DEPARTMENT OF CIVIL ENGINEERING

VISION

"Envisions to be a 'Centre of Excellence' by synergizing quality education with professional and human values, and to instill a broader sense of social responsibility"

MISSION

To provide quality education to the students with the fundamental background necessary for an active successful professional career in Civil Engineering in general, to impart knowledge and enlighten students to make them competent, self-motivated and expanding their knowledge skills through continuous education, and to inculcate human values and concern for environment and the society.

PROFILE

The Department was established in 1985. It started an U.G. course in Civil Engineering in the same year. This course had been accredited by N.B.A. and awarded 'A' Grade for three years in May, 1999, 'A' Grade for five years in May, 2002 and 'A' Grade for five years in September, 2007. The Department was well established and running successfully with an intake of 180 Students.

Civil Engineering is a challenging discipline. It encompasses all important aspects of Modern Technology. In Buildings, Airports, Railways, Irrigation Projects and Civil Engineers have been playing a leading role.

Development of STADD, STRAP, AutoCAD packages, Civil Desktop, PRIME VEERA, ANSYS and Auto Civil etc., revolutionized the way Civil Engineers tackle the problems. Design and Analysis of Modern Multi Stored Structures meeting the Architectural challenges is the order of the day for budding Civil Engineers. In the early days of the profession, most of the work of Civil Engineers consisted of Design & Construction. Now Civil Engineers need to know a lot of Principles from other disciplines of Engineering to stay ahead and keep the resources conservatively. Guest Lectures and Field visits are arranged for practical experience.

The Department has well established laboratories and students learn the concepts through Experienced and well trained Faculty. Several computing environments are available for their study and use computers is also an added advantage for problem solving in many Civil Engineering courses. As science and Engineering are rapidly changing and advancing, the courses offered by the Department take care of the needs of Prospective Civil Engineers. Civil Engineering curriculum covers the following areas:

- Concrete Structures Design
- Steel Structures Design
- Hydraulics and Irrigation
- Surveying
- Building Materials
- Environmental Engineering

The Department has 5 Professors all with Doctorate, 2 Associate Professors and 27 Assistant Professors. The entire faculty has Post- Graduate Degree in Civil Engineering with various specializations to provide in-depth Theoretical and Practical knowledge in all disciplines. All the faculty are research oriented and four of them are going to submit the thesis for Ph.D. Two staff members are in an advanced stage of research for their Ph.D. The doctorate holders of the department are acting as research supervises under Acharya Nagrajuna University, JNTUK...Etc. and guiding many scholars. The faculty are also the members of various professional societies at national and international level.

All the staff are passionate and dedicated towards teaching and have the welfare and prospect of the students as their main interest. Many of the staff have produced 100% result in the subjects taught by them for the last few years. The general feedback from the students on the Faculty is very good.

The Department regularly organizes various faculty development programs to update the knowledge of faculty. Most of the faculty development programs got financial support from AICTE and UGC. Our management is also give support to enrich the knowledge and to get familiar with the latest advancements.

Department is having highly skilled and motivated Technicians. They have done innovative projects. Our Technicians always lend a helping hand to the final year students of all Branches in fabricating and completing their project works.

The department is having 8 well equipped laboratories and they are garnering consultancy fees over 20 lakhs annually.

A total of Rs. 30 Lakhs have been received by the department for research activities, upgradation of various laboratories and computer systems from funding agencies like AICTE and UGC.

The Department is even doing well in placements. Almost 90% eligible students got placed into Core as well as Software companies. The major recruiters are TCS, CTS, INFOSYS, BSEPL, L&T, NCC and many more. The department organizes many training programs for the benefit of students to improve the skills and knowledge.

The Department library has 750 Text Books, 50 Video Cassettes, 28 Journals, NPTEL video Lectures and 400 Project Work Reports in its stock. It caters to the needs of students for good text books and reference books in various subjects.

Every student of Civil Engineering will become a member of RVR & JC Civil Engineering Association (RAJCEA). It conducts Technical Seminars, Quizzes and Group Discussions by various students and arranges Guest Lectures by eminent persons from Industry and Academic Institutions. Short and Long Industrial Study Tours are arranged frequently to improve the knowledge base of the students.

The Department has been appreciated and adored by all the stakeholders for the successful implementation of policies. The feedback was taken at regular intervals and necessary actions were implemented for the benefit of the Department. Regular counseling and advice is also given to the students to improve their learning, ability and overall performance apart from guiding in their career.

DEPARTMENT OF CIVIL ENGINEERING

B.TECH CIVIL ENGINEERING

Program curriculum grouping based on course components

Course Component	Curriculum Content (% of total number of credits program)	Total number of contact hours	Total number of credits
Basic Science (BS)	25 (13.22%)	33	25
Engineering Science (ES)	18 (9.52%)	27	18
Humanities and Social Science (HS)	10 (5.29%)	14	10
Program Core (PC)	118 (62.43%)	155	118
Program Elective (PE)	15 (7.94%)	24	15
Open Elective (OE)	3 (1.59%)	4	3
Total number of Credits			189

B.TECH CIVIL ENGINEERING

(w.e.f. the batch of students admitted from the academic year 2016-2017)

I YEAR I SEMESTER COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-101	Differential Equations	3	1	-	40	60	3	BS
2	CE-102	Engineering Physics	4	-	-	40	60	3	BS
3	CE-103	Applied Chemistry	4	-	-	40	60	3	BS
4	CE-104	English for Communication	4	-	-	40	60	3	ES
5	CE-105	Problem Solving with C	4	-	-	40	60	3	ES
6	CE-106	Engineering Mechanics	4	-	-	40	60	3	ES
7	CE-151	Engineering Chemistry Lab	-	-	3	40	60	2	BS
8	CE-152	C Programming lab	-	-	6	40	60	2	HS
9	CE-153	Engineering Graphics Lab	-	-	3	40	60	2	ES
		TOTAL	23	1	12	360	540	24	

I YEAR II SEMESTER COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-107	Calculus	3	1	-	40	60	3	BS
2	CE-108	Physics of Materials	4	-	-	40	60	3	BS
3	CE-109	Chemistry of Engineering Materials	4	-	-	40	60	3	BS
4	CE-110	Environmental Studies	4	-	-	40	60	3	HS
5	CE-111	Engineering Drawing	2	-	4	40	60	3	ES
6	CE-112	Solid Mechanics - I	4	-	-	40	60	3	PC
7	CE-154	Physics lab	-	-	3	40	60	2	BS
8	CE-155	English Communication Skills Lab	-	-	3	40	60	2	ES
9	CE-156	Workshop Practice	-	-	3	40	60	2	ES
		TOTAL	21	1	13	360	540	24	

II YEAR I SEMESTER — COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-201	Computational Techniques & Statistical Methods	3	1	-	40	60	3	BS
2	CE-202	Surveying - I	4	-	-	40	60	3	PC
3	CE-203	Fluid Mechanics	3	1	-	40	60	3	PC
4	CE-204	Solid Mechanics - II	3	1	-	40	60	3	PC
5	CE-205	Building Materials, Planning and Construction	4	-	-	40	60	3	PC
6	CE-206 *	Engineering Geology	4	-	-	40	60	3	PC
7	CE-251	Material Testing Lab	-	-	3	40	60	2	PC
8	CE-252	Building Drawing Lab	-	-	3	40	60	2	PC
9	CE-253	Surveying Field Work – I Lab	-	-	3	40	60	2	PC
		TOTAL	21	3	9	360	540	24	

The following Course can also be registered in this Semester in addition to the above or inplace of CE-206

CE-212 : Concrete Technology

II YEAR II SEMESTER — COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-207	Professional Ethics and Human Values	4	-	-	40	60	3	HS
2	CE-208	Surveying - II	4	-	-	40	60	3	PC
3	CE-209	Hydraulics & Hydraulic Machines	3	1	-	40	60	3	PC
4	CE-210	Structural Analysis - I	3	1	-	40	60	3	PC
5	CE-211	Environmental Engineering - I	4	-	-	40	60	3	PC
6	CE-212 *	Concrete Technology	4	-	-	40	60	3	PC
7	CE-254	Concrete Technology lab		-	3	40	60	2	PC
8	CE-255	Hydraulics & Hydraulic Machines Lab	-	-	3	40	60	2	PC
9	CE-256	Environmental Engineering Lab	-	-	3	40	60	2	PC
		TOTAL	22	2	9	360	540	24	

The following Course can also be registered in this Semester in addition to the above or inplace of CE-212

CE-206 : Engineering Geology

III YEAR I SEMESTER COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-301	Geo Technical Engineering - I	3	1	-	40	60	3	PC
2	CE-302	Water Resources Engineering - I	4	-	-	40	60	3	PC
3	CE-303*	Railway, Airport & Harbor Engineering	4	-	-	40	60	3	PC
4	CE-304	Design of Concrete Structures - I	3	1	-	40	60	3	PC
5	CE-305	Design of Steel Structures - I	3	1	-	40	60	3	PC
6	CE-306 *	Structural Analysis - II	3	1	-	40	60	3	PC
7	CE-351	Surveying Field Work - II	-	-	3	40	60	2	PC
8	CE-352	Geo-Technical Engineering Lab	-	-	3	40	60	2	PC
9	CE-353	Engineering Geology Lab	-	-	3	40	60	2	PC
		TOTAL	20	4	9	360	540	24	

Any one of the following Courses can also be registered in this Semester in addition to the above or inplace of CE-303 / CE-306

CE-309 : Highway Engineering CE-311 : Environmental Engineering - II

III YEAR II SEMESTER COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-307	Geo-Technical Engineering - II	3	1	-	40	60	3	PC
2	CE-308	Water Resources Engineering - II	4	-	-	40	60	3	PC
3	CE-309*	Highway Engineering	4	-	-	40	60	3	PC
4	CE-310	Design of Steel Structures - II	3	1	-	40	60	3	PC
5	CE-311 *	Environmental Engineering - II	4	-	-	40	60	3	PC
6	CE-312	Design of Concrete Structures - II	3	1	-	40	60	3	PC
7	CE-354	Professional Communication Skills Lab	-	-	3	40	60	2	HS
8	CE-355	Computer Programming in Civil Engineering	-	-	3	40	60	2	PC
9	CE-356	Highway Engineering Lab	-	-	3	40	60	2	PC
		TOTAL	21	3	9	360	540	24	

Any one of the following Courses can also be registered in this Semester in adition to the above or inplace of CE-309 / CE-311

CE-303 : Railway, Airport & Harbor Engineering CE-306 : Structural Analysis - II

IV YEAR I SEMESTER COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-401	Bridge Engineering	4	-	-	40	60	3	PC
2	CE-402	Quantity Surveying	4	-	-	40	60	3	PC
3	CE-403	MOOCS+	-	-	-	-	-	-	OE
4	CE-404 *	ELECTIVE – I (Open Elective)	4	-	-	40	60	3	OE
5	CE-405 *	ELECTIVE - II	4	-	-	40	60	3	PE
6	CE-406 *	ELECTIVE - III	4	-	-	40	60	3	PE
7	CE-451	Mini Project / Term Paper	-	-	3	100	-	2	PC
8	CE-452	Quantity Surveying and Project Management	-	-	3	40	60	2	PC
9	CE-453	CAD – Analysis, Design of Structures Lab	-	-	3	40	60	2	PC
		TOTAL	20	-	9	380	420	21	

+ MOOCS Certificate must be submitted on or before the last instruction day of IV/IV B.Tech. I Semester

Elective – I (Open Elective)

CE-404/A	Basic Surveying	CE-404/B	Building Materials & Estimation

Open Elective Subjects offered by other departments

CH-404/A	*Energy Engineering*	*CH-404/B*	*Bio Fuels*
CS-404/A	*JAVA Programming*	*CS-404/B*	*Database Management Systems*
EC-404/A	*Applied Electronics*	*EC-404/B*	*Basic Communication*
EE-404/A	*Non-Conventional Energy Sources*	*EE-404/B*	*Utilization of Electrical Energy*
IT-404/A	*Software Engineering*	*IT-404/B*	*Web Technologies*
ME-404/A	*Robotics*	*ME-404/B*	*Operations Research*

Elective - II

CE-405/A	Economics and Management Accounting for Engineers	CE-405/B	Advanced Surveying
CE-405/C	Remote Sensing and GIS	CE-405/D	Environmental Impact Analysis

Elective - III

CE-406/A	Pre-stressed Concrete	CE-406/B	Water Resources Systems Analysis
CE-406/C	Urban Transportation Planning	CE-406/D	Ground water development and Management

Any one of the following Courses can also be registered in this Semester in addition to the above or in place of CE-405 / CE-406

CE-409/A	Design and Drawing of Hydraulic Structures	CE-410/A	Repair and Rehabilitation of Structures
CE-409/B	Pavement Analysis and Design	CE-410/B	Design of Tall Buildings
CE-409/C	Advanced Environmental Engineering	CE-410/C	Green Buildings
CE-409/D	Earth Retaining Structures	CE-410/D	Ground Improvement Techniques

IV YEAR II SEMESTER COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	CE-407	Construction Technology and Management	4	-	-	40	60	3	PC
2	CE-408 *	ELECTIVE - IV	4	-	-	40	60	3	PE
3	CE-409 *	ELECTIVE - V	4	-	-	40	60	3	PE
4	CE-410 *	ELECTIVE - VI	4	-	-	40	60	3	PE
5	CE-454	Computer Aided Detailing of Structures Lab	-	-	3	40	60	2	PC
6	CE-455	Project and Viva - Voce	-	-	6	40	60	10	PC
		TOTAL	16	0	9	240	360	24	

Elective – IV

CE-408/A	Earthquake Resistant Design of Structures	CE-408/B	Advanced Foundation Engineering
CE-408/C	Disaster Management	CE-408/D	Fiber Reinforced Concrete

Elective - V

CE-409/A	Design and Drawing of Hydraulic Structures	CE-409/B	Pavement Analysis and Design
CE-409/C	Advanced Environmental Engineering	CE-409/D	Earth Retaining Structures

Elective - VI

CE-410/A	Repair and Rehabilitation of Structures	CE-410/B	Design of Tall Buildings
CE-410/C	Green Buildings	CE-410/D	Ground Improvement Techniques

Any one of the following Courses can also be registered in this Semester in addition to the above or in place of CE-409 /CE- 410

CE-405/A	Economics and Management Accounting for Engineers	CE-405/B	Advanced Surveying
CE-405/C	Remote Sensing and GIS	CE-405/D	Environmental Impact Analysis
CE-406/A	Pre-stressed Concrete	CE-406/B	Water Resources Systems Analysis
CE-406/C	Urban Transportation Planning	CE-406/D	Ground water development and Management

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Upon graduation, the students of the program will

PEO I : Contribute directly to professional careers with strong framework to apply principles of Mathematics, Basic Sciences and Engineering.

PEO II : Empower people to better understand, and engage in real time, engineering problems to design, build, analyze and realize the physical systems and components or processes using professional knowledge and skills resulting in significant societal benefit.

PEO III: Strive to achieve full potential and expand their capabilities through harnessing multidisciplinary skills and to analyze engineering issues in a broader perspective with ethical responsibility towards sustainable development.

PEO IV: Enhance knowledge and skills in the areas of interpersonal activities, leadership and team building to achieve organization goals, and the ability to constantly adapt and change through lifelong learning.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO 1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 : Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct Investigations of complex problems: Use research- based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including predication and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The Program "Civil Engineering" curriculum must prepare the students

PSO 1: an ability to utilize their knowledge in engineering, basic sciences and mathematics on an applied basis.

PSO 2: an ability to apply learned principles to the analysis, design development and implementation of more advanced Civil systems or processes.

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CE 101 DIFFERENTIAL EQUATIONS

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To provide knowledge on solving ordinary differential equations.
2 To provide knowledge on applications of first order ordinary differential equations.
3 To provide knowledge on solving higher order ordinary differential equations.
4 Focused in partial differential equations.
5 To provide knowledge on Laplace transforms.

COURSE OUTCOMES:

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

1 Understand methods of solving first order differential equations.
2 Understand some physical applications of first order differential equations.
3 To solve higher order differential equations
4 To solve partial differential equations
5 To understand Laplace transforms.

UNIT-I

Differential Equations of First Order:

Definition-Formation of differential equation-Equations of first order and first degree: Linear equations, Bernoulli's equation.

Exact differential equations - Equations reducible to exact equations.

UNIT II

Applications of differential equations of first order: Orthogonal trajectories, Newton's law of cooling.

Higher order Linear Differential Equations: Definitions–Operator D–Rules for finding the complementary function.

UNIT III

Inverse operator–Rules for finding Particular Integral–working procedure. Method of variation of parameters.

Equations reducible to linear equations with constant coefficients: Cauchy's and Legendre's Linear equations.

UNIT IV - Partial Differential Equations

Formation-Equations solvable by direct integration-Linear equations of first order- Lagrange's linear equation.

Linear Homogeneous partial differential equations of higher order with constant coefficients.

UNIT V

LAPLACE TRANSFORMS

Introduction-Transforms of elementary functions – Properties of Laplace transforms – Transforms of derivatives and integrals – Multiplication by tn and division by t – Evaluation of integrals by Laplace transforms. Inverse transforms.

Convolution theorem (without proof). Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

LEARNING RESOURCES:

TEXT BOOK:

1 Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

REFERENCE BOOK:

1 Advanced Engineering Mathematics by Erwin Kreyszig.

CE 102 **ENGINEERING PHYSICS**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To impart knowledge and understanding of basic principles of Ultrasound and its applications in imaging and industry
2 To understand about basic phenomena of light waves.
3 To understand about fundamentals of Laser, its types and applications. 3-D photography , principle and applications of optical fiber.
4 To understand Essential formulation of physics in the micro world.
5 To understand development of Electromagnetic wave equations.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1 Understand the concepts of Ultrasonic waves, production and applications in NDT.
2 Understand the interference in thin films and its application, Concept of diffraction and grating, birefringence and production and detection of different polarized lights.
3 Acquire Knowledge on basics of lasers, holography, fibers and their applications.
4 Understand Schrodinger wave equation and its applications in 1-D with respect to the domain of quantum world.
5 Describe the nature of electromagnetic radiation and matter in terms of the particles.

UNIT I

Ultrasonics: properties, production of ultrasonics by magnetostriction, piezo electric oscillator methods, detection by acoustic grating method, General applications of ultrasonics in industry and medicine.

NDT: Pulse echo testing methods (reflection & transmission modes), Ultrasonic imaging (A Scan & B scan).

UNIT II

Physical Optics: Interference: Introduction, Stoke's principle (change of phase on reflection), interference in thin films due to reflected light (Cosine law), theory of air wedge (fringes produced by a wedge shaped thin film), theory of Newton's rings(reflected system).

Diffraction: Introduction, Fraunhofer diffraction due to a single slit (quantitative), theory of plane transmission diffraction grating.

Polarization: Introduction, double refraction, construction and working of a nicol prism, quarter wave plate, production and detection of circular and elliptical polarizations(qualitative).

UNIT III

Lasers: characteristics, spontaneous and stimulated emissions, Einstein coefficients and Relation between them, population inversion, pumping, active system, gas (He-Ne) laser, Nd: YAG laser and semiconductor (GaAs) laser, applications of lasers.

