engineering Graphics", 15th Edition, New Age International (P) Limited, New Delhi, 2018.
2. Natarajan K.V., "Engineering Graphics", 32nd Edition, Dhanalakshmi Publishers, Chennai, 2019.

REFERENCES

1. K.R. Gopalakrishna, "Engineering Drawing Volume 1 & 2", 55th Edition Subhas Publications, Bangalore, 2017.
2. T.Jeyapoovan., "Engineering Graphics using Auto CAD" third edition vikas publishing house Pvt Ltd, New Delhi, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/112/103/112103019/(Geometric Constructions)
2. https://nptel.ac.in/courses/105/104/105104148/(Projections)

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19GEE101　　　**COMPUTER FUNDAMENTALS AND PYTHON PROGRAMMING**　　　**L T P C**
(Lab Embedded Theory Course)　　　**3 0 2 4**
(Common to Civil, CSE, ECE, EEE & Mechanical)

OBJECTIVES

The course objectives are to:

- Enable the student to learn the major components of a computer system and software.
- Know the basics of algorithmic problem solving and fundamentals of python programming.
- Develop simple python programs.
- Define controls and functions in python.
- Use python data structures – lists, tuples and dictionaries.

UNIT I: INTRODUCTION　　　　　　　　　　　　　　　　　　9

Introduction, Characteristics of Computers, Generation and Classifications of Computers, Basic Computer Organization, Computer Software, Types of Software, Software Development Steps, Internet, Getting connected to Internet Applications

UNIT II: PROBLEM SOLVING AND PYTHON FUNDAMENTALS　　　9

Algorithms, building blocks of algorithms (instructions/statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Introduction to Python: Basics of Python and history of Python – Unique features of Python, interpreter and interactive mode – Values and types: int, float, boolean, string, and list; variables.

UNIT III: EXPRESSIONS AND STATEMENTS　　　　　　　　　9

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 IV: CONTROL FLOW AND 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, Strings, Lists as arrays. Illustrative programs: square root, gcd, Tower of Hanoi, exponentiation, sum an array of numbers, linear search, binary search.

UNIT V: LISTS, TUPLES AND DICTIONARIES　　　　　　　　9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.

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LIST OF EXPERIMENTS

1. Document Creation, Table Creation and Flow chart.

2. Spread sheet– Chart, Formula, Sorting.

3. Compute the GCD of two numbers.

4. Find the square root of a number (Newton's method).

5. Exponentiation (power of a number).

6. Find the maximum of a list of numbers.

7. Linear search and Binary search.

8. First n prime numbers.

9. Multiplication of two matrices.

10. Simulate elliptical orbits in Pygame.

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

- Know the Computer basics, Components and Software's.

- Develop algorithmic solutions to simple computational problems and Read, write, execute by hand simple Python programs.

- Structure simple Python programs for solving problems.

- Decompose a Python program into functions.

- Represent compound data using Python lists, tuples, and dictionaries.

TEXT BOOKS

1. Ashok.N.Kamthane," Computer Programming", Pearson Education (India),(2015).

2. Allen B. Downey, ''Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think– python/).

REFERENCES

1. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python ''– Revised and updated for Python 3.2, Network Theory Ltd., 2011.

2. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem– Solving Focus, Wiley India Edition, 2013.

E-RESOURCES

1. https://nptel.ac.in/courses/106/106/106106145/(Introduction to Algorithms)

2. https://nptel.ac.in/courses/106/106/106106182/(Joy of Computing)

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19EEC101	**LIFE SKILLS FOR ENGINEERS**	**L T P C**
	(Employability Enhancement Course)	**0 0 2 0**
	(Common to Civil, CSE, ECE, EEE & Mechanical)	

OBJECTIVES

To enable students to:

- Develop communication competence for engineers and enable them to convey thoughts and ideas with clarity and focus.
- Inculcate critical thinking process on problem solving.
- Have an overview on career skills required in their profession.
- Learn professional Ethics and Moral values.
- Lead a team with more responsibilities to be succeeded in their endeavor.

UNIT I: COMMUNICATION SKILL **6**

Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology – based Communication – Technical Presentation.

UNIT II: CRITICAL THINKING & PROBLEM SOLVING **6**

Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Mind Mapping & Analytical Thinking.

UNIT III: CAREER SKILLS **6**

Introduction to Employability and Career Skills – developing a long – term career plan – making career changes – Time Management – General awareness of Current Affairs – Stress management – Leadership straits – Team work – Career planning.

UNIT IV: ETHICS MORAL & PROFESSIONAL VALUES **6**

Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues.

UNIT V: LEADERSHIP SKILLS **6**

Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation.

TOTAL: 30 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

- Communicate effectively and make effective presentations.
- Write different types of reports.
- Face interview & group discussion.

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- Critically think on a particular problem.
- Get success in all aspects and develop public skills.

TEXT BOOKS

1. Life Skills for Engineers, McGraw Hill Education (India) Private Ltd., 2016.
2. E.Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.

REFERENCES

1. Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxford Publishers.
2. Kalyana; (2015) "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd.

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SEMESTER II

19HST201   **COMMUNICATIVE TECHNO ENGLISH – II**   **L T P C**
(Common to Civil, CSE, ECE, EEE & Mechanical)   **3 0 0 3**

OBJECTIVES

To enable students to:

- Acquire usage of grammar in English language.
- Enhance the reading skill to comprehend technical writing.
- Improve business writing skills.
- Develop presentation skills in analytical view.
- Help learners to develop their speaking skills and speak fluently in real contexts.

UNIT I: GRAMMAR   9

Compound words – prepositions – articles – conditionals – Direct and indirect speeches – subject verb agreement – active and passive voice.

Activity: Grammar worksheets on the given topics.

UNIT II: LANGUAGE ENHANCEMENT THROUGH LISTENING & READING   9

Syllabification – sentence stress – Intonation – Listening to You Tube Documentaries – Reading Vocabulary – Reading News Papers – Reading short stories.

Activity: Playing video & TED and identifying stress and intonation.

UNIT III: BUSINESS WRITING   9

Writing Recommendations – Checklist – Business Letters – Calling for Quotations, Placing Orders, Letter of Complaint, Letter of Clarification – Cover Letter with Résumé – Report Writing – Accident Report, Industrial Visit Report, Survey Report and Feasibility Report.

Activity: Giving topic and ask the students to prepare checklist and complaint.

UNIT IV: WRITING   9

Transcoding Graphics – Bar Chart, Flow Chart, Pie Chart and Tables– – Tour Itinerary – Process Description – Agenda and Minutes of meeting.

Activity: Giving charts to the students and ask them to transcode.

UNIT V: SPEAKING   9

Collaborative task – Turn taking (initiating and responding appropriately) – Negotiating – Exchanging – suggesting – comparing and contrasting – expressing – Finding out facts, attitudes and opinions – Commonly mispronounced words.

TOTAL: 45 PERIODS

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OUTCOMES

Upon completion of the course, the students will be able to:

- Acquire advanced level grammatical knowledge.
- Improve their language usage in LSRW skills.
- Speak fluently using a wide range of vocabulary.
- Acquire the ability to understand different written texts.
- Enhance the writing skills to express the ideas in the business contexts.

TEXT BOOKS

1. Title: Technical English II Author: S. Sumant Maven Learning.
2. Communicative English by KN Shoba ,Lourdes Joavani Rayen Publised by Cambridge university, 2017.

REFERENCES

1. Dr K Elango, Dr. Veena Selvam, Dr. Sujatha Priyadarshini, "Resonance English for Engineers and Technologists".Cambridge University Press, 1st Edition, Foundation Books,New Delhi, 2013.
2. Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press, 2005.

E-RESOURCES

1. https://nptel.ac.in/courses/109/104/109104031/(Verbal and Non Verbal Communication)
2. https://nptel.ac.in/courses/109/106/109106094/(Technical English for Engineers)

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19CYT201	**ENVIRONMENTAL SCIENCE AND ENGINEERING**	**L T P C**
	(Common to Civil, CSE, ECE, EEE & Mechanical)	**3 0 0 3**

OBJECTIVES

To enable students to:

- Understand the importance of the environment and interrelationship between living organism and environment.

- Understand the various kinds of pollutions.

- Gain knowledge about natural resources and resource management.

- Be familiar with the social issues to improve the quality of environment.

- Gain knowledge about biodiversity,waste management and population explosion.

UNIT I: ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   11

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, rivers, oceans) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity – India as a mega– diversity nation – hot – spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Activity: Biodiversity in and around the campus and report submission.

UNIT II: ENVIRONMENTAL POLLUTION   9

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – e-waste – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake and cyclone.

Activity: Local Pollution Case Study and report submission.

UNIT III: NATURAL RESOURCES   10

Forest resources: Use and over – exploitation, deforestation, dams and their effects on forests and tribal people – Water resources: Use and over – utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources.

Activity: Waste to wealth.

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UNIT IV: SOCIAL ISSUES AND THE ENVIRONMENT 9

From unsustainable to sustainable development – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – Green Chemistry and principles – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Public awareness.

Activity: Creating Environmental Awareness.

UNIT V: HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

Activity: Visit to local primary health center.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

- Find scientific, technological, economic and political solutions to environmental problems.
- Invent innovative solutions for pollutions to improve the quality of environment.
- Participate the conservation of natural resources to save earth.
- Promote sustainable development and understand the concept of green chemistry.
- Analyse the effects of human population and issues related to the environment and human health.

TEXT BOOKS

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw–Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd Edition, Pearson Education, 2004.

REFERENCES

1. Erach Bharucha, 'Textbook of Environmental Studies', Universities Press(I) Pvt Ltd, Hydrabad, 2015.
2. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.

E-RESOURCES

1. https://nptel.ac.in/courses/122102006/(Nature of Environment)
2. https://nptel.ac.in/courses/127/105/127105018/(Sustainability Concepts)

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19MAT201   **ENGINEERING MATHEMATICS – II**   **L T P C**
(Common to Civil, CSE, ECE, EEE & Mechanical)   **3 1 0 4**

OBJECTIVES

The Course objectives are to:

- Acquire sound knowledge of techniques in solving Ordinary Differential Equations that model engineering problem.

- Acquaint the concepts of vector calculus, needed for problems in all engineering disciplines.

- Understand the concept of bilinear transform and analytic functions.

- Understand the standard techniques of complex integration.

- Use Laplace transforms for solving the problems efficiently that occur in various branches of engineering disciplines.

UNIT I: DIFFERENTIAL EQUATIONS   **9+3**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II: VECTOR CALCULUS   **9+3**

Gradient and directional derivative – Divergence and curl – Line integral over a plane curve – Surface integral – Area of a curved surface – volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III: ANALYTIC FUNCTIONS   **9+3**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by function $W = \dfrac{1}{z}$ – Bilinear transformation.

UNIT IV: COMPLEX INTEGRATION   **9+3**

Cauchy's integral theorem – Cauchy's integral formula – Laurent's series – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V: LAPLACE TRANSFORMS   **9+3**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Higher order linear differential equations with constant coefficients and variable coefficient.
- Green's,Gauss divergence and Stoke's theorems – Verification and application.
- Analytic functions, conformal mapping and Bilinear transformation.
- Application of residue theorem for evaluation of real integrals on contour integral.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.

REFERENCES

1. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, Delhi, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, New Delhi, 3rd Edition, 2007.

E-RESOURCES

1. https://nptel.ac.in/courses/111/105/111105134/(Vector Functions)
2. https://nptel.ac.in/courses/122/107/122107036/(Complex Integration)

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19PHT201	**PHYSICS OF MATERIALS**	**L T P C**
	(Common to Civil and Mechanical Engineering)	**3 0 0 3**

OBJECTIVES

The main objectives of this course are to:

- Study the heat transfer modes and thermal conductivity of different materials.
- Observe the Iron– carbon phase diagram, steels & its applications.
- Get knowledge about various materials characterization techniques.
- Understand the low temperature applications of materials and Superconductivity.
- Update the knowledge of new kind of Engineering materials and Carbon Nanotubes.

UNIT I: THERMAL PHYSICS   9

Transfer of heat energy – Thermal expansion of solids and liquids – Pxpansion joints – Bimetallic strips – Thermal conduction, convection and radiation – Heat conductions in solids – Thermal conductivity – Forbe's and Lee's disc method: theory and experiment – Conduction through compound media (series and parallel) – Thermal insulation.

UNIT II: FERROUS ALLOYS   9

The iron – carbon equilibrium diagram – Phases, Invariant reactions – Microstructure of slowly cooled steels – Eutectoid steel, hypo and hypereutectoid steels – Phase transformations – TTT diagram for eutectoid steel – Pearlitic, baintic and martensitic transformations (qualitative) – Tempering of martensite – Steels – Stainless steels – Cast irons.

UNIT III: MATERIALS CHARACTERIZATION   9

Introduction to materials and Techniques – X-ray diffraction (XRD) – Electron Microscope – Scanning Electron Microscope (SEM) – Transmission Electron Microscope (TEM) – Non-destructive testing (NDT): Liquid penetrant test, magnetic detection, Electromagnetic testing, Ultrasonic test, Thermal infrared testing and Spark test.

UNIT IV: CROYOGENICS   9

Introduction to Cryogenics – Properties of Cryogenic Fluids – Gas – Liquefaction of gases and Refrigeration Systems – Cryocoolers – Cryogenic Insulations – Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity – High Tc superconductors – General applications of superconductors – Cryotron and Magnetic levitation. High Tc Superconductors – Sperfluity.

UNIT V: NEW ENGINEERING MATERIALS   9

Ceramics – types and applications – Composites: classification, Role of matrix and reinforcement, Characterisation of fiber reinforced plastics – Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application – Canbon Nano Tubes (CNT) structure, properties and applications.

TOTAL: 45 PERIODS

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OUTCOMES

Upon completion of this course, the students will be able to:

- Knowledge on the thermal conductivity and their applications.

- Acquire knowledge on phase diagram,various microstructures and alloys.

- Get knowledge on materials characterization techniques.

- Have the potential applications of superconductors.

- Understand the basics of ceramics, composites and nanomaterials.

TEXT BOOKS

1. P.Mani, " A text book of Engineering Physics ", Dhanam Publications, 2018.

2. Rajendran V, "Engineering Physics", TaTa McGraw Hill Publications, 2012.

REFERENCES

1. Askeland, D. "Materials Science and Engineering". Brooks/Cole, 2010.

2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials" Narosa Publishing House, 2009.

E-RESOURCES

1. https://nptel.ac.in/courses/112108150/(Material Science)

2. https://swayam.gov.in/nd1_noc19_mm13/preview (Advanced Materials and Processes)

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19GEE202   **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**   **L T P C**
(Lab Embedded Theory Course)   **3 0 2 4**
(Common to Civil and Mechanical Engineering)

OBJECTIVES

The objective of this course will enable students to:

- Understand electric circuit laws, single and three phase circuits, wiring and measuring instruments.

- Know working principles of Electrical Machines.

- Realize the working principle of Various electronic devices and applications.

- Apply the principles of digital electronics in digital world.

- Aquire fundamental concepts of microprocessors and communication.

- Provide exposure with hands on training in electrical and electronics engineering.

UNIT I: ELECTRICAL CIRCUITS & MEASURMENTS   9

Basic circuit components – Ohms Law – Kirchoff's Law – steady state solution of DC circuits – Nodal analysis, Mesh analysis – Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three – phase balanced circuits – housing wiring, industrial wiring, materials of wiring – Classification of instruments – Operating Principles of indicating Instruments.

UNIT II: ELECTRICAL MACHINES   9

Construction – Principle of operation – Basic equations and characteristics of DC Generators – DC Motors – Transformers (single and three phases) – three phase and single phase induction motors.

UNIT III: SEMICONDUCTOR DEVICES AND APPLICATIONS   9

Introduction – Characteristics of PN Junction Diode – Forward and Reverse Bias – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics.

UNIT IV: DIGITAL ELECTRONICS   9

Binary Number System – Boolean Algebra theorems – Digital circuits – Introduction to sequential Circuits – Flip – Flops – Registers and Counters – A/D and D/A Conversion.

UNIT V: FUNDAMENTALS OF MICROPROCESSORS AND COMMUNICATION ENGINEERING   9

Block diagram – Pin diagram – Architecture – Addressing modes of 8085 microprocessor – Introduction – Elements of Communication Systems – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

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LIST OF EXPERIMENTS

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.

2. Fluorescent lamp wiring.

3. Stair case wiring.

4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.

5. Measurement of energy using single phase energy meter.

6. Measurement of resistance to earth of an electrical equipment.

7. Identification of AC and DC instruments.

8. Calibration of ammeter and voltmeter.

9. Identification of electronic components and equipments.

10. Soldering practice– components devices and circuits– using general purpose PCB.

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

- Understand electric circuits and choose appropriate instruments for electrical measurement for a specific application.

- Understand the concept of different types of DC and AC machines.

- Identify the diode's usage as a rectifier, and Zener diode's usage as an voltage regulator and discuss the basic characteristics of BJT.

- Employ Boolean algebra to implement the combinational logic circuits.

- Discuss about Microprocessors, Microcontrollers and recognize their needs.

- Carry out basic home electrical works and appliances and measure the electrical quantities and soldering practice.

TEXT BOOKS

1. D.P Kothari and I.J Nagarath, "Electrical Machines ,Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint , 2017.

2. Sedha R.S., "Applied Electronics", S. Chand & Co., 2008.

REFERENCES

1. Ramesh Goankar, "Microprocessor Architecture", Programming and Applications with 8085, Wiley Eastern, 2000.

2. B.L.Thereja, "A Text of Electrical Technology", S.Channd publications, Vol.1 – Vol 4, 2012.

E-RESOURCES

1. https://nptel.ac.in/courses/108/105/108105132/ (Digital Electronics Circuits)

2. http://onlinecourses.nptel.ac.in/108108076(Basic Electrical Technology)

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19MET201	ENGINEERING MECHANICS	L T P C
	(Common to Civil and Mechanical Engineering)	3 1 0 4

OBJECTIVES

The objective of this course will enable students to:

- Understand the definition of particle, body, force and their equilibrium conditions.
- Understand the concept of equilibrium of rigid bodies.
- Learn the basic concepts of friction.
- Learn about the center of gravity and moment of inertia of surfaces and solids.
- Understand the force motion relationship in components subjected to external forces and analysis of standard mechanism.

UNIT I: STATICS OF PARTICLES 9+3

Introduction – Laws of Mechanics – Parallelogram and triangular Law of forces – Principle of transmissibility – Coplanar Forces – Resolution and composition of force – Free body diagram – Equilibrium of a particle in plane – Forces in space – Equilibrium of a particle in space.

UNIT II: STATICS OF RIGID BODIES 9+3

Moments: Moment of a force about a point and about an axis – Scalar components of a moment – Varignon's theorem – Single equivalent force – Types of supports and reactions – Stable equilibrium – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.

UNIT III: FRICTION 9+3

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – Angle of Repose – Belt friction – Ladder friction – wedge friction – Rolling resistance.

UNIT IV: PROPERTIES OF SURFACES AND SOLIDS 9+3

Determination of areas and Volumes – First moment of area and Centroids of sections – T-section, I-section – Angle section, Hollow section by using standard formula – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I-section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Relation to area moments of inertia.

UNIT V: DYNAMICS OF PARTICLES 9+3

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – Work Energy Equation – Impulse and Momentum – Impact of elastic bodies.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

On successful completion of this course, The Students can

- Understand the forces and its related laws of mechanics in static and dynamic conditions.

- Solve problems in engineering systems using the concept of static equilibrium.

- Solve problems involving frictional phenomena in machines.

- Solve the moment of inertia of any sections and masses for the structural members.

- Apply the different principles to study the motion of a body and analyze their constitutive equations.

TEXT BOOKS

1. Dr.N.Kottiswaran, "Engineering Mechanics", 11th Edition, Sri Balaji Publications, Coimbatore, 2017.

2. Vela Murali, "Engineering Mechanics", Oxford University Press, 2017.

REFERENCES

1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education, 2010.

2. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw– Hill Publishing company, New Delhi, 2004.

E-RESOURCES

1. https://nptel.ac.in/courses/122/104/122104015/(Engineering Mechanics)

2. https://www.courses.com/indian– institute– of– technology– guwahati/engineering– mechanics (Engineering Mechanics)

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19EEC201	TECHNICAL SKILL (AutoCAD)	L T P C
	(Employability Enhancement Course)	0 0 2 0
	(Common to Civil and Mechanical Engineering)	

OBJECTIVES

- To develop skill to use software to create 2D and 3D models.

LIST OF EXERCISES USING SOFTWARE CAPABLE OF DRAFTING AND MODELING

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.

2. Drawing of a Title Block with necessary text and projection symbol.

3. Drawing of curves like parabola, spiral, involutes using Bspline or cubic spline.

4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc and dimensioning.

5. Drawing front view, top view and side view of objects from the given pictorial views (eg.V-Block, Base of a mixie, Simple stool,Objects with hole and curves).

6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.).

7. Drawing of a simple steel truss.

8. Drawing sectional views of prism, pyramid, cylinder, cone, etc.

9. Drawing isometric projection of simple objects.

10. Creation of 3D models of simple objects and obtaining 2D multi-view drawings from 3D model.

TOTAL: 20 PERIODS

OUTCOMES

- Students will be able to understand develop skill to use software to create 2D and 3D models.

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SEMESTER III

19MAT301   **TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**   **L T P C**
(Common to Civil, CSE, ECE, EEE & Mechanical)   **3 1 0 4**

OBJECTIVES

The objective of this course will enable students to:

- Introduce the basic concepts of PDE for solving standard partial differential equations.
- Introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- Acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- Acquaint the student with Fourier transform techniques used in wide variety of situations.
- Introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I: PARTIAL DIFFERENTIAL EQUATIONS   9+3

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients of homogeneous types.

UNIT II: FOURIER SERIES   9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range Sine and Cosine series – Parseval's identity – Harmonic analysis.

UNIT III: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   9+3

Classification of partial differential equations – Method of separation of variables – Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV: FOURIER TRANSFORMS   9+3

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V: Z – TRANSFORMS AND DIFFERENCE EQUATIONS   9+3

Z - transforms – Elementary properties – Inverse Z - transform (using partial fraction and residues) – Initial and final value theorems – Convolution theorem – Solution of difference equations using Z - transform.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

After successfully completing the course, the student will be able to:

- Understand how to solve the given standard partial differential equations.

- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.

- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

- Use the effective mathematical tools for the solutions of partial differential equations by using Z- transform techniques for discrete time systems.

TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.

2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES

1. N.P. Bali and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.

2. Erwin Kreyszig, "Advanced Engineering Mathematics",10th Edition, JohnWiley, India, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/111/105/111105035/(Review Groups, Fields and Matrices)

2. https://nptel.ac.in/courses/111105035/27(Complex Variables)

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19CET302 **APPLIED GEOLOGY** **L T P C**
3 0 0 3

OBJECTIVES

The objective of this course will enable students to:

- Understand branches of geology and its importance in civil engineering.
- Acquaint elements of important crystallographic systems, formation of minerals.
- Aware about soil, rocks, classification of rocks and engineering properties of rocks.
- Get awareness about introduction to geological maps, study of structures, fold, fault, joints and seismology.
- Study geological site investigation for dams, tunnels etc., through aerial and geophysical survey.

UNIT I: GENERAL GEOLOGY 9

Geology in Civil Engineering – Branches of geology – Earth Structures and composition – Elementary knowledge on continental drift and plate technologies. Earth processes – Weathering – Work of rivers, wind and sea and their engineering importance – Earthquake belts in India. Groundwater – Mode of occurrence – prospecting – Importance in civil engineering.

UNIT II: MINERALOGY 9

Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the following rock forming minerals – Quartz family.Feldpar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet – Properties, behaviour and engineering significance of clay minerals – Fundamentals of process of formation of ore minerals – Coal and petroleum – Their origin and occurrence in India.

UNIT III: PETROLOGY 9

Soil – Types of soils – Rocks and Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks. Description occurrence, engineering properties and distribution of following rocks.Igneous rocks – Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt Sedimentary rocks sandstone, Limestone, shale conglo, Conglomerate and breccia.Metamorphic rocks.Quartizite, Marble, Slate, Phyllite, Gniess and Schist.