Holography: basic principle, recording, reproduction and applications.

Fiber optics: Principle & structure of an optical fiber, numerical aperture, acceptance angle and acceptance cone, fractional index change, types of optical fibers, fiber optics in communication system and its advantages. Applications of optical fibers.

UNIT IV

Principles of Quantum Mechanics: de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle-experimental verification (electron diffraction - single slit).

Schrodinger equation and application: Time independent Schrodinger's wave equation, physical significance of the wave function, particle in a box (one dimensional), tunneling effect, expression for transition probability (Qualitative treatment).

UNIT V

Electromagnetism: induced electric fields, displacement current and conduction current, Maxwell's equation – qualitative (differential & integral forms)-significance, velocity of electromagnetic wave equation in free space, Poynting Theorem, LC oscillations (quantitative)

LEARINING RESOURCES:

TEXT BOOKS:

1 Engineering Physics – M.N. Avadhanulu & P.G. Kshirasagar, S.Chand & Co.Ltd.
2 Engineering Physics- V. Rajendran

REFERENCE BOOKS:

1 Fundamentals of Physics – Resnick & Halliday, John Wiley sons.
2 Engineering Physics – SL Kakani & Shubhra kakani (3rd Edition), CBS Publications Pvt. Ltd. Delhi.
3 Engineering Physics – B. K. Pandey & S. Chaturvedi, Cengage Learning India Pvt. Ltd., Delhi.
4 Engineering Physics – Hitendra K. Malik & A.K.Singh, Tata MacGraw Hill, New Delhi.
5 Engineering Physics – P.K.Palanisamy, Scitech Publications

CE 103 APPLIED CHEMISTRY

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To know the softening methods and quality parameters of water used in industries.
2 To know the requirements and purification methods of drinking water.
3 To understand the construction and functioning of electrochemical energy systems.
4 To study the mechanisms, types, factors influencing corrosion and protection methods of corrosion.
5 To acquire knowledge on latest analytical techniques.

COURSE OUTCOMES :

1 Students acquire knowledge on quality and utility of water in industries.
2 Students gain knowledge on water treatment for drinking purpose.
3 Able to understand functioning of electrochemical energy systems.
4 Students can relate corrosion and environment and suggest methods to prevent corrosion.
5 Can analyse substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.

UNIT I

Water technology: Types of Hardness- units and determination by EDTA method (simple problems), Water technology for industrial purpose: Boiler troubles- scales, sludges, caustic Embrittlement, boiler corrosion, priming and foaming- causes and prevention.

Internal conditioning-phosphate, calgon and carbonate treatment. External conditioning-lime soda process (simple problems), softening by ion exchange process. Desalination of brackish water by electro dialysis and reverse osmosis.

UNIT II

Water treatment for drinking purpose- WHO guidelines, sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Phase Rule: Statement and explanation of the terms involved, one component water system, condensed phase rule- construction of phase diagram by thermal analysis, simple eutectic system (Pb-Ag system only), applications eutectic compounds.

UNIT III

Electrochemistry: Electrode potential, electrochemical series and its significance, Nernst equation-derivation-related problems, Reference electrodes (SHE and Calomel electrode) Ion-selective electrode-glass electrode and measurement of pH.

Electrochemical Energy Systems: Types of electrochemical energy systems, electrochemistry of primary batteries (Lachlanche or dry cell), Secondary cells (Lead Acid cell, Ni-Cd cell), Lithium batteries (Li-MnO_2, Lithium organic electrolyte) and their advantages. Fuel cells (Oxygen-Hydrogen)

UNIT IV

Corrosion and its control: Introduction, dry corrosion, electrochemical theory of corrosion, Types of corrosion- differential aeration, galvanic (galvanic series) and Stress corrosion Factors affecting corrosion-design, pH, over voltage and temperature.

Protection methods: Cathodic protection, (Impressed current and sacrificial anode) corrosion inhibitors- types and mechanism of inhibition, metallic coatings-Galvanization, Tinning, Electroplating (Cu) and electro less plating (Ni)

UNIT V

Analytical Techniques: Spectroscopy- Beer-Lambert's law, UV-electronic transitions-chromophores-auxochromes-shifts, and IR- modes of vibrations, ex.H_2O, CO_2 Instrumentation of UV and IR.

Colorimetry- estimation of Iron, Conductometric (HCl vs NaOH) and potentiometric titrations (Fe(II)vs $K_2Cr_2O_7$)

LEARNING RESOURCES:

TEXT BOOKS:

1 Engineering Chemistry, P.C. Jain and Monika Jain, 15th Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.
2 A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.

REFERENCE BOOKS:

1 A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.

WEB REFERENCES:

1 http://www.powerstream.com/BatteryFAQ.html#lec
2 http://freevideolectures.com/Course/3029/Modern-Instrumental-Methods-of-Analysis
3 http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/

CE 104 **ENGLISH FOR COMMUNICATION**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To enable students improve their lexical and communicative competence.
2 To equip students with oral and written communication skills.
3 To help students understand and learn the correct usage and application of Grammar principles.
4 To get them acquainted with the features of successful professional communication.
5 To enable students acquire various specific features of effective written communication.

COURSE OUTCOMES:

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

1 Use vocabulary contextually.
2 Compose effectively the various forms of professional communication.
3 Apply grammar rules efficiently in spoken and written forms.
4 Understand and overcome the barriers in communication.
5 Develop professional writing.

UNIT I

Lexis:

a) Synonyms & Antonyms b) Words often confused.
c) One Word Substitutes d) Analogies

UNIT II

Written Communication:

a) Note-taking & Note-making b) Writing a Proposal
d) Memo Writing d) Paragraph writing

UNIT III

Principles of Grammar:

Exposure to basics of grammar with emphasis on

a) Articles & Prepositions b) Tenses
c) Voice d) Speech

UNIT IV

Communication:

Types:

a) Oral & Written
b) Barriers to communication
c) Non-verbal Communication
d) Kinesics
e) Proxemics
f) Occulesics
g) Haptics.

UNIT – V

Composition:

a) E-mail
b) Letter-writing: order, complaint, job application, invitation.
c) Precis writing
d) Biographical writing:
    i) APJ Abdul Kalam ii) Ratan Tata iii) Sudha Murthy iv) Mother Teresa

LEARINING RESOURCES:

TEXT BOOK :

1 Technical English - by Dr. M.Sambaiah, Wiley India Pvt. Ltd, New Delhi 2014.

REFERENCES:

1 Dictionary of Synonyms and Antonyms, Oxford & IBH, III Ed –(Unit-Ia) , 2010
2 Objective English III Edition, Mc-Graw Hill Companies- by Hari Mohan Prasad, Uma Rani Sharma. (Unit Ia & b) , 2007
3 Communication Skills – OUP, by Sanjay Kumar & Pushpa Latha (Unit - IIa) , 2015
4 Technical Communication – Principles & Practice. II Ed, by Meenakshi Raman & Sangeetha Sharma (Unit –II b,c,d) & (Unit –V a,b,c) , 2015
5 Oxford Michael Swan- Practical English Usage – III Ed . New international Students ‘ Ed,OUP. (Unit- III) , 2007
6 Business Communication II Ed. Meenakshi Raman & Prakash Singh, OUP, (Unit-IV). , 2012
7 Handouts-(Unit-V,(iv-a,b,c,d))
8 A course in English Communication – by Kiranmai Dutt, Rajeevan, C.L.N Prakash , 2013.
9 The Most Common Mistakes in English Usage – Thomas Elliott Berry , 2012.

CE 105 PROBLEM SOLVING WITH C

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

At the end of the course, the student will understand

1 The basic problem solving process using Flow Charts and algorithms.
2 The basic concepts of control structures in C.
3 The concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4 The concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

At the end of the course, the student will be able to

1 Develop algorithms and flow charts for simple problems.
2 Use suitable control structures for developing code in C.
3 Design modular programs using the concepts of functions and arrays.
4 Design well-structured programs using the concepts of structures and pointers.
5 Develop code for complex applications using file handling features.

UNIT I

Introduction: Computer & it's Components, Hardware , Software, programming languages, Algorithm, Characteristics of algorithm, Flowchart, Symbols used in flowchart, history of C, structure of C program, C language features.

C Tokens: Character set, Identifiers, Keywords, constants, Data types, type qualifiers, Declaration and Initialization of variables.

Operators & Expressions: C operators and expressions, Type-conversion methods, Operators Precedence and Associativity, Input/ Output functions and other library functions.

Programming Exercises: C-Expressions for algebraic expressions, Evaluation of arithmetic and boolean expressions. Values of variables at the end of execution of a program fragment, Computation of values using scientific and engineering formulae.

UNIT - II

Control Statements: If-Else statement, Else-If statement, Switch statement and goto statement, Looping- While, Do-While and for statements, Break and continue statements.

Programming Exercises: Finding the largest of three given numbers, Computation of discount on different types of products with different ranges of discount, finding the type of triangle formed by the given sides, Computation of income-tax, Computation of Electricity bill, finding roots of a quadratic equation. Finding the factorial of a given number, test whether a given number is-prime, perfect, palindrome or not, Generation of prime and Fibonacci numbers.

UNIT - III

Arrays: One - dimensional, Two-dimensional numeric and character arrays.

Functions: Function Definition, Function prototype, types of User Defined Functions, Function calling mechanisms, Built-in string handling and character handling functions, recursion, Storage Classes, multi-file compilation, Function with Arrays.

Programming Exercises: Computation of statistical parameters of a list of numbers, sorting and searching a given list of numbers, Operations on Matrices such as addition, multiplication, Transpose of a matrix. Finding whether a given string is palindrome or not, sorting of names, operations on strings

with and without using library functions, recursive functions to find the factorial value, Fibonacci series, GCD, swapping of two variables, calling the function by passing arrays.

UNIT - IV

Pointers: Pointer, Accessing a variable through pointer, pointer Arithmetic, pointer and Arrays, Dynamic memory allocation, pointer to pointer, Array of pointers.

Structures: Structures, Nested structures, Array of structures, Pointer to structures, passing structures to functions, self referential structure, Unions.

Programming Exercises: Sort and search the given list using functions and pointers, operations on arrays using functions and pointers. Operations on complex numbers, maintaining the books details by passing array of structures to functions, sorting the list of records.

UNIT-V

Files: defining and opening a file, closing a file, input/output operations on files using file handling functions, random access to files.
Command line arguments, C-preprocessor directives.

Programming Exercises: create and display the contents of text file, copy the contents of one file into another, merging the contents of two files, writing, reading and updating the student records in a file, programs to display the contents of a file and copy the contents of one file into another using command line arguments.

LEARNING RESOURCES:

TEXT BOOKS:

1 Programming with C (Schaum's Outlines) by Byron Gottfried, Third Edition, Tata McGraw-Hill.

REFERENCE BOOKS:

1 Programming in C by Stephen G. Kochan, Fourth Edition, Pearson
2 C Complete Reference, Herbert Sheildt, TMH., 2000.
3 Programming with C by K R Venugopal & Sudeep R Prasad, TMH., 1997
4 The C programming Language by Brian W. Kernighan & Dennis M. Ritchie, Second Edition, Prentice Hall

WEB REFERENCES:

1 http://cprogramminglanguage.net/
2 http://lectures-c.blogspot.com/
3 http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4 http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

CE 106 ENGINEERING MECHANICS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

To introduce the students to the concepts of :

1 Force systems, free body diagrams, resultant of forces and equations of equilibrium
2 Supports and support reactions
3 Determination of Centroid and Moment of inertia of material bodies, plane figures
4 Analysis of the truss and determination of axial forces by Method of Joints and sections
5 Laws of friction and applications
6 Principle of virtual work
7 Force systems in space

COURSE OUTCOMES:

At the end of this course, the student should be able to :

1 Construct free body diagrams and use appropriate equilibrium equations
2 Calculate unknown forces in a plane by resolution of force and equilibrium equations
3 Locate Centroid of composite figures and determine moment of inertia of material bodies, plane figures
4 Determine the axial forces in the members of determinate truss.
5 Analyze the systems with friction.
6 Calculate unknown forces using virtual work equation
7 Determine forces in space using equilibrium equations

UNIT I

Concurrent Forces in a Plane: Principles of statics, Rectangular components of a force, Resultant and equilibrium of concurrent forces in a plane, Method of projections.

UNIT II

Parallel Forces in a Plane: Moment of a force about a point, Couple, Resultant and equilibrium of parallel forces in a plane, Centre of parallel forces and centre of gravity, Centroids of composite plane figures and curves.

UNIT III

Moments of Inertia of Material Bodies: Moment of inertia of a rigid body; Moment of inertia of a lamina; Moments of inertia of three- dimensional bodies.

Moments of Inertia of Plane Figures : Moment of inertia of a plane figure with respect to an axis in its plane ; Moment of Inertia with respect to an axis perpendicular to the plane of the figure ; Parallel axis theorem.

UNIT IV

General Case of Forces in a Plane: Resultant and equilibrium of general case of parallel forces in a plane, Statically determinate plane trusses-Method of joints and Method of sections.
Friction : Types of friction, Dry friction - Mechanism of friction , Types of friction problems.

UNIT V

Principle of virtual work: Equilibrium of ideal systems, Stable and Unstable equilibrium.

Force Systems in Space (using vector notation): Position vector, Unit vector, Force vector, Component of a force about an axis, Moment of a force about a point, Moment of a force about an axis, Couple, Resultant and equilibrium of concurrent forces in space, Resultant and equilibrium of parallel forces in space, Centre of parallel forces and centre of gravity.

LEARNING RESOURCES

TEXT BOOKS:

1. Engineering mechanics by S. Timoshenko, D.H.Young and J.Rao , Tata McGraw Hill Publishing Company Ltd.,2007.
2. Engineering Mechanics Statics and dynamics by A.K.Tayal, Umesh Publication, Delhi

REFERENCE BOOKS:

1. Engineering mechanics by J. L. Meriam and L. Kraige , 6th Edition, Johnley & Sons,2010.
2. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
3. Vector Mechanics for Engineers Statics and Dynamics by Beer and Johnston, Tata McGraw Hill Publishing Company, New Delhi.
4. Engineering Mechanics , Fedinand . L. Singer , Harper – Collins.
5. Engineering Mechanics statics and dynamics , A Nelson, Mc Graw Hill publications
6. Engineering Mechanics by SS Bhavikatti and KG Rajasekharappa

WEB REFERENCES:

1. http://en.wikibooks.org/wiki/Engineering_Mechanics
2. http://emweb.unl.edu/
3. http://nptel.ac.in/courses/122104015/

CE 151 **ENGINEERING CHEMISTRY LAB**

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To learn the concepts of equivalent weight, molecular weight, normality, molarity, weight percent, volume percent.
2 To prepare molar solutions of different compounds.
3 To know the methods of determining alkalinity, hardness and chloride ion content of water sample.
4 To know the methods to determining purity of washing soda, percentage of available chlorine in bleaching powder.
5 To learn the redox methods to determine Fe2+ ions present in solution.
6 To know principles and methods involved in using instruments like conductivity bridge, spectrophotometer, pH meter and potentiometer

COURSE OUTCOMES :

1 Students acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.
2 Students can prepare solutions with different concentrations.
3 Students can analyze water for its hardness, alkalinity, chloride ion content, iron content.
4 Students understand the principles behind the development of instruments suitable for chemical analysis. Later he can use the knowledge in modifying instruments.

Any 10 out of the following experiments

1. Determination of total alkalinity of water sample
   a) Standardization of HCl solution
   b) Determination of alkalinity of water
2. Determination of purity of washing soda
   a) Standardization of HCl solution
   b) Determination of percentage purity of washing soda
3. Estimation of Chlorides in water sample
   a) Standardization of $AgNO_3$ solution
   b) Estimation of Chlorides in water
4. Determination of Total Hardness of water sample
   a) Standardization of EDTA solution
   b) Determination of Total Hardness of water
5. Estimation of Mohr's salt-Permanganometry
   a) Standardization of $KMnO_4$ solution
   b) Estimation of Mohr's salt
6. Estimation of Mohr's salt -Dichrometry
   a) Standardization of $K_2Cr_2O_7$ solution
   b) Estimation of Mohr's salt

7. Determination of available chlorine in bleaching powder-Iodometry
    a) Standardization of Hypo
    b) Determination of available chlorine in bleaching powder
8. Estimation of Magnesium
    a) Standardization of EDTA solution
    b) Estimation of Magnesium
9. Conductometric titration of an acid vs base
10. Potentiometric titrations: Ferrous Salt vs Dichromate

Demonstration Experiments:

11. pH metric titrations of an acid vs base
12. Spectrophotometry: Estimation of Mn/Fe

Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CE 152 C-PROGRAMMING LAB

Practicals	: 6 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

At the end of the course, the student will understand

1 The fundamentals of C and working with ANSI C/Turbo C compilers.
2 The basic concepts of control structures in C.
3 The concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4 The concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

At the end of the course, the student will be able to

1 Write simple programs using C fundamentals and control statements.
2 Develop various menu driven programs using concepts of control statements, arrays, functions and pointers.
3 Use dynamic memory allocation for efficient memory management.
4 Design well-structured programs using the concepts of structures, unions and file handling features.
5 Design applications using C.

LAB CYCLE:

1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if else statement or Switch statement).

Domestic level consumption as follows	
Consumption units	Rate of charges(Rs.)
0-200	0.50 per unit
201-400	100 plus 0.65 per unit
401-600	230 plus 0.80 per unit
601 and above	390 plus 1.00 per unit
Street level consumption as follows	
Consumption units	Rate of charges(Rs.)
0-100	0.50 per unit
101-200	50 plus 0.60 per unit
201-300	100 plus 0.70 per unit
301 and above	200 plus 1.00 per unit

2. Write a C program to evaluate the following (using loops):
   (i) $x-x^3/3!+x^5/5!-x^7/7!+$----------up to n terms
   (ii) $1+x+x^2/2!+x^3/3!+$----------up to n terms
   (iii) $1-x^2/2!+x^4/4!-x^6/6!+$----------up to n terms
3. A menu driven program to test whether a given number is (using Loops):
   (i) Prime or not
   (ii) Perfect or not
   (iii) Armstrong or not
   (iv) Strong or not
   (v) Palindrome or not
4. A menu driven program to display statistical parameters (using one - dimensional array)
   (i) Mean
   (ii) Median
   (iii) Mode
   (iv) Standard deviation

5. A menu driven program to perform the following operations in a list (using one -Dimensional array)
   (i) Insertion of an element
   (ii) Deletion of an element
   (iii) Remove duplicates form the list
   (iv) Print the list
6. A menu driven program with options (using two dimensional array)
   (i) To compute A+B
   (ii) To compute A x B
   (iii) To find transpose of matrix A.
   Where A and B are matrices.

7. Write C programs to perform the following using Strings
   (i) To test the given string is palindrome or not
   (ii) To sort strings in alphabetical order

8. Write C programs using recursive functions
   i) To find the Factorial value
   ii) To generate Fibonacci series
   iii) To find the GCD of two given numbers

9. A menu driven program with options (using dynamic memory allocation)
   (i) Linear search
   (ii) Binary search

10. A menu driven program with options (using Character array of pointers)
   (i) To insert a student name
   (ii) To delete a name
   (iii) To sort names in alphabetical order
   (iv) To print list of names

11. Write a program to perform the following operations on Complex numbers (using Structures & pointers):
   i) Read a Complex number
   ii) Addition, subtraction and multiplication of two complex numbers
   iii) Display a Complex number

12. Write C programs to perform the following operations on files
   i) merging the contents of two files
   ii) writing, reading and updating student records in a file
   iii) Copy the contents of one file into another using command line arguments

Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CE 153 **ENGINEERING GRAPHICS LAB**

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To study and know the use of instruments applicable to Engineering Drawing.
2 To impart knowledge on shop floor dimensioning, lettering and line types.
3 To understand the fundamentals of geometry like scales and Engineering curves.
4 To make the students learn different methods in constructing conics and curves.
5 To study different types of projections and to impart knowledge on projecting one & two dimensional figures and to visualize the different positions of planes.

COURSE OUTCOMES :

On completion of the course, students will

1 Acquire basic skills in technical graphic communication and also get thorough knowledge of various geometrical elements used in Engineering practice.
2 Be able to use the instruments required for Drawing.
3 Be able to dimension, print letters which can be understood globally.
4 Gather good knowledge in various kinds of scales and their practical usage.
5 Understand the Projections of points, lines and planes and their representation and dimensioning.

List of Experiments:

Practice with mini Drafter on Drawing sheets:

General: Use of Drawing instruments, Lettering -Single stroke letters, Dimensioning- Representation of various type lines, Geometrical Constructions.

Conics and Curves: General construction, Oblong and Concentric circle, methods for Ellipse, Tangent and Rectangular methods for Parabola. Cycloidal curves - Cycloid, Epicycloid and Hypocycloid, involute of circle, Spirals.

Scales: Types of scales, Representative Fraction, Construction of Plain, Diagonal and Vernier scales.

Method of Projections: Principles of projection - First angle and third angle projection of points. Projection of straight lines. Traces of lines.

Projections of Planes: Projections of planes, projections on auxiliary planes.

LEARINING RESOURCES:

TEXT BOOK:

1 Engineering Drawing by N.D. Bhatt & V.M. Panchal. 52nd Edition, Charotar Publishing House Pvt. Ltd, 2014.
2 Engineering Drawing by N.S.Pardthasarathy & Vela Murali, Oxford Univeristy Press, 2015.

REFERENCE BOOKS:

1 Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah., 2nd Edition, Scitech Publications

WEB RESOURCES:

- https://www.youtube.com/watch?v=HnjWHta89g0
- https://www.youtube.com/watch?v=1AMyZ-WzPB0
- https://www.youtube.com/watch?v=j6zPhf3d8uo
- https://www.youtube.com/watch?v=K-NceraNnS0

CE 107 **CALCULUS**

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Finding the Eigen values and Eigen vectors and inverse of a matrix and getting familiarity with diagonalization and quadratic forms.
2 To give basic knowledge on evaluation of double, triple integrals, area and volume.
3 To provide sufficient theoretical and analytical background of differentiation and integration of vector functions.
4 To provide knowledge on complex analysis because technology we rely on requires scientists and engineers to understand this topic.
5 Complex analysis is widely used in the fields of science and technology.
6 To provide knowledge on singularities, poles and residues.

COURSE OUTCOMES:

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

1 Understand the basic linear algebraic concepts.
2 To evaluate double, triple integrals and the area, volume by double & triple integrals respectively.
3 To solve gradient, divergence, curl and integration of vector function problems.
4 Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.
5 Find singularities of complex functions and determine the values of integrals using residues

UNIT I

MATRICES : Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values (without proofs) – Cayley – Hamilton theorem (without proof).
Reduction to diagonal form. Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT II

DIFFERENTIAL CALCULUS: Rolle's theorem (without proof), Lagrange's Mean value theorem (without proof), Taylor's and Maclaurin's series for single variable (without proof).
Maxima and minima of two Variables, Lagrange's method of undetermined multipliers.

UNIT III

MULTIPLE INTEGRALS: Double integration in Cartesian and polar coordinates – Change of order of integration – Area as a double integral.
Change of variables in double integrals from Cartesian to polar – Triple integration in Cartesian coordinates – Volume as a Triple Integral.

UNIT IV

VECTOR CALCULUS: Gradient, Directional derivatives, divergence, curl – Solenoidal and irrotational fields – Vector identities (without proof).
Line, surface and volume integrals – Green's theorem in the plane, Stoke's theorem and Gauss divergence theorem (without proofs).

UNIT V

COMPLEX ANALYSIS: Introduction - Derivative of complex function - Analytic functions - The necessary and sufficient conditions for the analyticity of the function (without proof) - Cauchy-Riemann equations in polar form (without proof) - Harmonic functions, Milne-Thomson method.

Complex integration - Line integrals, Cauchy's integral theorem, Cauchy's integral formulae (without proofs).

LEARNING RESOURCES:

TEXT BOOK:

1 B.S.Grewal - Higher Engineering Mathematics, Khanna publishers, 40th edition, 2007.

REFERENCE BOOK:

1 Erwin Kreyszig - Advanced Engineering Mathematics, 8th edition, New Age International (P) Ltd., 2007.

WEB RESOURCES:

1 http://nptel.iitm.ac.in/courses/

CE 108 PHYSICS OF MATERIALS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To understand the general, scientific concepts required for technology.
2 To familiarize with the new concepts of composite, ceramic and nano science and technology.

COURSE OUTCOMES:

1 Characterization of materials and introduction to advanced materials to present technologies.
2 Acquire knowledge on properties of solids, fluids & nano, composite materials and their applications.
3 To know the concepts of rotational motion, principles & moment of inertia.
4 To understand the modern engineering materials (shape memory & ceramic materials) and their applications

UNIT I

Mechanics of solids: Elastic behavior, Stress-strain relationship, factors affecting mechanical properties, Hooke's law, Young's modulus, bulk modulus, shear, modulus of rigidity, Poisson's ratio; elastic energy, shafts, torsion pendulum, determination of rigidity modulus of a wire, bending of beams, plane of bending and neutral axis of bent beam, bending moment, uniform bending and non-uniform bending.

UNIT II

Mechanics of fluids: Fluids and solid, General concepts of fluid flow, pressure and density, variation of pressure in a fluid at rest, Pascal's principle and Archimedes' principle, buoyancy, stability of submerged and floating bodies, metacentre, metacentric height, surface tension, viscosity (basic concepts),

UNIT III

Motion of System of Particles and Rigid Body: Moment of a force, torque, angular momentum, conservation of angular momentum with some examples. DAlembert's Principle, Work-Energy and Impulse-Momentum, Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of M.I.for simple geometrical objects. parallel and perpendicular axes theorems.

UNIT IV

Nanomaterials: Basic Concepts of science & technology, nano scale, introduction to nano materials, surface to volume ratio, General properties of nano materials in brief, fabrication of nano materials (sol-gel and chemical vapour deposition methods), applications of nano materials.

Composite Materials: Classification, Large particle reinforced and dispersion strengthened composites; Fiber orientation and Concentration Influences, discontinues and alignment randomly oriented; Processing techniques for composites materials (Pre Preg and Wet Hand Lay Up), applications.

UNIT V

Modern Engineering Materials: Basic concepts of Smart materials – Shape memory alloys – Chromic materials (Thermo, Photo and Electro) – Rheological fluids (Electro and Magneto), classification of ceramics, ceramic fabrication (Casting and Wet Bag Isotatic processes), ceramic materials (piezo and ferroelectric), applications of ceramics.

LEARNING RESOURCES:

TEXT BOOKS:

1 Engineering Physics – M. Arumugam, Anuradha agencies, Kumbakonam (Unit-I)
2 Engineering Physics- V. Rajendran, Tata MacGraw Hill, New Delhi.(Unit – IV & Unit-V)
3 Fundamentals of Physics – Resnick & Halliday, John Wiley sons. (Unit-II & Unit-III)

REFERENCE BOOK:

1 Engineering Physics – M.N. Avadhanulu & P.G. Kshirasagar, S.Chand & Co.Ltd

CE 109 CHEMISTRY OF ENGINEERING MATERIALS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To acquire knowledge on formation of polymers and conditions to act as conducting polymers.
2 To gain knowledge on the chemistry of some important plastics and rubbers commonly used.
3 To understand parameters related to efficiency of various fuels
4 To gain knowledge on the characteristics of refractories and lubricants.
5 To understand the requirements and chemistry of explosives and utility of liquid crystals

COURSE OUTCOMES:

1 Students know the formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.
2 Students would be able to know usage of plastics and elastomers in day-to-day life and in fields like automobile, electronics, etc.
3 Would acquire knowledge on composition, quality and uses of various fuels.
4 Would be capable of selecting appropriate lubricant for a given system, and know the characteristics and utility of refractories.
5 Students acquire knowledge on the requirements, applications of liquid crystals and explosives.

UNIT I

Polymers: Monomer functionality, degree of polymerization, Tacticity, classification of polymerization-addition, condensation and co-polymerization, mechanism of free radical polymerization.

Conducting polymers: Introduction, examples and applications, Polyacetylene- mechanism of conduction.

UNIT II

Plastics- Thermoplastic and thermosetting resins, preparation, properties and uses of Bakelite, polyesters, Teflon and PVC. Compounding of plastics.

Rubber- Processing of latex, Drawbacks of natural rubber- Vulcanization, Chemistry of Synthetic rubbers- Buna-S and Buna-N, polyurethane rubber and silicone rubber, epoxy resin (adhesive)

UNIT III

Fuels: Classification of fuels, calorific value- LCV and HCV-units and determination by Bomb calorimeter, Coal- Ranking, proximate and ultimate analysis, carbonization of coal-types (using Beehive oven), Metallurgical coke-properties and uses.

Petroleum based: Fractional distillation, cracking-fixed bed, reforming, octane number and cetane number of liquid fuels, composition and uses of petrol, diesel, CNG and LPG.

UNIT IV

Refractories: Characteristics, classification, properties and their significance–refractoriness, strength of refractoriness under load, dimensional stability, thermal spalling, thermal expansion, thermal conductivity, porosity Common refractory bricks- silica, fire clay and carborundum

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Lubricants: Classification, functions, properties of lubricants- Viscosity, Viscosity index, Flash point, Fire point, Cloud point, Pour point, Oilyness. Solid lubricants –Graphite and Molybdenum sulphide, Additives, determination of viscosity by Red wood viscometer

UNIT V

Liquid crystals: Structure of liquid crystal forming compounds, Classification and applications.

Explosives: Characteristics, terms related to explosives, classification-primary, low and high explosives. Manufacture of gun powder, lead azide, nitroglycerine and RDX

LEARNING RESOURCES:

TEXT BOOKS:

1 Engineering Chemistry, P.C. Jain and Monika Jain, 15th Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.
2 A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.

REFERENCE BOOKS:

1 A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.
2 Principles of Polymer Science, P.Bahadur and N.V. Sastry, Narora Publishing House

WEB REFERENCES:

1 http://www.chem1.com/acad/webtext/states/polymers.html
2 http://www.nptel.ac.in/courses/104105039/
3 http://freevideolectures.com/Course/3070/Science-and-Technology-of-Polymers

CE 110 ENVIRONMENTAL STUDIES

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To give a comprehensive insight into natural resources, ecosystems and bio diversity.
2 To create an awareness on various aspects of environmental pollution and effects.
3 To educate the ways and means to protect the environment from pollution.
4 To impart fundamental knowledge on human welfare and environmental acts.
5 To demonstrate the environmental problems like global warming, ozone layer depletion, acid rains.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1 Define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.
2 Describe and discuss the environmental implications of biologically important materials through the ecosystems.
3 Describe and discuss the environmental pollution implications and watershed management.
4 Discuss the benefits of sustaining each of the following resources - food, health, habitats, energy, water, air, soil and minerals.
5 Understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies.

UNIT I

Introduction: Definition, Multidisciplinary nature, Scope and Importance of environmental studies

Natural Resources: Forest Resources – Use and over-exploitation, Deforestation, Mining, dams and their effects on forests and tribal people; Water Resources – Use and over-utilization of surface and ground water, floods and droughts, Water logging and salinity, Dams – benefits and problems, Conflicts over water; Energy resources – Energy needs, Renewable and non-renewable energy sources;
Land resources – Land as a resource, land degradation, soil erosion & desertification, Effects of modern agriculture on land resources.

UNIT II

Ecosystems: Definition, Structure and functions of an Ecosystems, Biogeochemical cycles-water, carbon, nitrogen and water cycles, Types-Forest, Greenland, Desert, Aquatic ecosystem.

Biodiversity and its Conservation: Definition of Biodiversity, Values and threats to biodiversity and conservation of biodiversity. Bio-geographical classification of India, India as a mega-diversity nation, Hot-spots of biodiversity, IUCN classification of Biodiversity; Endemic, Exotic and Endangered species - Meaning with a few examples from India.

UNIT III

Environmental Pollution: Causes, effects and control measures of Air pollution including Noise, Fresh Water pollution, Marine pollution, Thermal pollution, and nuclear pollution. Solid wastes - Types based on source (Ex. municipal, industrial, constructional and medical) and nature (degradable and non-degradable); Effects of improper dumping. Solid waste management - Objectives, practices.

Water shed and its management: Definition and importance; Water shed management methods including rain water harvestment.

UNIT IV

Social Issues and Environment: Definition of sustainable development, key types and measures for sustainable development; salient features of Stockholm conference 1972, Earth summit, 1992; Human Population and environment, Green revolution, Resettlement and rehabilitation of people - problems and concerns.

Climate Changes: Green House Gases, Kyoto Protocol, Global warming (The story of Tuvalu); Ozone depletion and Acid rain; Environmental Impact Assessment.

UNIT V

Environmental acts: Environmental Legislation; Wild life protection act, 1972; Water(Prevention and Control of pollution) act, 1974; Forest Conservation act, 1980; Air (Prevention and Control of pollution) act, 1981; Environmental protection act, 1986.

International Conventions: Stockholm Conference 1972, Earth Summit 1992. Copenhagen Summit 2009.

Case Studies:

Chipko movement, Narmada Bachao Andolan, Silent Valley Project, Chernobyl Nuclear Disaster, Bhopal Tragedy, Ralegaon Siddhi, The story of Ganga.

Field work:

Visit to a local area to document environmental assets – river/ forest/ grassland / hill/mountain.
Study of local environment-common plants, insects, birds.
Study of simple ecosystems – pond, river, hill, slopes etc.
Visits to industries, water treatment plants, effluent treatment plants.

LEARINING RESOURCES:

TEXT BOOKS:

1 Anubha Kaushik and C.P.Kaushik - Environmental Studies, 3rd Edition, New Age International Publishers, New Delhi., 2012.
2 R. Rajagopalan - Environmental studies from crisis to cure, 3rd Edition, Oxford University press, 2012.

REFERENCE BOOKS:

1 T Benny Joseph - Environmental Studies, Tata McGraw-Hill Publishing Company Limited, 2006.
2 G. Tyler Miller Jr. - Environmental Science, 3rd edition, CENGAGE Learning, New Delhi, 2011.

CE 111 ENGINEERING DRAWING

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Comprehend general projection theory with emphasis on orthographic projection to represent three dimensional objects in two dimensional views.
2 To visualize the different positions of solids and to be able to plan and prepare neat orthographic drawings of solids.
3 To evident the features when solids are cut into sections, to draw and identify various types of section views.
4 To enable the students learn various aspects of development of surfaces used in sheet metal working along with a thorough knowledge in interpenetration of solids.
5 To know various isometric and orthographic views and their applications in the daily life.

COURSE OUTCOMES:

On completion of the course the students will:

1 Be able to visualize and communicate with two dimensional as well as three dimensional shapes.
2 Understand the application of industry standards and best practices applied in Engineering drawing.
3 Be able to apply the knowledge of development of surfaces in real life situations.
4 Get insight into the concepts of projection, representation and dimensioning of three dimensional objects like Prisms, Cylinders, Pyramids, Cones.
5 Thoroughly understand the concept of isometric & orthographic projections which will be useful for the visualization of any object. This subject also paves the way for learning Auto Cad and advanced software packages.

UNIT I

Projections of Solids: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.

UNIT II

Sections Of Solids: Sections of Cubes, Prisms, Pyramids, cylinders and Cones, true shapes of sections. (Limited to the Section Planes perpendicular to one of the Principal Planes).

UNIT III

Development of Surfaces: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones.

UNIT – IV

Interpenetration Of Solids: Interpenetration of Prism in prism, (Treatment is limited to triangular & square prisms) and Cylinder in Cylinder with their axes perpendicular without offsets.

Isometric Views: Conversion of Orthographic Projections into isometric views. (Treatment is limited to simple objects only).

UNIT – V

Orthographic Projections: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).

TEXT BOOK:

1 Engineering Drawing by N.D. Bhatt & V.M. Panchal. 52nd Edition , Charotar Publishing House Pvt. Ltd , 2014.

REFERENCE BOOKS:

1 Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah. , 2nd Edition , Scitech Publications

CE 112 SOLID MECHANICS – I

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To establish an understanding of the fundamental concepts of
2 The stress, strains and different engineering properties of materials.
3 The internal resistances against the applied loads on different shaped materials.
4 Shear force and bending moment.
5 Torsion and design for torsion for materials.

COURSE OUTCOMES:

At the end of this course, the student should be able to

1 Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
2 Draw bending moment and shearing force diagrams for beams.
3 Design simple bars, beams, and circular shafts for allowable stresses and loads.
4 Understand the concept of shear flow in sections.
5 Understands the core and kernel of the section.

UNIT I

Stress : Introduction; Method of sections; Definition of stress; Normal stresses in axially loaded bars; Shear stresses ; Analysis for normal and shear stresses; Stresses on inclined sections in axially loaded bars; Allowable stress and factor of safety.

Strain : Introduction; Normal strain; Stress-strain diagrams; Hooke's law; Deformation of axially loaded bars; Thermal strain and deformation; statically indeterminate axially loaded bars; Shear strain; Hooke's law for shear stress and shear strain.

Generalized Hooke's law and Pressure vessels: Poisson's ratio; Gen- eralized Hooke's law for isotropic materials; Relationship between Modu- lus of elasticity and Modulus of rigidity; Dilatation and Bulk modulus; Thin- walled pressure vessels - Cylindrical and spherical vessels.

UNIT II

Internal forces in beams : Introduction; Diagrammatic conventions for supports and loads; Calculation of beam reactions; Application of method of sections; Shear force in beams; Bending moment in beams; Shear force and bending moment diagrams; Differential equations of equilib-rium for a beam element.

UNIT III

Normal stresses in beams : Introduction; Basic assumptions; The elastic flexure formula ; application of flexure formula; Unsymmetric bending - Bending about both principal axes of a beam with symmetric cross-section.

UNIT IV

Shear stresses in beams : Introduction; Shear flow; The shear stress formula for beams; Shear stress in beam flanges; Shear centre

Torsion : Introduction; Application of the method of sections; Torsion of circular elastic bars - Basic assumptions, the torsion formula ; Power transmission by circular shafts.