UNIT IV: STRUCTURAL GEOLOGY AND SEISMOLOGY 9

Attitude of beds – Outcrops – Introduction to Geological maps – Study of structures – Folds, faults and joints – Their bearing on engineering construction – Tectonics Plates – Seismology.

UNIT V: GEOLOGICAL STUDY IN CIVIL ENGINEERING 9

Remote sensing techniques – Study of air photos and satellite images – Interpretation for Civil Engineering projects – Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Landslides – Causes and preventions – Sea erosion and coastal protection.

TOTAL: 45 PERIODS

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OUTCOMES

After completing this course students are able to:

- Understand the importance of geological knowledge earthquake, volcanism and the action of various geological agencies.
- Get basics knowledge on properties of minerals.
- Gain knowledge about types of rocks, their distribution and uses.
- Understand the methods of study on geological structure.
- Understand the application of geological investigation in projects tunnels, bridges, roads, airport and harbor.

TEXT BOOKS

1. Parbin Singh, "Engineering and General Geology", Katson Publication House, January, 2013.
2. Krynine and Judd, "Engineering Geology and Geotechniques", McGraw– Hill Book Company, January, 2018.
3. Engineering Geology By S.K Duggal, H K Pandey, N Rawat© 2014 | Published: 1 July, 2017.

REFERENCES

1. Legeet, "Geology and Engineering", McGraw– Hill Book Company 1998.
2. Blyth, "Geology for Engineers", ELBS, 2006.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105106/(Engineeering Geology)
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19– ce47/(Structural Geology)

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19CET303	CONSTRUCTION MATERIALS	L T P C
		3 0 0 3

OBJECTIVES

The objective of this course will enable students to:

- Develop knowledge on building materials and their properties.
- Be familiar with the protection and functional materials.
- Impart knowledge on new materials and their properties.
- Impart the fundamental knowledge about building materials and building component.
- ESnable students to learn basic concepts of masonry and blocks.

UNIT I: STONES – BRICKS – CONCRETE BLOCKS 9

Stone as Building Material – Criteria for Selection – Tests on Stones – Deterioration and Preservation of Stone Work – Bricks – Classification – Manufacturing of Clay and Fly Ash Bricks – Tests on Bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for Special Use – Refractory Bricks – Cement, Concrete Blocks – Light weight Concrete Blocks.

UNIT II: LIME – CEMENT – AGGREGATES – MORTAR 9

Lime: Characteristics, Classification, Manufacturing Process – Cement: Ingredients, Types and Grades, Properties, Manufacturing process, Testing of Cement – Industrial By – products: Fly ash – Aggregates: Natural Stone Aggregates, Classification Characteristics of Aggregates, Testing of Aggregates – Cement Mortar: Functions, Uses of Mortar, Types of Mortar, Ingredients of Mortar, Tests.

UNIT III: CONCRETE 9

Introduction – Characteristics of Good Concrete – Advantages and Disadvantages of Concrete – Application – Classification – Plain Cement Concrete – Ingredients – Bulking of Sand – Water Cement Ratio – Grading of Aggregates – Methods of Proportioning – Mix design (IS method) – Workability – Preparation of Plain Cement Concrete – Properties – Water Proof Concrete – Concepts of Precast, Reinforced & Pre-stressed Concrete.

UNIT IV: TIMBER AND OTHER MATERIALS 9

Timber – Market Forms – Industrial Timber– Plywood – Veneer – Thermacole – Panels of Laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Uses – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – UPVC in doors, windows, MDF materials – Paneling materials and false ceiling techniques

UNIT V: MODERN MATERIALS 9

Glass – Ceramics – Sealants for Joints – Fibre Glass Reinforced Plastic – Clay Products – Refractories – Composite Materials – Types – Applications of Laminar Composites – Fibre Textiles – Geo – membranes and Geo – textiles for Earth Reinforcement – Recycled Aggregates.

TOTAL: 45 PERIODS

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OUTCOMES

On Completion of this course, the student will be able to:

- Understand the Identify suitable construction materials for building construction.

- Provide knowledge on lime, cement, aggregates and mortar.

- Gain knowledge on basic properties of concrete.

- Understand Familiar with timber and other materials used in construction.

- Select and justify appropriate advanced and modern building materials for various construction applications.

TEXT BOOKS

1. Varghese.P.C, "Building Materials", Prentice Hall India Learning Private Limited; 2nd Edition, 2015.

2. Rajput. R.K., "Engineering Materials", S Chand & Company; 3rd edition, 2008.

REFERENCES

1. Jagadish.K.S, Venktarama Reddy, B.V. NanjundaRao, K.S. "Alternative Building Materials Technology", New Age International Private Limited; 2nd Edition, 2017.

2. Gambhir. M.L., &NehaJamwal., "Building Materials, Products, Properties and Systems", McGraw Hill Education; 1st Edition, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/105/102/105102088/(Building Materials and Construction)

2. https://nptel.ac.in/noc/courses/noc21/SEM1/noc21– ce10/(Basic construction materials)

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19CET304	SOLID MECHANICS	L T P C
		3 1 0 4

OBJECTIVES

The objective of this course will enable students to:

- Know the basics of solid mechanics.
- Acquaint the concepts of mechanics of structures.
- Determine the internal forces and analyses the stresses of various structural elements under action of different types of forces.
- Know bending stress and shear stress distribution in various sections.
- Evaluate the behavior of torsional members, beams, columns and cylinders.

UNIT I: STRESS AND STRAIN AT A POINT 9+3

Introduction – Assumption made in strength of materials – Classification of materials – Stress and strain: Types; Elastic limit – Hooke's law; Stress strain curves: Brittle material – Ductile material: Mild steel – High strength steel – Determination of yield stress and Young's modulus; Elastic constants and its relation – Volumetric strain.

UNIT II: ANALYSIS OF SIMPLE SYSTEMS AND STRAIN ENERGY 9+3

Analysis of bars of varying sections; Principles of superposition; Analysis of bars of composite sections subjected to normal and thermal stress. Strain energy and strain energy density – Strain energy due to: Axial load – Suddenly applied load – Impact load.

UNIT III: SHEAR FORCE AND BENDING MOMENT 9+3

Beams: Types of supports and its reaction – Types of beams – Types of loads – Shear force and bending moment: Statically determinate beams subjected to transverse loading (point load and uniformly distributed load) – Shear force diagram – Bending moment diagram: Point of contra flexure.

UNIT IV: BENDING AND SHEAR STRESSES IN BEAMS 9+3

Theory of simple bending – Assumptions and derivation of simple bending equation – Flexural rigidity – Bending and shear stress distribution diagram: Rectangle – Circle – Symmetric I section.

UNIT V: TORSION IN A CIRCULAR SHAFT AND SPRINGS 9+3

Theory of simple torsion – Assumptions and derivation of torsion equation – Torsion rigidity – Polar modulus – Torsion in solid and hollow circular shafts – Power transmitted by a shaft. Closed coiled helical springs under axial load and axial twist – Laminated springs.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

On Completion of this course, the student will be able to:

- Understand the Identify suitable construction materials for building construction.

- Get knowledge on lime, cement, aggregates and mortar.

- Gain knowledge on properties of concrete and its properties.

- Familiar with timber and other materials used in construction.

- Accustom on advanced and modern building materials for various construction applications.

TEXT BOOKS

1. Rajput R.K, "Strength of Materials",S.Chand and Co, New Delhi, 2015.

2. Bansal R.K, "Strength of Materials", Laxmi Publications, New Delhi, 2018.

REFERENCES

1. Chandramouli P.N, "Fundamentals of Strength of Materials", PHI Learning Private Limited, New Delhi, 2018.

2. Subramanian R, "Strength of Materials", Oxford University Press, New Delhi, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/112/102/112102284/(Solid Mechanics)

2. https://nptel.ac.in/courses/105/104/105104160/(Mechanics of solids)

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19CEE301	**ENGINEERING SURVEY**	**L T P C**
	(Lab Embedded Theory Course)	**3 0 2 4**

OBJECTIVES

The objective of this course will enable students to:

- Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities.

- Translate the knowledge gained for the implementation of Civil infrastructure facilities.

- Relate the knowledge on Surveying to the new frontiers of science like Global Positioning System and to acquaint the various functions of surveying instruments.

- Calculate horizontal angle using prismatic and surveyor compass and understand plane table surveying and to compute levels using leveling instruments and angles by theodolite.

- Impart a clear understanding on the working principle & use of tachometer.

UNIT I: CHAIN AND COMPASS SURVEYING   9

Principles and Concepts: Chaining and Ranging – Distance measuring instruments – Compass – Prismatic compass – Surveyor's Compass – Bearing systems and Conversions – Traversing – Local attraction – Magnetic Declination and Dip.

UNIT II: LEVELLING   9

Leveling: Types of instruments – Bench marks – Temporary and permanent adjustments – Types of Levelling – Methods of Leveling. Contours: Contouring – Methods – Characteristics and uses of contours – Calculation of Areas and Volumes by Trapezoidal and Simpson's rule.

UNIT III: THEODOLITE AND TACHEOMETRIC SURVEY   9

Theodolite – Description and uses – Horizontal angles – Heights and distances – Traversing. Tachometric systems – Tangential and stadia systems – Horizontal and inclined sights – Vertical and normal staff – Stadia constants – Anallatic lens.

UNIT IV: CONTROL AND ENGINEERING SURVEY   9

Horizontal and vertical control points – Triangulation – Signal – Instrument and Accessories – Well – Conditioned triangles. Curves: Horizontal and vertical curves – Types and uses of curves.

UNIT V: DIGITAL SURVEY   9

Total station – Basic principle – Electro – optical system: Measuring principle – Working principle – Sources of error – Care and maintenance. EDM – Types of EDM instruments – Measuring and working principle.Basic concepts – Different segments – Space, Control and user segments – Satellite configuration – Anti spoofing and selective availability.

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LIST OF EXPERIMENTS

1. Measurement of given area using chain and cross staff survey.

2. Measurement of bearings and calculation of included angles using prismatic and surveyors compass.

3. Reduction of levels – height of collimation and rise and fall method.

4. Measurement of horizontal and vertical angle using theodolite.

5. Measurement of height and distance by single plane method.

6. Measurement of height and distance using stadia and tangential system of tachometry.

7. Setting out of a simple curve using linear method.

8. Setting out of foundation for a given building.

9. Calculation of latitude and longitude using GPS.

10. Measurement of angles, height and area using total station.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Conduct linear and angular measurement survey with the help of chain, tape and compass.

- Determine the horizontal and vertical distance by traversing using theodolite and measure difference in elevation and produce reduced level of the given points.

- Describe the methods of setting out curves in the field and to determine the area and volume of structures.

- Handle total station instrument for making the horizontal and vertical measurements and Conduct the global positioning system for determining geographical location of the site.

- Use conventional surveying tools such as chain/tape, compass, dumpy level, theodolite in the field of civil engineering applications such as structural plotting and highway profiling.

TEXT BOOKS

1. Punmia B.C, "Surveying, Vol. I and II", Laxmi Publications, 2016.

2. Basak N.N, "Surveying and Levelling", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.

REFERENCES

1. Arora K. R, "Surveying Vol. I and II", Standard Book House, 2018.

2. Duggal S.K, "Surveying Vol. I and II", Tata McGraw Hill, New Delhi, 2017.

3. KanetkarT.P, "Surveying and Levelling Vols. I &II", United Book Corporation, Pune, 2014

E-RESOURCES

1. https://nptel.ac.in/courses/105/107/105107122/(Surveying)

2. https://nptel.ac.in/courses/105/104/105104101/(Surveying)

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19CEE302   **FLUID MECHANICS AND FLOW MEASUREMENTS**   **L T P C**
(Lab Embedded Theory Course)   **3 0 2 4**

OBJECTIVES

The objective of this course will enable students to:

* Outline the basic properties of the fluid, fluid kinematics and fluid dynamics.

* Acquaint boundary layer of fluids and to compute the major and minor losses occurring in pipe flow.

* Analyze and solving the fluid flow problems.

* Learn to use fluid statics, kinematics and dynamics to develop basic equations and to solve real world problems.

* Design the various types of pumps and turbines and analyze the issues associated with hydraulic machines.

UNIT I: DEFINITION AND FLUID PROPERTIES   9

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties: Density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension.

UNIT II: FLUID STATICS & KINEMATICS   9

Pascal's Law and Hydrostatic equation – Forces on plane and curved surfaces – Buoyancy and floatation – Pressure measurement by manometer. Fluid Kinematics Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – Flow nets – Velocity measurement.

UNIT III: FLUID DYNAMICS   9

Control Volume Approach – Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow – Darcy – Weisbach formula – Moody diagram – Moment of momentum Principle

UNIT IV: BOUNDARY LAYER AND FLOW THROUGH PIPES   9

Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes – Pipes in series and in parallel – Pipe network analysis.

UNIT V: DIMENSIONAL ANALYSIS AND MODEL STUDY   9

Fundamental Dimensions – Rayleigh's method – Buckingham's Pi-theorem – Similitude and models– Scale effect and distorted models.

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LIST OF EXPERIMENTS

A. Flow Measurement

1. Calibration of Venturimeter/Orificemeter
2. Bernoulli's Experiment

B. Losses in Pipes

1. Determination of friction factor in pipes
2. Determination of Minor losses

C. Velocity Measurement

1. Pitot Tube

TOTAL: 45+15=60 PERIODS

OUTCOMES

At the end of the course students will be able to :

- Understand the various parameters equipped with Fluid.
- Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- Learn types of flow and losses of flow in pipes.
- Understand and solve the boundary layer problems.
- Gain knowledge about dimensional and model analysis.

TEXT BOOKS

1. Bansal R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2017.
2. Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2017.

REFERENCES

1. Kumar K.L, "Engineering Fluid Mechanics", Eurasia Publishing House Pvt. Ltd, New Delhi, 2017.
2. Rajput R.K., "Fluid Mechanics and Hydraulic Machines", S. Chand Publishing Ltd, New Delhi, 2016.
3. Subramanya K, "Fluid Mechanics and Hydraulic Machines– Problems and Solutions", Tata McGraw Hill Education, New Delhi, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/112/105/112105171/   (Fluid Mechanics).
2. https://nptel.ac.in/courses/112/105/112105182/   (Introduction to Fluid Mechanics and Compressible flow).

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19EEC302	**ENTREPRENEURSHIP DEVELOPMENT ACTIVITY** (Common to Civil, CSE, ECE, EEE & Mechanical)	**L T P C** **0 0 2 0**

OBJECTIVES

The objectives make students to:

- Evaluate social and civil responsibilities of business ownership.
- Describe typical behavioral characteristics of an effective entrepreneur.
- Develop a business plan, including identifying an executive summary; conducting a marketing and competitive analysis report; and developing a marketing, management, and financial plan.
- Determine career opportunities, responsibilities, and educational and credentialing equirements related to various entrepreneurship ventures.
- Interpret research data to determine market– driven problems faced by entrepreneurs.

TOIPICS TO BE COVERED

1. Should You Become an Entrepreneur?
    - Entrepreneurship: Present & Past.
    - Is Entrepreneurship Right for You.
    - Identify Business Opportunities & Set Goals.

2. What Skills Do Entrepreneurs Need
    - Communication Skills.
    - Math Skills.
    - Problem Solving Skills.

3. Entrepreneurs in a Market Economy
    - What is an Economy?
    - The Concept of Cost.
    - Government in a Market Economy.

4. Select a Type of Ownership
    - Run an Existing Business.
    - Own a Franchise or Start a Business.
    - Choose the Legal Form of Your Business.

5. Develop a Business Plan
    - Why Do You Need a Business Plan.
    - What Goes into a Business Plan.
    - Create an Effective Business Plan.

6. Identify and Meet a Market Need
    - The Value of Market Research.
    - How to Perform Market Research Entrepreneurship Syllabus.
    - Identify Your Competition.

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7. Finance, Protect, and Insure Your Business

- Put Together a Financial Plan.

- Obtain Financing for Your Business.

- Protect Your Business.

8. Choose Your Location & Set Up for Business

- Choose a Retail Business Location.

- Choose a Location for a Nonretail Business.

- Obtain Space and Design the Physical Layout.

- Purchase Equipment, Supplies, and Inventory.

9. Market Your Business

- The Marketing Mix.

- Product, Price, Distribution, Price, and Promotion.

- Set Marketing Goals.

10. Hire and Manage a Staff

- Hire Employees.

- Create a Compensation Package.

- Manage your Staff.

11. Record– Keeping and Accounting

- Set up a Record Keeping System.

- Understand Basic Accounting.

- Track Your Inventory.

12. Financial Management

- Manage your Cash Flow.

- Analyze Your Financial Performance.

- Hire Experts.

13. Use Technology

- Technology and Your Business.

- Learn about the Interest.

- Purchase Technology.

14. Intellectual property Rights

- Patents.

- Copyright.

- Industrial design rights.

- Trademarks.

- Trade secrets.

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15. Innovation Contest

- Innovative Idea.

- Proof of Concept (PoC).

- Prototype Creation.

- The students may be grouped into 2 to 3 and work under a project supervisor. The Prototypes to be fabricated may be decided in consultation with the supervisor. A innovative report to be submitted by the group and the model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department.

TOTAL: 15 PERIODS

OUTCOMES

At the end of the course, the students will be able to:

- Identify personal strengths and value systems.

- Recall important tenets of digital literacy.

- Discuss the essentials of matters pertaining to money.

- Prepare for employment and self-employment.

- Illustrate the basics of entrepreneurship and identify new business opportunities.

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19MDC301	LEADERSHIP ENHANCEMENT PROGRAMME	L T P C
	(Common to Civil, CSE, ECE, EEE & Mechanical)	1 0 0 0

OBJECTIVES

The objective of the course is enabling the students to:

- Find new, innovative ways of developing and managing people.
- Develop new business opportunities.
- Tackle the broader societal issues the face.
- Key benefits of leadership skills in different situations.
- Formulate and implement effective leadership strategies.

TOIPICS TO BE COVERED

1. Leadership for an Engineering students: Skills & Strategies.
2. Qualities of good leaders and 21 irrefutable laws of Leadership.
3. Empowering Others and Managing People.
4. Leading Meetings.
5. Leadership competencies and Leadership Styles.
6. Difference between a boss and a leader.
7. Leadership and Assertiveness Skills : A Good Leader, Leadership Theories, Leadership Behaviour , Assertiveness skills.
8. Leadership development opportunities and suggestions.
9. Teamwork and Leadership : Concept of teams , Building Effective teams, Concept of leadership and sharpening leadership skills.
10. Teamwork and Leadership Activities: Group discussion, Solving Puzzle as a team, describing a leadership style.

TOTAL: 12 PERIODS

OUTCOME

At the end of the course, the students will be able to:

- Develop the capabilities needed to increase team's work productivity.
- Help to decrease employee turnover and increase engagement, creating a strong and united team.
- Develop communication skills, mastering the art of negotiation, influence and conflict management.
- More confident as a leader and find new ways of influencing the teams they lead.
- Effectively connect to people, developing the ability to give constructive feedback, and critically seek the feedback of the team.

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TEXT BOOKS

1. John maxwell, "21 Irrefutable Laws of Leadership" 2008.
2. Sara n. King, David g. Altman, Robert j. Lee, "Discovering the leader in you".
3. Louis carter ,David ulrich , Marshall goldsmith "Best practicesin leadership development and Organization change".

REFERENCES

1. Barry Benator, Albert Thumann,"Project Management and Leadership Skills for Engineering and Construction Projects" 2003.
2. Sydänmaanlakka Pentti. "Intelligent leadership and leadership competencies". Dissertation Series.

E-RESOURCES

1. https://nptel.ac.in/courses/122/105/122105021/(Introduction to Leadership)
2. www.ccl.org/leadership/research/index.aspx(Centre for Creative Leadership)

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SEMESTER IV

19MAT403	NUMERICAL METHODS	L T P C
	(Common to EEE and Civil)	3 1 0 4

OBJECTIVES

The objective of the course is enabling the students to:

* Introduce the basic concepts of solving algebraic, transcendental, exponential and logarithmic equations.
* Introduce the numerical techniques of interpolation in various intervals in real life situations.
* Acquaint the student with understanding of numerical techniques of differentiation and integration this plays an important role in engineering and technology disciplines.
* Acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
* Understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I: SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   9+3

Solution of algebraic and transcendental equations by Newton Raphson method – Solution of linear system of equations by Gauss elimination, Gauss Jordan and Gauss Seidel methods – Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method.

UNIT II: INTERPOLATION AND APPROXIMATION   9+3

Interpolation with equal intervals by Newton's forward and backward difference formulae – Interpolation with unequal intervals by Lagrange's interpolation and Newton's divided difference formulae – Cubic Spline interpolation.

UNIT III: NUMERICAL DIFFERENTIATION AND INTEGRATION   9+3

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 rule – Romberg's Method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV: INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS   9+3

Single step methods – Taylor's series method – Euler's and Modified Euler's method – Fourth order Runge – Kutta method for solving first order equations – Multi step methods – Milne's and Adams – Bash forth predictor corrector methods for solving first order equations.

UNIT V: BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL   9+3
EQUATIONS

Finite difference solution for the second order ordinary differential equations – Finite difference techniques for the solution of two dimensional Laplace and Poisson equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Understand the basic concepts and techniques of solving algebraic, transcendental, exponential and logarithmic equations.

- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.

- Apply the numerical techniques of differentiation and integration for engineering problems.

- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

2. Dr.Kandasamy. P, Dr.Thilagavathy . K and Dr. Gunavathy .K., "Numerical Methods", S. Chand and Company Pvt. Ltd., New Delhi, 2016.

REFERENCES

1. Veerarajan.T and Ramachandran.T., "Numerical Methods with Programming in C" Tata Mc.Graw Hill Publishers, New Delhi, 2007.

2. Burden,R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/111/107/111107105/(Numerical Methods)

2. https://www.classcentral.com/course/swayam-numerical-analysis-17709 (Numerical Methods)

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19CET402   CONSTRUCTION TECHNIQUES, EQUIPMENTS AND PRACTICES   L T P C
3 0 0 3

OBJECTIVES

The objective of this course will enable students to:

- Make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
- Acquaint the foundation, Earthwork and flooring.
- Know reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.
- Impart the fundamental knowledge about building materials and building component.
- Enable students to learn basic concepts of masonry and blocks.

UNIT I: CONCRETE TECHNOLOGY   9

Cements – Grade of cements – Concrete chemicals and Applications – Grade of concrete – manufacturing of concrete – Batching – Mixing – Transporting – Placing – Compaction of concrete – curing and finishing – Testing of fresh and hardened concrete – Quality of concrete – Vibrators – Extreme Weather Concreting – Ready Mix Concrete – Non-destructive testing.

UNIT II: CONSTRUCTION PRACTICES   9

Specifications, details and sequence of activities and construction co– ordination – Site Clearance – Marking – Earthwork – Masonry – Stone masonry – Bond in masonry – Concrete hollow block masonry – Flooring – Damp proof courses – Construction joints – Movement and expansion joints – pre cast pavements – Building foundations – Basements – Temporary shed – Centering and shuttering – Slip forms – Scaffoldings – De-shuttering forms – Fabrication and erection of steel trusses – Frames – Braced domes – Laying brick – Weather and water proof – Roof finishes – Acoustic and fire protection.

UNIT III: SUB STRUCTURE CONSTRUCTION   9

Techniques of Box jacking – Pipe Jacking – Under water construction of diaphragm walls and basement– Tunneling techniques – Piling techniques – Well and caisson – Sinking cofferdam – Cable anchoring and grouting – Driving diaphragm walls, sheet piles – Shoring for deep cutting – Well points – Dewatering and stand by Plant equipment for underground open excavation – Power trowel for flooring works and dewatering techniques.

UNIT IV: SUPER STRUCTURE CONSTRUCTION   9

Launching girders, bridge decks, off shore platforms – Special forms for shells – Techniques for heavy decks – In-situ pre-stressing in high rise structures, Material handling – Erecting light weight components on tall structures – Support structure for heavy Equipment and conveyors – Erection of articulated structures, braced domes and space decks.