UNIT V

Compound stresses : Introduction; Superposition and its limitation; Superposition of normal stresses; Stresses in a dam-middle-third rule; Eccentrically loaded short columns; Core or kernel of a section;

Superposition of shear stresses; Stresses in closely coiled helical springs; Deflection of closely coiled helical springs

Work and Strain Energy: Introduction; Elastic strain energy for uni-axial stress; elastic strain energy in pure bending; Strain energy of beams in shear; Strain energy of circular shafts in torsion; Work and strain energy method; Determination of displacements by work and strain energy method.

LEARNING RESOURCES

TEXT BOOKS

1. Elements of strength of materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press Pvt.Ltd.,2005.
2. Mechanics of materials by E.P. Popov , Prentice Hall of India ,1986.

REFERENCES

1. Mechanics of Materials by Pytel and Kiusalaas , Cengage Learning, 2003.
2. Engineering Mechanics of Solids by E.P.Popov, PHI Learning.

WEB REFERENCES:

1. http://nptel.iitm.ac.in/video.php?subjectId=105101084
2. http://www.engineeringcivil.com/theory/civil-engineering-notes-from-universities/

CE 154 **PHYSICS LABORATORY**

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1. To understand the general, scientific concepts required for technology.

COURSE OUTCOMES :

1. Use CRO, signal generator, spectrometer for making measurements.
2. Test the optical components using principles of interference & diffraction.
3. Determination of the selectivity parameter in electrical circuits.

(Any 10 out of the following experiments)

1. Interference fringes – measurement of thickness of a foil using wedge method.
2. Newton's rings - measurement of radius of curvature of Plano- convex lens.
3. Lissajous' figures – calibration of an audio oscillator.
4. Photo cell – characteristic curves and determination of stopping potential.
5. Diffraction grating - measurement of wavelengths.
6. Torsional pendulum – determination of Rigidity modulus of a wire.
7. Photo-Voltaic cell – determination of fill factor.
8. Series LCR resonance circuit –determination of Q factor.
9. Sonometer – determination of A.C. frequency.
10. Laser- determination of wave length using diffraction grating.
11. Variation of magnetic field along the axis of a circular current carrying coil.
12. Optical Fiber – Determination of Numerical Aperture and Acceptance Angle

REFERENCE BOOK :

1. Lab Manual

CE 155 ENGLISH COMMUNICATION SKILLS LAB

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1. To acquaint the students with the standard English pronunciation, i.e., Received Pronunciation(RP), with the knowledge of stress and intonation.
2. To develop the art of effective reading and answer comprehension passages.
3. To enable the students use phrasal verbs and idiomatic expressions in an apt manner.
4. To equip with appropriate and spontaneous speech dynamics.
5. To develop production and process of language useful for social and professional life.

COURSE OUTCOMES:

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

1. Know the IPA phonetics symbols, and their relation to pronunciation; recognize the difference among the native, regional and neutral accent of English.
2. Employ different skills, inferring lexical and contextual meaning and attempt comprehension passages.
3. Use confidently phrases and idioms for effective communication.
4. Develop appropriate speech dynamics in professional situations.
5. Focus on communication skills and social graces necessary for effective communication.

Phonetics:

i. Sounds, Symbols, Stress and Intonation.
ii. Pronunciation – Mother tongue influence – Indianisms etc.

Reading Comprehension: Strategies, Reading skills – Skimming and Scanning,Intensive and Extensive reading.

Idioms & Phrases: Idioms of variety.

Interactive classroom activities.

Jam– (Guided & Free) – Extempore –Elocution – Telephonic Skills.

Articulation and flow of oral presentation – voice modulation – content generation – Key Word Approach(KWA).

Communication Skills

Greeting and Introducing; Making Requests; Agreeing and disagreeing; Asking for and giving permissions; Offering help; Art of small talk; making a short formal speech; Describing people, places, events & things.

LEARNING RESOURCES :

1 A Course in Listening & Speaking II, Foundation books by G. Raja Gopal,2012. (Unit – I) & (Unit-IV)
2 Books on GRE, IELTS & TOEFEL (Unit –II)
3 English Idioms by Jennifer Seidl W. Mc Mordie, OUP, V Edition , 2009
4 Interactive classroom activities. (10 titles -CUP) (Unit-IV)
5 A course in English Communication – by Kiranmai Dutt, Rajeevan, C.L.N Prakash, 2013.(Unit -V).
6 Better English Pronunciation - J.D.O' Connor, Second Edition, 2009, Cambridge Semester Press. (Unit-I).

SOFTWARE :

1 Pronunciation power I & II
2 Author plus - Clarity.
3 Call Centre Communication - Clarity.

CE 156 WORKSHOP PRACTICE LAB

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To provide the students hands on experience to make different jointsin carpentry with hand tools like jack plane, various chisels & handsaws
2 To provide the students hands on experience to make different jointsin welding with tools & equipment like electric arc welding machine,
3 TIG Welding Machine, MIG Welding Machine, hack saws, chippingtools etc.
4 To provide the students hands on experience to make different jointsin Sheet metal work with hand tools like snips, stacks, nylon malletsetc.
5 To provide the students hands on experience to make differentconnections in house wiring with hand tools like cutting pliers ,tester,lamps& lamp holders etc .

COURSE OUTCOMES:

1 To familiarize with_ The Basics of tools and equipment used in Carpentry, Tin Smithy,
2 Welding and House Wiring.
3 The production of simple models in the above four trades

LIST OF EXPERIMENTS:

Minimum three experiments should be conducted from each trade

1) CARPENTRY
   To make the following jobs with hand tools
   Lap joint
   Lap Tee joint
   Dove tail joint
   Mortise &Tenon joint
   Cross-Lap joint

2) WELDING USING ELECTRIC ARC WELDING PROCESS / GAS WELDING.
   The following joints to be welded.
   Lap joint
   Tee joint
   Edge joint
   Butt joint
   Corner joint

3) SHEET METAL OPERATIONS WITH HAND TOOLS.
   Rectangular Tray
   Triangular Tray
   Pipe Joint
   Funnel
   Rectangular Scoop

4) HOUSE WIRING
   To connect one lamp with one switch
   To connect two lamps with one switch
   To connect a fluorescent tube
   Stair case wiring
   Go down wiring

REFERENCE BOOKS:

1) Kannaiah P. &Narayana K. C., "Manual on Work Shop Practice", Scitech Publications, Chennai,1999.
2) Workshop Lab Manual , R.V.R. & J.C. College of Engineering , Guntur.

CE 201 COMPUTATIONAL TECHNIQUES & STATISTICAL METHODS

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To provide knowledge on Fourier series.
2 To provide basic knowledge of numerical methods including solving systems of linear equations.
3 To provide knowledge on numerical solution of ordinary differential equations.
4 To impart the basic principles of various probability distributions.
5 To provide basic knowledge of statistical inference and applying it to practical problems.

COURSE OUTCOMES:

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

1 Find Fourier series.
2 Find numerical solution of ordinary differential equations.
3 Evaluate integrals using numerical techniques.
4 Apply knowledge of distribution theory to various data.
5 Test hypotheses and draw inference for engineering problems

UNIT I

FOURIER SERIES : Introduction-Euler's formulae-conditions for a Fourier expansion-Functions having points of discontinuity-Change of interval-Even and odd functions.
Half range series- Parseval's formula.

UNIT II

Numerical Solution of Equations and Interpolation : Newton - Raphson method – Gauss Seidel method. Forward and backward differences – Differences of a polynomial.

Interpolation – Newton-Gregory Forward and Backward Interpolation formulae (without proof), Lagrange's Interpolation formula (without proof) – Inverse interpolation.

UNIT III

Numerical Integration and Numerical solution of ODE : Trapezoidal rule – Simpson's one third rule.
Solution by Taylor's series – Picards method, Euler's method - Runge-Kutta method of fourth order.

UNIT IV

PROBABILITY : Discrete random variables: Poisson and Binomial distributions.
Continuous random variable: Normal and Exponential distributions.

UNIT V

TESTING OF HYPOTHESIS : Large sample tests based on Normal distribution – Hypothesis concerning one Mean, Hypothesis concerning two means.

Small sample tests based on t-distribution - Hypothesis concerning one Mean, Hypothesis concerning two means.

LEARNING RESOURCES:

TEXT BOOKS:

1 Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.
2 Probability and Statistics for Engineers , 6th Edition by Richard A. Johnson,(Prentice Hall of India)

CE 202 SURVEYING – I

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To study the basics of linear/angular measurement methods like chain surveying, compass surveying.
2. To study the basics of leveling and theodolite survey in elevation and angular measurements.
3. To determine the relative positions of the existing features on the ground.
4. To acquaint with procedures of leveling by dump level & auto level.
5. To study the significance of plane table surveying in plan making.

COURSE OUTCOMES:

By the end of the course surveying-I, the students will be able to

1. To determine the relative positions of a point on the existing ground by conducting the survey.
2. To take the levels of existing ground and to determine the reduced levels.
3. To minimize the errors while taking measurements.
4. To gain knowledge about traversing and various methods of adjustments.
5. To know about difficulties in leveling.

UNIT I

Surveying & Measurements : Definitions; Classification; Principles of Surveying; Basic measurements in surveying; Instruments used for different measurements; Units of measurement(linear & Angular); Plan and map; Scales used for Maps and plans; Phases of survey work and Duties of a surveyor.

Linear Measurements : Accuracy, Precision; Methods of distance measurement; Equipments for distance measurement; Procedures for distance measurement - Ranging, Chaining/taping a line; Types and Sources of Errors in chaining , taping and their corrections; Degree of accuracy in chaining.

UNIT II

Chain Surveying : Principle of Chain surveying; Basic definitions; Well-Conditioned & Ill-Conditioned triangles; Selection of stations and survey lines; Procedure of Field Work in Chain Surveying; Off-sets; Booking the survey (Field Book); Conventional Symbols; Problems encountered in chaining; Obstacles in chain Surveying.

Minor instruments & Errors : Optical Square; Prism Square; Simple Clinometer; Sources and types of errors; Significant figures, rounding of Numbers; Probability in Survey measurements; Normal distribution; Errors in computed results; Weights of measurements.

UNIT III

Compass Surveying : Angles and Bearings; Instruments used to measure angles and bearings; Designation of Bearings; Traverse Survey; Types of traverse; Fore and Back Bearings; Calculation of Included Angles from Bearings and Bearings from Included Angles; Prismatic & Surveyor's Compass; Magnetic Dip & Declination; Local Attraction and Corrections; Plotting of a Compass Traverse.

Theodolite Surveying : Types of Theodolites; Vernier Theodolite - Essential Parts; Basic definitions; Fundamental lines and desired relations; Temporary and permanent adjustments; Field operations - Measurement of horizontal angles(Repetition & Reiteration), vertical angles, direct angles, deflection angles, bearings; Lining-in, Balancing- in, Double sight, Random line method of running a line, Prolonging a straight line and location of intersection of two straight lines, to lay off a horizontal angle.

UNIT IV

Traversing : Definition; Methods of Traversing; Selection of Traverse Stations; Marking of Stations; linear and angular (both bearings and angles) measurements; Compatibility of linear and angular

measurements; Traverse Computations - Consecutive Co-ordinates, Independent Co-ordinates, Checks in traversing; Closing error; Methods of adjustments; Gale's traverse table; Omitted measurements.

Plane Table : Principle; Accessories of plane table; Orientation; Procedure of setting up plane table over a station; Methods of Plane Tabling - Radiation, Intersection, Traversing; Resection - Two point problem; Advantages and disadvantages.

UNIT V

Simple Leveling : Basic definitions; Curvature and Refraction; Different methods of leveling; Levels - Dumpy level, Tilting level, Auto level; Sensitivity of a Level tube; Leveling staff; Level field book; Booking and reducing levels; Classification of direct differential leveling methods -Fly leveling, Check leveling, Profile leveling and Cross sectioning, Reciprocal leveling and Precise leveling; Sources of errors & Difficulties in leveling.

Contouring : Methods of representing Relief; Contouring; contour interval; Characteristics of contours; Methods of locating contours; Direct and indirect methods of contouring; Interpolation and sketching of contours; Location of a contour gradient on map and ground; Uses of contour maps.

LEARNING RESOURCES

TEXT BOOKS:

1. Surveying Vol.1 & II by Dr. K. R. Arora,11th Edition, Standard Book House,2012.
2. Surveying Vol. I & II by S K Duggal, 4th Edition, McGraw Hill Education (India) Private Limited,2013.

REFERENCE TEXT BOOKS :

1. Surveying Vol. I&II by B.C. Punmia ,Laxmi Publications,2005.
2. Surveying and Levelling by N.N Basak, McGraw Hill Education (India) Private Limited,2014.
3. Plane Surveying by AM Chandra, 2nd Edition,New Age International (P) Ltd.,2006.

WEB REFERENCES :

1. http://nptel.ac.in/courses/105104101/
2. http://nptel.ac.in/courses/105107121/
3. http://nptel.ac.in/courses/105107122/

CE 203 FLUID MECHANICS

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To explain various properties of fluids and pressure measurement.
2. To determine the hydrostatic forces on plane & curved surfaces and principle of buoyancy.
3. To derive basic equations of conservation of mass, energy & momentum and their applications.
4. To determine the discharge using various flow measuring devices.
5. To learn analysis of laminar & turbulent flow through pipes.

COURSE OUTCOMES:

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

1. Understand properties of fluids and pressure measurement.
2. Calculate the hydrostatic forces on plane & curved surfaces and Analyze the stability of submerged and floating bodies.
3. Determine the variation of pressure and velocity in a flow field and force on pipe bends.
4. Determine the discharge by using various flow measuring devices.
5. Calculate the head loss, power loss and discharge in laminar & turbulent flow through pipes.

UNIT I

Introduction : Dimensions and units – Physical properties of fluids- specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion

Fluid Statics : Variation of static pressure; Absolute and gauge pressure; Pressure measurement by manometers; Pressure on plane surfaces and curved surfaces.

UNIT II

Buoyancy : Buoyancy; Stability of submerged bodies and floating bodies; Metacentre and metacentric height.

Fluid Kinematics : Methods of describing fluid motion; Classification of flows; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; One, two and three dimensional flows; Irrotational and rotational flows; Streamline; Path line; Streak line; Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation; Velocity potential and stream function; Flow net;

UNIT III

Fluid Dynamics : Euler's equation of motion; Bernoulli's equation; Energy correction factor; Momentum principle; Applications of momentum equation- Force exerted on a pipe bend.

Flow Measurement in Pipes : Discharge through venturimeter, orificemeter and flow nozzle; Measurement of velocity by pitot tube.

UNIT IV

Flow through Orifices and Mouthpieces

Flow through orifices; Determination of coefficients for an orifice; Flow through large rectangular orifice; Flow through submerged orifice; Classification of mouthpieces; Flow through external and internal cylindrical mouthpiece.

Flow over Notches and Weirs

Flow through rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Broad crested weir.

UNIT V

Analysis of Pipe Flow : Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – branched pipes; Total energy line and hydraulic gradient line, Hydraulic power transmission through a pipe; Siphon; Water hammer.

Laminar Flow : Reynold's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe (Hagen Poiseuille equation).

Turbulent Flow in Pipes

Characteristics of turbulent flow, Hydro dynamically smooth and rough boundaries, Velocity distribution, Friction factor for pipe flow, Variation of friction factor with Reynolds number- Moody's chart.

LEARNING RESOURCES:

TEXT BOOKS:

1. Hydraulics and Fluid Mechanics including Hydraulic Machines by P. N. Modi and S. M. Seth; Standard book house; New Delhi, 2009.
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal; 9th Edition, Laxmi Publications,2011.

REFERENCE BOOKS:

1. Fluid Mechanics by A. K Jain, Khanna Publishers, 2008.
2. Fluid Mechanics by Streeter and Wyile, 9th Edition,Tata McGraw-Hill, 2010.

WEB REFERENCES:

1 www.nptel.iitm.ac.in

CE 204 SOLID MECHANICS - II

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

To introduce the concepts of

1 Equations for transformation of plane stress.
2 Strain energy in uni-axial, pure bending and shear.
3 Failure theories and the behavior of columns subjected to different end conditions for different loadings.
4 Deflection of statically determinate beams by using relation of moment curvature, moment of area and conjugate beam method.
5 Three hinged and two hinged, circular arches and cables for static loads and moving loads
6 Influence line diagrams.

COURSE OUTCOMES:

At the end of this course, the student should be able to

1 Understand and application to several number of stresses on a plane.
2 Understand problems on columns.
3 Apply mathematics to deflection of beams along with other methods of finding the deflections of beams.
4 Analyze determinate arches subjected to different loading which in turn helps them to resolve forces of certain type of circular and arched structures.
5 Draw influence line diagrams for Determinate Beams, simple trusses and three-hinged arches.

UNIT I

Analysis of Plane-Stress: Introduction; The basic problem; Equations for transformation of plane-stress; Principal planes and Principal stresses ; Maximum shear stresses ; Mohr's circle of stress ; Construction of Mohr's circle

Failure Theories: Introduction; maximum normal stress theory; maximum shearing stress theory; maximum strain energy theory; maximum distortion energy theory; comparison of theories.

UNIT II

Buckling of Columns:

Introduction: Examples of instability; Criteria for stable equilibrium; Euler load for column with pinned ends; Euler loads for columns with different end restraints; Limitations of the Euler's formulae; Generalized Euler buckling load formulae; Eccentric loads and the secant formula

UNIT III

Deflection of statically determinate beams :

Introduction: strain-curvature and Moment-Curvature relation; Governing differential equation for deflection of elastic beams; Solution of beam deflection problem by Direct integration; Introduction to moment area method; Derivation of Moment area theorems; conjugate-beam method; slope and deflection of beams using moment area method.

UNIT IV

Arches: Theoretical and actual arch, Eddy's theorem, Types of arches, Three-hinged arches and Two-hinged arches.

Cables: Cable subjected to uniformly distributed load and concentrated loads, cable supported at same and different levels, Length of the cable, Effect of change in temperature.

Displacements of statically determinate structures by Energy Methods: Virtual Work, Betti's and Maxwell's laws of reciprocal deflections, Applications of virtual work, Deflection of trusses and frames, Castigliano's theorems.

UNIT V

Rolling loads and Influence Lines: Maximum shear force and bending moment in simply supported beams due to single concentrated load, uniformly distributed load longer than span, uniformly distributed load shorter than span, two concentrated loads, series of concentrated loads; Concept of influence line, Influence Lines for reaction, shear force and bending moment in simply supported beams, Influence lines for simple trusses and three-hinged arches.

LEARNING RESOURCES:

TEXT BOOK:

1 Mechanics of Materials by Pytel and Kiusalaas, Cengage Learning, 2003.
2 Mechanics of Materials by RC Hibbiler, 8th Edition,Person publication
3 Analysis of Structures - Vol. II V.N. Vazirani, M.M Ratwani and S.K. DuggalTheory, Design and Details of Structures, 16th Edition, Khanna Publications.

REFERENCES:

1 Mechanics of materials by E.P. Popov, Prentice Hall of India, 1986.
2 Elements of strength of materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press Pvt.Ltd.,2005.

WEB REFERENCES:

1 http://nptel.iitm.ac.in/video.php?subjectId=105101084
2 http://www.engineeringcivil.com/theory/civil-engineering-notes-from- universities/

CE 205 BUILDING MATERIALS, PLANNING & CONSTRUCTION

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To teach the basics involved in selection of good quality building materials for construction
2. To demonstrate various types of masonry works including types of bonds and their finishing
3. To give knowledge about various building elements and their specifications
4. Effectively deals with the types of form work and rehabilitation work of building
5. Presents the basics of planning strategies, building bye laws and acoustics of building

COURSE OUTCOMES:

After successful completion of the course, the students

1. Students are familiar with various building materials
2. Students are familiar with types of masonry works and bonds used in construction
3. Students will have knowledge regarding acoustics of building
4. Students are capable of understanding building plan and have knowledge about building rules, bye-laws and building elements
5. Students will have knowledge about the form work, scaffolding and shoring

UNIT I

Clay bricks: Brick clay, Preparation of bricks, Types of bricks, Dimensions of bricks, Weight of bricks, Storing of bricks, Brick substitutes, Classification of bricks, Tests for bricks.

Timber: Classification of trees, Structure of wood, seasoning and con-version of timber, Market forms of timber, Defects of timber, Treatment of timber, Classification of timber.

Glass: Manufacture and Classification, Treatment of glass, Uses of glass, testing for quality, Characteristics and Performance of glass, Glass fibre.

Plastics: Classification of plastics, Properties of plastics, Fabrication of plastic articles, some plastics in common use, Reinforced plastics.

UNIT II

Paints: Types of paints, Composition of paints, Considerations in choosing paints, Paints commonly used in buildings.

Brick Masonry: Terms used in brickwork, Mortars to be used, bonding of bricks, Method of laying bricks.

Plastering: Specifications for cement plastering, plastering method, Specifications for plastering with cement mortar.

UNIT III

Stairs and lifts: Terminology used in stairs, Types of stairs, Reinforced concrete stairs, lifts.

Acoustics: Basic theory, Reverberation and echos, Sound isolation, Acoustical materials, Recommendations for different types of buildings.

UNIT IV

Shoring, Underpinning, Scaffolding and Formwork: Shoring, Types of shores; Underpinning - Pit method, Pile method; Scaffolding -Types of scaffolding; Formwork for columns, beams, slabs

UNIT V

An Approach to Planning : Site planning, Space requirement, Establishing areas for different units, Furniture requirements, Roominess, Flexibility, Sanitation, Lighting, Ventilation, Space for equipment for air conditioning, Space for machinery etc.; Flow diagram and line plan-Grouping, Circulation, Orientation, Aspect and prospect, Privacy, Elegance and economy; Climatic considerations; Architectural composition-Unity, Mass composition, Contrast, Proportion, Scale, Accentuation and rhythm, Materials for the exterior and Expression, Colour.

Building Rules and Bye-Laws: Zoning regulations; Regulations regarding layouts or sub-divisions; Building regulations; Rules for special type of buildings; Calculation of plinth, floor and carpet area; Floor space index.

Building Elements: Conventional signs; Guidelines for staircase planning; Guidelines for selecting doors and windows; Terms used in the construction of door and window; Specifications for the drawing of door and window.

LEARNING RESOURCES

TEXT BOOKS:

1. Building Materials by P.C. Vergese, 1st Edition, PHI, 2009.
2. Building construction by P.C. Vergese, 1st Edition, PHI, 2009.
3. Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki, Tata McGraw-Hill, New Delhi, 2009.

REFERENCE BOOKS:

1. Engineering Materials by Rangawala, Charotar Publications, Fortieth Edition: 2013
2. Building construction by BC Punmia et al., 10th Edition, Laxmi Publications, 2008.
3. Building planning, designing and scheduling by Gurucharan Singh, Standard book House, 2006.
4. Building material by S K Duggal – New Age International Publishers; Second Edition

WEB REFERENCES:

http://nptel.iitm.ac.in/courses.php
http://freevideolectures.com/Course/86/Building-Materials-and-Construction
http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv053-Page1.htm
http://bookmoving.com/register.php?ref=Building%20materials%20rangwala
http://bookmoving.com/book/building-materials_654.html

CE 206 **ENGINEERING GEOLOGY**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. Develops the ability to understand the importance of geology in civil engineering
2. Develops the ability to identifying the various rock forming group of minerals and rocks and analyze the attitude of rock formations
3. Develops the skills for site investigations for projects like dams, tunnels etc
4. Develops the solutions for various geological problems at different projects
5. To introduce the concept of RS& GIS concepts.

COURSE OUTCOMES:

1. Students able to understand the importance of geology in civil engineering
2. Students are familiar with identifying the geological process of the region related to the civil engineering works
3. Students are able to evaluate the formation and properties of the minerals , rocks and soil
4. Develops the ability to understand the site and solutions for different geological problems.
5. Will be able to know that GIS & RS can be used for managing resources and solving the problems

UNIT – I

INTRODUCTION: Branches of geology, Importance of geology in Civil engineering.

PHYSICAL GEOLOGY: Geological processes; Weathering, Erosion ,Importance of the process of Weathering and Erosion.

MINERALOGY: Definition of mineral; Significance of different physical properties in mineral identification; Study of physical properties, structure and chemical composition of following common rock forming and economic minerals: Feldspar, Quartz, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Apatite , Kyanite, Garnet, Beryl, Talc, Calcite, Dolomite, Pyrite, Hematite, Magnetite, Galena, Graphite, Magnesite , Bauxite and Clay minerals

UNIT – II

PETROLOGY: Introduction; Civil engineering importance of petrology; Rock cycle, Geological Classification of rocks

IGNEOUS ROCKS: Forms, Structures and textures of igneous rocks. Megascopic description and civil engineering uses of Granite, Basalt, Dolerite, Pegmatite and Charnockite

SEDIMENTARY ROCKS: Formation; Structures and textures of sedimentary rocks. Megascopic description and civil engineering uses of Laterite, Conglomerate, Sand stone, Lime stone and Shale

METAMORPHIC ROCKS: Types of metamorphism; Structures and textures of metamorphic rocks. Megascopic description and civil engineering uses of Gneiss, Schist, Quartzite, Marble and slate

UNIT – III

STRUCTURAL GEOLOGY: Introduction; Causes for development of structures; Out crop, Strike and dip; Folds; Faults; Joints; Unconformities.

IMPORTANCE OF GEOLOGICAL STRUCTURES: Effects of folds, faults, joints, unconformities and their civil engineering importance.

EARTHQUAKES: Classification and causes; Intensity and magnitude and their measuring scales; Effects of earthquakes; Seismic belts; Civil Engineering considerations in seismic areas; Seismic zones of India.

Land Slides : Classification; Causes and effects; Preventive measures.

UNIT – IV

GEOPHYSICAL INVESTIGATIONS: Geophysical methods of investigation –Civil engineering importance of geophysical methods; Electrical resistivity method and Seismic refraction method.

DAMS: Geological considerations for the selection of dam sites; Stages of investigation; Case histories of some dam failures;

TUNNELS: Effects of tunneling; Geological considerations for tunneling; Over break; Geology of some tunnel sites;

UNIT – V

IMPROVEMENT IN PROPERTIES OF ROCK MASS : Materials and Methods of Grouting, Principles and mechanism of Rock bolting

RS and GIS : Remote Sensing- Platforms and sensors, Visual image interpretation: Basics of geographical information systems(GIS)

LEARNING RESOURCES

TEXT BOOKS:

1. A text Book of Engineering Geology by N. Chennakesavulu; Macmillan India Ltd., Delhi.
2. Basics of Remote sensing and GIS, Dr.S.Kumar: Lakshmi Publications (P) Ltd.

REFERENCE BOOKS:

1. Engineering Geology For Civil Engineers by D. Venkata Reddy; Oxford & IBH Publishing Company Pvt. Ltd., New Delhi.
2. Introduction to Geographical Information Systems, Kang-tsung ChangMcGraw Hill Education (India)Pvt Ltd.
3. Remote Sensing and its Applications LR A Narayan , Universities Press (India) Pvt. Ltd.
4. Engineering and General Geology by Parbin Singh; S. K. Kataria & Sons, New Delhi.
5. Rock Mechanics for Engineers by Dr.B.P.Varma, Khana Publishers, Delhi-6.
6. Engineering Geology an environmental approach by P Harahn, PHI
7. Principles of Petrology by G W Tyrrell, B.I Publications Delhi-1
8. Principles of Engineering Geology by K M Bangar, Standard Publishers and Distributers

WEB REFERENCES:

1. NPTEL COURSE- Developed by Prof. Debasis Roy, IIT, Kharagpur - 721302
2. http://www.eos.ubc.ca/academic/undergraduate/appsci.html
3. http://web.mst.edu/~rogersda/umrcourses/ge341/
4. http://web.env.auckland.ac.nz/course_pages/geology771/

CE 251 MATERIAL TESTING LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

To develop adequate knowledge

1 To study the behaviour of materials like steel, wood, concrete etc under direct tension, compression, shear, torsion and bending by conducting relevant tests
2 To find young's modulus, modulus of rigidity, hardness, impact resistance of the given materials like steel, wood by conducting relevant tests
3 To determine the modulus of rigidity of the spring
4 To determine the compressive strength and percentage of water absorption of bricks

COURSE OUTCOMES:

By the end of this course students will have the capability/knowledge of

1 Behavior of materials like steel, wood, concrete etc under direct tension, compression, shear, torsion and bending
2 Finding properties of materials like young's modulus, modulus of rigidity, hardness, impact resistance
3 Determining the strength properties of concrete
4 Determinining the percentage of water absorption of bricks

Note: A minimum of 10 experiments shall be done and recorded

1 Study of stress-strain characteristics of mild steel bars by UTM.
2 Study of stress-strain characteristics of HYSD bars by UTM.
3 Determination of modulus of elasticity of the material of the beam by conducting bending test on simply supported beam.
4 Determination of modulus of elasticity of the material of the beam by conducting bending test on cantilever beam.
5 Determination of modulus of rigidity by conducting torsion test on solid circular shaft.
6 Determination of hardness of the given material by Brinnel's hardness test.
7 Determination of hardness of the given material by Rockwell hardness test.
8 Determination of hardness of the given material by vickers hardness test.
9 Determination of impact strength of the given material by conducting Charpy/Izod test
10 Determination of ultimate shear strength of steel by conducting double shear test.
11 Determination of modulus of rigidity of the material of closely coiled helical spring.
12 Determination of compressive strength of wood with grain parallel / perpendicular to loading.
13 Determination of compressive strength of CLAY/ FAL-G bricks.
14 Determination of water absorption of bricks .

CE 252 BUILDING DRAWING LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To learn basic commands of Auto CAD software.
2 To draw conventional signs, symbols of materials and building services.
3 To draw plan, section and elevations of buildings and various building components.
4 To create 3D building model and rendering the model.

COURSE OUTCOMES:

By the end of this course students will have the capability/knowledge of

1 Basic Auto CAD commands.
2 Various conventional signs, symbols of materials and building services.
3 Drawing plan, section and elevations of buildings and various building components.
4 Basics of creating 3D building model and rendering the model.

Note: Any ten of the following shall be done using AutoCAD /3D MAX software.

1 Learning basic commands of CAD software & drawing various geometrical Shapes using
a) Draw commands b) Editing commands c) Creating text d) Dimensioning
2 Draw Conventional signs for building materials and symbols for sanitary installations and fittings.
3 Draw symbols for Doors & Windows and Electrical Installations.
4 Draw Elevation and Sections of Door & Window.
5 Draw Cross section of load bearing wall over spread footing.
6 Draw plan & sectional elevation of Dog-Legged staircase.
7 Draw Pitched roof (King post truss).
8 Draw plan of a single storied residential building showing furniture & cub-boards using layers and blocks in CAD software.
9 Draw plan of a single storied residential building showing Electrical and Sanitary features using layers and blocks in CAD software.
10 Draw Plan, Section & Elevation of single storied residential building.
11 Learning basic commands in 3-D, creating pre-defined solid primitives and applying Boolean operations.
12 Create a two roomed ground floor building in 3-D and render the model.

CE 253 SURVEYING FIELD WORK – I LAB

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To measure chainage of a line using tape and chain and recording of details along the chain line.
2 To find the included angles and local attraction of traverse by using compass.
3 To determine the elevation difference between two points & eliminate errors due to curvature of earth and refraction.
4 To prepare a contour plan of a small area by method of blocks.
5 To plot a building by using plane table surveying.
6 To measure the horizontal and vertical angles of various points by theodolite.

COURSE OUTCOMES:

By the end of the course the students will be able

1 To perform basic field surveys.
2 To prepare a plan of residential building by making use of a chain and compass.
3 To gain excellence in using Auto level, theodolite instruments.
4 To take the levels of existing ground & prepare a contour plan.
5 To prepare the plan or map showing the ground features from the data obtained by surveying.

Any 10 of the following:

1) Chain & Compass Survey
   Measurement of area - Cross staff survey
   Traversing by compass and graphical adjustment.
   Plotting of an area using Chain/Compass.

2) Simple Leveling
   Measurement of elevation difference between two points using any leveling Instrument (Fly Leveling)
   Elevation difference between two points by Reciprocal leveling method.
   Profile Leveling - Plotting of Profile.
   Contouring of a small area by method of Blocks/Tacheometric Survey.

3) Plane Table Survey
   Determination of the distance between two inaccessible points.
   Plotting of a building by plane table Traversing
   Resection methods.

4) Theodolite
   Measurement of horizontal and vertical angles.
   Determination of distance between two inaccessible points

LEARNING RESOURCES:

WEB REFERENCES:

1) http://nptel.ac.in/courses/105104100/
2) http://nptel.ac.in/courses/105104101/
3) http://nptel.ac.in/courses/105107121/
4) http://nptel.ac.in/courses/105107122/

CE 207 PROFESSIONAL ETHICS AND HUMAN VALUES

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1) To provide essential complementarily between ”VALUES” and ”SKILLS” to ensure sustained happiness and prosperity.
2) To introduce Ethical concepts that are relevant to resolving Moral issues in Engineering and to impart reasoning and analytical skills needed to apply ethical concepts to Engineering decisions.
3) To facilitate the development of a Holistic perspective towards life, profession and happiness, based on a correct understanding of the Human reality.
4) To understand the need for lifelong learning and have the knowledge and skills that prepare them to identify the moral issues involved in engineering areas.
5) To provide an understanding of the interface between Social, Technological and Natural environments.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1) Comprehend a specific set of behaviours and values the professional interpreter must know and must abide by, including confidentiality, honesty and integrity.
2) Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.
3) Understand the moral requirements of engineering experiments, and have the ability to apply their knowledge to the solution of practical and useful problems;
4) Understand Lack of communication, prejudice in not asking for clarification, fear of law and plain neglect will lead to the occurrence of many repetitions of past mistakes.
5) Know and respect existing laws pertaining to professional work. The students can speak out against abuses in these areas affecting the public interest.

UNIT I

Morals, Values and Ethics - Self-Confidence - Character - Valuing Time - Courage - Honesty - Caring - Sharing-Self respect - Respect for Others - Spirituality - Living Peacefully.Integrity- Commitment - Empathy - Work Ethics - Service Learning - Stress management - Civic Virtue - Co-operation.

UNIT II

Scope and aims of Engineering Ethics - Senses of ’Engineering Ethics’ - Variety of Moral Issues - Types of Inquiry - Engineering Ethics and Philosophy.

Moral Dilemmas - Moral Autonomy - Kohlberg’s theory - Gilligan’s theory - Criteria for a profession - Multiple Motives - Models of Professional Roles.

UNIT III

Moral reasoning and Ethical Theories - Virtue Ethics - Utilitarianism-Duty ethics - Right ethics-Self interest, Customs and Religion - Uses of Ethical Theories-Testing of Ethical Theories.

Engineering as experimentation - Similarities to Standard Experiments - Contrasts with Standard Experiments - Engineers as Responsible Experimenters - A Balanced Outlook on Law - Problems with Law in engineering - The Challenger Case Study.

UNIT IV

Safety and Risk - Assessment of safety and risk - Risk benefit analysis and reducing risk - Testing for safety The Three Mile Island and Chernobyl case studies and safe exit.

Collegiality and loyalty - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - Occupational crime - Intellectual property rights (IPR) - Discrimination.

UNIT V

Professional rights - Employee rights - Whistle blowing - discrimination - Multinational corporations - Environmental ethics - Computer ethics - Weapons development.

Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership - codes of ethics - role and limitations of codes - Sample code of ethics like ASME, ASCE, IEEE, Institution of Engineers (IE), India Indian Institute of Materials Management, Institution of electronic and telecommunication engineers (IETE), India, etc.

LEARNING RESOURCES:

TEXT BOOK(s):

1) Mkie Martin and Roland Schinzinger, Ethics in Engineering, McGraw - Hill, New Jersey, 2004 (Indian Reprint)
2) Govindarajan M, Natarajan S, Senthil Kumar V.S - Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOK(s):

1) Charles D. Fleddermann - Engineering Ethics, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint).
2) Charles E Harris, Michael S. Protchard and Michael J Rabins, Engineering Ethics - Concepts and Cases, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint).

CE 208 SURVEYING – II

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To introduce about EDM, Digital theodolite and total station.
2 To deal with various methods employed for the measurement of areas and volumes.
3 To determine distances and relative positions using tachometric surveying and trigonometric leveling
4 To study different methods of setting & design of simple circular curves.
5 To study the positioning of structure, setting out foundation, setting out a sewer and setting out culvert.

COURSE OUTCOMES:

By the end of the course, the students will be able

1 To know about the latest Surveying Instruments.
2 He gains enough knowledge about tachometric survey.
3 To find out the reduced level of different structures when base is inaccessible and accessible.
4 To design and layout curves for a roads and railways.
5 To layout or to mark the positions of the proposed structures on the ground.

UNIT I

Modern Systems in Surveying: Electronic Distance Measurements - Basic definitions, distance from measurement of transit time; Infrared EDM instruments; Microwave EDM instruments; Digital theodolite; Total Station; Digital Level; Global Positioning System.

Computation of Areas: Introduction; Simpson's rule; Boundaries with offsets at irregular intervals; Meridian methods; Coordinate method; Planimeter - Area of Zero circle. Area of cross sections - two level section only.

UNIT II

Computation of volumes: Trapezoidal rule; Prismoidal formula; Volume from spot levels; volume from contour plan; Capacity of a reservoir

Trigonometric Leveling: Introduction; Plane trigonometric leveling methods - When base of the vertical or inclined object accessible and when base of the object is not accessible; Axis signal correction; Difference in elevation by single observation and reciprocal observations.

UNIT III

Tacheometric Surveying: Advantages of tachometric surveying; Basic systems of tachometric measurements; Principle of stadia measurements, Determination of constants K and C; Inclined sight with staff vertical; Inclined sight with staff normal to the line of sight; External- Focussing Telescope with an Anallactic lens; Internal focussing telescope; uses of Tacheometry; Errors in Tacheometric surveying; Accuracy of Tacheometric Surveying.

UNIT IV

Curves Ranging: Circular curves - Basic definitions; Designation of a curve; Relationship between radius and degree of curve; Elements of a simple circular curve; Location of the tangent points; selection of peg interval; Methods of setting out; Problems in setting out curves; Com-pound and Reverse curves.