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UNIT V: CONSTRUCTION EQUIPMENT 9

Selection of equipment for earth work – Earth moving operations – Types of earthwork equipment – Tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting – Equipment for material handling and erection of structures – Equipment for dredging, trenching, tunneling.

TOTAL: 45 PERIODS

OUTCOMES

Students completing this course will be able to:

- Understand the concrete technology.
- Maintain and operate hand and power tools and equipment used in the building construction sites.
- Plan the requirements for substructure construction.
- Make the usage of superstructure construction.
- Know the different construction techniques and structural systems.

TEXT BOOKS

1. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2017.
2. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2018.

REFERENCES

1. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
2. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/105/103/105103206/ (Construction methods and equipment management)
2. https://onlinecourses.nptel.ac.in/noc21_ce21/preview (Construction methods and equipment management)

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19CET403   **APPLIED HYDRAULICS ENGINEERING**   **L T P C**
3 1 0 4

OBJECTIVES

The objective of this course will enable students to:

- Introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines.
- Relate the theory and practice of problems in hydraulic engineering.
- Acquaint the fluid properties and its applications in civil engineering.
- Aware to use fluid statics, kinematics and dynamics to develop basic equations and to solve real world problems.
- Design the various types of pumps and turbines and analyze the issues associated with hydraulic machines.

UNIT I: OPEN CHANNEL FLOW   **9+3**

Open Channel Flow: Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation.

UNIT II: UNIFORM FLOW   **9+3**

Uniform Flow: Velocity measurement – Manning's and Chezy's formula – Roughness co– efficient – normal depth and velocity – Most economical sections (rectangular, trapezoidal, circular and triangular sections) – Non-erodible channels.

UNIT III: VARIED FLOW   **9+3**

Varied Flow: Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions – Hydraulic jump – Types – Energy dissipation – Surges – Surge channel transitions.

UNIT IV: PUMPS   **9+3**

Pumps: Application of momentum principle – Impact of jets on plane and curved plates – Centrifugal pump – Minimum speed to start the pump – Multistage pumps – Reciprocating pump – Negative slip – Air vessels – Indicator diagrams.

UNIT V: TURBINES   **9+3**

Turbines: Turbines – Classification – Radial flow turbines – Axial flow turbines – Impulse and reaction turbines – Draft tube and cavitations – Performance of turbines.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

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

- Apply their knowledge of fluid mechanics in addressing problems in open channels.

- Identify a effective section for flow in different cross sections.

- Solve problems in uniform, gradually and rapidly varied flows in steady state conditions.

- Understand the principles, working and application of turbines.

- Realize the principles, working and application of pumps.

TEXTBOOKS

1. Subramanya.K ,"Flow in open channels", Tata McGraw Hill, New Delhi, 2019.

2. Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2017.

REFERENCES

1. VenTe Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2017.

2. Jain.A.K., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.

3. Subramanya.K., "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105203/(Hydraulic Engineering)

2. https://nptel.ac.in/courses/105/103/105103096/(Introduction to Hydraulics)

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19CET404	HIGHWAY ENGINEERING	L T P C
		3 1 0 4

OBJECTIVES

The objective of this course will enable students to:

- Impart knowledge on highway planning and its geometric design.
- Aware the desirable properties of highway materials and maintenance.
- Make familiar with design and evaluation of pavements.
- Gain knowledge about planning, design, construction of highways.
- Acquire knowledge of site investigation for location and planning of highways.

UNIT I: HIGHWAY PLANNING AND ALIGNMENT 9+3

History of Road Construction, Highway Development in India – Jayakar Committee Recommendations and Realizations, Twenty-year Road Development Plans, Concepts of on-going Highway Development Programmes at National Level, Institutions for Highway Development at National Level – Indian Road Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MoRTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment, Engineering Surveys for Alignment – Classification and Cross Section of Urban and Rural Roads (IRC) – Principles of Highway Financing.

UNIT II: GEOMETRIC DESIGN OF HIGHWAYS 9+3

Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Design of Horizontal Alignment – Horizontal Curves Super Elevation, Widening of Pavements on Horizontal Curves and Transition Curves, Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves– Sight Distances – Factors Affecting Sight Distances, PIEV Theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] – Geometric Design of Hill Roads [IRC Standards Only].

UNIT III: HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9+3

Desirable Properties and Testing of Highway Materials: Soil – California Bearing Ratio Test, Field Density Test – Aggregate – Crushing, Abrasion, Impact Tests, Water Absorption, Flakiness and Elongation Index and Stone Polishing Value Test – Bitumen – Penetration, Ductility, Viscosity, Binder Content And Softening Point Tests. – Construction Practice – Water Bound Macadam Road,Bituminous Road And Cement Concrete Road [As Per IRC And Morth Specifications] – Highway Drainage [IRC Recommendations].

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UNIT IV: FLEXIBLE AND RIGID PAVEMENTS   9+3

Rigid And Flexible Pavements – Components and their Functions – Design Principles of Flexible and Rigid Pavements, Factors Affecting the Design Of Pavements – ESWL, Climate, Sub-Grade Soil And Traffic – Design Practice for Flexible Pavements [IRC Method And Recommendations – Problems] – Design Practice for Rigid Pavements – IRC Recommendations – Concepts Only.

UNIT V: HIGHWAY MAINTENANCE   9+3

Types of Defects in Flexible Pavements – Surface Defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. – Types of Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks, Spalling of Joints and Mud Pumping – Special Repairs – Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of Pavement Failure and Strengthening – Overlay Design by Benkelman Beam Method [Procedure Only].

TOTAL: 45+15 = 60 PERIODS

OUTCOMES

On Completion of this course, the student will be able to:

- Acquire skills in selecting the best highway alignment and develop the highway proposal.
- Learn Design various highway cross sectional elements.
- Understand Design flexible and rigid pavements as per IRC codes.
- Gain knowledge on highway materials and construction practice.
- Extend knowledge on highway maintenance.

TEXT BOOKS

1. Khanna.S.K., Justo.C.E.G.,Veeraragavan A, "Highway Engineering", Nemchand Publishers, 10th Edition, 2018.

2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Pvt. Ltd., 2018.

REFERENCES

1. Kadiyali. L. R, "Transportation Engineering", Hanna Book Publishing; 1st edition, 2019.

2. Mallick,Rajib B. Tahar El– Korchi, "Pavement Engineering: Principles and Practice",CRC Press, 3rd Edition, 2017.

3. Rangwala, "Highway Engineering", Charotar Publishing House pvt. Ltd., 10th Edition,2016.

4. Guidelines for the design of rigid pavements for highways, IRC 58 – 1998, The Indian roads congress, New Delhi.

5. Guidelines for the design of flexible pavements for highways, IRC 37 – 2001, The Indian roads congress, New Delhi.

E-RESOURCES

1. https://nptel.ac.in/courses/105/101/105101087/ (Pavement Design)

2. https://nptel.ac.in/courses/105/105/105105107/ (Introduction to Transport Engineering)

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19CEE401	**STRENGTH OF MATERIALS**	**L T P C**
	(Lab Embedded Theory Course)	**3 0 2 4**

OBJECTIVES

The objective of this course will enable students to:

- Aware the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

- Get criteria for choice of the appropriate material and the various tests for quality control in the use of these materials.

- Know Various tests on fresh and hardened concrete that is commonly used in civil engineering construction materials.

- Acquaint the fundamental concepts of Stress, Strain and deformation of solids and to perceive bending stress and shear stress distribution in various sections.

- Evaluate the behavior of torsional members, beams, columns and cylinders.

UNIT I: COMPRESSION MEMBERS 9

Column: Types – Modes of failure – Buckling load – Factor of safety – Euler's theory – Different end conditions – Rankine's – Gordon formula. Axial and eccentric loads – Direct, bending and combined bending stress – Calculation of combined bending stress: Core section – Middle third and Middle fourth rule.

UNIT II: DEFLECTION OF DETERMINATE BEAMS 9

Governing differential equation – Elastic curve for various types of beams – Slope and deflection: Macaulay's method – Moment area method – Conjugate beam method.

UNIT III: CYLINDERS 9

Thin cylinder: Circumferential and longitudinal stress – Shear stress – Volumetric strain. Thick cylinder: Lame's equation – Hoop and radial stress distribution – Compound cylinders.

UNIT IV: PRINCIPAL STRESS AND THEORIES OF ELASTIC FAILURE 9

Two dimensional state of stress at a point – Normal and shear stresses: Analytical method. Theories of failure: Maximum principal stress theory – Maximum shear stress theory – Maximum principal strain theory – Strain energy theory – Maximum shear strain energy theory – Simple Problems.

UNIT V: ANALYSIS OF PLANE MEMBERS 9

Elements and types of a truss – Determinacy and stability – Analysis of statically determinate plane truss: Method of joints – Method of sections – Method of tension coefficient.

LIST OF EXPERIMENTS

A. Steel

- Stress– strain characteristics – Young's modulus – Hardness – Impact strength– Shear strength.

- Evaluation of Stiffness on helical spring.

- Stiffness and modulus of rigidity of the specimen using torsion testing machine.

- Deflection test on cantilever and simply supported beam.

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B. Brick/Building blocks

- Shape and Size– Efflorescence– Compressive strength– Water absorption– Field test.

C. Wood

- Compressive strength, Bending Test.

D. Cement

- Specific gravity test– Fineness – Consistency test– Setting time– Soundness – Compressive strength of cement mortar cubes– Field test.

E. Fine aggregate

- Specific gravity test– Bulking of sand– Fineness modulus.

F. Coarse aggregate

- Specific gravity test – Crushing strength – Impact strength – Shape test – Water absorption – Fineness modulus, Abrasion of Los Angeles Test.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Determine the physical properties of given cement, fine aggregates coarse aggregates and wooden sample.
- Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.
- Apply the technical concepts and ways to solve engineering problems through conducting experiments.
- Compute the deflection of beams by different methods and selection of method for determining slope or deflection.
- Describe the failure modes for various types of columns.

TEXT BOOKS

1. Rajput R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2018.
2. Bansal R.K, "Strength of Materials", Laxmi Publications, New Delhi, 2017.

REFERENCES

1. Chandramouli P.N, "Fundamentals of Strength of Materials", PHI, New Delhi, 2018.
2. Subramanian R, "Strength of Materials", Oxford University Press, New Delhi, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/112/107/112107146(Strength of Materials)
2. https://nptel.ac.in/courses/105/105/105105108/(Introduction to Strength of Materials)

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19CEE402 **SOIL MECHANICS** **L T P C**

(Lab Embedded Theory Course) **3 0 2 4**

OBJECTIVES

The objective of this course will enable students to:

- Get ample knowledge in assessing both physical and engineering behaviour of soil.
- Impart knowledge on stress distribution, settlement and shear strength of the soil.
- Perceive the mechanism of stress transfer in two – phase systems and stability analysis of slopes.
- Provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures to identify factors controlling soil behavior and methods to determine soil properties.
- Students will acquire basic knowledge in engineering design of geotechnical systems.

UNIT I: SOIL CLASSIFICATION AND COMPACTION 9

Nature of Soil – Problems with Soil – Phase Relation – Sieve Analysis – Sedimentation Analysis – Atterberg Limits – Classification for Engineering Purposes – BIS Classification System – Soil Compaction – Factors Affecting Compaction – Laboratory Compaction Methods.

UNIT II: SOIL WATER AND PERMEABILITY 9

Soil Water – Various Forms – Influence of Clay Minerals – Capillary Rise – Suction – Effective Stress Concepts in Soil – Total, Neutral and Effective Stress Distribution in Soil – Permeability – Darcy's Law – Permeability Measurement in the Laboratory – Quick Sand Condition – Seepage – Introduction to Flow Nets – Properties and Uses – Application to Simple Problems.

UNIT III: STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT 9

Stress Distribution – Soil Media – Boussinesq Theory – Use of Newmark's Influence Chart – Components of Settlement – Immediate and Consolidation Settlement – Terzaghi's One Dimensional Consolidation Theory – Computation of Rate of Settlement. – √t and log t Methods – e-log p Relationship – Factors Influencing Compression Behaviour of soils.

UNIT IV: SHEAR STRENGTH 9

Shear strength of Cohesive and Cohesion less Soils – Mohr – Coulomb Failure Theory – Saturated Soil – Strength Parameters – Measurement of Shear Strength, Direct Shear, Tri-axial Compression, UCC and Vane Shear Tests – Types of Shear Tests Based on Drainage and their Applicability – Drained and Un–drained Behaviour of Clay and Sand.

UNIT V: SLOPE STABILITY 9

Slope Failure Mechanisms – Modes – Infinite Slopes – Finite Slopes – Total and Effective Stress Analysis – Stability Analysis for Purely Cohesive and C – ø Soil – Method of Slices – Modified Bishop's Method – Friction Circle Method – Stability Number – Problems – Slope Protection Measures.

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LIST OF EXPERIMENTS

1. Grain Size Distribution – Sieve Analysis.
2. Grain Size distribution – Hydrometer Analysis.
3. Specific Gravity of Soil.
4. Relative density of Sands.
5. Field Density by Core Cutter Method and Sand Replacement Method.
6. Atterberg's Limits Test.
7. Coefficient of Permeability – Variable and Constant Head Method.
8. California Bearing Ratio Test (study).
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Standard Proctor Compaction Test.
12. Tri-axial compression tests in Cohesion less Soil (Demo).
13. One Dimensional Consolidation Test (Demo).

TOTAL: 45+15=60 PERIODS

OUTCOMES

On Completion of this course, the student will be able to:

- Describe the origin, phase relation physical properties and classification of soil and to Introduce the concept of soil pressure distribution and flow of water in soil.

- Outline the concepts of stress distribution in soil and Terzaghi's one dimensional consolidation theory.

- Analysis of shear strength behaviour of soil by direct shear, triaxial, UCC and Vane shear test and to analyse the concept of slope stability and slope failures of cohesive and C– ø soil.

- Absorb knowledge about grain size distribution using sieve analysis and by hydrometer analysis.

- Identify and classify soils with reference to their characteristics, calculate different soil properties and to explain the strength of the soil and be able to calculate shear strength of the soils.

TEXT BOOKS

1. Dr. K. R. Arora, "Soil Mechanics and Foundations", Standard Publishers; 7th reprint 2019 Edition.

2. Gopal Ranjan and Rao A.S.R, "Basic and applied Soil Mechanics", New Age Internationals, 2017.

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REFERENCES

1. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Soil Mechanics and Foundations", Laxmi Publications; 16th Edition, 2017.

2. Muni Budhu, "Soil Mechanics and Foundations", John Willey & Sons, Inc, 2016.

3. Venkatramaiah C. "Geotechnical Engineering", New Age International, 6th Edition, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/105/101/105101084/(Soil Mechanics)

2. http://www.nptelvideos.in/2012/11/soil– mechanics.html(Soil Mechanics)

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19EEC301	COMMUNICATION SKILLS	L T P C
		0 0 2 0

OBJECTIVES

The purpose of learning this course is to:

- Improve fluency in English through well developed vocabulary.
- Improve the oral communication skills.
- Focus the effective reading of general and technical text.
- Improve writing skill.
- Communicate ideas in group discussion and interviews.

UNIT I: VOCABULARY   6

Vocabulary building – articulate ideas and thoughts; usage of palindromes,greetings, wishes, festival related words – homophones and homonyms – connotation – vocabulary words with sentences. – Idiomatic Expressions – One – Word Substitutes.

Activities: Learn a word a week, Use newspaper to write unfamiliar words, Word association games.

UNIT II: LISTENING   6

Listening Skill – Its importance – Purpose – Process – Types – Barriers – Effective Listening strategies – Listening and note – Taking – Listening to telephonic conversations – Ted talks – Watching Inspiring Speech videos on You tube – Listening native speaker's videos for pronunciation.

Activities: Listen and draw the different scenes in a story, Secret Message games,watching videos and listing difficult words.

UNIT III: SPEAKING   6

JAM Talk – Role play – Debate – Conversational skills (formal and informal) – Conversation practice – group discussion and interview skills – Introducing oneself and others – Presentation skills – Making presentations (individual and group) through seminars / PPTs.

Activities: Picture Description, Giving Directions and Guidelines, Making a short speech – Extempore.

UNIT IV: READING   6

Strategies for effective reading (Guessing meanings from contexts – Scanning, skimming, inferring meaning and critical reading) – Read and recognize different text types ranging from newspaper articles, magazines, books, Technical articles and Reading autobiographies.

Activities: Reading online sources like e – books, e – journals and e – newspapers, cloze exercises, Reading and answering questions.

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UNIT V: WRITING 6

Develop a paragraph: topic sentence, supporting sentences, concluding sentence – Writing simple Essays – argument, descriptive and comparative essays – Creative writing.

Activities: Write Essays with sub titles, Write a story that uses as many clichés and idioms, Write Paragraph.

TOTAL: 30 PERIODS

The following Practice Session will be conducted for the Communication Skills (CS) Lab sessions:

- Activities on Presentations Skills– Students make presentations on given topics.
- Activities on Group Discussion– Students participate in group discussions.
- Interview Skills– Students participate in Mock Interviews.
- Essay Writing – Students prepare their own paragraph and essay.

Guidelines for conducting assessments as per 2019 regulations

- 30 hours – Two consecutive hours allotted for each class.
- Three Continuous assessments only conducted and no end semester exam.
- For the award of Continuous assessment the best three activities from Essay Writing, Oral Presentation, Extempore, Group Discussion and Mock Interview (one– on– one basis) can be taken.

OUTCOMES

At the end of this course, learners will be able to:

- Improve vocabulary and express the same contextually.
- Communicate to his peer group properly and make presentations.
- Comprehend the general and technical text.
- Write simple paragraph and essay in any topic.
- Participate in group discussions expressing ideas relevantly, coherently and cogently.

TEXT BOOKS

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011.
2. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.

REFERENCES

1. Davis, Jason and Rhonda LIss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006.
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan.

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3. Anderson, Kenneth et al. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press, 1992.

4. Technical communication by Asraf rezvi.

E-RESOURCES

1. www.youglish.com
2. www.Newwellington University.com
3. www.newsinlevels.com
4. www.Britishcouncil.org
5. www.writeandimprove.com
6. www.purdueonline.com

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| 19MDC401 | VALUE ADDED COURSE – I | L T P C |
| | (SKETCHUP SOFTWARE) | – – – – |

OBJECTIVES

The objective of this course will enable students to:

- Draw shapes and lines and to move the surfaces back and forth for turning them into 3D forms quickly and accurately.

- Apply drawing scales, and insert dimensions, graphics, further to learn the sketch up for building design applications.

- View and presenting models in 3D and to make everyday shapes, from 2– D plans, elevations and sections.

- Create rectangles, circles, polygons, arcs and also for moving, scaling and rotating objects with the process of applying, creating and editing materials.

COURSE CONTENTS

3D – modeling using sketch up software.

TOTAL: 15 PERIODS

OUTCOMES

At the end of the course, students can:

- Apply basic 3D modeling and apply basic concepts to create simple building models.

- Create everyday shapes, from 2D plans, elevations; create rectangles, circles, polygons and arcs.

- Move, scale and rotate objects with processes of applying, creating and editing materials.

- Export in 2D and 3D and Map textures on straight and curved objects.

TEXT BOOKS

1. Marcus Ritland, "3D Printing with SketchUp".
2. Paul Lee, "Construction Documents Using SketchUp Pro 2020".

REFERENCES

1. Robert Lang, "Building Blocks of SketchUp".
2. John Romeo, "Create Scenery & Props with SketchUp".

E-RESOURCES

1. https://www.iit.edu/sites/default/files/2021– 02/google_sketchup.pdf(SketchUp Introduction)
2. https://www.naukri.com/learning/design–your–room–using–sketchup–course–udeml724 (Design your Room Using Sketchup)

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SEMESTER V

19CET501	STRUCTURAL ANALYSIS I	L T P C
		3 1 0 4

OBJECTIVES

The students should be made to:

- Introduce the basic concepts of structural analysis and the classical methods for analysis of buildings.

- Understand on influence lines for statically determinate and indeterminate beams.

- Analyze the structures for internal forces by theorem of three moments and slope deflection method.

- Analyze the structures for internal forces by Moment distribution method.

- Analyze the three hinged, two hinged and fixed arches.

UNIT I: FUNDAMENTALS OF STRUCTURAL ANALYSIS   **9+3**

Determination of static indeterminacy and kinematic indeterminacy – Deficiency for beams, frames and pin jointed trusses – Behaviors of Structures – Principle of superposition – Analysis of Pin jointed space trusses by Method of Tension coefficient.

UNIT II: INFLUENCE LINE FOR STATICALLY DETERMINATE STRUCTURES   **9+3**

Influence line for Statically Determinate Beams for Bending moment and Shear force – Muller Breslau's Principles – Influence lines for forces in members for statically determinate trusses – Parallel chord truss – Reversal of stresses – Focal length.

UNIT III: SLOPE DEFLECTION METHOD   **9+3**

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.

UNIT IV: MOMENT DISTRIBUTION METHOD   **9+3**

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

UNIT V: ANALYSIS OF ARCHES   **9+3**

Analysis of three hinged arches of parabolic and circular profiles – Analysis of two hinged symmetric parabolic and circular arches. Settlement and temperature effects – Influence lines for bending moment, normal thrust and radial shear at sections of an arch.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Determine the static and kinematic indeterminacy of beam, truss and frame.
- Draw about influence line diagrams for determinate and indeterminate beams.
- Understand the concepts of slope deflection method for beams and portal frame.
- Analysis continuous beams and portal frame using moment distribution method.
- Analysis on arches and statically indeterminate beams.

TEXT BOOKS

1. Menon, D., "Structural Analysis", Alpha Science International Limited, 2015.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 12th Edition, 2017.

REFERENCES

1. Vaidyanathan.R, "Comprehensive Structural Analysis", Volume 1, Laxmi Publications, New Delhi, 2016.
2. Pandit .G.S, "Theory of Structures", Vol – I, McGraw – Hill Education (India) Pvt Limited, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105166/(Structural Analysis I)
2. https://nptel.ac.in/courses/105/101/105101085/(Structural Analysis I)

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ESTD 2001

19CET502	DESIGN OF REINFORCED CONCRETE ELEMENTS	L T P C
	(IS 456: 2000 and SP 16 Code Books are to be Permitted)	3 1 0 4

OBJECTIVES

The students should be made to:

- Introduce the different types of philosophies related to design of basic structural elements.
- Know about bond, anchorage, shear & torsion.
- Give an exposure to design of slab and staircase.
- Understand the axial, uniaxial and biaxial eccentric loadings column.
- Slab, beam, column and footing form of any structural system with reference to Indian standard code of practice.

UNIT I: METHODS OF DESIGN OF CONCRETE STRUCTURES   9+3

Objective of structural design – Steps in RCC Structural Design Process – Type of Loads on Structures and Load combinations – Code of practices and Specifications – Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC – Properties of Concrete and Reinforcing Steel – Analysis and Design of Singly reinforced Rectangular beams by working stress method – Limit State philosophy as detailed in IS code – Advantages of Limit State Method over other methods – Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II: LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION   9+3

Behaviour of RC members in Shear, Bond and Anchorage – Design requirements as per current code – Behaviour of rectangular RC beams in shear and torsion – Design of RC members for combined Bending, Shear and Torsion.

UNIT III: LIMITS STATE DESIGN FOR FLEXURE AND STAIRCASE   9+3

Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects. Analysis and design of Flanged beams. Types of Staircases – Design of dog – legged Staircase.

UNIT IV: LIMIT STATE DESIGN OF COLUMNS   9+3

Types of columns – Axially Loaded columns – Design of short Rectangular, Square and circular columns – Design of Slender columns – Design for Uniaxial and Biaxial bending using Column Curves.

UNIT V: LIMIT STATE DESIGN OF FOOTING   9+3

Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Design of combined rectangular footing for two columns only – Standard method of detailing RC beams, slabs and columns.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

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

- Understand the various design methodologies for the design of RCC elements.
- Know about beams for shear, bond and torsion.
- Design the various types of slabs, flanged beams and staircase by limit state method.
- Design columns for axial, uniaxial and biaxial eccentric loadings.
- Learn about the design of footing by limit state method.

TEXT BOOKS

1. Subramanian, N.,"Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2017.
2. Krishnaraju.N "Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2016.

REFERENCES

1. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2017.
2. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete" Structures Publications, Pune, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105105/(Design of reinforced concrete structures)
2. https://nptel.ac.in/courses/105/105/105105104/(Design of concrete structures)

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19CET503	FOUNDATION ENGINEERING	L T P C
	(IS 6403 Code Book is to be Permitted)	3 0 0 3

OBJECTIVES

The students should be made to:

- Impart knowledge for plan and execute a detail site investigation programme.
- Explain the concepts related to bearing capacity and settlement for various types of soils and loading conditions.
- Select geotechnical design parameters and type of foundations.
- Discuss different types of pile foundation and its capacity.
- Study the various earth pressure theories.

UNIT I: SOIL INVESTIGATION AND CHOICE OF FOUNDATION 9

Methods of Soil Exploration – Boring – Sampling – Disturbed and undisturbed Sampling – Sampling techniques – Bore log and soil investigation report – Function and requirements of good foundation – Choice of foundation based on soil conditions.

UNIT II: BEARING CAPACITY AND SETTLEMENT 9

Location and depth of foundations – Bearing capacity of shallow foundations on homogeneous deposit – Terzaghi's Theory – IS Code method – Problems – Field tests (SPT and SCPT) – Factors influencing Bearing Capacity – Settlement of foundations – Components of settlement – Allowable and maximum differential settlement.

UNIT III: SHALLOW FOUNDATION 9

Types of footings – Contact pressure distribution: isolated footing – Combined footings – Proportioning – Mat foundation – Types and applications – Floating foundation.

UNIT IV: PILE FOUNDATION 9

Need for deep foundations – Types of piles – Classification of piles – Load carrying capacity of piles in granular and cohesive soils – Static and Dynamic formulae – Pile carrying capacity by field tests – Pile load test – Group Capacity – Settlement of Pile groups – Negative skin friction – Introduction to pile raft.

UNIT V: STABILITY OF SLOPES AND EARTH PRESSURE 9

Slopes – Infinite and finite slopes – Types of failure – Causes of failure – Procedure for slip circle method – Earth pressure in soils: active and passive states – Lateral earth pressure – Rankine's theory – Cullman's Graphical method – Stabilization of soil using various methods – Landslide – Mechanics of landslide.

TOTAL: 45 PERIODS

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OUTCOMES

Upon completion of the course, the students will be able to:

- Understand the importance of soil investigation in various civil Engineering projects.
- Estimate bearing capacity incorporating IS codal provisions.
- Do proper foundation proportioning for any kind of shallow foundation system and get exposure in foundation analysis.
- Estimate pile and pile group capacity, group efficiency for various types of soils.
- Analysis earth retaining structures for various soil conditions.

TEXT BOOKS

1. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
2. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.

REFERENCES

1. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2016.
2. Gopal Ranjan A.S.R. Rao, "Basic and Applied soil Mechanics",New Age International (P) Limited, Publishers, New Delhi, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105176/(Foundation Engineering)
2. https://nptel.ac.in/courses/105/107/105107120/(Foundation Engineering)

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19CEE501	WATER SUPPLY ENGINEERING	L T P C
	(Lab Embedded Theory Course)	3 0 2 4

OBJECTIVES

The students should be made to:

- Understand the principles of water supply system and planning the sources.
- Get knowledge in conveyance system of water.
- Grasp the treatment of water.
- Recognize the advanced treatment techniques of water supply.
- Gain knowledge about water distribution and supply of buildings.
- Provide an opportunity to learn and to analyse the water quality parameters.

UNIT I: PLANNING FOR WATER SUPPLY SYSTEM   9

Public water supply system – Planning – Objectives – Design period – Population forecasting – Water demand – Sources of water and their characteristics – Surface and Groundwater – Impounding Reservoir Well hydraulics – Development and selection of source – Water quality – Characterization and standards – Impact of climate change.

UNIT II: CONVEYANCE SYSTEM   9

Water supply – Intake structures – Functions and drawings – Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – Drawings appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III: WATER TREATMENT   9

Objectives – Unit operations and processes – Principles, functions design and drawing of Chemical feeding, Flash mixers, flocculators, sedimentation tanks and sand filters – Disinfection – Residue Management – Construction and Operation & Maintenance aspects of Water Treatment Plants.

UNIT IV: ADVANCED WATER TREATMENT   9

Principles and functions of Aeration – Iron and manganese removal, Defluoridation and demineralization – Water softening – Desalination – Membrane Systems – Recent advances.

UNIT V: WATER DISTRIBUTION AND SUPPLY   9

Requirements of water distribution – Components – Service reservoirs – Functions and drawings – Network design – Economics – Computer applications – Analysis of distribution networks – Appurtenances – Operation and maintenance – Leak detection, Methods. Principles of design of water supply in buildings – House service connection – Fixtures and fittings – Systems of plumbing and drawings of types of plumbing.

TOTAL: 45 PERIODS

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LIST OF EXPERIMENTS

1. Determination of Turbidity by using Nephlometer.
2. Measurement of PH and conductivity of water sample.
3. Determination of Hardness by EDTA method.
4. Determination of Alkalinity.
5. Determination of Acidity in water.
6. Determination of Chlorides.
7. Determination of Residual chlorine.

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Recognize the water supply system, water sources and water quality characteristics and standards.
- Concept of various water conveyance systems.
- Understand the various treatments for water supply.
- Learn about the advanced treatment for water supply.
- Know the various concepts of water distribution network and supply for buildings.
- Gain sufficient idea on practice and procedure of water treatment.

TEXT BOOKS

1. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2018.
2. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2016.

REFERENCES

1. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2017.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/103/107/103107084/(Environmental Engineering)
2. https://nptel.ac.in/courses/105/106/105106119/(Water and Waste Water Engineering)

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19CEE502   **CONCRETE TECHNOLOGY AND TESTING OF CONCRETE**   **L T P C**
(Lab Embedded Theory Course)   **3 0 2 4**
(IS: 10262– 2009 Code Book is to be Permitted)

OBJECTIVES

The students should be made to:

- Impart knowledge on the types and properties of cement.
- Understand about properties of concrete making materials.
- Study about concrete design mix.
- Study the behaviour of concrete at the fresh and hardened state.
- Impart knowledge on the special concretes.
- Provide an opportunity to learn and how to measure the parameters which governs the quality of the materials.

UNIT I: PROPERTIES OF CEMENT   9

Manufacturing of Cement by wet and dry Process, Types of cement – Properties of Cement – Heat of Hydration – Test on Cement – Field Test – Laboratory Testing Methods – Fineness of cement, Consistency of cement, Specific Gravity of cement, Setting properties of cement, Soundness of cement and compressive strength of cement mortar.

UNIT II: AGGREGATES AND ADMIXTURES   9

Fine aggregate and coarse aggregate – Properties and testing methods of fine aggregates(M – Sand and P – Sand) – Fineness modulus – Bulking of Sand – Sieve analysis – Properties and testing methods of coarse aggregates – Crushing test, Abrasion test, Impact test, Specific gravity and water absorption test – Mineral and chemical admixture.

UNIT III: MIX DESIGN AND CONCRETE PRODUCTION   9

Selection of materials for concrete – Water cement ratio – Concrete mix design – Concepts variables in proportioning – Methods of mix design – Indian Standard method, Factor affecting the test results, process of manufacture of concrete – Properties of fresh concrete – Workability – Measurement of workability – Statistical and quality control of concrete – Outline the design of Ready mix concrete.

UNIT IV: STRENGTH OF CONCRETE   9

Strength of concrete – Gain of strength with age – Testing of hardened concrete – Compressive strength – Tensile strength – Flexural strength – Modulus of elasticity of concrete – Stress and Strain characteristics. Introduction to NDT Techniques – Rebound hammer and Ultrasonic pulse velocity test.

UNIT V: SPECIAL CONCRETES   9

Introduction to Polymer concrete, High performance concrete – High strength concrete – Fibre reinforced concrete – Light weight concrete – Ready mix concrete and pumping of concrete.

TOTAL: 45 PERIODS

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LIST OF EXPERIMENTS

1. Fineness Test on Cement.

2. Consistency, Initial and Final Setting Time Test on cement.

3. Specific Gravity and Fineness Modulus Test on Fine aggregate.

4. Water Absorption and Specific Gravity Test on Coarse Aggregate.

5. Crushing Strength and Impact Strength Test on Coarse Aggregate.

6. Test on Fresh Concrete (Slump, Vee – Bee, Compaction Factor).

7. Test on Hardened concrete (Cube, Cylinder, Prism).

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Determine the properties of cement.

- Find out the properties of aggregates and admixtures.

- Understand the IS mix design and quality control of concrete.

- Determine the properties of fresh and hardened concrete.

- Acquire knowledge about the application of special concretes.

- Ensure the strength characteristics of the given concrete materials.

TEXT BOOKS

1. Gambir M. L, Concrete Technology, Tata MC-Graw Hill-Education, 2018.

2. Shetty M.S., Concrete Technology, S. Chand & Company Ltd., 2019.

REFERENCES

1. Santhakumar A. R., "Concrete Technology", Oxford University Press, New Delhi, 2018.

2. Neville A.M., "Properties of Concrete", Pearson England Limited, England, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/102/105102012/(Concrete Technology)

2. https://nptel.ac.in/courses/105/106/105106176/(Advance Concrete Technology)

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19EEC501	**QUANTITATIVE APTITUDE LEARNING**	**L T P C**
	(Common to Civil, CSE, ECE, EEE & Mechanical)	**0 2 0 0**

OBJECTIVES

The students should be made to:

- Understand the basics of the numbers, Highest common factor and Least common multiple.

- Develop the use of decimal fraction and problems on ages.

- Introduced basic concepts of time, work, distance, calender and clock.

- Acquaint the student with the concept of simple and compound interest.

- Understand the knowledge of polynomial and quadratic equations.

UNIT I: NUMBERS, HIGHEST COMMON FACTOR AND LEAST COMMON MULTIPLE   **6**

Numbers and their basic classification – Types of number – Basic operations of numbers – Progression – Tests of divisibility – Highest common factor – Least common multiple.

UNIT II: DECIMAL FRACTION AND PROBLEMS BASED ON AGES   **6**

Decimal fraction – Types of fraction – Comparison of fractions – Inserting fractions in between two given fractions – Relation between decimal fraction and normal fraction – Conversion of a decimal fraction into a vulgar fraction – Types of decimals – Conversion of mixed recurring decimal into a vulgar fraction – Standard form of decimal – Problems based on ages.

UNIT III: TIME, WORK, DISTANCE, CALENDER AND CLOCK   **6**

General rule for time and work – General rule for work and wages – Speed – Unit of speed – Average speed – Some useful relations – Problems on Trains – Calenders and clocks – Odd days – Ordinary year – Leap year.

UNIT IV: SIMPLE INTEREST, COMPOUND INTEREST AND ELEMENTARY ALGEBRA   **6**

Simple interest – Compound interest – Some useful relations – Difference between compound interest and simple interest – Short cut methods to solve special types of problems – Elementary Algebra and averages.

UNIT V: POLYNOMIAL AND QUADRATIC EQUATIONS   **6**

Polynomial introduction – Degree of a polynomial – Types of polynomial – Operations on polynomial – Remainder and factor theorem – Quadratic equation – Pure Quadratic equation – Discriminant – Roots of the Quadratic equations – Solution of Quadratic equation – Framing of a Quadratic equation – Special types of roots.

TOTAL: 30 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the basic concepts and techniques of the numbers, Highest common factor and Least common multiple.

- Apply the concept of decimal fraction and problems on ages.

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- Understand and apply the concept of time, work, distance, calendar and clock.

- Acquire skills in simple interest, compound interest and elementary algebra.

- Exposed to concepts and properties of polynomial and quadratic equations.

TEXT BOOKS

1. Aggarwal R.S., "Quantitative Aptitude", S.Chand & Company Ltd, New Delhi, 2016.

2. Dinesh Khattar, "Quantitative Aptitude for competitive examinations ", Pearson India Education Services Pvt. Ltd, New Delhi, 2019.

REFERENCES

1. Praveen R.V., "Quantitative Aptitude and Reasoning", PHI Learning Private Limited, Delhi, 2013.

2. Gupta P, "A unique Approach to Quantitative Aptitude ", Unique Publishers (I) Pvt. Ltd, New Delhi, 2017.

E-RESOURCES

1. https://youtube.com/playlist?list=RDQM5Xl256aOq24(Quantative Aptitude Learning)

2. https://youtu.be/KE7tQf9spPg(Quantative Aptitude Learning)

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19MDC501	VALUE ADDED COURSE – II	LT P C
	(STAAD Pro)	– – – –

OBJECTIVES

The students should be made to:

- Train in Structural Modeling.
- Know about Loading.
- Understand about seismic load.
- Give an exposure to designing and analysis.
- Integrated Design and Finite Element Analysis.

UNIT I: MODELLING

Introduction to STAAD – Starting a project – Modeling a structure – Creating nodes & members geometry wizard – Property definition – Material definition – Support definition – Specifications.

UNIT II: LOADING

Nodal load – Member loads – Uniform force and moment – Concentrated force and moment – Linear varying load – Trapezoidal load – Hydrostatic Load – Area load – Floor load.

UNIT III: LOAD DEFINITIONS

Wind load – Creating load combination – Automatic load combination – Edit auto load rules – Moving load – Seismic load.

UNIT IV: ANALYSIS

Frame analysis – Truss analysis.

UNIT V: DESIGN

Concrete design – Steel design – Introduction to other softwares related to civil engineering.

TOTAL: 15 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Familiarize on the modeling of different kinds of structures.
- Understand the concepts of loading in the structures.
- Know about the various loading patterns on the structures.
- Analyse the frame and truss type structures.
- Design the different types of structures.

TEXT BOOKS

1. Sham Tickoo "Exploring Bentley STAAD.Pro CONNECT", 3rd Edition, 2017.
2. T. S. Sarma "Design of Industrial Steel and R C C Buildings Using Staad Pro: With Indian Examples 2020".

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REFERENCES

1. T. S. Sarma "Staad Pro v8i for beginners", 3rd Edition ,2017.

2. C.S.Changeriya, "STAAD.Pro", Chetan Publication;, 2016.

E-RESOURCES

1. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17 – ce21/(Staad.Pro)

2. https://nptel.ac.in/courses/105/106/105106149/(Staad.Pro)

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19MDC502   **SURVEY CAMP**   **L T P C**
                                                                       0 0 2 0

OBJECTIVES

The students should be made to:

- To give practical exposure on the application of various basic principles of survey in the field.

- Practically apply various simple surveying techniques, both in field and construction industries.

- Measure and draw the longitudinal and cross sectioning.

- Measure the horizontal and vertical angles for triangulation work.

- Provide experience to handle modern surveying equipments using total station.

LIST OF EXPERIMENTS

Ten days survey camp using theodolite, leveling and total station. At the end of the camp, each student shall have plot the contour map and calculate the area. The camp record shall include all original field observations, calculations and plots.

1. Triangulation.
2. Trilateration.
3. Contouring.
4. Co– ordinates and distance measurement with GPS.
5. Distance and angular measurement using total station.
6. Layout Preparation of field using total station.
7. Setting out works using total station.

(Ten Days Survey Camp will be conducted during 5th Semester winter vacation)

OUTCOMES

Upon the completion of the course, the students will be able to:

- Calculate the area of various construction project sites.

- Estimate the volume of earthwork required and planned the layout of engineering projects.

- Prepare detailed topographical map of the area.

- Acquire knowledge about the layout preparation by using total station.

- Gain sufficient idea on setting out of works.

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SEMESTER VI

19CET601	**DESIGN OF STEEL STRUCTURES**	**L T P C**
	(IS 800 – 2007, IS 875 – 1987 and Steel Tables are to be Permitted)	**3 1 0 4**

OBJECTIVES

The students should be made to:

- Study the design of bolted and welded connections.
- Provide knowledge on design of tension members.
- Get familiar with compression member design.
- Study the behavior of flexural members and design the beams.
- Understand the design of industrial buildings.

UNITI: INTRODUCTION 9+3

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Connections using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections – Efficiency of joints.

UNIT II: TENSION MEMBERS 9+3

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+3

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of laced and battened type columns – Design of column bases – Gusseted base.

UNIT IV: BEAMS 9+3

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders – Intermediate and bearing stiffeners – Flange and web splices – Introduction to tubular sections.

UNIT V: ROOF TRUSSES AND INDUSTRIAL STRUCTURES 9+3

Roof trusses – Roof and side coverings – Design of purlin and elements of truss; End bearing – Design of gantry girder –.Metro Station roof and truss – Arches.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Analyse the behaviour of bolted and welded connecting and design them.
- Know the concept and design of tension members.
- Design compression members using simple and built– up sections.
- Aspire various types of flexural members.
- Understand the Industrial structures and their components.

TEXT BOOKS

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2016.
2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2016.

REFERENCES

1. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800 – 2007, IK International Publishing House Pvt. Ltd., 2019.
2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105162/(Design of steel structures)
2. https://nptel.ac.in/courses/105/106/105106113/(Design of steel structures II)

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19CET602	STRUCTURAL ANALYSIS II	L T P C
		3 1 0 4

OBJECTIVES

The students should be made to:

* Analyses statically indeterminate structures by imposing boundary conditions on flexibility matrix.
* Formulate the element stiffness matrix and assemble the structure matrix for solving indeterminate problems.
* know the concepts of elastic analysis and plastic analysis.
* Analyse the suspension bridges and space truss.
* Understand the basics of finite element method and its application in structural analysis.

UNIT I: MATRIX FLEXIBILITY METHOD   9+3

Element flexibility – Structure flexibility – Formulation of Structure flexibility matrix – Determination of forces / displacements – Application to simple determinate and indeterminate beams, frames and trusses.

UNIT II: MATRIX STIFFNESS METHOD   9+3

Element stiffness – Structure stiffness – Formulation of Structure stiffness matrix – Application to simple determinate and indeterminate beams, frames and trusses.

UNIT III:PLASTIC ANALYSIS OF STRUCTURES   9+3

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

UNIT IV: SPACE AND CABLE STRUCTURES   9+3

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – Suspension bridges with two and three hinged stiffening girders.

UNIT V: INTRODUCTION OF FINITE ELEMENT METHOD   9+3

Introduction – Discretization of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain – Triangular elements.

TOTAL: 45 +15=60 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

* Analyse the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.
* Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

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- Analyse the indeterminate beams and frames using plastic analysis.

- Determine the member forces in suspension bridges and space truss.

- Explain the basic concepts in finite element method.

TEXT BOOKS

1. Vaidyanathan, R and Perumal, P. "Comprehensive Structural Analysis," Volume I and II, Laxmi Publications Pvt. Ltd., Chennai, 4th Ed., 2016.

2. V.N.Vazirani and M.M.Ratwani, "Analysis of Structures" Volume I and II, Khanna Publishers, New Delhi, 2015.

REFERENCES

1. S.S.Bhavikatti, "Structural Analysis" – Vol. I & II, Vikas Publishing Pvt Ltd., New Delhi, 4th Edition, 2015.

2. G.S.Pandit & Gupta S.P, Structural Analysis (A Matrix Approach), Tata McGraw Hill, Publishing Ltd, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105109/ (Structural Analysis II)

2. https://nptel.ac.in/courses/105/105/105105041/ (Finite Element Analysis)

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19CET603   DESIGN OF REINFORCED CONCRETE AND MASONRY STRUCTURES   L T P C
(IS 456, SP 16, IS 1905 and IS 3370 Code Books are to be Permitted)   **3 0 0 3**

OBJECTIVES

The students should be made to:

- Provide knowledge in solid background on the principles of structural engineering design.
- Acquire the knowledge of liquid retaining structures.
- Give an exposure to the design of continuous beams, slabs and water tank.
- Introduce yield line theory.
- Understand the design of axially and eccentrically loaded brick walls.

UNIT I: RETAINING WALL   **9**

Design of Cantilever and Counterfort Retaining walls.

UNIT II: WATER TANKS   **9**

Design of rectangular and circular water tanks both below and above ground level – Design of circular slab.

UNIT III: SELECTED TOPICS   **9**

Design of flat slabs – Principles of design of mat foundation, box culvert and road bridges.

UNIT IV: YIELD LINE THEORY   **9**

Assumptions – Characteristics of yield line – Determination of collapse load / plastic moment – Application of virtual work method – Square, rectangular, circular and triangular slabs – Design problems.

UNIT V: BRICK MASONRY   **9**

Introduction, Classification of walls, Lateral supports and stability, effective height of wall and columns, effective length of walls, design loads, load dispersion, permissible stresses, design of axially and eccentrically loaded brick walls.

                                                                              TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Determine the reinforced concrete Cantilever and Counterfort Retaining Walls.
- Analyse the flat slab as per code provisions.
- Explain and draw reinforced concrete steel water tanks.
- Understand the yield line theory.
- Design of axially and eccentrically loaded brick walls.

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TEXT BOOKS

1. Gambhir.M.L, "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2015.

2. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2015.

REFERENCES

1. Varghese.P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2015.

2. Subramanian. N., Design of Reinforced Concrete Structures", Oxford University, New Delhi, 2016.

E– RESOURCES

1. https://nptel.ac.in/courses/105/106/105106197/(Design of Masonry Structures)

2. https://nptel.ac.in/courses/105/105/105105105/(Design of Reinforced Concrete Structures)

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19CEE601	**WASTE WATER ENGINEERING**	**L T P C**
	(Lab Embedded Theory Course)	**3 0 2 4**

OBJECTIVES

The students should be made to:

- Gain the knowledge of Physical, Chemical and Biological Characteristics of waste water and their sources.
- Design the primary treatment units of wastewater.
- Design various secondary sewage treatment units.
- Understand the various disposal methods of sewage.
- Acquire basic knowledge of treatment of sludge.
- Get knowledge in treatment of water.

UNIT I: SEWAGE AND DESIGN OF SEWERS   9

Sources of wastewater – Quantity of sanitary sewage – Storm water runoff estimation – Wastewater characteristics and significance – Design of sewers – Laying, jointing and testing of sewers– Sewer appurtenances – Pump selection.

UNIT II: UNIT OPERATIONS AND PRIMARY TREATMENT   9

Objectives – Selection of unit operations and process – Physical, Chemical and Biological Unit operations – Design principles of primary treatment – Screen chamber, grit chamber, primary sedimentation tank – Primary & secondary clarifiers – Grey water harvesting.

UNIT III: SECONDARY TREATMENT   9

Design principles of secondary treatment – Activated sludge process – Modified activated sludge process and oxidation ditch – Trickling filter– Stabilization ponds – Septic tank with soak pits – Sequencing Batch Reactor (SBR) – Membrane Bioreactor – UASB – Recent Advances in Sewage Treatment – Industrial Waste.

UNIT IV: SEWAGE DISPOSAL   9

Disposal on land – Sewage farming – Disposal into water bodies – Oxygen sag curve – Streeter Phelps model – Wastewater reclamation techniques – One pipe and two pipe system – Soil dispersion system – Mass balance principle.

UNIT V: TREATMENT AND DISPOSAL OF SLUDGE   9

Characteristics – Thickening – Dewatering – Phosphorus recovery – Digestion – Design of Digesters – Composting – Incineration – Drying Beds – Biogas Recovery – Emerging Technologies.

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LIST OF EXPERIMENTS

1. Determination of Optimum Coagulant by Jar test.
2. Determination of Total, Dissolved and Suspended solids.
3. Determination of Available chlorine in bleaching powder.
4. Determination of Dissolved Oxygen for the given sample.
5. Determination of BOD for the given sample.
6. Determination of COD for given sample.
7. Determination of Sulphates for given sample.

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Know the basic characteristics and sources of wastewater.
- Design the primary treatment units of wastewater.
- Design secondary treatment units of wastewater.
- Familiar with the sewage disposal methods.
- Design the treatment units for sludge disposal.
- Recognize the water supply system, water sources and its quality, characteristics and standards.

TEXTBOOKS

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2016.

REFERENCES

1. Syed R. Qasim "Wastewater Treatment Plants", CRC Press,Washington D.C., 2017.
2. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., NewDelhi, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/105/106/105106119/(Waste and Waste Water Engineering)
2. https://nptel.ac.in/courses/105/105/105105048/(Waste Water Management)

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19CEJ601	DESIGN PROJECT	L T P C
	(Activity Based –Subject Related)	0 0 2 1

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.