UNIT V

Construction Surveying: Control stations; Horizontal Control - Reference grid; Vertical Control; Positioning of a structure; offset pegs; Reference pillars and Batter boards; Grade stakes; Boning rods or travelers; Sight rails; Slope rails; Profile boards or batter boards; controlling side slopes in embankment and cutting; Setting out a foundation; setting out a culvert; Setting out a sewers and pipe lines; Setting out of Bridges - Location of centre line, Location of piers.

LEARNING RESOURCES:

TEXT BOOKS:

1 Surveying Vol. 1 & II by Dr. K. R. Arora,11th Edition, Standard Book House,2012.
2 Surveying Vol. I & II by S K Duggal, 4th Edition, McGraw Hill Education (India) Private Limited,2013.

REFERENCE BOOKS :

1 Surveying Vol. I&II by B.C. Punmia ,Laxmi Publications,2005.
2 Surveying and Levelling by N.N Basak, McGraw Hill Education (India) Private Limited,2014.
3 Plane Surveying by AM Chandra, 2nd Edition,New Age International (P) Ltd.,2006.

WEB REFERENCES:

1 http://nptel.ac.in/courses/105104100/
2 http://nptel.ac.in/courses/105104101/
3 http://nptel.ac.in/courses/105107121/
4 http://nptel.ac.in/courses/105107122/

CE 209 HYDRAULICS AND HYDRAULIC MACHINES

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To introduce the various types of flows and concepts of specific energy, critical flow and their applications.
2 To introduce different surface profiles of the gradually varied flow and computation of length of GVF profiles.
3 To derive the relation between sequent depths of hydraulic jump and energy loss in hydraulic jump.
4 To introduce dimensional analysis techniques and various similarities between prototype and model.
5 To impart knowledge of hydraulic turbines and centrifugal pumps.

COURSE OUTCOMES:

By the end of the course, the student will be able to

1 Analyze and design open channel
2 Analyze GVF problems.
3 Determine the relation between sequent depths and energy loss in hydraulic jump.
4 Obtain dimension less numbers and construct models using similarity laws.
5 Apply momentum principle in the analysis of flow through turbines and pumps.

UNIT I

Open Channel Flow - Uniform Flow

Introduction, Classification of flows, Types of channels; Chezy, Manning's, Bazin, Kutter's Equations; Hydraulically efficient channel sections - Rectangular, Trapezoidal and Circular channels; Velocity distribution; Energy and momentum correction factors; Pressure distribution.

Open Channel Flow - Non - Uniform Flow

Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; Different slope conditions; Channel transitions- Reduction in width of channels, hump;

UNIT II

Open Channel Flow - Gradually Varied Flow

Dynamic equation; surface profiles; Computation of surface profiles by single step method; Back water curves and Draw down curves; Examples of various types of water surface profiles.

Open Channel Flow - Rapidly Varied Flow

Hydraulic jump; Momentum principle applied to open channel flow; Specific force, relation between sequent depths, Types of hydraulic jump; Energy loss in a hydraulic jump.

UNIT III

Dimensional Analysis and Similitude

Dimensional homogenity; Rayleigh's method; Buckingham π -method ; Geometric, Kinematic and Dynamic similarities; Reynold's, Froude, Euler, Mach and Weber numbers; Model laws; Scale effect; Distorted models.

Momentum Principles

Action of jets on stationary and moving flat plates and curved vanes; Angular momentum principle; Torque in roto - dynamic machines.

UNIT IV

Hydraulic Turbines

Classification; Impulse; Reaction; Radial, Axial, mixed and tangential flow turbines; Pelton, Francis turbines; Runner profiles; Velocity triangles; Head and efficiency; Draft tube theory; Concept of specific speed and unit quantities; Selection of Turbines; Operational characteristics.

UNIT V

Centrifugal Pumps

Manometric head; Losses and efficiencies; Work done; Working Principle; Priming; Velocity triangles; specific speed, Performance and characteristic curves; Cavitation effects.

LEARNING RESOURCES:

TEXT BOOKS

1 Hydraulics and Fluid Mechanics including Hydraulic Machines by P. N. Modi and S. M. Seth; Standard Book house, New Delhi,2009.
2 Fluid Mechanics and Hydraulic Machines by R. K. Bansal,9th Edition, Laxmi Publications, 2011

REFERENCE BOOKS

1 Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi, 2008.
2 Flow in Open channels by K. Subramanya, 3rd Edition, Tata McGraw-Hill,2008.

WEB REFERENCES:

1 www.nptel.iitm.ac.in
2 www.springerlink.com for e-journals

CE 210 STRUCTURAL ANALYSIS – I

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

To introduce the students to the concepts of

1 Degree of Indeterminacy and stability of Structures.
2 Influence lines for continuous members.
3 Methods of structural analysis: Three moment theorem, Slope Deflection Method, Moment Distribution Method, Energy Methods.
4 Analyze plane frames undergoing side sway by Slope Deflection Method, Moment Distribution Method and Kani's method.
5 Three hinged and two hinged parabolic and circular arches for static and moving loads.
6 To analyze multistoried frames by using Approximate Methods.

COURSE OUTCOMES:

At the end of this course, the student are able to

1. Analyze the statically indeterminate structures like fixed beams, continuous beams, two hinged arches and influence lines for continuous members
2. Calculate the forces in arches, cables with different end conditions of the structure subjected to different loading which in turn helps them to resolve forces of certain type of parabolic and circular arched structures
3. Formulate questions and develop analytical answers for analysis of structures, and solve broad-based structural analysis problems.
4. Make qualitatively correct sketches of Shear force and bending moment diagrams, Deflections for beams and frames.
5. Students will learn to analyze multistoried frames by using portal and cantilever methods.

UNIT I

Statically Indeterminate Structures - Compatibility methods: Degree of indeterminacy and stability of structures, propped Cantiliver and fixed beams, Theorem of three moments, Two-hinged arches, Influence lines for continuous members-Muller-Breslau's principle

UNIT II

Slope Deflection Method: Slope - deflection equations; Principles of the method; Applications of the method to the analysis of continuous beams and portal frames (Single bay, single storey with vertical legs only) without and with sidesway.

UNIT III

Moment Distribution Method: Principles of the method; Application of the method to analysis of continuous beams and portal frames (Single bay, single storey with vertical legs only) without and with side sway.

Kani's Method: Principles of the method; Application of the method to analysis of continuous beams and portal frames (Single bay, single storey with vertical legs only) without and with side sway.

UNIT IV

Curved Beams: Calculation of Internal forces – circular beams supported on equally spaced columns – semicircular beams on three equally spaced supports. Analysis of Indeterminate trusses up to second degree of redundancy.

UNIT V

Statically Indeterminate Structures - Approximate Methods: Building frames subjected to gravity loads - substitute frame method, Building frames subjected to lateral loads - Portal method and Cantilever method.

LEARNING RESOURCES

TEXT BOOKS:

1. Structural analysis by RC Hibbeler, 6th Edition, Pearson Education.
2. Structural analysis (vol-1) by Dr.P.Vidhyanathan, Dr.P.Perumal, 3rd Edition, Lakshmi Publications.
3. Analysis of Structures - Vol. II V.N. Vazirani, M.M Ratwani and S.K. Duggal,Theory, Design and Details of Structures, 16th Edition, Khanna Publications.

REFERENCE BOOKS:

1. Basic structural analysis by KU Muthu et.al. , IK International,2011.
2. Intermediate structural analysis by CK Wang, Tata McGraw-Hill, 2010.,
3. Structural Analysis by Devdas Menon, Narosa Publishinh House, 2008.

WEB REFERENCES:

1. http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Structural%20Mechanic%20II/Course%20Objective.html.
2. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Structural%20Analysis/New_index1.html

CE 211 ENVIRONMENTAL ENGINEERING – I

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To estimate future population at the end of design period and to determine water requirement to satisfy various water demands and to select a suitable water supply source based on quality and quantity criteria.
2. To design required pipe diameter by using various hydraulic formulae and to discuss the method of laying and testing of pipes.
3. To discuss methods for determining the physical, chemical and biological characteristics of water and to ascertain suitability for drinking based on BIS standards for drinking water.
4. To understand theory and design aspects of water treatment facilities-sedimentation, coagulation, filtration and to discuss various methods of disinfection with special emphasis on chlorination.
5. To introduce methods for water softening, defloridation, desalination and removal of colour, odour and taste.
6. To learn about various layouts of distribution networks and analyse distribution systems by Hardy-cross method and Equivalent pipe method.

COURSE OUTCOMES:

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

1. Determine the future population at the end of design period and select a suitable water supply source to satisfy present and future water demands.
2. Conduct tests on physical, chemical and biological characteristics of water and to ascertain the suitability of water for drinking purpose based on water quality standards.
3. Design various water treatment facilities and select a suitable method of disinfection.
4. Suggest suitable treatment method for the removal of hardness, salinity, excess fluorides and colour, odour and taste.
5. Analyse complex water distribution networks.

UNIT I

Introduction to Water Supply Engineering: Need for protected water supplies; Objectives of water supply systems; Water borne diseases; Role of Environmental Engineers.

Quantity of Water: Estimating requirements; Design period; Per capita consumption; Factors affecting per capita consumption; Fire demand; Fluctuations in demand; Prediction of population.

Sources of water: Classification of sources of water supply; Choice of source; Suitability with regard to quality and quantity.

UNIT II

Intakes, Transportation and Pumping of Water : Intake structures: Location of intake; River, reservoir and canal intakes, Types of conduits; Capacity and design; Materials for pipes, Laying and Jointing of pipes; Leakages and testing of pipeline; Classification of pumps; Choice of pumps

Quality of Water : Impurities in water; Routine water analysis - physical, chemical and bacteriological tests; BIS Standards for drinking water.

UNIT III

Purification of Water : Methods of purification of water; Sequence of treatment units

Plain Sedimentation and Coagulation : Theory of sedimentation; Stoke's law; Sedimentation tanks; Design aspects; Principle of coagulation; Chemicals used for coagulation; Units of coagulation plant; Optimum Dose of Coagulant.

Filtration of Water : Theory of filtration; Filter materials; Slow sand and rapid sand filters; Construction operation and design; Slow sand filters verses rapid sand filters; Under drainage system design in rapid sand filters; Troubles in rapid sand filters; Pressure filters.

UNIT IV

Disinfection of Water : Different methods of disinfection; Chlorination: Disinfection action; Forms of chlorine; Types of chlorination; Testing of chlorine residuals.

Miscellaneous Treatment Methods : Water softening: Methods of removing temporary and permanent hardness; Removal of colour, odour and taste from water; Defluoridation, Desalination: Importance, methods.

UNIT V

Distribution System : General requirements; Classification; Methods of supply; Available pressure in the distribution system; Layouts of distribution networks; Distribution reservoirs; Functions; Types; Capacity of balancing tank; Analysis of distribution system by Hardy-cross method and Equivalent pipe method.

Pipe Appurtenances : Appurtenances in the distribution system; Service connection, Sluice valves; Check valve; Air valve; Drain valve; Hydrants; Meters.
*Field visit to water treatment facility covering all treatment units

LEARNING RESOURCES:

TEXT BOOKS:

1. Elements of Environmental engineering by K. N. Duggal, S. Chand & Company Ltd., 2010.
2. Environmental Engineering Vol. I - Water supply engineering by S. K. Garg; Khanna Publishers, Delhi, 2010.

REFERENCE BOOKS

1. Environmental Engineering by Peavy and Rowe, Mc Graw Hill 7th Edition, 1987.
2. Water Supply and Sewerage by E.W. Steel and Terence J. Mc Ghee, Mc Graw Hill Publishers, New York.
3. Water & Wastewater Technology by Mark J. Hammer; John Wiley & Sons.
4. Manual on Water Supply & Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.

WEB REFERNCES:

1. www.nptel.iitm.ac.in

CE 212 CONCRETE TECHNOLOGY

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

To develop adequate knowledge on

1. Composition, manufacturing process, types and testing of cement
2. Properties and standards of materials used for making concrete i.e cement, Fine aggregate, coarse aggregate, water and admixtures
3. Properties and behaviour of concrete during fresh state and hardened state by various concepts and tests
4. Concrete production process and mix design procedure using Indian standard code
5. Special concretes

COURSE OUTCOMES:

Going through the course,

1. Students are familiar with the properties of materials used for concrete production
2. Students will have knowledge about the behaviour of the concrete during fresh and hardened state
3. Students are capable of designing the concrete mix as per IS:10262 code
4. Students will have knowledge in special concretes using different admixtures and construction chemicals
5. Students are familiar with the problems associated with concrete during its life time.

UNIT I

Cement: General, Manufacture of Portland cement by dry process, Approximate oxide composition limits of OPC, Bogue's compounds, Hydration of cement, heat of hydration, structure of hydrated cement.

Types of Cements and testing of cement: Ordinary Portland cement, low alkali cement, Rapid hardening cement, Sulphate resisting cement, Portland blast furnace slag cement, Portland pozzolana cement, air entraining cement, white cement, hydro phobic cement, oil well cement, low heat Portland cement.

Soundness test, Setting times test, Compressive strength test and Fineness test by air permeability apparatus.

UNIT II

Aggregates and Testing Of Aggregates : Classification of aggregates according to size and shape. Characteristics of aggregates-shape and texture, cleanliness, toughness, hardness.

Tests for bulking of fine aggregate, Fineness modulus and Zoning of fine aggregate, Fineness modulus of coarse aggregate.

Water : Tolerable concentrations of impurities in mixing water, Use of sea water for mixing concrete.

UNIT III

Chemical and Mineral Admixtures : Functions of admixtures, accelerators, retarders, air entraining admixtures, plasticizers and super plasticizers, water proofers, fly ash, silica fume, ground granulated blast furnace slag.

Fresh Concrete : Workability, factors affecting workability, Segregation and Bleeding in concrete, measurement of workability using slump cone test, Kelly ball test, Vee-Bee test, compaction factor test.

UNIT IV

Hardened Concrete : Factors affecting compressive strength of concrete, Cube compression test, split tensile strength test, flexural strength of concrete. Creep and factors effecting creep, Shrinkage, types of shrinkages and factors effecting shrinkage

Non-destructive testing : Rebound hammer test, Ultrasonic pulse velocity test

Durability of concrete : factors affecting durability of concrete, sulpahate attack, Corrosion of steel, corrosion control

UNIT V

Production of Concrete : Batching of materials, mixing, transportation, placing, compaction and finishing of concrete. Curing of concrete and methods of curing.

Concrete Mix Design : Basic considerations for concrete mix design, factors influencing the choice of mix proportions, Indian standard method of concrete mix design.

Special concretes in Construction : Ferro-cement, self-compacting concrete, fibre reinforced concrete, high strength concrete, High performance concrete.

LEARNING RESOURCES:

TEXT BOOKS:

1. Concrete technology by A.R.Santha kumar, Ist Edition**,** Oxford University Press,2006.
2. Concrete technology by M.S.Shetty, S.Chand & Company Pvt. Ltd., New Delhi,2005

REFERENCE BOOKS :

1. Properties of concrete by A.M.Neville, Pearson Education, 2007.
2. Concrete technology by M.L.Gambhir, McGraw-Hill, 2013.

WEB REFERENCES:

1 http://nptel.iitm.ac.in/video.php?subjectId=105102088
2 http://www.engineeringcivil.com/theory/concrete-engineering/

CE 254 CONCRETE TECHNOLOGY LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To develop adequate knowledge
2 To conduct tests like Normal consistency and fineness of cement, Initial setting and final setting time of cement, Specific gravity, soundness, Compressive strength of Cement to find the quality of cement
3 To determine the workability of fresh concrete using Slump cone, Compaction factor, Vee-Bee consistometer tests
4 To study the Bulking characteristics of fine aggregate and to determine the Specific gravity of fine and coarse aggregates and fineness modulus of fine aggregate and coarse aggregate.
5 To determine the compressive strength of concrete & split tensile strength of concrete.
6 To determine the modulus of Elasticity of concrete by conducting compression test on cylinders.
7 To demonstrate the Non-destructive testing on concrete and concrete mix design (IS method)
8 To understand the flow properties of SCC

COURSE OUTCOMES:

By the end of this course students will have the capability/knowledge of

1 Behavior of materials like steel, wood, concrete etc under direct tension, compression, shear, torsion and bending
2 Finding properties of materials like young's modulus, modulus of rigidity, hardness, impact resistance
3 Finding the quality of cement
4 fresh concrete workability properties to judge the suitability of concrete for the field conditions
5 Physical properties of concrete making materials like cement, fine aggregate and coarse aggregate to judge suitability for making concrete
6 Know the quality of concrete i.e compressive, tensile strength of concrete and also by using non destructive testing methods.

Note: A minimum of 10 experiments shall be done and recorded

1 Determination of (a) Normal consistency of cement (b) Fineness of cement using 90 microns IS sieve.
2 Determination of Initial setting and final setting time of cement.
3 Determination of (a) Specific gravity of cement (b) soundness of cement.
4 Determination of Fineness modulus of (a) Fine aggregate (b) Coarse aggregate.
5 Determination of workability of concrete by conducting Slump cone test.
6 Determination of workability of concrete by conducting Compaction factor / Vee-Bee consistometer test
7 Determination of (a) Cube compressive strength (b) Cylinder compressive strength.
8 Determination of (a) Split tensile strength of concrete (b) Flexural strength of concrete.
9 Determination of modulus of elasticity of concrete by conducting compression test on concrete cylinder
10 Determination of Bulk density and Specific gravity of (a) fine aggregate (b) coarse aggregates.
11 Determination of Bulking of fine aggregate.
12 Study of the effect of Super plasticizer on workability of concrete.
13 Study on flow properties of self compacting concrete
14 Non-destructive test on concrete using Rebound Hammer / Ultrasonic Tester.

CE 255 HYDRAULICS AND HYDRAULIC MACHINES LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To determine the Darcy's friction factor for the pipes.
2 To determine the coefficient of discharge of venturimeter, orfice, orifice meter, mouth piece and v-notch.
3 To determine the efficiency of jet of vane.
4 To determine the loss of head in pipes due to sudden expansion and contraction.
5 To determine the manning's and chezy's constant for open channel.
6 To study the performance and determine the efficiencies of pelton turbine and Francis turbine.
7 To study the performance characteristics and efficiency of centrifugal pump

COURSE OUTCOMES:

By the end of the course the students will be able

1 To understand the determination of discharge for hydraulic equipments.
2 To understand the minor and major losses in pipes.
3 To understand the performance of turbines and pumps with varying speed

Note: A minimum of ten (10 No) shall be done and recorded

1. Verification of Bernoulli's theorem.
2. Venturi meter : Determination of Coefficient of discharge.
3. Orifice meter: Determination of Coefficient of discharge.
4. Orifices : Determination of Coefficient of discharge by steady and unsteady flow methods.
5. Mouth pieces: Determination of Coefficient of discharge by steady and unsteady flow methods.
6. Characterization of laminar and turbulent flows by Reynold's apparatus.
7. Determination of friction factor of Pipes.
8. Determination of loss of head in pipes due to bend /sudden contraction/ sudden expansion.
9. Determination of Coefficient of discharge for rectangular notch / V – notch.
10. Determination of Manning's and Chezy's coefficients in open channel.
11. Study on Characteristics of Hydraulic Jump
12. Measurement of force due to impact of jets on vanes of different types.
13. Performance studies on Pelton turbine.
14. Performance studies on Francis turbine /Kaplan turbine.
15. Performance studies on single stage centrifugal pump.
16. Performance studies on Reciprocating pump.

CE 256 ENVIRONMENTAL ENGINEERING LAB

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1. To determine the physical characteristics of drinking water/sewage Turbidity.
2. To determine chemical characteristics of drinking water/sewage -pH, various types of solids, acidity, alkalinity, D.O etc.
3. To determine the chlorine dosage and residual chlorine in treated water sample.
4. To determine the Bio-chemical and Chemical Oxygen Demands of sewage.
5. To estimate Most Probable Number of given water sample.
6. To train the student for using instruments like pH meter, turbidimeter etc.
7. To estimate optimum dosage of coagulant (Alum).

COURSE OUTCOMES:

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

1. Conduct tests for physical, chemical, biological quality of water/sew-age.
2. Use the instruments with appropriate precautions to obtain maximum precision in the readings.
3. Conduct jar test to determine the exact quantity of alum needed at treatment plant based on the turbidity of the given sample.
4. Ascertain whether the given water sample contain pathogens or not.
5. Conclude whether the given water is fit for drinking or not by comparing the quality parameters with BIS standards (IS 10500 - 1991
6. Decide whether the given sewage can be directly disposed off into a stream or to be treated.

Note: A minimum of ten (10 Nos) shall be done and recorded

1. Determination of total, suspended and dissolved solids in water / sewage sample.
2. Determination of fixed and volatile solids in water / sewage sample.
3. Determination of Settleable Solids.
4. Determination of turbidity of water / sewage sample.
5. Determination of pH value of water / sewage sample.
6. Determination of optimum dose of coagulant.
7. Determination of residual chlorine.
8. Determination of temporary and permanent hardness of water sample.
9. Determination of chloride concentration of water / sewage sample.
10. Determination of acidity of water sample.
11. Determination of alkalinity of water sample.
12. Determination of fluorides in water sample.
13. Determination of Dissolved Oxygen of water / sewage sample.
14. Determination of Biochemical Oxygen Demand (BOD) of waste water.
15. Determination of Chemical Oxygen Demand (COD) of waste water.

CE 301 GEOTECHNICAL ENGINEERING – I

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To introduce the subject including genesis and historical aspect to the student.
2 To understand the significance of the basic principles of soil mechanics and their applications.
3 To go through basic definitions, simple tests, plasticity characteristics, flow of water through soils, permeability, seepage and effective stress principle.
4 To bring out the importance of concepts of stresses due to vertical loads, compression, consolidation and shear strength of soil and their applications.

COURSE OUTCOMES:

Students will be able to:

1 Understand index properties of soils
2 Classify the soil.
3 Assess engineering properties of soils like permeability,
4 Compaction, consolidation, shear strength and their importance.
5 Calculate vertical stresses increase due to applied loads, useful to determine settlement of structures

UNIT I

Introduction: Soil formation and soil types; Regional soil deposits of India

Basic Definitions and Relations: Phase diagrams; Simple definitions; some important relationships; Index Properties; Grain size distribution; Atterberg Limits; Significance of other Soil Aggregate properties

UNIT II

Soil Classification: Introduction; Particle size classification as per IS-code; Unified soil classification system; Indian standard soil classification system, Applications of Soil Classification,

Permeability: Introduction, Principle of effective stress; physical meaning of effective stress; Permeability of Soils :Darcy's law and its Validity; Determination of coefficient of permeability - constant and variable head methods, indirect methods, Factors affecting permeability; Permeability of stratified soil deposits.

UNIT III

Seepage through Soils : Types of head, seepage forces and quicksand condition.

Vertical Stresses below Applied Loads: Introduction; Boussinesq's equation; vertical stress distribution diagrams; vertical stress beneath loaded areas; Newmark's influence chart; Approximate stress distribution methods for loaded areas; Westergaard's equation.

UNIT IV

Compaction of Soils: Introduction; Laboratory tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Compaction in the field; Compaction specifications and field control.

Compressibility of Soil And Consolidation : Introduction; Compressibility; Time-rate of consolidation; Consolidation test; Computation of settlement; Secondary consolidation settlement.

UNIT V

Shear Strength of Soils : Introduction; Stress at a point- Mohr Circle of stress; Mohr-coulomb Failure Criterion; Modified failure envelope; Measurement of Shear Strength-Direct shear test, Triaxial test,

Unconfined compression test and Vane shear tests; Shear strength of Clayey soils; Shear Strength of Sands, Drainage conditions and Strength parameters, critical void ratio, liquefaction.

LEARNING RESOURCES

TEXT BOOK

1. Basic and Applied Soil Mechanics - Gopal Ranjan and A.S.R.Rao, New Age International Publishers, 2011.

REFERENCES

1. Foundation Analysis & Design by Bowles, J.E., McGraw- Hill , 1995.
2. A Text book of Soil Mechanics and Foundations by B.C.Punmia, Laxmi Publications,2005.
3. A Text book of Soil Mechanics and Foundation Engineering by K.R.Arora, Standard Publishers & Distributors, 2011.
4. A Text book of Soil Mechanics and Foundation Engineering - P.Purushotthama Raj, Pearson Education

WEB REFERENCES:

www.iitm.ac.in

CE 302 WATER RESOURCES ENGINEERING – I

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

Course Objectives:

1 To study measurement of rainfall and computation of runoff over a basin.
2 To introduce concept of Unit Hydrograph and to construct storm hydrograph of any duration using Unit Hydrograph concept.
3 To introduce various methods of stream gauging.
4 To study steady state well hydraulics and to determine yield from open well.
5 To introduce necessity, methods of irrigation and computation of irrigation scheduling.
6 To introduce different silt theories and design aspects of channels.
7 To discuss the causes and remedial measures of water logging and to design lined canals.

Course Outcomes:

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

1 Compute rainfall, runoff and peak flood discharge over a basin.
2 Measure stream flow by different methods.
3 Determine the discharge from tube wells and open wells.
4 Estimate crop water requirement and irrigation scheduling.
5 Design lined and unlined canals.
6 Suggest suitable methods to control water logging of irrigation lands.

UNIT I

Hydrology

Hydrologic cycle; Precipitation types; Rain gauges; Computation of average rainfall over a basin; Abstraction from rainfall; evaporation, factors affecting evaporation, measurement of evaporation; Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices; Run off; Factors affecting runoff; Computation of run-off; Design flood, Estimation of maximum rate of run-off.

UNIT II

Hydrographs

Hydrograph analysis; Unit hydrograph; Construction of UH for an isolated storm, Application of UH to the construction of a flood hydrograph resulting from rainfall of unit duration; Construction of unit hydrograph of different unit duration from a unit hydrograph of some given unit duration by superposition method and S-curve method.

UNIT III

Stream Gauging

Necessity; Selection of gauging sites; Discharge measurement- Area-Velocity method; Slope-Area method; Tracer method, Electromagnetic induction method, ultrasonic method; Measurement of depth – Sounding rod, Echo-sounder; Measurement of velocity; Floats – Surface float, Sub–surface float, Velocity rod; Current meter; Measurement of stage – Staff gauge, wire gauge, water stage recorder, bubble gauge recorder; stage-discharge curve.

Ground Water

Introduction; Aquifer; Aquiclude; Aquifuge; Specific yield; Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; Well hydraulics- Steady radial flow to a well– Dupuit's theory for confined and unconfined aquifers; Tube wells - Open wells; Yield of an open well–Constant level pumping test and Recuperation test.

UNIT IV

Introduction to Irrigation

Definition; Necessity; Scope of irrigation science; Benefits of irrigation; Ill-effects of irrigation; Types of irrigation.

Methods of Irrigation

Methods of applying water to crops; Uncontrolled or wild flooding; Free flooding; Contour laterals; Border strip method; Check flooding; Basin flooding; Zigzag method; Furrow method; Contour Farming; Sub-surface irrigation; Sprinkler irrigation; Drip irrigation.

Water Requirement of Crops

Functions of irrigation water; Classes and availability of soil water; Saturation capacity; Field capacity; Wilting point; Available moisture and readily available moisture; Moisture equivalent; Soil – moisture deficiency; Limiting soil moisture conditions; Depth and frequency of irrigation; Duty and Delta; Base period; Relation between Duty and Delta; Factors affecting duty; Methods of improving duty; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; Consumptive use of water ; Irrigation efficiencies – Water conveyance efficiency, Water application efficiency, Water distribution efficiency and Consumptive use efficiency; Determination of irrigation requirements of crops; crop rotation, Assessment of Irrigation water.

UNIT V

Irrigation Channels – Silt Theories and Design Procedure

Classification; Canal alignment; Inundation canals; Cross–section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Silt theories–Kennedy's theory, Kennedy's method of channel design; Drawbacks in Kennedy's theory; Lacey's regime theory; Lacey's theory applied to channel design; Defects in Lacey's theory; Comparison of Kennedy's and Lacey's theory.

Water Logging and Canal Lining

Water logging; Effects of water logging; Causes of water logging; Remedial measures; Saline and alkaline soils and their reclamation; Losses in canal; Lining of irrigation channels – necessity, advantages and disadvantages; Types of lining; Design of lined canal.

LEARINING RESOURCES:

TEXT BOOKS:

1 Irrigation and water power Engineering by B.C. Punmia and Pande B.B. Lal; 16th Edition,Laxmi Publications Pvt. Ltd., New Delhi.
2 Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi,2011.

REFERENCE BOOKS:

1 Irrigation, Water Resources and Water Power Engineering by P.N. Modi, 7th Edition, Standard Book House, 2008.
2 Irrigation, water power and water resources Engineering by K R Arora, Standard Publishers, 2010.
3 Engineering Hydrology by K. Subramanya, 3rd Edition, Tata McGraw-Hills
4 Engineering Hydrology by P. Jayarami Reddy, Laxmi Publications
5 Applied Hydrology by Ven Te Chow, Maidenment and Mays, Mc Graw Hill Publications.

WEBREFERENCES:

1 **www.nptel.iitm.ac.in**
2 **www.sprinkerlink.org for e-journals.**

CE 303 RAILWAY, AIRPORT & HARBOR ENGINEERING

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To understand the role of railways in transportation.
2. To understand various parts of a railway track. And Introduction to geometric design of a railway section.
3. To emphasize on various requirements of stations
4. It will present the concept airport planning, various obstruction runway and structural design of airport pavement.
5. Emphasize on various facilities of a harbor and port and various controlling devices of an harbour

COURSE OUTCOMES:

1. An ability to understand the importance of railway sector
2. An ability to judge and select proper material and component for a railway track and to understand and deign various component of a track.
3. For basic knowledge of a railway station.
4. Better planning of various amenities of an airport and planning and also serves as a basic for air port pavement design and runway design.
5. Creates a basic introduction of various features of a harbor and a port to enable for proper design and maintenance of various amenities.

UNIT I

Railway Engineering: Introduction; Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways.

Railway Track : Permanent way: Gauges in Railway track, Railway track cross – sections; Coning of wheels.

Rails & Rail Joints : Functions of rails; Requirements of rails; Types of rails sections; Standard rail sections; Length of rails; Rail failures; Wear on rails. Requirements of an ideal joint; Types of rail joints; Welding of rails.

Sleepers : Functions of sleepers; Requirements of sleepers; Classification of Sleepers – Timber sleepers, Metal sleepers & Concrete sleepers; Comparison of different types of sleepers.

UNIT II

Fish Plates : Fish plates, section of fish plates, failure of fish plates.

Geometric Design Of Track : Necessity; Gradients & Gradient Compensation; Elements of horizontal alignment; Super elevation; Cant deficiency and cant excess; Negative Super elevation; Length of Transition Curve, Length of vertical curve.

Points And Crossings : Functions of components of turnout; Crossings.

UNIT III

Ballast : Functions and requirements of ballast; Types of ballast; Renewal of ballast.

Stations And Yards : Site selection for railway station; Requirements of railway station; Classifications; Station yards; Level crossing.

Signalling : Objects of signaling; Classification of signals; Controlling- absolute block system. Standards of inter locking.

UNIT IV

Airport Planning And Design: Introduction; Development of air transportation system with particular reference to India; Aeroplane components; Air–craft characteristics.

Airport planning and layout : Selection of site; Apron; Hanger; Typical airport layouts; Airport marking; Airport lighting; Drainage systems.

Airport Obstruction : Zoning laws; Classification of obstructions; Imaginary surfaces; Approach zone; Turning zone.

Runway Design : Runway orientation; Basic runway length; Corrections for elevation; Temperature and gradient; Runway geometric design.

Specifications for Structural Design of Airport Pavements: Design factors methods for flexible and rigid pavements; LCN system of pavement design.

UNIT V

Docks And Harbour Engineering: Introduction; Types of water transportation; Economics and advantages of water transportation.

Planning and Design of Port Facilities : General layout and design considerations; Pier and wharf structures; Fender systems; Transit sheds and Apron; Container ports; Docks; Dredging; Light Houses.

LEARINING RESOURCES:

TEXT BOOKS:

1. UNIT I, II & III Railway Engineering by S.C.Saxena and S.Arora Dhanpat Rai & sons.
2. UNIT IV: Airport Planning and Design by S. K. Khanna & M. G. Arora; Nemchand & Bros, Roorkee.
3. UNIT V Harbour, Dock and Tunnel Engineering, 1995 by R. Srinivasan and S. C. Rangwala, , Charotar Pub. House, Anand

REFERENCE BOOKS:

1. Railway Engineering by M.M.Agarwal; Prabha & Co, New Delhi.
2. Airport Engineering by G.V.Rao; Tata Mc Graw Hill, New Delhi

CE 304 DESIGN OF CONCRETE STRUCTURES - I

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

To introduce the students

1. Course is designed to shape the concrete and use the steel bars in concrete for external loads on structural elements.
2. To bring about an understanding of the behavior of reinforced concrete for flexure by working stress method for different types beams.
3. To understand the design of limit state method for flexure in different types of beams.
4. To understand the analysis and design shear and torsion for RC elements.

COURSE OUTCOMES:

At the end of the course students shall be able to

1. Design the beams for flexure in working stress method.
2. Design the beams for flexure in limit state method.
3. Design the beams for shear and torsion.
4. Design of beam for Bond and Development length

UNIT - I

Introduction: Role of structural engineer; Reinforced concrete; Structural elements; Loads on structures ; Strength and serviceability; Methods of design ; Codes of practice IS456-2000.

Design of beams for Flexure (Working Stress Method)

Assumptions; Permissible stresses in concrete and steel; Transformed section; Analysis and design of beams for flexure of singly reinforced, doubly reinforced and flanged sections.

UNIT - II

Design of beams for Flexure (Limit State Method)

Assumptions; Limit states; Partial safety factors; Modes of failure; Maximum depth of neutral axis; Analysis and design for flexure of singly reinforced, doubly reinforced and flanged sections.

UNIT - III

Design of beams for Shear and Torsion

Shear in a homogeneous beam; Shear in R.C. beams; Diagonal tension and diagonal compression; Design for shear by working stress method and limit state method; Torsion - Introduction, Effect of torsion, IS Code provisions; Design for torsion;

UNIT - IV

Design of beam for Bond and Development length

Anchorage bond; flexural bond; Design for bond; Check for development length by working stress method and limit state method.

Deflection and Cracking

Span/Effective depth ratio; Calculation of Short-term and Long-term deflections; Cracking; Bar spacing controls.

UNIT - V

Design and Detailing of the following:

a. Simply supported and Cantilever beams (Working stress method)
b. Simply supported and Cantilever beams (Limit state method)
c. Dog-legged stair case (Limit state method)
d. Design of one way slab (limit state method)

NOTE:

Two questions of 10 marks each will be given from each unit out of which one is to be answered. Ten questions of 1 mark each will be given from entire syllabus which is a compulsory question.

LEARNING RESOURCES

TEXT BOOKS

1. Reinforced Concrete (limit state design) by Ashok K. Jain, Nem Chand & Bros., Roorkee
2. Reinforced Concrete , Vol.1 by H. J. Shah, Charotar publishing house Pvt.Ltd.,

REFERENCES

1. Reinforced concrete design by Pillai and Menon, 2nd Edition,Tata McGraw-Hill
2. Reinforced-concrete-structures-R-Park-T-Paulay

CODE BOOKS

IS 456-2000,IS-875 (All parts), ACI 318-2011 and Euro Codes for RCC Design.

WEBREFERENCES:

http://nptel.ac.in/courses/105105105/

CE 305 **DESIGN OF STEEL STRUCTURES – I**
(Using Limit State Method)

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

Course objectives:

1. To introduce steel structures and its basic components
2. To introduce structural steel fasteners like welding and bolting
3. To design tension members, compression members, beams and beam-columns
4. To design column splices and bases

Course outcomes:

1. Learn the basic elements of a steel structure
2. Learn the fundamentals of structural steel fasteners
3. Able to design basic elements of steel structure like tension members, compression members, beams and beam-columns
4. Able to design column splices and bases.

UNIT - I

Introduction

What are steel structures? ; What a steel structure consists of? ; Structural steel; Products of structural steel ; Standards , Codes and Specifications; Fatigue ;Brittle fracture ; Corrosion protection of steel structures ; Design philosophies ; Methods of structural analysis ; Plate(Local) buckling ; Classification of sections

Structural steel fasteners

Introduction; Welding - Shield metal arc-welding, Automatic submerged arc- welding, Types of welds, Quality of welds, Weld symbols and notation, Specifications for welding ; Bolting-Types of failure, Design specifications, High- strength bolts

UNIT-II

Tension members

Introduction ; Net area ; Shear-lag ; Design of tension members

UNIT - III

Compression members

Introduction ; Euler's buckling theory ; Behaviour of real columns ; Types of sections ; Design of columns ; Validity of design strength calculations ; Design of compression members ; Design Procedure ; Built-up compression members.

UNIT – IV

Beams

Introduction ; Flexural behaviour of beams which does not undergo lateral buckling; Flexural behaviour of beams which undergo lateral buckling ; Shear behaviour ; Web buckling and Crippling ; Design strength in bending ; Design strength in shear ; Limit state serviceability – Deflection

UNIT –V

Beam-columns

Introduction; Analysis of beam-columns; Modes of failure; Design specifications

Column Splices and Bases

Introduction ; Column splices ; Column bases.

NOTE

Two questions of 10 marks each will be given from each unit out of which one is to be answered. Ten questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1.Design of steel structures by K.S.Sai Ram, Pearson Education, 2015

REFERENCE BOOKS

1. Steel Structures - Design and Practice by N. Subramanian, Oxford University press, 2010.
2. Limit state design of steel structures by M.R.Shiyekar , PHI Learning,2017.
3. Limit state design of steel structures by S.K.Duggal, McGraw-Hill,2017.