GUIDELINES

This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings, prototype/ model which follow the design.

TOTAL: 15 PERIODS

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks (Continuous Assessment):40 marks.

   (Decided by review committee consist of HoD, Guide and senior faculty member conducting 3 reviews)

2. End semester assessment (Evaluation of Project Report &Vivavoce examination) : 60 marks.

   (Evaluated by the internal & external examiner appointed by the CoE and approval by HoD)

OUTCOME

- At the end of the course the students will have a clear idea of his/her area of work.

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19MDC601	**CONSTITUTION OF INDIA**	**L T P C**
	(Common to Civil, CSE, ECE, EEE & Mechanical)	**3 0 0 0**

OBJECTIVES

The students should be made to:

- Understand the Meaning of the constitution law and constitutionalism.
- Realize the fundamental rights.
- Understand the execution powers of union and states bout.
- Be aware of the Constitutional powers.
- Acquaint with other Constitutional Functionaries.

UNIT I: INTRODUCTION 9

Meaning of the constitution law and constitutionalism – Historical perspective of the Constitution of India – Preamble – Salient features and characteristics of the Constitution of India – Citizenship.

UNIT II: FUNDAMENTAL RIGHTS 9

Scheme of the fundamental rights – The scheme of the Fundamental Duties and its legal status – The Directive Principles of State Policy – Its importance and implementation.

UNIT III: UNION AND STATE EXECUTIVE 9

Federal structure and distribution of legislative and financial powers between the Union and the States – Parliamentary Form of Government in India – The constitution powers and status of the President of India – Governor – Appointment, Powers and Functions.

UNIT IV: CONSTITUTIONAL POWERS 9

Amendment of the Constitutional Powers and Procedure – The historical perspectives of the constitutional amendments in India – Emergency Provisions: National Emergency, President Rule, Financial Emergency.

UNIT V: OTHER CONSTITUIONAL FUNCTIONARIES 9

Election Commission of India: Organization, Powers and Functions, Union Public Service Commission, State Public Service Commission – Local Self Government.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the Salient features and characteristics of the Constitution of India.
- Analyze the scheme of the Fundamental rights and Duties.
- Evaluate in detail about the powers between the Union and the States.
- Know the concept of Constitutional Powers.
- Recognize other constitutional functionaries.

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TEXT BOOKS

1. Introduction to the Constitution of India – Durga DasBasu.

2. Our Constitution by Subhash by C.Kashyap.

REFERENCES

1. Indian Polity by Spectrum.

2. The Indian Constitution: Cornerstone of a Nation, by Granville Austin.

E-RESOURCES

1. https://www.youtube.com/watch?v=vq2Q1_v6TNU

2. https://www.india.gov.in/my– government/constitution– india/constitution– india– full– text

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SEMESTER VII

19CET701 **PRE-STRESSED CONCRETE STRUCTURES** **L T P C**

(IS 1343, IS 3370 Code Book is to be Permitted) **2 2 0 3**

OBJECTIVES

The students should be made to:

- Introduce the design of prestressed concrete structures subjected to flexure.
- Establish the design of prestressed concrete structures subjected to shear.
- Calculate prestressed losses for simple prestressed concrete girders.
- Design prestressed concrete girders for flexure using current design procedures.
- Construct moment – curvature and load – deflection curves for a prestressed concrete beam.

UNIT I: BASICS OF PRESTRESSED CONCRETE 6+3

Basic principles of prestressing – Historical development – Classification and types – Advantages over ordinary reinforced concrete – Materials – Necessity of high strength concrete and high tensile steel. Mechanical systems of prestressing – Freyssinet, Magnel Blaton, Lee McCall and Killick Anchorage systems. Losses – Elastic shortening – Anchorage slip – Shrinkage and creep of concrete – Relaxation of steel – Friction losses – Introduction to Segmental Construction.

UNIT II: DESIGN CONCEPT 6+3

Design for shear based on IS 1343 – 1980 code – Determination of anchorage zone stresses in post – Tensioned beams by Magnels method and IS 1343 – 1980 code method – Design of anchorage zone reinforcement – Check for transfer bond length – Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections – Check for serviceability limit state of deflection.

UNIT III: FLEXURE 6+3

Basic assumptions – Permissible stresses in steel and concrete as per IS 1343-1980 code – Design of sections of post – Tensioned and pre-Tensioned beams (Type I and II) – Check for strength limit state based on IS 1343-1980 code – Layout of cables in post tensioned beams – Location of wires in pre– Tensioned beams – Principles, methods of achieving, partial pre stressing – Design of Partial pre stressing members.

UNIT IV: CIRCULAR PRESTRESSING, TENSION COMPRESSION MEMBERS 6+3

Circular pre stressing – General features of prestressed concrete tanks – Analysis and design of prestressed concrete tanks – Types of prestressed concrete pipes – Design of prestressed concrete pipes (non cylinder type) – Design of prestressed concrete tension and compression members.

UNIT V: CONCRETE CONTINUOUS BEAMS 6+3

Methods of achieving continuity in prestressed concrete beams – Analysis for secondary moments in continuous beams – Concordant cable profile and linear transformation – Calculation of stresses in continuous beams – Formwork and Erection of pre-stressed elements.

TOTAL: 30+15=45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand prestressing methods, principles and concepts and determine losses in prestress.
- Determine anchorage zone stresses and deflections.
- Design flexural members with partial prestressing.
- Construct prestressed concrete tanks, pipes and tension and compression members.
- Calculate the stresses in continuous beam.

TEXT BOOKS

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2018.
2. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2017.

REFERENCES

1. Sinha N C and Roy S K, "Fundamentals of Prestressed Concrete", S Chand & Co, 2017.
2. T.Y. Lin and Ned.H Burnes "Design of Prestressed Concrete", John Wiley Sons, NewYork, Latest, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/106/105106118/(Prestressed Concrete Structures)
2. https://nptel.ac.in/courses/105/106/105106117/(Prestressed Concrete Structures)

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19CET702   CONSTRUCTION RESOURCE PLANNING AND MANAGEMENT   L T P C
3 0 0 3

OBJECTIVES

The students should be made to:

- Study the concepts of construction resource planning, scheduling and to apply appropriate tools and techniques like allocation of resources as per requirement.
- Introduce the methods of project estimation and obtain the knowledge of planning and   preparing budgets for the construction projects.
- Know the materials and equipments used in construction projects and gain knowledge in proper utilization of procurement.
- Make aware of labour management and regulations for construction activities.
- Create awareness on resource leveling and resource allocation.

UNIT I: RESOURCE PLANNING   9

Introduction to resources – Types of resources, manpower, Equipment, Material, Money – Resource Planning – Manpower, Equipment, Material, Money – Scheduling – Procurement management.

UNIT II: COST MANAGEMENT   9

Methods of Estimating project cost (An overview), Classification of construction cost – Planning resources unit rate, cost inflation, Escalation and Contingencies, Earned value budget – Project master budget – Contractors cost control system.

UNIT III: PROCUREMENT MANAGEMENT   9

Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution – control methods – Inventory basics, Inventory Planning – EOQ.

Equipment: Planning and selecting, Extension of Equipment, Types,Cost control Methods, Depreciation and Replacement.

UNIT IV: LABOUR MANAGEMENT   9

Labour Regulations: Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial disputes. Labour Administration – Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour, Insurance and Safety Regulations – Workmen's Compensation Act – Other labour Laws.

UNIT V: RESOURCE ALLOCATION AND LEVELLING   9

Resource list – Resource Allocation – Resource Leveling and Smoothening – Importance of
Project Scheduling – Time – cost trade off – Value Management.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the importance of construction planning and organizational cultures.

- Estimate costs associated with different construction projects.

- Discuss the relationship between strategic planning and project planning.

- Describe the advanced scheduling techniques.

- Prepare various types of Project Information using Database Management Systems.

TEXT BOOKS

1. Chitkara .K.K, "Construction Project Management", McGraw Hill, 2019.

2. Sharma .S.C, "Construction Engineering and Management", Khanna Publishers, 2017.

REFERENCES

1. Senguptha .B, "Construction Management and Planning", Tata McGraw Hill, 2005.

2. Prasanna Chandra, (2017), Project Planning, Analysis, Selection, Implementation and Review, 8th Edition, McGraw – Hill, New Delhi.

E-RESOURCES

1. https://nptel.ac.in/courses/105/103/105103093/ (Construction Planning and Management)

2. https://nptel.ac.in/courses/105/104/105104161/(Principal of Construction Management)

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19CEE701	**ESTIMATION COSTING AND VALUATION**	**L T P C**
	(Lab Embedded Theory Course)	**3 0 2 4**

OBJECTIVES

The students should be made to:

* Impart the knowledge on basic concepts related to estimate preparation.

* Analyses the rate of a work item according to the specification.

* Understand the concepts behind the preparation and estimation of the various civil engineering works.

* Study the rate analysis, valuation of properties and preparation of reports for estimating various items.

* Understand the terminologies and concepts behind the valuation of properties, depreciation and time value of money.

* Know the real– time practical estimation and quantity arrival of materials.

UNIT I: INTRODUCTION TO ESTIMATES AND SPECIFICATIONS   9

General introduction to Quantity surveying – Purpose of estimates – Types of estimates, various items to be included in estimates – Principles in selecting units of measurement for items, various units and modes of measurement for different trades – I.S. 1200, Specifications – Purpose and basic principles of general and detailed specifications – Detailed specifications for various items of work.

UNIT II: RATE ANALYSIS AND TENDERS   9

Standard Data – Observed Data – Standard schedule of rates – Market rates – Standard Data for Man Hours and Machineries for common civil works of rates, factors affecting the cost of materials, labour, Task work, schedule as basis of labour costs. Plants and equipment – Hour costs based on total costs and outputs.Overhead charges, rates for various items of construction of civil engineering works. Price escalation.

UNIT III: ESTIMATION OF CIVIL ENGINEERING WORKS   9

Reading and interpretation of architectural and structural drawings – Detailed estimate of masonry buildings, R.C.C works, Preparation of schedule for steel as reinforcement – Preparation of bills of quantities – Approximate estimates, purpose, various methods used for buildings and other civil engineering works such as culvert and road projects – Estimating of irrigation works – Aqueduct, siphon.

UNIT IV: VALUATION   9

Principles of valuation, definition of value, price and cost – Attributes of value, Different types of values – Valuer and his duties, purpose of valuation and its function. Factors affecting the valuation of properties – Free hold and leasehold properties, different types of lease – Methods of valuation – Forms of rent, different types of rent – Carpet area basis, unit basis, cubic content basis – Sinking fund, Depreciation.

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UNIT V: REPORT PREPARATION AND CONTRACTS   9

Principles for report preparation – Report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells. Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements.

LIST OF EXPERIMENTS

1. Rate analysis for earth work, PCC, RCC, Brick work, plastering and steel fabrication and cost Estimates – (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper).
2. Calculation of quantities and prepare the estimate for load bearing structure (Residential).
3. Calculation of quantities and prepare the estimate for framed structure(Commercial).
4. Prepare the bar– bending schedule for footing, column, plinth / roof beam and slab.

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Prepare the estimate corresponding to the required specification.
- Arrive rates of various work items in civil Engineering works and familiarized with tendering and contacts.
- Prepare bills of quantities in construction works.
- Predict the value of properties considering various influencing factors.
- Get familiarized with report process.
- Get more knowledge about the Valuation and Estimation of buildings.

TEXT BOOKS

1. Dutta, B.N., "Estimating and Costing in Civil Engineering (Theory and Practice)", UBS Publishers & Distributors Pvt. Ltd., New Delhi, 2016.
2. Birdie .G.S, "Text Book on Estimating and Costing", Dhanpat Rai Publishing Company, New Delhi, 2015.

REFERENCES

1. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2015.
2. Rangwala .S.C.," Estimating, Costing and Valuation", Charotar Publishing House, Anand, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/105/103/105103093/(Construction Planning and Management)
2. https://nptel.ac.in/content/storage2/courses/105103023/pdf/mod5.pdf(Construction Economics)

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19CEJ701   **PROJECT WORK (PHASE – I)**   **L T P C**
                                                              0 0 2 0

OBJECTIVES

The students should be made to:

- Identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- Develop the methodology to solve the identified problem.
- Train the students in preparing project reports and to face reviews and viva– voce examination.

GUIDELINES

The students work on a specific topic approved by faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programmed. The topic may be experimental or analytical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. Project work may be allotted to a single student or to a group of students not exceeding 4 per group. The title of project work is approved by head of the department under the guidance of a faculty member and student(s) shall prepare a comprehensive project report after completing the work to the satisfaction of the guide.

TOTAL: 15 PERIODS

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks (Continuous Assessment):100 marks.

   (Decided by review committee consist of HoD, Guide and senior faculty member conducting 3 reviews)

OUTCOME

- At the end of the course project the students will have a clear idea of his/her area of work and they are in a position to carry out the remaining phase II work in a systematic way.

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19MDC701	**INDUSTRIAL TRAINING**	**L T P C**
	(Minimum 15 Days during Vacation 6th Semester Vacation)	**0 0 0 1**

OBJECTIVES

The students should be made to:

- Train in field work as a first hand knowledge by giving practical problems to carry out engineering tasks.
- Develop skills in facing and solving the field problems.
- Form groups by submitting a complete report on the practical training.

GUIDELINES

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.

EVALUATION PROCEDURE

The Industrial Training shall carry 100 marks and shall be evaluated through internal assessment.

The method of evaluation will be as follows:

1. Evaluation of Industrial Training Report : 50 marks (Evaluated by the Internal examiner).
2. Power Point Presentation: 50 marks.

   (Evaluated by the internal examiner appointed by the HoD with the approval of HoD and the CoE)

OUTCOMES

Upon the completion of the training, the students will be able to:

- Gain better experience in practical knowledge and construction needs.
- Acquire the intricacies of implementing textbook knowledge into practice.
- Know the concepts of developments and implementation of new techniques.

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19CEJ801	PROJECT WORK (PHASE – II)	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 and also to train the students in preparing project reports, face reviews and viva voce examination.

GUIDELINES

The students work on a specific topic approved by faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programmed. The topic may be experimental or analytical or case studies or combination these. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. Project work may be allotted to a single student or to a group of students not exceeding 4 per group. The title of project work is approved by head of the department under the guidance of a faculty member and student(s) shall prepare a comprehensive project report after completing the work to the satisfaction of the guide.

TOTAL: 300 PERIODS

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks (Continuous Assessment):40 marks.

   (Decided by review committee consist of HoD, Guide and senior faculty member conducting 3 reviews)

2. End semester assessment (Evaluation of Project Report & Viva voce examination):60 marks.

   (Evaluated by the internal & external examiner appointed by the CoE and approval by HoD)

OUTCOME

- On completion of the project work students will be in a position to take up any challenging practical problem and find better solutions.

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PROFESSIONAL ELECTIVE – I

19CEPX01 **ARCHITECTURE AND TOWN PLANNING** **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

- Impart knowledge on the fundamentals of visual perception and principles.
- Demonstrate competency in the technical, practical skills of landscape architecture and their role in investigating complex and innovative ideas.
- Give exposure about architectural principles in the design of buildings.
- Suggest the land requirement as per the zoning regulations.
- Understand the approach of various building types with specific reference to site.

UNIT I: INTRODUCTION TO ARCHITECTURE   9

Fundamentals concepts of architecture – Principles of planning – Qualities – Strength – Refinement – Repose – Scale, Proportion, Colour, Solids and Voids and Symmetry.

UNIT II: INTERIOR DECORATIONS   9

Interior Planning and treatment – Use of natural and synthetic building materials – Thermal and Acoustical materials – Lighting & illumination.

UNIT III: PLANNING AND CONCEPTS OF TOWN PLANNING   9

Planning Surveys – Importance of Climate topography, drainage and water supply in the selection of site for the development – Residential – Commercial – Industrial – Public – Transportation, Basic amenities and services – Planning in smart cities.

UNIT IV:FUNCTIONAL PLANNING OF BUILDINGS   9

Occupancy classification of buildings – General requirements of site and building – Building codes and rules – Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings – The process of identifying activity areas and linkages.

UNIT V: COUNTRY PLANNING AND HOUSING   9

Plan implementation: Town planning legislation and municipal acts – Planning control development schemes – Urban financing – Land acquisitions – Slum clearance schemes. Examples of planned cities and housing in India – Applications of Remote Sensing and GIS in town planning.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the various elements of architecture and principles of orientation.
- Choose the various building materials as per the interior design aspects.
- Make plan for the buildings by considering our Indian climatic conditions.
- Solve the problem in Town Planning level.
- Know various rules and regulations of town planning and development authorities.

TEXTBOOKS

1. Pramar. V.S. "Design fundamental in Architecture", Somiya Publications Pvt. Ltd., New Delhi, 2016.
2. G.K. Hiraskar, "Fundamentals of Town Planning", Dhanpat Rai Publications Pvt.Ltd., New Delhi., 2017.

REFERENCES

1. Biswas Hiranmay, "Principles of Town Planning and Architecture", VAYU Education of India, New Delhi., 3rd Edition., 2016.
2. S.C.Rangwala, K.S.Rangwala and P.S.Rangwala, 'Town Planning", Charotar Publishing House, 25th Edition., 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/124/107/124107001/ (Housing Policy and Planning)
2. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19– ar04/ (Housing Policy and Planning)

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19CEPX02	**CONSTRUCTION PLANNING AND SCHEDULING**	**L T P C**
		3 0 0 3

OBJECTIVES

The students should be made to:

- Study the necessity of the planning in the diverse construction projects.
- Know the appropriate techniques used for scheduling the resources.
- Know the exposure on various cost control methods and accounting.
- Study the quality control and monitoring techniques.
- Produce awareness among the learners about management information system.

UNIT I: CONSTRUCTION PLANNING   **9**

Basic concepts in the development of construction plans – Choice of Technology and Construction method – Defining Work Tasks – Definition – Precedence relationships among activities – Estimating Activity Durations – Estimating Resource Requirements for work activities – Coding systems – Overview of Primavera, Building Information Modeling and 3D Printing.

UNIT II: SCHEDULING PROCEDURES AND TECHNIQUES   **9**

Relevance of construction schedules – Bar charts – The critical path method – Calculations for critical path scheduling – Activity float and schedules – Presenting project schedules – Critical path scheduling for Activity – on-node and with leads, Lags and Windows – Calculations for scheduling with leads, lags and windows – Resource oriented scheduling – Scheduling with resource constraints and precedence – Use of Advanced Scheduling Techniques – Scheduling with uncertain durations – Crashing and time/cost tradeoffs – Improving the Scheduling process – Introduction to application software.

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 – Schedule and Budget updates – Relating cost and schedule information.

UNIT IV: QUALITY CONTROL AND SAFETY DURING CONSTRUCTION   **9**

Quality and safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality control – Quality control by statistical methods – Statistical Quality control with Sampling by Attributes – Statistical Quality control by Sampling and Variables – Safety.

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 database Management systems – Databases and application programs – Information transfer and Flow.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand basic concepts of construction planning.

- Schedule the construction activities.

- Forecast and control the cost in a construction.

- Understand about quality control and its safety during construction.

- Organize information in Centralized database Management systems.

TEXT BOOKS

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2019.

2. Virendra Kumar Paul, "Construction Project Planning and Scheduling ",Copal Publishing Group, 2018.

REFERENCES

1. Abdul Razzak Rumane, "Construction Management – Scope, Schedule, and Cost Control", CRC Press, 2016.

2. Moder.J, Phillips. C. and Davis E, "Project Management with CPM", PERT and Precedence Diagramming,VanNostrand Reinhold Co., 3rd Ed., 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/104/105104161/ (Principal of Construction Management)
2. https://nptel.ac.in/courses/105/103/105103093/(Construction Planning andscheduling)

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19CEPX03	ADVANCED SURVEYING	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Study the basic principles and methods of hydrographic surveying.
- Introduce the concept of astronomy in locating a celestial body.
- Impart knowledge on the basics of aerial photogrammetry.
- Learn the principles of Electronic distance measurements, Total station and GPS.
- Exposure on advanced surveying techniques involved such as remote sensing, GIS, etc.

UNIT I: HYDROGRAPHIC SURVEYING 9

Shore line survey – River survey – Sounding – Gauges & Equipment – Sounding Rods and Lead Lines – Sounding Chain and lead – Sounding Machine, Fathometers, Signals, Sextants – Methods of sounding – Location of soundings – Plotting of sounding – The Three point problem – Mechanical, Graphical & Analytical methods.

UNIT II: ASTRONOMICAL SURVEYING 9

Celestial sphere – Astronomical terms and definitions – Motion of sun and stars – Apparent altitude and corrections – Celestial co-ordinate systems – Spherical trigonometry – Latitude and longitude of a place – Field observations and calculations for azimuth – Nautical almanac.

UNIT III: AERIAL PHOTOGRAMMETRY 9

Photogrammetry – Types and geometry of aerial photograph – Photographic scale – Flying heights and altitude – Relief and tilt displacement – Corrections – Flight Planning – Layout of Photography.

UNIT IV: EDM, TOTAL STATION AND GPS SURVEYING 9

Electromagnetic distance measurement (EDM) – Principle – Types – Total station – Working principle, GPS Basics – System overview – Working principle of GPS – Satellite ranging – Calculating position – GPS Survey – Types – Kinematic and static survey techniques.

UNIT V: BASICS OF REMOTE SENSING AND GIS 9

Introduction – Historical Background – Electromagnetic Radiation (EMR) – Electromagnetic Spectrum – Airborne Platforms – Sensors – Types – Optical Remote Sensing, Microwave remote sensing – Applications of Remote sensing – LIDAR – GIS – History of Development – Components of GIS – Data models – Raster and Vector data structures – Advanced applications of GIS.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Get knowledge about types of rigid and flexible pavements.
- Able to design of flexible pavements.

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- Able to design of rigid pavements.

- Determine the causes of distress in rigid and flexible pavements.

- Understand stabilization of pavements, testing and field control.

TEXTBOOKS

1. Satheesh Gopi, "Advanced Surveying", Pearson Education, 2017.

2. Kanetkar T.P., "Surveying and Levelling", Vols. I and II, Standard Publishers, New Delhi, 2018.

REFERENCES

1. Bannister A and Raymond S, "Surveying", Addison Wesley Longman ltd, England, 2016.

2. Bossler, J.D., "Manual of Geospatial Science and Technology", Taylor and Francis, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/104/105104100/ (Modern Surveying Techniques)

2. https://nptel.ac.in/courses/105/103/105103176/ (Higher Surveying)

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19CEPX04   **ENVIRONMENTAL HEALTH ENGINEERING**   **L T P C**
                                                                 3 0 0 3

OBJECTIVES

The students should be made to:

- Get exposure about health aspects in the field of environmental engineering.
- Learn about characteristics, transmission, and control of diseases.
- Know the characteristics, collection, conveyance, disposal of refuse.
- Study the aspects of health full housing like ventilation and air conditioning.
- Obtain knowledge on milk sanitation.

UNIT I: OCCUPATIONAL HEALTH AND HYGIENE   9

Definition – Categories of health hazards – Exposure pathways and human responses to hazardous and toxic substances – Environmental monitoring and occupational exposure limits – Role of personal protective equipment – Selection criteria – Control methods and reduction strategies for radiation and excessive stress.

UNIT II: DISEASES AND CONTROL   9

Epidemic and Endemic Diseases and their control – Common microbial diseases and their control bacterial – Typhoid, tuberculosis, cholera, leprosy, syphilis and diarrhea – Viral – AIDS, Hepatitis, Ebola, SARS, MERS, Polio and Rabies – Protozoa – Amoebiosis – Covid 19.

UNIT III: REFUSE SANITATION   9

Refuse – Definition & terms connected with it – Quality and characteristics of refuse – Collection, conveyance and disposal methods – Waste recycling – Biogas and gobar gas plants.

UNIT IV: VENTILATION AND AIR CONDITIONING   9

Basic principles of health full housing – Heating, ventilation, lighting and conditioning – Definition – composition of air – Airspace requirements – Other effects on human occupancy – Systems of ventilation – Air conditioning systems.

UNIT V: FOOD AND MILK SANITATION   9

Food borne diseases – Bacterial treatment of kitchen utensils – Bacteriological contents of milk sanitation – Dairy barn sanitation – Pasteuration methods – Milk test.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to,

- Know the basics of occupational health and hygiene.
- Apply the methods of controlling infectious diseases.
- Describe the characteristics and disposal methods of refuse sanitation.
- Apply the knowledge of ventilation and air conditioning in housing.
- Conduct food and milk sanitation techniques.

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TEXT BOOKS

1. Park .J.E and Park .K, "Text Book of Preventive and Social Medicine", M/s Banarsidos – Bhanot, Jalapur, 2017.

2. Salvato, "Environmental Sanitation", John Wiley and Sons, New York, 2016.

REFERENCES

1. Cuniff .P.F, "Environmental Noise Pollution", John Wiley and Sons, NewYork, 2015.

2. Garg .S.K "Environmental Engineering", Khanna Publication, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/114/106/114106017/(Health, Safety and Environmental Management)

2. https://nptel.ac.in/courses/114/106/114106039/(Health, Safety and Environmental Management)

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19CEPX05   **DIGITAL CADASTRE**   **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

- Know introduce about the cadastral survey Methods and its applications in generation of Land information system.
- Execute recording the land rights systematically
- Learn about photogrammetric methods of digital cadastre
- Study about map projection and processes.
- Know about maintenance and measurement of cadastral surveying.

UNIT I: INTRODUCTION   9

History of cadastral survey – Types of survey – Tax – Real Property – Legal cadastre – Graphical and Numerical Cadastre, Legal Characteristics of Records, Torrens System.

UNIT II: CADASTRAL SURVEY METHODS   9

Steps in survey of a village – Instruments used for cadastral survey & mapping – Orthogonal, Polar survey methods – Boundary survey – Rectangulation – Calculation of area of Land – GPS and Total Station in Cadastral survey.

UNIT III: PHOTOGRAMMETRIC METHODS   9

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber Optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV: CADASTRAL MAPPING AND LIS   9

Cadastral map reproduction – Map projection for cadastral maps – Conventional symbols – Map – reproduction processes – Automated cadastral map, Management of Digital Cadastral. Creation of Land Information System.Integrating LIS – Land administration.

UNIT V: MAINTENANCE AND MEASUREMENTS   9

Cadastral survey maintenance – Resurveys – Measurement of sub-division – Measurement of obstructed lines – Survey of urban areas – Control requirement for Urban survey use of Satellite Imagery in boundary fixing.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Gain knowledge about cadastral survey.
- Understand the methods of cadastral survey.
- Get the knowledge about photogrammetric methods.

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- Understand Land Record System and computational procedure for modernization of the same.
- Know the Government procedure in Land Record Management.

TEXT BOOKS

1. Paul. R Wolf Bon A. DeWitt, Elements of Photogrammetry with Application in GIS McGraw Hill International Book Co., 4th Ed., 2015.

2. R.Subramanian, Surveying and Levelling, Oxford University Press, 2nd ed., 2015.

REFERENCES

1. Karl Kraus, Photogrammetry: Geometry from Images and Laser Scans, Walter de Gruyter GmbH & Co. 2nd Ed., 2016.

2. E. M. Mikhail, J. S. Bethel, J. C. McGlone, Introduction to Modern Photogrammetry, Wiley Publisher, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/105/107/105107158/(Digital Land Surveying and Mapping)

2. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19– ce09/(Digital Land Surveying and Mapping)

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PROFESSIONAL ELECTIVE – II

19CEPX06	**DESIGN OF MACHINE FOUNDATION**	**L T P C**
	(IS Code 5249: 1992, IS Code 2974: (Part 1 & 2),	**3 0 0 3**
	1982 Codes Books are to be Permitted)	

OBJECTIVES

The students should be made to:

- Gain basic knowledge in vibration and its instruments.
- Know the wave propagation of soil.
- Assess the dynamic properties of soil.
- Understand the various design parameters required for the design of machine foundation.
- Design the foundation for various machines on piles.

UNIT I: FUNDAMENTALS OF VIBRATION   9

Vibration of elementary systems – Vibratory motion – Single degree freedom system – Free and forced vibration with and without damping – Principles of vibration measuring instruments – Viscous damping.

UNIT II: WAVES AND WAVE PROPAGATION   9

Wave propagation in an elastic homogeneous isotropic medium – Raleigh, shear and compression waves – Waves in elastic half space – Wave propagation due to Machine foundation – Surface wave – Typical values – Particle movements and velocity.

UNIT III: DYNAMIC PROPERTIES OF SOILS   9

Elastic properties of soils – Soil treated as spring or elastic half space – Principles of measuring dynamic properties – Determination of dynamic properties of soil – Laboratory and field testing techniques – Codal provisions.

UNIT IV: DESIGN OF MACHINE FOUNDATION   9

General requirements of machine foundations – Design criteria – Principles of & simple procedures of design of foundations for machineries of reciprocating type, Impact & Rotary type (treated as single degree freedom only) – Dynamic loads, simple design procedures for foundations under Reciprocation machines.

UNIT V: MACHINE FOUNDATION ON PILES   9

Introduction – Analysis of piles under vertical vibrations – Analysis of piles under translation and rocking – Analysis of piles under torsion – Design procedure for a pile supported machine foundation.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Gain knowledge in vibratory motion and its elementary systems.
- Understand the fundamentals of wave propagation in soil media.
- Evaluate the dynamic properties of soil.
- Design foundations for centrifugal and reciprocating machines.
- Create foundation for machines on piles.

TEXT BOOKS

1. Swamisaran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt.Ltd. New Delhi– 110002, 3rd Edition, 2016.
2. Kameswara Rao., "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2015.

REFERENCES

1. Moore, P.J., "Analysis and Design of Foundation for Vibration", Oxford and IBH, 2015.
2. Steven L. Kramer, "Geotechnical Earthquake Engineering", Prentice Hall, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/105/101/105101083/(Foundation Engineering)
2. https://nptel.ac.in/courses/105/105/105105176/(Foundation Engineering)

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19CEPX07   INDUSTRIAL POLLUTION PREVENTION AND CLEANER PRODUCTION   L T P C
3 0 0 3

OBJECTIVES

The students should be made to:

- Understand the basic concepts of sustainable developments and strategies.

- Learn the fundamental concepts of pollution prevention and cleaner production.

- Introduce the importance, and different approaches of cleaner production in industries.

- Know about the life cycle and assessment in clean environment.

- Impart knowledge on environmental management tools and applying cleaner production principle.

UNIT I: INTRODUCTION   **9**

Industrial Activity and Environment – Industrialization and Sustainable Development – Indicators of Sustainability Strategies – Barriers to Sustainability – Industrial Ecology – Pollution Prevention (PP) and Cleaner Production (CP) in achieving Sustainability – Prevention versus Control of Industrial Pollution.

UNIT II: CLEANER PRODUCTION   **9**

Definition – Methodology – Historical evolution – Benefits – Promotion – Barriers – Role of Industry, Government and Institutions – Environmental Management Hierarchy – Relation of CP and EMS – Integrated prevention and pollution limitation – Best Available Technology concept (BAT) – Internet information & Other CP Resources.

UNIT III: CLEANER PRODUCTION PROJECT DEVELOPMENT   **9**

Assessment Steps and Skills – Preparing for the Site, Visit, Information gathering, and Process Flow Diagram – Material Balance – CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives – Total Cost Analysis – CP Financing.

UNIT IV: LIFE CYCLE AND ENVIRONMENTAL ASSESSMENT   **9**

Life Cycle Assessment and Environmental Management Systems – Elements of LCA – Life Cycle Costing – Eco labeling – Designs for the Environment – International Environmental Standards – ISO 14001 – Environmental Audit.

UNIT V: CASE STUDIES   **9**

Industrial Applications of PP and CP – LCA, EMS – Environmental Audits.

                                                                        TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Explain the concept of sustainable development and strategies.

- Describe and comment the evolution of corporate environmental management strategies in cleaner production.

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- Use Cleaner Production measures and also to do different projects in various industries.
- Conduct life cycle assessment and environmental assessment.
- Supervision on environmental audits.

TEXT BOOKS

1. Paul L. Bishop,"Pollution Prevention: Fundamentals and Practice', McGraw Hill International, 2016.

2. Prasad modak C. Visvanathan and Mandarparasnis, "Cleaner Production Audit, Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok, 2015.

REFERENCES

1. World Bank Group "Pollution Prevention and Abatement Handbook – Towards Cleaner Production,World Bank and UNEP, Washington D.C., 2015.

2. Garg .S.K "Environmental Engineering", Khanna Publication, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/122/102/122102006/(Environment and Ecology)

2. https://nptel.ac.in/courses/103/107/103107084/(Environmental Engineering)

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19CEPX08 **TRAFFIC ENGINEERING AND MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

* Understand the basic traffic flow conditions and related theories.
* Gain the ability to conduct traffic survey.
* Develop a strong knowledge base of intersection and signal designs.
* Have a basic knowledge in causes of accidents.
* Know the traffic management and IRC recommendations.

UNIT I: FUNDAMENTALS OF TRAFFIC FLOW   9

Basic components of traffic flow – Road user, vehicle, environment and their characteristics, speed – volume – Density relationship – Homogenous and heterogonous traffic flow – PCU concept – Vehicle operating cost – PIEV theory – Whithams theory.

UNIT II: TRANSPORTATION SURVEYS   9

O-Surveys, spot – Speed survey (using enoscope and radar speedometer) – Traffic volume counts, travel time – Parking survey – Interaction volume count and delay surveys – Origin Destination Survey – Methods analysis and interpretation – Level of service.

UNIT III: DESIGN OF INTERSECTIONS AND SIGNALS   9

Design of Intersection: Design of at grade & grade separated intersection – Rotary intersection – Capacity of rotary intersection – Traffic signals – Warrants of traffic signals – Types of signals, signal coordination, design of fixed time signal – Websters approach.

UNIT IV: TRAFFIC SAFETY AND ENVIRONMENT   9

Causes and effects of road accidents – Collection of accident data – Influence of road, the vehicle, the driver, the weather and other factors on road accident – Preventive measures – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures.

UNIT V: TRAFFIC MANAGEMENT   9

Traffic System Management (TSM) with IRC standards – Scope of traffic management measures restrictions to turning movements – One way streets – Tidal flow operations – Traffic segregation – Traffic calming – Travel Demand Management (TDM) – Regulation of traffic – Need and scope of traffic regulations – Motor Vehicle Act.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

* Apply traffic flow theories in real situations.
* Conduct traffic survey.

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- Design Intersections and signals.

- Apply safety measures in traffic management.

- Develop Traffic management Systems.

TEXTBOOKS

1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2015.

2. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd. ,2016.

REFERENCES

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., NewDelhi, 2019.

2. Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/101/105101008/(Traffic Engineering andManagement)

2. https://nptel.ac.in/courses/105/101/105101087/(Transportation Engineering I)

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19CEPX09   **HOUSING PLANNING AND MANAGEMENT**   **L T P C**
                                                              3 0 0 3

OBJECTIVES

The students should be made to:

- Have a comprehensive knowledge of housing projects.
- Give awareness about the existing housing programme.
- Train in the planning and design of housing projects.
- Give exposure on cost effective construction materials and methods.
- Train and perform the project appraisal of housing projects.

UNIT I: INTRODUCTION TO HOUSING   **9**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms – All basic infrastructure consideration – Institutions for Housing at National, State and Local levels.

UNIT II: HOUSING PROGRAMMES   **9**

Basic Concepts, Contents and Standards for Housing Programmes – Sites and Services, Neighborhoods – Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing & Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects, Role of Public housing agencies, and Private sector in supply, quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

UNIT III: PLANNING AND DESIGN OF HOUSING PROJECTS   **9**

Formulation of Housing Projects – Land Use and Soil suitability analysis – Building Byelaws and Rules and Development Control Regulations – Site Analysis, Layout Design, Designs of Housing Units (Design Problems) – Housing Project Formulation.

UNIT IV: CONSTRUCTION TECHNIQUES AND COST EFFECTIVE MATERIALS   **9**

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction – Green building concept – Building Centers – Concept, Functions and Performance Evaluation – Mass housing, Group housing and Modular housing.

UNIT V: HOUSING FINANCE AND PROJECT APPRAISAL   **9**

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy – Public Private Partnership Projects – Viability Gap Funding – Pricing of Housing Units (Problems).

                                                          TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Plan and design the housing projects as per regulations.
- Design the various housing programme with sustainability concepts.
- Formulate and design the housing layouts by conducting site analysis.
- Evaluate the suitability of various cost effective construction materials.
- Perform the economic analysis based project appraisal of housing projects.

TEXT BOOKS

1. Mhupa, "State of the Urban Poor Report 2015: Gender and Urban Poverty", Ministry of Housing and Urban Poverty Alleviation, 2016.

2. K.Chandrasekar and N.Karthikeyan "Housing Planning And Management", CGS Publishers, 2016.

REFERENCES

1. Wiley – Blackwell, "Neufert Architects" Data, 4th ed., Blackwell Publishing Ltd, 2012.

2. Anderson, " Retire on Real Estate: Building Rental Income for a Safe and Secure Retirement", Kindle edition, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/124/107/124107001/(Housing Policy and Planning)

2. https://nptel.ac.in/courses/105/103/105103093/(Constructison Planning andManagement)

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19CEPX10   **RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING**   **L T P C**
                                                                                                                          3 0 0 3

OBJECTIVES

The students should be made to:

- Give exposure to railway planning, geometric design, railway track construction and maintenance.
- Understand the modern methods of railway construction.
- Make layout for airport and classification.
- Prepare geometric design for runway.
- Provide knowledge on various components of harbour and ports.

UNIT I: RAILWAY PLANNING AND DESIGN   9

Significance of Road, Rail, Air and Water transports – 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 – Geometric design of railways, gradient, super elevation, widening of gauge on curves – Points and Crossings.

UNIT II: RAILWAY CONSTRUCTION AND MAINTENANCE   9

Tunneling Methods, drainage and ventilation – Materials required for track laying – Construction and maintenance of tracks – Modern methods of construction and maintenance – Railway stations and yards and passenger amenities Urban rail – Infrastructure for Metro, Mono and underground railways – Bullet Train.

UNIT III: AIRPORT PLANNING   9

Air transport characteristics – Airport classification – Airport planning: objectives, components, airport layouts – Apron, terminal building, hangars, motor vehicle parking area and circulation pattern, socio – Economic.

UNIT IV: AIRPORT DESIGN   9

Runway Design: Orientation, Wind Rose Diagram (Problems) – Runway length – Problems on basic and Actual Length, Geometric design of runways, Configuration – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings and lighting.

UNIT V: HARBOUR ENGINEERING   9

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours : Requirements, Classification – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Mooring, types of mooring – Navigational aids – Inland Water Transport – Wave action on Coastal Structures, Coastal zone regulations and Coastal Protection Works.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the methods of route alignment and design elements in Railway Planning and Constructions.
- Understand the Construction techniques and Maintenance of Track laying and Railway stations.
- Gain an insight on the planning and site selection of Airport Planning and design.
- Analyze and design the elements for orientation of runways and passenger facility systems.
- Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.

TEXT BOOKS

1. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2015.
2. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2015.

REFERENCES

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2015.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/114/106/114106025/ (Port and Harbour Structures)
2. https://nptel.ac.in/courses/105/107/105107123/ (Transportation Engineering II)

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PROFESSIONAL ELECTIVE – III

19CEPX11	DESIGN OF INDUSTRIAL STRUCTURES	L T P C
	(IS 456:2000 and IS800:2009 Code Books are Permitted)	3 0 0 3

OBJECTIVES

The students should be made to:

- Layout planning based on factory requirements and rules.
- Design steel structures like Industrial structures, Gantry girders.
- Know about Preliminary design of bunkers, silos, towers, ducts etc.
- Design elevated structures as Chimneys and line towers.
- Plan a foundation for chimneys and cooling towers.

UNIT I: PLANNING AND FUNCTIONAL REQUIREMENTS   9

Classification of Industries and Industrial structures – Planning for Layout Requirements regarding Lighting, Ventilation and Fire Safety – Protection against noise and vibration – Guidelines of Factories Act.

UNIT II: INDUSTRIAL BUILDINGS   9

Steel and RCC – Gantry Girder, Crane Girders – Design of Corbels and Nibs – Design of Staircase.

UNIT III: POWER PLANT STRUCTURES   9

Types of power plants – Containment structures – Cooling Towers – Bunkers and Silos – Pipe supporting structures.

UNIT IV: TRANSMISSION LINE STRUCTURES AND CHIMNEYS   9

Analysis and design of transmission line towers – Sag and Tension calculations, testing of towers – Design of self – Supporting chimney, Design of Chimney bases.

UNIT V: FOUNDATION   9

Design of foundation for Towers, Chimneys and Cooling Towers – Machine Foundation – Design of Turbo Generator Foundation.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Do layout planning based on factory requirements and rules.
- Analyse steel structures for Industrial structures, Gantry girders.
- Determine the RCC structures for bunkers, silos, towers, ducts etc.
- Calculate the elevated structures of Chimneys and line towers.
- Design a foundation for chimneys and cooling towers.

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TEXT BOOKS

1. Jurgen Axel Adam, Katharria Hausmann, Frank Juttner, Klauss Daniel, Industrial Buildings: A Design Manual, Birkhauser Publishers, 2014.

2. Manohar S.N, Tall Chimneys – Design and Construction, Tata McGraw Hill, 2015

REFERENCES

1. Santhakumar A.R. and Murthy S.S., Transmission Line Structures, Tata McGraw Hill, 2016.

2. Srinivasulu P and Vaidyanathan.C, Handbook of Machine Foundations, Tata McGraw Hill, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105104/(Design of Concrete Structures)

2. https://nptel.ac.in/courses/105/106/105106113/(Design of Steel Structures II)

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19CEPX12	ENVIRONMENTAL IMPACT ASSESSMENT	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Know the basics and importance of Environmental Impact Assessment.
- Study the methods of EIA.
- Understand the various impact assessment strategies and report preparation.
- Prepare and analyze the Environmental Management Plan.
- Gain knowledge in risk assessment analysis.

UNIT I: INTRODUCTION   **9**

Historical development of Environmental Impact Assessment – EIA in Project Cycle – Types and limitations of EIA –.EIA process – Screening – Scoping – Setting – Analysis – Mitigation – Public Participation in EIA – EIA Consultant Accreditation.

UNIT II: METHODOLOGIES   **9**

Matrices – Networks – Checklists – Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA – Prediction tools for EIA.

UNIT III: IMPACT ASSESSMENT AND EIA DOCUMENTATION   **9**

Assessment of impacts – Air – Water – Soil – Noise – Biological – Cumulative Impact Assessment – Documentation of EIA findings – Planning – Organization of information and visual display materials – EIA Report preparation – Codes related to environment.

UNIT IV: ENVIRONMENTAL MANAGEMENT PLAN   **9**

Preparation, implementation and review for EMP – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment.

UNIT V: ENVIRONMENTAL RISK ASSESSMENT   **9**

Risk assessment framework – Hazard identification – Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment – HAZOP and FEMA methods – Event tree and fault tree analysis.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Apply basic knowledge of environmental impact assessment in various projects.
- Choose the appropriate methods to conduct environmental impact assessment.
- Audit and make document for environmental impact assessment.
- Prepare Environmental Management Plan.
- Apply suitable analysis technique in Risk Assessment.

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TEXT BOOKS

1. Canter .R.L, "Environmental Impact Assessment", McGraw – Hill Inc., New Delhi, 2016.

2. Shukla .S.K. and Srivastava .P.R, "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 2016.

REFERENCES

1. John G.Rau and David C Hooten (Ed). "Environmental Impact Analysis Handbook", McGraw– Hill Book Company, 2015.

2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/120/108/120108004/(Environmental Management)

2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19 ge22/(Environmental Management)

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19CEPX13	**DYNAMICS AND ASEISMIC DESIGN**	**L T P C**
	(IS 1893, IS 13920 and IS 4326 Code Books are to be Permitted)	**3 0 0 3**

OBJECTIVES

The students should be made to:

- Introduce dynamic loading and the dynamic performance of the structures.
- Discuss different types of dynamic loading.
- Study the performance of structures under earthquake loading.
- Understand the codal provisions and also to design the structures as earthquake resistant.
- Study about the earth quake design concepts and it's control measures.

UNIT I: THEORY OF VIBRATIONS 9

Theory of vibrations and harmonic motion – Dynamic Loads – D'Alembert's Principle and inertia forces – Degree of freedom – Equation of motion for SDOF – Damped and Undamped free vibrations – Undamped forced vibration – Natural frequencies.

UNIT II: MULTIPLE DEGREE OF FREEDOM SYSTEM 9

Two degree of freedom system – Normal modes of vibration – Natural frequencies – Mode shapes Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

UNIT III: ENGINEERING SEISMOLOGY 9

Elements of Seismology – Causes of Earthquakes – Seismic waves – Magnitude &Intensity of earthquake, Seismogram – Case studies on past earthquakes – Seismic zone maps of India – Strong motion characteristics.

UNIT IV: DESIGN METHODOLOGY 9

IS 1893 – Codal provisions – Design horizontal seismic coefficient – Design base shear distribution, IS 13920 and IS 4326 – Codal provisions, Effect of soil properties and damping – Liquefaction Types, effects and controlling factors.

UNIT V: EARTHQUAKE RESISTANT DESIGN 9

Principles of Earthquake Resistant Design – Response spectrum theory and Design spectra– Time Acceleration method, Base isolation techniques – Vibration control measures – Important points in mitigating effects of earthquake on structure.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Assess the influence of vibrations and selection of remediation methods based on the nature of vibration.
- Understand the dynamic concepts of MDOF systems.

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- Realize the origin, various terminologies and behavior of earthquakes.

- Analyse and design the structures for earthquake forces as per IS 1893 and IS13920.

- Know the control measures as well as the Aseismic design methodology.

TEXT BOOKS

1. A K. Chopra, "Dynamics of Structures – Theory and Applications to Earthquake Engineering", Printice– Hall India Pvt Ltd, 2015.

2. Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India, 2015.

REFERENCES

1. Mario Paz, "Structural Dynamics – Theory and Computation", CBS Publications, 2016.

2. Damodarasamy S. R., kavitha S, "Basics of Structural Dynamics and Aseismic Design", PHI Learning, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/105/101/105101006/(Structural Dynamics)

2. https://nptel.ac.in/courses/105/101/105101004/(Introduction to Earthquake Engineering)

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19CEPX14   **GROUND IMPROVEMENT TECHNIQUES**   **L T P C**
                                                                                   3 0 0 3

OBJECTIVES

The students should be made to:

- Exposed to various problems associated with soil deposits and methods to evaluate them.
- Improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.
- Get the knowledge about cohesionless and cohesive soils.
- Possess knowledge about earth reinforcement.
- Gain the knowledge of grouting techniques.

UNIT I: PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES   9

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II: DEWATERING   9

Dewatering Techniques – Well points – Vacuum and electro osmotic methods – Seepage analysis for two dimensional flows for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

UNIT III: INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS   9

Insitu densification of cohesionless soils – Shallow as deep compaction – Dynamic compaction – Vibroflotation, Sand compaction piles and deep compaction. Consolidation of cohesive soils.– Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles – Installation techniques – Simple design – Relative merits of above methods and their limitations.

UNIT IV: EARTH REINFORCEMENT   9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall –Mechanism – Simple design – Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications – Natural Fibres.

UNIT V: GROUTING TECHNIQUES   9

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Gain knowledge on methods and selection of ground improvement techniques.
- Understand dewatering techniques and design for simple cases.
- Get knowledge on in-situ treatment of cohesion less and cohesive soils.
- Understand the concept of earth reinforcement and design of reinforced earth.
- Know types of grouts and grouting technique.

TEXT BOOKS

1. Purushothama Raj. P, "Ground Improvement Techniques", Lakshmi Publications, 2nd Edition, 2016.
2. Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, 1st Edition, 2015.

REFERENCES

1. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2015.
2. Koerner, R.M., "Designing with Geosynthetics" (Sixth Edition), Xlibris Corporation U.S.A, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/108/105108075/(Ground Improvement Techniques)
2. https://nptel.ac.in/courses/105/106/105106144/(Advanced Techniques in Geotechnical and Foundation Engineering)

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19CEPX15	AIR QUALITY MONITORING AND MODELLING	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Acquire basic skills of standards of air quality.
- Understand the air quality monitoring and sampling techniques.
- Know the estimating techniques of air quality.
- Have basic knowledge in vehicle emission.
- Conduct air quality modelling by using various techniques.

UNIT I: INTRODUCTION 9

Concept of unpolluted air – Gaseous and vapour pollutants in atmosphere – Primary & secondary pollutants – Ambient Air Quality – Monitoring for pollutants (SO_2– NO_2– O_3– PAN – Particulates – Hydrocarbons – PAHs) and their health effects – Effects of air pollution on vegetation, materials and structures.

UNIT II: SAMPLING AND MONITORING AIR MATRICES 9

Scope; Purpose and Objectives of Air Quality Monitoring Program – Preliminary information required for planning an air quality survey – Guidelines for planning a survey – Site Selection – Design of an air quality surveillance network – Period; frequency and duration of sampling.

UNIT III: ESTIMATION OF AIR QUALITY 9

GLC estimates for multiple sources using standard software (eg. EPAs ISC model) – Determination of effective stack height – Distribution & sources of Particulate matter – Hood duct design – Particulate collection mechanisms – Control systems and their design.

UNIT IV: VEHICLE EMISSIONS 9

Flue – Gas desulfurization processes – Flue gas control methods for NOx – Emission standards for automobiles – Origin of exhaust emissions from gasoline – Diesel – CNG & LPG engines.

UNIT V: AIR QUALITY MODELLING 9

Basic Components of an Air Quality Simulation Model – Parameters of Air Pollution Meteorology – Steady – State; Non-Steady – State and Grid Meteorological Modelling – Dispersion and Receptor modelling techniques – Gaussian plume model – Pasquillis stability classification – Modelling software's – Applications of Modelling.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Know the types of pollutants present in air and their effects.
- Collect samples for air quality monitoring.

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- Estimate the quality of air by using various softwares.

- Apply knowledge to reduce vehicle emissions.

- Conduct air quality modelling.

TEXT BOOKS

1. Tiwary A and Colls J, Air Pollution: Measurement; Modelling and Mitigation; SponPress, 2015.

2. Khare M, Air Pollution – Monitoring; Modelling; Health and Control; InTech Publishers, 2016.

REFERENCES

1. BrebbiaCA,Power H and Tirabassi T, Air Pollution V: Modelling; Monitoring and Management; InTech, 2015.

2. Zannetti P, Air Quality Modelling – Theories; Methodologies; Computational Techniques; and Available Databases and Software: Volume IV – Advances and Updates; EnviroComp Institute, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/103/106/103106162/ (Environmental Quality Monitoring and Analysis)

2. https://nptel.ac.in/courses/105/104/105104099/(Environmental Air Pollution)

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PROFESSIONAL ELECTIVE – IV

19CEPX16	REPAIR AND REHABILITATION OF STRUCTURES	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Get the knowledge on quality of concrete.
- Acquire the knowledge of durability aspects.
- Understand the causes of deterioration.
- Obtain about assessment of distressed structures.
- Understand the repairing of structures and demolition procedures.

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.

UNIT II: SERVICEABILITY AND DURABILITY OF CONCRETE **9**

Quality assurance for concrete construction concrete properties – Strength, permeability, thermal properties and cracking – Effects due to climate, temperature, chemicals, corrosion – Design and construction errors – Effects of cover thickness and cracking.

UNIT III: MATERIALS 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.

UNIT IV:TECHNIQUES FOR REPAIR AND DEMOLITION **9**

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures – Case studies.

UNIT V: REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES **9**

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure – Heritage Structure and Detoration.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- The importance of maintenance and assessment method of distressed structures.
- The strength and durability properties, their effects due to climate and temperature.
- Recent development in concrete.
- The techniques for repair rand protection methods.
- Repair, rehabilitation and retrofitting of structures and demolition methods.

TEXT BOOKS

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 2018.
2. R.T.Allen and S.C.Edwards, Repair of Concrete Structures, Blakie and Sons, UK, 2015.

REFERENCES

1. M.S.Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 8th revised Edition, 2019.
2. Poonam I. Modi, Chirag N. Patel, "Repair and Rehabilitation of Concrete Structures" Prentice Hall India Pvt., Limited, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/106/105106202/(Maintenance & Repair of Concrete Structures)
2. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ce26/(Maintenance & Repair of Concrete Structures)

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TIRUCHENGODE – 637 205 NAMAKKAL (Dt) TAMILNADU

19CEPX17	TALL BUILDINGS	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Know the materials used in Tall building construction.
- Understand the acting of load in Tall building.
- The analysis and design aspects of Tall Buildings.
- Understand the behavior of structural systems.
- Comprehend stability calculations of Tall buildings.

UNIT I: DESIGN CRITERIA AND MATERIALS   9

Development of High Rise Structures – General Planning Considerations – Design philosophies – Materials used for Construction.

UNIT II: LOADING   9

Gravity Loading – Dead Load – Live Load – Live load reduction technique – Impact Load – Construction Load – Sequential Loading, Lateral Loading – Wind load – Earthquake Load – Combination of Loads.

UNIT III: BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS   9

Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems – Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall – Frames, tubular structures, cores, outrigger – Braced and hybrid mega systems.

UNIT IV: ANALYSIS AND DESIGN   9

Modelling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerised general three dimensional analysis.

UNIT V: STABILITY OF TALL BUILDINGS   9

Overall buckling analysis of frames, Wall-frames – Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first – Order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the materials used in Tall Building construction.
- Evaluate the loading acting in the buildings.
- Understand the behaviour of structural systems.
- Apply the concepts for design and analysis of Tall Buildings.
- Assess the stability of Tall Buildings.

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TEXT BOOKS

1. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 2015.

2. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2017.

REFERENCES

1. Lin.T.Y, Stotes Burry.D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 2015.

2. Gupta.Y.P.,(Editor), Proceedings of National Seminar on High Rise Structures – Design and Construction Practices for Middle Level Cities, New Age International Limited, New Delhi, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/124/107/124107012/(Structure, Form and Architecture: The Synergy)

2. https://onlinecourses.nptel.ac.in/noc20_ar10/preview(Structural System in Architecture)

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19CEPX18	BRIDGE ENGINEERING	L T P C
	(IS: 800– 1984 and IS: 456– 2000 Code Books are to be Permitted)	2 2 0 3

OBJECTIVES

The students should be made to:

- Know the basics of bridges and design loads.
- Analyze and design Deck Slab and T Beam Bridge.
- Understand the components and design of Culverts.
- Design of bridge bearings, piers and abutments.
- Acquire knowledge on bridge Inspection and Maintenance.

UNIT I: INTRODUCTION   6+3

Components of a bridge structure – Inspection and site investigations for a bridge – Determination of linear waterway, Design discharge and scour depth – Economical span – Types and choice of bridges. IRC loading classifications – Simple problems.

UNIT II: SLAB BRIDGE   6+3

Slab Bridge – Distribution of concentrated loads by IRC and Pigeaud's Method – Design of tee beam bridge – Design of main girder – Design of cross girders – Load distribution by Courbon's Method – Skew slab Bridge.

UNIT III: BRIDGE & CULVERT   6+3

Single span rigid frame bridge (barrel or slab type only) – Box culvert (single vent only) balanced cantilever RC bridges – Design of articulations.

UNIT IV : MODERN BRIDGES   6+3

Temporary and movable bridges. RC Arch bridge (open spandrel and string girder type only) – Cable stayed bridges – Suspension bridges – Design principles only.

UNIT V: BEARING, SUBSTRUCTURE AND REBUILDING OF STRUCTURES   6+3

Bearings – Types, functions – Simple problems – Substructures – Abutment, pier – Materials – Stability requirements – Rebuilding of bridges – Replacement – Pier tops – Girders – Side sleeving and end launching methods.

TOTAL: 30+15=45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Classify bridges and loads acting on them.
- Determine the Deck slab and T-beam bridges.
- Understand the culverts design.
- Design bridge bearings, piers and abutments.
- Inspect the bridge and suggest the repair for Maintenance.

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TEXT BOOKS

1. N. Krishna Raju, "Design of Bridges", Oxford and IBH Publishing Company Pvt. Ltd., 2015.

2. T.R. Jagadeesh and M.A. Jayaram "Design of Bridge Structures", PHI Learning Pvt. Ltd, New Delhi, 2019.

REFERENCES

1. Victor DJ., "Essentials of Bridge Engineering" , Oxford and IBH Publishing Company Pvt. Ltd. 2017.

2. B.C. Punmia, "Design of Reinforced Concrete Structures", Vol. II, Laxmi Publishers, New Delhi, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105165/(Reinforced Concrete Road Bridges)

2. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18– ce23/(Reinforced Concrete Road Bridges)

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19CEPX19	**DESIGN OF SPECIAL STRUCTURES**	**L T P C**
	(IS: 800– 1984 and IS: 456– 2000 Code Books are to be Permitted)	**3 0 0 3**

OBJECTIVES

The students should be made to:

- Know the design RCC slab and girder bridges.
- Acquire knowledge on design welded plate girders.
- Comprehend about design of underground and overhead tanks.
- Assess the design of waffle slab.
- Apply the concepts of cantilever, Counter fort retaining walls.

UNIT I: RCC BRIDGES   9

IRC loadings – IRC codes – Design of slab culverts – Effective width – Design of girder bridges – Pigeaud curves – Courban's theory – Design of bridge girder.

UNIT II: PLATE GIRDERS   9

Necessity of plate girders – Equivalent uniformly distributed load – Design of welded plate girders – intermediate stiffeners – Vertical and horizontal – Bearing stiffeners.

UNIT III: RCC WATER TANKS   9

Design of rectangular and circular water tanks – Underground and overhead – Intze type tanks – Design of staging – Shaft type and conventional types.

UNIT IV: WAFFLE SLABS (GRID SLAB SYSTEM)   9

Necessity of column free space – Foyers – Workshops – Design of two way waffle slabs – Ribs – Edge beams – Long term and short term deflection.

UNIT V: DESIGN OF SILOS   9

Design and detailing of silos.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the design of slab culverts and girder.
- Know about the design of welded plate girder.
- Evaluate the analysis, designing and detailing of RC Water tank.
- Apply the concepts for designing and detailing of RC Water tank two waffle slabs.
- Assess the analysis, designing and detailing of Silo.

TEXT BOOKS

1. Krishna Raju .N, "Design of Bridges", Oxford & IBH Publishing Company Pvt. Ltd., 4th edition, 2019.

2. Unnikrishna Pillai .S and Deavadas Menon, "Reinforced Concrete Design",Tata MacGraw Hill Publishing Company Limited, Second Edition, New Delhi, 2017.

REFERENCES

1. Krishnaraju .R, Pranesh .R.N," Design of Reinforced concrete", IS: 456 – 2000, New age International Publication (P) Ltd., New Delhi, 2017.

2. Punmia .B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publications, New Delhi, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105104/(Design of Concrete Structures)

2. https://nptel.ac.in/courses/105/106/105106113/(Design of Steel Structures II)

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19CEPX20	DESIGN OF MULTISTORIED BUILDINGS	L T P C
	(IS: 16700– 2017and IS: 456– 2000 Code Books are to be Permitted)	2 2 0 3

OBJECTIVES

To students should be made to:

- Introduce the concept of multistoried buildings.
- Impart knowledge on the planning and designing aspects of multistoried buildings.
- Expose the students to various types of structural systems those are employed for multistoried buildings.
- Impart knowledge about the special service requirements of multistoried buildings.
- Create awareness about the sigh multistoried buildings.

UNIT I: INTRODUCTION   6+3

Definition of Multistoried in different contexts – Need – Scope – Advantages and disadvantages – History of Multistoried structures – 5 ages of Multistoried structures – Current tall buildings and their salient features.

UNIT II: DESIGN OF MULTI STORIED BUILDINGS   6+3

Multistoried building design approach – Planning strategies – Building form – Plan shape efficiencies– Core Planning – Types, Components – Planning strategy for shafts and ducts – Parking strategies.

UNIT III: STRUCTURE   6+3

Aerodynamics – Structural systems – Height vs Footprint – Wind load issues – Seismic issues – Materials – Foundation.

UNIT IV: SERVICES   6+3

Vertical transportation – HVAC systems – Water supply transmission & distribution – Waste disposal – Fire fighting regulations & Strategies – Service Floor – Relevant regulations in Indian Context.

UNIT V: SUSTAINABILITY   6+3

Building Automation – Green Elements – Passive and Active design – Works of Architects like KenYeang, Norman Foster.

TOTAL: 30+15=45 PERIODS

OUTCOMES

The students will be able to

- Sufficiently design a multistoried building.
- Knowledge to suggest appropriate structural systems for multistoried buildings.
- Design vertical transportation systems, Water supply systems, Electrical and Communication systems and Fire protection systems.

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- Know about Concept of HVAC.

- Apply aspects of sustainability in multistoried building design.

TEXT BOOKS

1. U.H. Varyani, Structural Design of Multi Storeyed Building, Standard Publications-Delhi, 2015.

2. Bungale S Taranath, Structural Analysis and Design of Tall Buildings, Tata Mc Graw Hill, 2015.

REFERENCES

1. Kolousek V, Pimer M, Fischer O and Naprstek J, Wind effects on Civil Engineering Structures. Elsevier Publications, 2015.

2. Robert L Wiegel, Earthquake Engineering.Prentice Hall, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105104/(Design of Concrete Structures)

2. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m3l22.pdf   (Multistory frames with sideway)

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PROFESSIONAL ELECTIVE – V

19CEPX21	PREFABRICATED STRUCTURES	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

* Impart knowledge to students on modular construction.
* Understand the prefabricated components.
* Know about problems in design.
* Get the exposure of industrialized construction.
* Get the knowledge of design for abnormal loads.

UNIT I: INTRODUCTION   9

Need for prefabrication – Principles of prefabrication – Modular coordination – Standarization – Materials – Systems – Production – Transportation – Erection.

UNIT II: PREFABRICATED COMPONENTS   9

Behaviour and types of structural components – Large panel systems – Roof and floor slabs – Walls panels – Beams – Columns – Shear walls.

UNIT III: DESIGN PRINCIPLES   9

Design philosophy – Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation – Demountable precast concrete systems.

UNIT IV: JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS   9

Types of Joints – Based on action of forces – Compression joints – Shear joints – Tension joints – Based on function – Construction, contraction, expansion. Design of expansion joints – Dimensions and detailing – Types of sealants –Types of structural connections – Beam to Column – Column to Column – Beam to Beam – Column to foundation.

UNIT V: DESIGN FOR ABNORMAL LOADS   9

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

* Acquire good knowledge about design principles, layout of factory and stages of loading in precast construction.
* Get the exposure of panel systems, slabs, connections used in precast construction and they will be in a position to design the elements.

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- Know about types of floor systems, stairs and roofs used in precast construction.

- Knowledge about types of walls used in precast construction, sealants, design of joints.

- Understand the components in industrial building.

TEXTBOOKS

1. Lewitt,M. " Precast Concrete – Materials, Manufacture, Properties and Usage", Applied Science Publishers , London And New Jersey, 2019.

2. Bachmann, H. and Steinle, A. "Precast Concrete Structures", Ernst & Sohn, Berlin, 2015.

REFERENCES

1. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.

2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/105/106/105106117/(Pre-Stressed Concrete Structures)

2. https://nptel.ac.in/courses/124/105/124105013/(Building Materials and Composites)

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19CEPX22	**ADVANCED RCC DESIGN**	**L T P C**
	(IS: 456– 2000 and SP 16 Code Books are to be Permitted)	**3 0 0 3**

OBJECTIVES

The students should be made to:

- Estimate the crack width and deflection with regard to the service ability.
- Analyze and design of slabs using two collapse load methods – Yield Line Method.
- Get the exposure of design a flat slab system.
- Get the knowledge of deep beams corbels and nibs.
- Design of combined footings for water tanks.

UNIT I: BASIC DESIGN CONCEPTS   9

Behaviour in flexure, Design of singly reinforced rectangular sections, Design of doubly reinforced rectangular sections, Design of flanged beams, Design of shear, Design for Torsion, Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs, short term deflection and long term deflection, estimation of crack width in RCC members, calculation of crack widths.

UNIT II: LIMIT ANALYSIS OF R.C. STRUCTURES   9

Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, and applications for fixed and continuous beam. Yield line analysis for slabs: Upper bound and lower bound theorems – Yield line criterion – Virtual work and equilibrium methods of analysis for square and circular slabs with simple and continuous end conditions.

UNIT III: DESIGN OF RIBBED SLABS, FLAT SLABS   9

Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements. Flat slabs: Direct design method – Distribution of moments in column strips and middle strip – Moment and shear transfer from slabs to columns – Shear in Flat slabs – Check for one way and two way shears – Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip.

UNIT IV: DESIGN OF REINFORCED CONCRETE DEEP BEAMS & CORBELS   9

Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels , Design of Procedure of Corbels, Design of Nibs.

UNIT V: DESIGN OF COMBINED FOOTINGS   9

Distribution of soil Pressure – Geometry of Two Column Combined Footing – Design Considerations in Combined Footing for Two – Columns.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Estimate the crack width and deflection with regard to the serviceability.
- Understand about slabs using two collapse load methods – Yield Line Method.
- Design a flat slab system.
- Analyze and design deep beams corbels and nibs.
- Get the knowledge of combined footings for water tanks.

TEXT BOOKS

1. Krishnaraju .R, Pranesh .R.N, "Design of Reinforced concrete" IS: 456 – 2000, New age International Publication (P) Ltd., New Delhi, 2018.
2. Varghese, P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India, 2016.

REFERENCES

1. Krishnaraju .R, "Prestressed Concrete", Tata McGraw – Hill Education, 2018, New Delhi.
2. Punmia .B.C, Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publications, New Delhi, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/105/105105105/(Design of Reinforced Concrete Structures)
2. https://nptel.ac.in/courses/105/105/105105039/(Advanced Foundation Engineering)

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19CEPX23 **GROUND WATER CONTAMINATION AND QUALITY** **L T P C**
MONITORING AND MODELING **3 0 0 3**

OBJECTIVES

The students should be made to:

- Understand various hydro– geological parameters and their estimation.
- Impart knowledge of well hydraulics.
- Familiar with various ground water management techniques.
- Provide information on ground water quality and its application.
- Emphasis the importance of ground water conservation.

UNIT I: HYDROGEOLOGICAL PARAMETERS   9

Introduction – Water bearing Properties of Rock – Type of aquifers – Aquifer properties – Permeability, specific yield, transmissivity and storage coefficient – Methods of estimation – Ground water table fluctuation and its interpretations – Ground water development and Potential in India – GEC norms.

UNIT II: WELL HYDRAULICS   9

Objectives of Ground water hydraulics – Darcy's Law – Ground water equation – Steady state flow – Dupuit Forchheimer assumption – Unsteady state flow – Thesis method – Jacob method.

UNIT III: GROUNDWATER MANAGEMENT   9

Need for management model – Database for groundwater management – Ground water balance study – Introduction to mathematical model – Conjuctive use – Collector well and infiltration gallery.

UNIT IV: GROUNDWATER QUALITY   9

Groundwater chemistry – Origin, movement and quality – Water quality standards – Health and aesthetic aspects of water quality – Saline intrusion – Environmental concern and regulatory requirements.

UNIT V: GROUNDWATER CONSERVATION   9

Artificial recharge techniques – Remediation of Saline Intrusion – Groundwater management studies – Protection zone delineation, Contamination source inventory, remediation schemes – Ground water Pollution and legislation.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Estimate the various aquifer parameters.
- Analyze the steady and unsteady state of flow into a well.
- Apply mathematical models for ground water management.
- Implement various saline water prevention techniques.
- Adopt appropriate rainwater harvesting techniques.

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TEXT BOOKS

1. Raghunath H.M., "Ground water Hydrology", New Age International (P) Ltd. New Delhi, 2016.

2. Ramakrishnan, S, Ground water, K.J. Graph arts, Chennai, 2018.

REFERENCES

1. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2018.

2. Fitts R Charles, "Groundwater Science", Elsevier, Academic Press, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/103/105103026/(Ground Water Hydrology)

2. https://nptel.ac.in/courses/105/105/105105042/(Ground Water Hydrology)

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19CEPX24   **COMPUTER AIDED DESIGN OF STRUCTURES**   **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

- Understand the design process based on software.
- Study about the wire frame modelling and solid modelling.
- Acquire the concept of FEA and stiffness matrix formulation.
- Get the knowledge about the optimization techniques.
- Provide information about the artificial intelligence systems.

UNIT I: INTRODUCTION   9

Fundamental reason for implementing CAD – Software requirements – Hardware components in CAD system – Design process – Applications and benefits.

UNIT II: COMPUTER GRAPHICS   9

Graphic Software – Graphic primitives – Transformations – 2D & 3D transformations – Concatenation – Wire frame modeling – Solid modeling – Graphic standards – Drafting packages.

UNIT III: STRUCTURAL ANALYSIS   9

Principles of structural analysis – Fundamentals of finite element analysis – Concepts of finite elements – Stiffness matrix formulation – Variational Method – Weighted residual method – Problems – Convergence criteria – Analysis packages and applications.

UNIT IV: DESIGN AND OPTIMIZATION   9

Principles and design of steel, RC structures – Beams and Columns – Applications to simple design problems – Optimization techniques – Algorithms – Linear programming – Simplex Method.

UNIT V: EXPERT SYSTEMS   9

Introduction to artificial intelligence – Knowledge based expert systems and Applications – Rules and decision tables – Inference mechanisms – Simple applications.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the concepts of Computer – Aided Design, Software requirements and Hardware components in CAD system.
- Acquire the knowledge in Computer Graphics and Graphics standard.
- Understand the fundamentals of finite element analysis and be able use software for modeling, analysis and design of structures.
- Understand the concepts of Optimization techniques and its practical applications to Civil Engineering.
- Acquire the knowledge in Artificial Intelligence and Knowledge based expert systems.

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TEXT BOOKS

1. R.B.Patil, "Computer Aided Manufacturing", Tech– Max Publications; 2nd edition, 2019.
2. P Rao, "Computer Aided Manufacturing", McGraw Hill Education, 2017.

REFERENCES

1. Ruchi Agarwal Anup Goel, A. Jacob Moses, "Computer Aided Design & manufacturing", Technical Publications; 1st edition, 2019.
2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/112/102/112102101/(Computer Aided Design and Manufacturing)
2. https://nptel.ac.in/courses/112/104/112104252/(Design Practice II)

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19CEPX25	PAVEMENT ENGINEERING	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Gains knowledge on various IRC guidelines for designing rigid and flexible pavements.
- Study about the flexible pavement design and specification.
- Study about the factors and design procedure for pavement.
- Get exposure on evaluation and maintenance of pavement.
- Obtain information on stabilisation with special reference to highway pavements.

UNIT I: PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM   **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: PERFORMANCE EVALUATION AND MAINTENANCE   **9**

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**

Stabilisation with special reference to highway pavements – Choice of stabilizers – Testing and field control – Stabilisation for rural roads in India – Use of Geo synthetics in roads.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Get knowledge about types of rigid and flexible pavements.
- Design of flexible pavements.
- Calculate the rigid pavements.
- Determine the causes of distress in rigid and flexible pavements.
- Understand stabilisation of pavements, testing and field control.

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TEXTBOOKS

1. Khanna, S.K. and Justo C.E.G. and Veeraragavan, A, "Highway Engineering", Revised 12th edition, New Chand and Brothers, Roorkee 2017.

2. Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 2015.

REFERENCES

1. Yoder, R.J. and Witchak M.W. "Principles of Pavement Design", John Wiley, 2016.

2. Guidelines for the Design of Flexible Pavements, IRC– 37–2001, The Indian Roads Congress, New Delhi.

E-RESOURCES

1. https://nptel.ac.in/courses/105/101/105101087/(Transportation Engineering I)

2. https://nptel.ac.in/courses/105/104/105104098/(Advanced Transportation Engineering)

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OPEN ELECTIVE – I

19CEOX01 **SOIL CHEMISTRY AND ITS IMPACT** **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

- Identify soil deposits and clay minerals.
- Understand interaction between soil and pollutant movement in the ground.
- Get the knowledge of applied soil chemistry the field of engineering.
- Identify the behavior and weathering of soils.
- Obtain information on chemistry process in soil.

UNIT I: INTRODUCTION TO SOIL, SOIL DEPOSITS AND CLAY MINERALS **9**

Introduction – Major mineral groups in earth's crust, sediments and clays – Formation of soils – Various soil deposits.

UNIT II: SOIL INTERACTION WITH POLLUTANTS **9**

Introduction to Geo environmental engineering – Environmental cycle – Sources, Production and Classification of waste – Causes of soil pollution – Factors governing soil – Pollutant interaction.

UNIT III: PHYSICAL AND PHYSIO– CHEMICAL BEHAVIOUR OF SOILS **9**

Physical and Physico – Chemical behaviour of soils – Effect of ion concentration, ionic valency, dielectric constant, temperature on double layer – Stern layer – Attractive and repulsive forces in clays.

UNIT IV: SOIL STRUCTURE **9**

Water and air in soil , inorganic components of soil, organic matter and major organic compounds in soil – Weathering – Physical aspect and chemical weathering (reactions involved in general).

UNIT V: APPLIED SOIL CHEMISTRY **9**

Soil acidity – saline soil chemistry – Application of soil chemistry to chemical transport process – Sorption and process – Soil microbe – Using soil chemistry principle in other fields.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Demonstrate an understanding of the process leading to the formation ofsoils.
- Understand the pollutant in environments.
- Gain the knowledge in physio-chemical behavior of soil.
- Identify the behavior of soil.
- Apply the knowledge of soil application in chemistry.

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TEXT BOOK

1. Mitchell.J.K," Fundamentals of Soil Behaviour", John Wiley, New York, 2017.

2. Manahan. S.E, "Environmental Chemistry", CRC press. 7th Edition, 2016.

REFERENCES

1. Yong.R.N and Warkentin.B.P, "Introduction to Soil Behaviour", Macmillan, Limited, London, 2018.

2. Grim.R.E, "Applied Clay Mineralogy", McGraw Hill, New York, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/124/105/124105014/(Environmental Soil Chemistry)

2. https://nptel.ac.in/courses/105/105/105105200/(Soil Structures Interaction)

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19CEOX02 **WATER POLLUTION AND ITS MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

- Learn the sources and types of water pollution.
- Know the quality standards of water.
- Understand the mitigation measures of water pollution.
- Identify the various Water Pollution control Act.
- Know the role of various regulatory bodies in water management.

UNIT I: SOURCES & CHARACTERISTICS OF WATER POLLUTION 9

Water pollution – Sources & types of water pollution – Physical, chemical & biological – Effect of water pollution – Drinking water quality standards – Waste water treatment – Primary, secondary, tertiary – Water pollution prevention & control act – 1974.

UNIT II: WATER QUALITY & STANDARDS 9

Quality of surface waters – Water quality in flowing waters – Water quality in impounded waters – Groundwater quality – Water quality standard – Microbiological quality of drinking water – Chemical quality of drinking water.

UNIT III: INDUSTRIAL ACTIVITY AND MITIGATION MEASURES 9

Role of water in different industries – Effluent discharge characteristics – Discharge Standards for Rivers and Streams – Role of stakeholders, Public NGO'S, Government in Protection of Water bodies – Control Measures – Mitigation Measures for Industrial Water Contamination due to industries.

UNIT IV: WATER POLLUTION REGULATIONS 9

Administrative regulation under recent legislations in water pollution control – Water (Prevention & control of pollution) Act 1974 as amended by Amendment Act 1988 – Water (Prevention &control of pollution) Rules 1975 – Water (Prevention & control of pollution) Cess Act 1977 as amended by Amendment Act 1991.

UNIT V: ROLE OF REGULATORY BOARDS 9

Sustainable Development – Rain Water Harvesting – Methods – Water Pollution – Causes and Effects – Role of Regulatory bodies and Local bodies – CPCB – TWAD Board – CMWSSB etc. – Case Studies related to Effective Water Management.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the various sources and types of water pollution.
- Use various quality standards of water in pollution prevention.

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- Learn the role of various organizations in water pollution prevention.
- Apply the rules and regulations of various water acts in preventing pollution.
- Identify the common role of regulatory bodies.

TEXT BOOKS

1. Fair.G.M, "Water and Waste water engineering Vol.I& II" .John Wiley and sons, Newyork, 2015.
2. Metcalf & Eddy, "Wastewater engineering, Treatment and Reuse", Tata Mac Grawhill publications, 2019.

REFERENCES

1. Eckenfelder, W.W., ""Industrial Water Pollution Control", McGraw – Hill, 2019.
2. Arceivala.S.J, "Wastewater Treatment for Pollution Control", Tata McGraw – Hill, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/103/107/103107084/(Environmental Engineering)
2. https://nptel.ac.in/courses/123/105/123105001/(Fundamentals of Environmental Pollution and Control)

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19CEOX03   INDUSTRIAL POLLUTION PREVENTION AND CLEANER PRODUCTION   L T P C
3 0 0 3

OBJECTIVES
The students should be made to:

- Understand the basic concepts of sustainable developments and strategies.
- Learn the fundamental concepts of pollution prevention and cleaner production.
- Introduce the importance, and different approaches of cleaner production in industries.
- Know about the life cycle and environment assessment in clean environment.
- Impart knowledge on environmental management tools applying cleaner production principle.

UNIT I: INTRODUCTION   9
Industrial Activity and Environment – Industrialization and Sustainable Development – Industrial Ecology – Pollution Prevention (PP) and Cleaner Production (CP) in achieving Sustainability – Prevention versus Control of Industrial Pollution.

UNIT II: CLEANER PRODUCTION   9
Definition – Methodology – Historical evolution – Benefits – Promotion – Barriers – Role of Industry, Government and Institutions – Best Available Technology concept (BAT) – Internet information & Other CP Resources.

UNIT III: CLEANER PRODUCTION PROJECT DEVELOPMENT   9
Assessment Steps and Skills – Preparing for the Site, Visit, Information gathering, and Process Flow Diagram – Material Balance – CP Option Generation – Technical and Environmental Feasibility analysis .

UNIT IV: LIFE CYCLE AND ENVIRONMENTAL ASSESSMENT   9
Life Cycle Assessment and Environmental Management Systems – Elements of LCA – Life Cycle Costing – Eco labeling – Environmental Audits.

UNIT V :CASE STUDIES   9
Industrial Applications of PP and CP– LCA, EMS – Environmental Audits.

TOTAL: 45 PERIODS

OUTCOMES
Upon the completion of the course, the students will be able to:

- Explain the concept of sustainable development and strategies.
- Describe and comment the evolution of corporate environmental management strategies in cleaner production.
- Use Cleaner Production measures to different projects in various industries.
- Conduct life cycle assessment and environmental assessment.
- Conduct environmental audits.

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TEXT BOOKS

1. Paul L.Bishop, "Pollution Prevention: Fundamentals and Practice", McGraw Hill, International 2015.

2. Prasad modak C. Visvanathan and Mandarparasnis, "Cleaner Production Audit, Environmental System Reviews,No.38, Asian Institute of Technology, Bangkok, 2016.

REFERENCES

1. Washington D.C.,"Pollution Prevention and Abatement Handbook – Towards Cleaner Production,World Bank and UNEP, 2019.

2. Garg .S.K "Environmental Engineering", Khanna Publication, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/122/102/122102006/ (Environmental and Ecology)

2. https://nptel.ac.in/content/storage2/courses/103107084/module1/lecture1/lecture1.pdf (Introduction)

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19CEOX04	RENEWABLE ENERGY RESOURCES	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Learn about the types of solar collectors and solar cells.
- Provide knowledge on wind turbine types and wind energy application.
- Acquire knowledge on the basics of biomass resources and their conversion technologies.
- Gain knowledge on other renewable energy sources.
- Identify the new methodologies / technologies for effective utilization of renewable energy sources.

UNIT I: SOLAR ENERGY   **9**

Introduction to Renewable Energy and its type – Solar Radiation – Measurements of Solar Radiation – Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation – Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation.

UNIT II: WIND ENERGY   **9**

Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.

UNIT III: BIO ENERGY   **9**

Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration – Biomass Applications.

UNIT IV: OTHER RENEWABLE ENERGY SOURCES   **9**

Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro – Geothermal Energy – Hydrogen and Storage – Fuel Cell Systems – Hybrid Systems.

UNIT V: NEW ENERGY SOURCES   **9**

Hydrogen as a renewable energy source – Sources of Hydrogen – Fuel for Vehicles – Hydrogen Production – Direct electrolysis of water, thermal decomposition of water, biological and biochemical methods of hydrogen production – Storage of Hydrogen – Gaseous, Cryogenic and Metal hydride – Fuel Cell.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Gain knowledge on solar equipment like dryer, furnace, water heater, pump using solar energy.
- Design wind power plants using vertical and horizontal axis turbine.

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- Construct different biogas plant using biomass resource.
- Implement new ideas like fuel cell technology, OTEC, tidal and wave energy.
- Analyze the appropriate kinds of energy for future development.

TEXT BOOKS

1. Rai.G.D, "Non– conventional resources of energy", Khanna publishers, 4th edition, 2015.
2. Khan. B.H, "Non– Conventional Energy Resources", The McGraw Hills, 2nd edition, 2019.

REFERENCES

1. Rao.S & Parulekar, "Energy Technology", Khanna publishers, 4th edition, 2015.
2. Godfrey Boyl "Renewable Energy: Power Sustainable Future",Oxford University Press, 2nd edition, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/121/106/121106014/(Non-Convention Energy Resources)
2. https://nptel.ac.in/courses/108/105/108105058/ (Energy Resources & Technology)

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19CEOX05	AIR AND NOISE POLLUTION CONTROL	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Identify the sources and effects of pollutants.
- Know about source inventory and control mechanism of metrology.
- Get idea on principles and design of control measures on air pollution.
- Know the air quality standards and monitoring.
- Study about the characteristics and effects of noise pollution and the methods of controlling the same.

UNIT I: INTRODUCTION 9

Definition of clean air – Source and Classification of Air Pollutants – Physiochemical and Microbiological Characteristics of Air Pollution – Unit Measurement of Pollutants – Sampling Techniques – Effects of Air pollution on man, animal, vegetation and Properties – Indoor Air Pollutants – Monitoring atmospheric pollution.

UNIT II: AIR POLLUTION METROLOGY 9

Fundamentals of Metrology – Wind Roses – Atmospheric Stability – Plume behavior – Atmospheric Diffusion Theories – Plume rise – Gaussian Diffusion Model.

UNIT III: AIR POLLUTION CONTROL TECHNOLOGIES 9

Principles of removal of gaseous constituents – Absorption, Adsorption and Catalytic Converters – Principles of removal of particles – Settling chambers – Momentum separators – Fibrous, Metallic and Bio filters – Electrostatic precipitators – Bag houses – Centrifugal spray scrubbers – Venturi scrubbers.

UNIT IV: AIR QUALITY MANAGEMENT 9

Air quality standards – Air quality monitoring – Air Pollution indices – Air Pollution Control efforts– Zoning – Town Planning – Regulation for New Industries, Legislation and Enforcement.

UNIT V: NOISE POLLUTION 9

Sound and Noise – Source of Noise pollution – Environmental and Industrial noise – Effects of Noise pollution – Fundamentals of sound generation, propagation – Sound measurement – Sound level meters – Types – components – Measures of Prevention and Control of Noise – Noise control legislation and standards.

TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand about nature and characteristics of air pollutants.
- Identify the basic elements of atmosphere and its stability.
- Design stacks and particulate air pollution control devices to meet applicable standards.
- Understand the basic concepts of air quality management.
- Identify, formulate and solve air and noise pollution problems.

TEXT BOOKS

1. Rao C.S., "Environmental Pollution Control Engineering", New Age International editors and publishers, 2017.
2. Rao M.N. and Rao H.V.N., "Air Pollution Control", Tata McGraw Hill, 2020.

REFERENCES

1. Peavy H.S., Rowe D.R., and Tchobanoglous G., "Environmental Engineering", Tata McGraw Hill, Newyork, 2017.
2. Garg S.K., "Sewage disposal & Air Pollution Engineering", 22nd Edition, Khanna Publishers, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/104/105104099/(Environmental Air Pollution)
2. https://nptel.ac.in/courses/112/104/112104227/(Noise Management and Control)

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OPEN ELECTIVE – II

19CEOX06   **GREEN BUILDINGS**   **L T P C**
                                                                                    3 0 0 3

OBJECTIVES

The students should be made to:

- Understand about the concepts and need of green buildings in environment.
- Impart required knowledge on assessment of green buildings.
- Impart knowledge on the sustainable construction strategies.
- Study about the various assessment strategies.
- Get knowledge about cost management.

UNIT I: INTRODUCTION   9

Historical Perspective Buildings, Conventional versus Green Buildings – Comparison. Minor and major aspects of Green Buildings – The Integrated Design Process, Green Building Documentation Requirements, Conventional, Contemporary and Future Ecological Design – Green Design to Regenerative Design.

UNIT II: GREEN BUILDING SYSTEMS   9

Sustainable sites and landscaping – Enhancing ecosystems, Building envelop – Selection of green materials, Products and applications, Passive design strategies, Internal load reduction – Indoor environment quality, Building water and waste water management, Use of LEED / IGBC standards – Leed Griha.

UNIT III: GREEN BUILDING IMPLEMENTATION   9

Site Planning, Health and Safety Planning, Construction and Demolition, Waste Management – Reducing the Footprint of Construction Operations – Maximizing the Value of Building Commissioning, HVAC Systems, Lighting and cleaning systems for green buildings, Costs and Benefits of Building Commissioning – Use of LEED / IGBC standards.

UNIT IV: GREEN BUILDING ASSESSMENT   9

International Building Assessment Systems – The USGBC/ LEED Building Assessment Standard – The LEED Certification Process – The Green Globes Building Assessment Protocol – Example of a Platinum/Gold/Silver Building, Comparison of present Building Rating Systems – Code compilation requirements.

UNIT V: ECONOMICS OF GREEN BUILDINGS   9

Economic aspects of Green Buildings – Quantifying Green Building Benefits – Managing Costs and Barriers, Short & long term environment benefits. Some typical case studies of Green Buildings.

                                                                        TOTAL: 45 PERIODS

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OUTCOMES

Upon the completion of the course, the students will be able to:

- Get exposure about green building requirements.
- Identify the materials and design strategies.
- Study about implementation of green building systems.
- Learn the concept and assessment of standards.
- Understand about the economics of green buildings.

TEXT BOOKS

1. Jerry Yudelson,"Green BuildingA to Z", Understanding the buildings,www.newsociety.com, 2018.

2. Means R.S., "Green building: project planning and cost estimating: a practical guide to materials, systems and standards", 2nd Edition, Kingston, Mass., 2016.

REFERENCES

1. Alex Wilson and Mark Peipkorn, "Green Building Products: The Green Spec guide to residential building materials", 2nd Edition, Gabriola Island, 2017.

2. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", 2nd Edition, Wiley, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/102/105102195/(Sustainable Material Green Buildings)

2. https://nptel.ac.in/courses/124/107/124107011/(Sustainable Architecture)

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19CEOX07	SMART MEASURING DEVICES	L T P C
		3 0 0 3

OBJECTIVES

The students should be made to:

- Provide the fundamentals of the smart materials.
- Understand the strain measuring techniques.
- Give exposure to select suitable sensor for analyzing problems.
- Enable to select and use the different actuator material.
- Introduce signal processing and control system in smart structures.

UNIT I: INTRODUCTION 9

Introduction of Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT II: MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III: SENSORS 9

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV: ACTUATORS 9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electro orheological Fluids – Electromagnetic actuation – Role of actuators and Actuator Materials.

UNIT V: SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Understand the fundamentals of Smart materials.
- Know the concepts of strain measuring techniques.
- Suggest suitable sensors for various applications.
- Adapt the different actuator material in structural components.
- Apply signal processing and control system in smart structures.

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TEXT BOOKS

1. L. S. Srinath – Experimental Stress Analysis – Tata McGraw – Hill, New Delhi, 2018.
2. A.V. Srinivasan, Smart Structures: Analysis and Design, Cambridge University Press, Cambridge; New York, 2016.

REFERENCES

1. P. Rama Krishna Rao and Shankar Prakriya , Signals and Systems, 2016, 2nd Edition – Mc-Graw Hill, India.
2. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 2006.

E-RESOURCES

1. https://nptel.ac.in/courses/103/103/103103135/(Measurement Technique in Multiphase Flow)
2. https://nptel.ac.in/content/storage2/courses/112108092/module5/lec40.pdf (Micro and Smart System)

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19CEOX08   **GEOGRAPHICAL INFORMATION SYSTEMS**   **L T P C**
                                                                 3 0 0 3

OBJECTIVES

The students should be made to:

- Possess knowledge about GIS techniques in the field of Civil Engineering.
- Knowledge on GIS Components.
- Understand the modeling soil characteristics using satellite data.
- Solve the Civil Engineering problems with the help of Geographic technique.
- Gain the knowledge of applications of GIS.

UNIT I: INTRODUCTION TO GIS   9

Map as a model of geographic data – Types of maps – Scale, Map projections and coordinate systems.

UNIT II: COMPONENTS OF GIS   9

Data models – Vector and Raster data structures – Topology – Meta data – Data input – Data editing – Data management – Data display.

UNIT III: GIS ANALYSIS CONCEPTS   9

Vector data analysis – Raster data analysis – Set theory – Intersection – Union – Querying, Overlay, buffering. Map statistics – Regional analysis, Network analysis – Shortest path,location – Allocation problems – GIS outputs.

UNIT IV: TERRAIN MAPPING AND ANALYSIS   9

Digital terrain modeling concepts – DEM generations, spatial interpolation – Applications of DEM. Uncertainties and errors in GIS – Error propagation.

UNIT V: GIS APPLICATIONS   9

Socio– Economic data visualization and analysis, AM/FM Application – Natural resources – Change analysis working with GIS latest Software's and application demos.

                                                               TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Learn the basic principles of remote sensing.
- Compute knowledge of remote sensing and GIS in different civil engineering applications.
- Describe the process of data acquisition of satellite images and their characteristics.
- Students able to explain the concepts and fundamentals of GIS.
- Gain knowledge in modern image interpretation and recent analysis techniques.

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TEXT BOOKS

1. Burrough P.A., Principles of GIS for Land Resources Assessment, Oxford Publications, London,2015.

2. Basude Bhatta B "Remote Sensing and GIS" Oxford University Press, 2nd Edition, Chennai.– 2016.

REFERENCES

1. Kang– Isung Chang, Introduction to Geographical Information Systems, Tata Mcgraw Hill, New Delhi,2019.

2. Michael Kennedy, Introducing Geographic Information Systems with Arc GIS, Wiley Publications, New York, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/105/107/105107155/(Introduction to Geographic Information Systems)

2. https://nptel.ac.in/courses/107/105/107105088/(Geographic Information Systems)

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19CEOX09 **REMOTE SENSING AND ITS APPLICATIONS** **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

* Study the basic principles of remote sensing.
* Get knowledge about the characteristics of the instrument used for remote sensing.
* Examine the optical remote sensing.
* Understand the basic concepts of aerial photography and photogrammetry.
* Outline the different areas of applications of Remote sensing.

UNIT I: INTRODUCTION TO REMOTE SENSING 9

Energy Sources and Radiation principles – Electromagnetic radiation – Characteristic of real remote sensing system, platforms & sensors – Airborne space borne, TIR and Microwave sensors, Satellite – Pay load description of important Earth Resources and Meteorological satellites.

UNIT II : PHOTOGRAMMETRY 9

Geometric elements of a vertical photograph – Ortho photos & Flight planning – Stereoscopic plotting instruments.

UNIT III: IMAGE INTERPRETATION 9

Elements of visual image interpretation, concepts of digital image processing image Rectification and Restoration, Image enhancement & Image classification.

UNIT IV: PLATFORMS AND SENSORS 9

Platforms – Spaceborne, airborne, Remote sensing sensors – Active and passive Sensors, Across track and along the track Scanning, Optical sensors, Thermal scanners, Microwave sensing radar, Satellite missions: Landsat series, SPOT series, IRS satellite series, IKNOS, Metrological satellites.

UNIT V: REMOTE SENSING APPLICATIONS 9

Introduction to image Interpretation, Visual and Digital Image interpretation. Basic principles of Image Interpretation, Elements of Image Interpretation, Techniques of image Interpretation, Interpretation Keys, Applications of Remote Sensing in Natural Resource Management – Water, Forest , Soil and Land use, Agriculture, Geology, EIA (Air, water and soil pollution and quality, Solid waste management – Application of Earthquakes and Landslides.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

* Outline the basic components of remote sensing techniques.
* Apply the concepts of remote sensing techniques for atmospheric characteristics analysis.
* Contrast about EMR interaction and scattering of EMR.
* Examine the positions of satellites and its uses in remote sensing technology.
* Apply the concepts of Remote sensing various Technologies.

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TEXT BOOKS

1. Floyd F. Sabins, Jr: "Remote Sensing Principles and Interpretation", Freeman and Co., San Franscisco,2020.

2. Sinha S.K., "Fundamentals of Remote sensing and GIS", Ayushman Publication house, 2015.

REFERENCES

1. P.H. Swain and S.M. Davis, McGraw Hill. Remote Sensing: "The quantitative approach" 2018.

2. John R. Jensen, Prentice Hall, Introductory Digital Image Processing: "A remote sensing perspective", 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/105/103/105103193/(Remote Sensing and GIS)

2. https://nptel.ac.in/courses/105/108/105108077/(Remote Sensing)

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19CEOX10 **AIR QUALITY MONITORING AND MODELLING** **L T P C**
3 0 0 3

OBJECTIVES

The students should be made to:

- Acquire basic skills of standards of air quality.
- Understand the air quality monitoring and sampling techniques.
- Know the estimating techniques of air quality.
- Have basic knowledge in vehicle emission.
- Conduct air quality modelling by using various techniques.

UNIT I: INTRODUCTION   9

Concept of unpolluted air – Gaseous and vapour pollutants in atmosphere – Primary & secondary pollutants – Ambient Air.

UNIT II: SAMPLING AND MONITORING AIR MATRICES   9

Scope; Purpose and Objectives of Air Quality Monitoring Program – Preliminary information required for planning an air quality survey – Guidelines for planning a survey – Site Selection.

UNIT III: ESTIMATION OF AIR QUALITY   9

Determination of effective stack height – Distribution & sources of Particulate matter – Hood duct design – Particulate collection mechanisms – Control systems and their design.

UNIT IV: VEHICLE EMISSIONS   9

Flue – gas desulfurization processes – Flue gas control methods for NOx – Emission standards for automobiles – Origin of exhaust emissions from gasoline.

UNIT V: AIR QUALITY MODELLING   9

Basic Components of an Air Quality Simulation Model – Parameters of Air Pollution Meteorology – Steady-state; Non-steady – State and Grid Meteorological Modelling – Classification – Modelling softwares – Applications of Modelling – Case Studies.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of the course, the students will be able to:

- Know the types of pollutants present in air and their effects.
- Collect samples for air quality monitoring.
- Estimate the quality of air by using various softwares.
- Apply knowledge to reduce vehicle emissions.
- Conduct air quality modelling.

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TEXT BOOKS

1. Borrego C and Ana IM, Air Pollution Modelling and its Application; Springer 2018.

2. Khare M, Air Pollution – Monitoring; Modelling; Health and Control; InTech Publishers 2017.

REFERENCES

1. Brebbia C A,Power H and Tirabassi T, Air Pollution V: Modelling; Monitoring and Management; InTech 2015.

2. Zannetti P, Air Quality Modelling – Theories; Methodologies; Computational Techniques; and Available Databases and Software: Volume IV – Advances and Updates; EnviroComp Institute 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/103/106/103106162/(Environmental Quality Monitoring & Analysis)

2. https://nptel.ac.in/courses/105/104/105104099/(Environmental Air Pollution)