WEB REFERENCES: http://nptel.iitm.ac.in

CE 306 STRUCTURAL ANALYSIS – II

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

To introduce the students to the concepts of

1 Stiffness and flexibility in matrix form.
2 To analyze the structures like beams and simple frames using stiffness and flexibility matrix methods.
3 The plastic behavior of structures and collapse load analysis of the structures.
4 Evaluation of element stiffness matrix and nodal load vector for one-dimensional and two-dimensional problems of elasticity.
5 Basic concepts of structural dynamics and system descritisation methods.

COURSE OUTCOMES:

At the end of this course, the student should be able to

1 Analyze the structures like continuous beams and single bay, storey rigid jointed frames for internal forces using stiffness and flexibility matrix methods.
2 Develop a computer program by various software's .
3 Behavior of structures beyond yield load, finding shape factors, length of plastic hinge.
4 Collapse load analysis
5 Know evaluation of element stiffness matrices and element load vectors for one-and two-dimensional problems of elasticity .
6 Can obtain global stiffness matrix and nodal load vector .

UNIT I

Matrix methods of Structural analysis by Flexibiity Method : Flexibility and stiffness; Flexibility matrix; Relationship between flexibility matrix and stiffness matrix; Analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) by flexibility method.

UNIT II

Matrix methods of Structural analysis by Stiffness Method : Stiffness; Stiffness matrix; Relationship between flexibility matrix and stiffness matrix; Analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) stiffness method.

UNIT III

Plastic analysis of structures : Introduction, Stress-strain curve, Plastic moment - Plastic section modulus, Shape factor, Load factor, Failure mechanisms; Methods of analysis - Static method and Mechanism method; Analysis of continuous beams and single bay rectangular portal frames

UNIT IV

Introduction to Finite Element Method : Different types of elements; Displacement models; Relation between nodal degrees of freedom and generalized coordinates; Convergence requirements; Compatibility requirement; Geometric invariance; Natural coordinate systems; Shape functions; Element strains and stresses; Element stiffness matrix; Element nodal load vector

Isoparametric elements – Definition, Two-dimensional isoparametric elements – Jacobian transformation, Numerical integration

UNIT V

Introduction to Structural Dynamics : Fundamental objective of structural dynamics; Types of prescribed loadings ; Essential characteristics of a dynamic problem; Methods of descritisation –

Lumped, Generalised displacements, Finite element concept; Formulation of equation of motion ; Dynamic equilibrium equation using D'Alembert's Principle.

LEARNING RESOURCES:

TEXT BOOKS:

1. Structural Analysis - A matrix approach by G. S. Pandit & S. P. Gupta; Tata Mc Graw - Hill Publishing Co. Ltd., 2008.
2. Fundamentals of limit analysis of structures by Manicka Selvam, Dhanpat Rai &Sons
3. Concepts and Applications of Finite Element Analysis, by Robert D. Cook.
4. Dynamics of structures by A.K Chopra

REFERENCE BOOKS:

1. Structural Analysis by Devdas Menon, Narosa Publishinh House, 2008.
2. Intermediate structural analysis by CK Wang, Tata McGraw-Hill,2010.
3. Finite Element Analysis: Theory And Programming, 2nd Edition Krishnamurthy.
4. Dynamic Analysis of Structures Using the Finite Element Method by Mario Paz William Leigh
5. The finite element method - Its basis & Fundamentals by Zienkiewicz, Taylor and Zhu , 6th Edition, Elsevier India Private Ltd, 2007.
6. Dynamics of structures by Ray W. Clough & Joseph Penzien

WEB REFERENCES:

1 http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Structural%20Mechanic%20II/Course%20Objective.html.

2 http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Structural%20Analysis/New_index1.html

CE 351 SURVEYING FIELD WORK – II LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 The main objective of this laboratory course is to introduce Total Station instrument for regular field survey purpose.
2 To make every student familiar with Total Station
3 All of the experiments which are done by mechanical instruments before are now done with Total station.
4 To set out a simple circular curve by various methods using tape, theodolite.
5 This course will also present a survey camp after completing the regular lab sessions.

COURSE OUTCOMES:

By the end of the course, the students will be able to

1 Gain required excellence in using the Total Station Instrument by avoiding manual errors.
2 Every student can meet the requirement of knowing the Total Station instrument which is vital for any construction firm.
3 Students can make accurate designs and set out a simple circular curve for roads.
4 Not only he/she can work out the experiments inside the institution but also they are trained for the on-site works outside the institution.

Any 8 of the following:

1) **Theodolite**
   Traversing and adjustment of traverse
   Setting of simple circular curve using tape or/and theodolite.
   Setting of simple circular curve using two theodolite method.
   Setting out for Building Foundation.

2) **Total Station**
   Study of Instrument - Determination of Distances, Directions and Elevations.
   Determination of Boundaries of a Field and computation of area and volume.
   Determination of Heights of objects.
   Stake out and point to line.
   Setting of a simple circular curve using Total Station.
   Setting out for Building Using Total Station.

3) **Survey Camp is to be conducted for a minimum period of seven days to train in one of the following areas:**
   Preparation of a contour Plan/ Map.
   Earth work Computations for a high way / canal projects
   Marking of a Sewer line/ Water supply line.
   Any type of Execution works.

NOTE: 50% Weight- age of total marks of this laboratory is to be given for total survey camp work including for Report submission by each batch.

LEARNING RESOURCES:

WEB REFERENCES:

http://nptel.ac.in/courses/105104100/
http://nptel.ac.in/courses/105104101/
http://nptel.ac.in/courses/105107121/
http://nptel.ac.in/courses/105107122/

CE 352 GEOTECHNICAL ENGINEERING LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To determine physical properties like water content, specific gravity, bulk unit weight, Atterberg limits and gradation analysis.
2 To determine engineering properties of soils like permeability, compaction, consolidation and shear strength of soils.

COURSE OUTCOMES:

Students will be able to:

1 Classify the soil.
2 Based on classification plan for suitability of soil for various civil engineering projects.
3 Determine engineering properties of soils which are required design of retaining walls, foundations, checking settlements and stability of slopes.

Note: A minimum of ten (10 Nos) shall be done and recorded

1. Determination of water content by oven drying method and rapid moisture tester.
2. Determination of specific gravity soil by using density bottle and pycnometer
3. Gradation analysis
    (a) Mechanical Sieve analysis
    (b) Hydrometer analysis.
4. Determination of Atterberg limits
5. Determination of free swell index and swelling pressure of expansive soils.
6. Determination of field unit weight by
    a) Core cutter method.
    b) Sand replacement method.
7. Determination of permeability by
    a) Constant head permeameter.
    b) Variable head permeameter.
8. Direct shear test.
9. Vane shear test.
10. Unconfined compression test
11. IS - Light compaction test
12. IS - Heavy compaction test.
13. Triaxial shear test.
14. Det.of coefficient of consolidation by Taylor’s and Casagrande’s methods.
15. Det.of relative density of sand.

CE 353 ENGINEERING GEOLOGY LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1. Develops the ability to understand the importance of geology in civil engineering
2. Develops the ability to identifying the various rock forming group of minerals and rocks and analyze the attitude of rock formations
3. Develops the knowledge in interpreting the topographic geological maps and satellite Imageries

COURSE OUTCOMES:

1. Students able to understand the importance of geology in civil engineering
2. Students are familiar with identifying the geological process of the region related to the civil engineering works
3. Students are able to evaluate the formation and properties of the minerals , rocks and soil
4. Develops the ability to prepare the geological section and maps and interpret the site conditions

Note: A minimum of ten (10No) shall be done and recorded

1. Study of Survey of India Topographical Maps
2. Study of Satellite Imageries through appraisal cards
3. Study of Physical Properties and identification Minerals (2 experiments)
    i. Silicate minerals
    ii. Non silicate minerals
4. Megascopic description and identification of Rocks (3 experiments)
    i. Igneous rocks
    ii. Sedimentary rocks
    iii. Metamorphic rocks
5. Joint Data Analysis
6. Simple Structural geology Problems
7. Study of Geological Maps and their Cross-section
8. Electrical Resistivity Method (demo)
9. Seismic Hammer Sounding Method (demo)
10. Study of Structural Models
11. Study of Tunnel Models

LEARNING RESOURCES:

TEXTBOOKS:

1. F.G. Bell, Fundamental of Engineering Geology , BS Publications PVT Ltd, Hyderabad.
2. Parbin Singh, " Engineering and General Geology ", Katson Publication House, 1987.

WEB REFERENCES:

1. NPTEL COURSE- Developed by Prof. Debasis Roy, IIT, Kharagpur - 721302
2. http://web.mst.edu/~rogersda/umrcourses/ge341/
3. http://web.env.auckland.ac.nz/course_pages/geology771/

CE 307 GEOTECHNICAL ENGINEERING – II

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To introduce the soil exploration, field testing of soil to know soil strata, strength and water table location.
2 The civil engineering structures like retaining wall which are to resist lateral stresses are also introduced. To introduce concepts of stability of slopes, bearing capacity, pile capacity and its determination.

COURSE OUTCOMES:

1 Equip the student with knowledge of how to explore the soil,
2 Calculation of earth pressures to design retaining walls
3 Checking stability of slopes
4 Determination of Allowable bearing pressure so as to determine dimensions of the footings.
5 Selection of pile and its capacity

UNIT I

Soil exploration: Introduction; Methods of exploration; Methods of Boring; Soil Samples; Soil samplers and Sampling; Number and disposition of trial pits and borings; Depth of exploration; Ground water observations; Plate load test; Penetration tests- SPT,CPT(static and dynamic), Pressuremeter tests(PMT);Geophysical methods- Electrical resistivity and seismic refraction methods; Bore logs; Site investigation report.

UNIT II

Earth Pressures & Retaining Walls : Introduction; Effect of wall movement on Earth Pressure; Earth Pressure at rest; Rankine's theory of Earth pressure; Coulomb's theory of earth pressure; Culmann's graphical method for active earth pressure; Types of retaining walls, selection of backfill and placement condition, drainage in retaining walls, Design considerations for retaining walls.

Stability of Slopes : Introduction; Infinite slopes and translational slides; Definitions of factor of safety; Finite slopes- forms of slip surface; Total stress and Effective stress methods of analysis; φ_u=0 Analysis (Total Stress Analysis) ; c-φ Analysis- Method of slices; Location of most Critical Circle; Stability of Earth Dam Slopes; Friction Circle Method; Taylor's Stability Number.

UNIT III

Shallow Foundations : Concept of foundations; Types of foundations and their applicability; General requirements of foundations; Location and Depth of foundation.

Bearing Capacity of Shallow Foundation : Terminology relating to bearing capacity; Bearing Capacity of Shallow Foundations - Terzaghi's Bearing Capacity theory; Skempton's Bearing Capacity Analysis for Clay soils; IS-Code Recommendations for Bearing Capacity; Influence of water table on bearing capacity.

UNIT IV

Settlement Analysis: Settlement of Shallow foundation - types; Methods to reduce differential settlements; Allowable Bearing Pressure; Immediate settlement, Allowable Bearing pressure of Granular Soils based on Standard Penetration Test Value.

Well Foundations : Types of wells; Components of well foundation; Shapes of wells; Depth of a well foundation, Forces acting on well foundation; Construction and Sinking of wells.

UNIT V

Pile Foundations : Introduction; Uses of Piles; Types of Piles; Cast- in-situ Pile construction; Selection of Pile type; Pile driving; Pile load carrying capacity in compression - Static Pile Load formula, Load tests-static and cyclic pile load tests, Dynamic Pile formulae; Correlations with Penetration test data; Group action of Piles - load carrying capacity and settlement; Negative skin friction.

LEARNING RESOURCES

TEXT BOOK

1. Basic and Applied Soil Mechanics - Gopal Ranjan and A.S.R.Rao, New Age International Publishers, 2011.

REFERENCES

1. Foundation Analysis & Design by Bowles, J.E., McGraw- Hill, 1995.
2. Geotechnical Engineering by SK Gulati & Manoj Datta, Tata McGraw- Hill,2010.
3. Principles of Foundation Engineering by B.M. Das., PWS Publishing Company, 4th edition, 1999.
4. Foundation Engineering by Varghese,P.C.,Printice Hall of India.,New Delhi
5. Soil Mechanics and Foundation Engineering by B.C.Punmia,Ashok Kumar Jain and Arun Kumar Jain,Laxmi Publications Pvt.Ltd.,New Delhi.

WEB REFERNCES:

www.iitm.ac.in

CE 308 WATER RESOURCES ENGINEERING – II

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To discuss the planning criteria of a reservoir, flood routing methods and to determine storage capacity & life of reservoir.
2 To study modes of failure, stability analysis and design of gravity dam.
3 To study types, causes of failures of earth dams and seepage control measures.
4 To study various types of spillways and their suitability, energy dissipation below spillways.
5 To study seepage theories and their applications in the design of weirs on permeable foundations.
6 To study functions, types and suitable locations for outlets, falls, regulators , cross drainage works and escapes of a canal.
7 To study about component parts and their function of a hydel project and introduction of load factor, capacity factor, utilization factor.

COURSE OUTCOMES:

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

1 Calculate the storage capacity of a reservoir and estimate the life of a reservoir.
2 Analyse stability of gravity dam and obtain section of an earth dam based on the locally available materials.
3 Suggest a suitable spillway at a dam site and understand the criteria for design of stilling basin for energy dissipation under spillway.
4 Design weirs on permeable foundations based on Bligh's creep theory and Khosla's theory.
5 Understand the functions and suitable locations of canal outlets, canal falls, canal regulators and cross drainage works.
6 Understand the functions of component parts of a hydro electric power scheme and determine load, capacity, and utilization factors for a hydel project.

UNIT I

Reservoir Planning

Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Sediment flow in streams; Reservoir sedimentation; Life of reservoir; Reservoir sediment control; Multipurpose reservoir; Flood routing; Methods of flood routing – Inflow - Storage Discharge Curves method and Trial and error method (Description only).

Dams In General

Introduction; Classification; Gravity dams, Arch dams, Buttress dams, Steel dams, Timber dams, Earth dams and rock fill dams; Physical factors governing selection of type of dam and selection of site for a dam.

UNIT II

Gravity Dams: Introduction; Forces acting on a gravity dam; Combination of loading for design; Modes of failure and criteria for stability requirements; Stability analysis; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam; High and low gravity dams; Design of gravity dams–single step method; Galleries; Joints; Keys and Water seals; Stability analysis of non–overflow section of gravity dam.

UNIT III

Earth Dams: Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams; Section of an earth dam; Seepage control measures.

Spillways: Introduction; Types of spillways; Energy dissipation below spillways for relative positions of jump height curve and tail water curve; Stilling basins; Indian standards on criteria for design of hydraulic jump type stilling basins with horizontal and sloping aprons.

UNIT IV

Diversion Head Works: Component parts of a Diversion Head work; Weirs and barrages- Types of weirs; Causes of failure of weirs and their remedies; Bligh's creep theory, Khosla's theory Design of weirs on permeable foundations, Silt control at head works.

Cross Drainage Works: Introduction; Types of cross - drainage works; Selection of suitable type of cross - drainage work; Classification of Aqueducts and Syphon Aqueducts.

UNIT V

Canal outlets and regulation works

Types of outlets; Non–modular outlets; Semi-module outlets; Rigid modules; Canal falls; Necessity and location of falls; Development of falls; Types of falls; Canal regulators; Off-take alignment; Head regulators and cross-regulators; Canal escape (Designs not included).

Water Power Engineering

Introduction; Hydropower - Advantages and disadvantages; Estimation of hydropower; Flow duration curve; Power duration curve; Load curve; Load factor; Capacity factor; Utilization factor; Diversity factor; Load duration curve; Firm Power; Secondary power; Types of hydel schemes; Forebay; Intake structures; Penstocks; Surge tank; Tail race; Turbines; Selection of suitable type of turbine.

LEARNING RESOURCES:

TEXT BOOKS:

1 Irrigation and Water Power Engineering by B.C. Punmia and Pande B.B. Lal; 16th Edition, Laxmi Publications, New Delhi.
2 Irrigation Engineering and Hydraulic Structure by S. K. Garg; Khanna Publishers, Delhi, 2011.

REFERENCE BOOKS:

1 Irrigation, Water Resources and Waterpower Engineering by P.N. Modi, 7th Edition, Standard Book House, 2008.
2 Irrigation, Waterpower and Water Resources Engineering by K R Arora, Standard Publishers, 2010.
3 Water Power Engineering by M.M. Dandekar and K. K. Sharma; Vikas Publishing House Pvt. Ltd., 1979.

CE 309 HIGHWAY ENGINEERING

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To emphasize on highway development planning and various surveys to be conducted.
2 To understand material properties and performances and limits of various tests
3 Introduction to the design concepts, vehicle loading criteria and to demonstrate how they are combined to design and construct road pavements.
4 To understand the principles of geometric design, both vertical and horizontal
5 Emphasize on various traffic control operations and regulations.

COURSE OUTCOMES:

1 For proper planning of a road network by linking of various surveys and to evaluate and develop master plans for a better road network.
2 Selecting the appropriate materials for use in different road layers for different types of pavements.
3 Perform road pavement design and analysis by various IRC and other methods.
4 Interpret geometric design fundamentals, in relation to safety and driver comfort, focusing on horizontal and vertical alignment.
5 An ability to develop traffic signals and help to properly regulate the traffic and better use of road network.

UNIT I

Highway Development and Planning : Brief Introduction; necessity of highway planning suveys preparation of master plan highway planning in India.

Highway alignment : Factors controlling alignment; Engineering surveys, Drawing & report.

UNIT II

Highway Geometric Design : Highway cross section elements; Sight distance; Design of horizontal alignment; Design of vertical alignment.

Highway materials : Sub grade soils- CBR tests; Stone aggregates; Bitumen materials; Paving mixes.

UNIT III

Design of Highway Pavements: Design factors; Design of flexible pavements – IRC method, IRC recommendations; Design of Rigid pavements -Westergard's stress equation for wheel loads and temperatures stress; IRC recommendations.

UNIT IV

Highway construction and maintenance: Construction of water bound macadam roads; bituminous pavements and cement concrete pavements; Construction of joints in cement concrete pavements; Maintenance of highways- Water bound macadam roads, Bituminous pavements, Cement concrete pavements.

Highway Drainage: Importance of highway drainage; Requirements; Surface drainage; Sub–surface drainage; Road construction in water logged areas and black cotton soils.

UNIT V

Traffic engineering: Introduction; Traffic characteristics- Road user, vehicular & travel pattern; Traffic operation- signal design; Types of intersections; Design of rotary intersection;

LEARNING RESOURCES:

TEXT BOOKS:

1 Highway Engineering by S. K. Khanna & C. E. G. Justo; Nemchand & Brothers, Roorkee, 2011.
2 Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003).

REFERENCE BOOKS:

1 Principles of Transportation Engineering by Partha Chakroborty & Animesh Das, PHI Learning, 2009.
2 Principles of Transportation Engineering and highway engineering by G. Venkatappa Rao, Tata McGraw-Hill, 1995.

WEB REFERENCES:

1 http://nptel.iitm.ac.in/syllabus/syllabus.php?subjectId=105101087
2 www.irc.org.in (for various journals and manuals and code provisions)
3 www.springerlink.com (for various e journals)

CE 310 **DESIGN OF STEEL STRUCTURES - II**

(Using Limit State Method except Light Gauge Steel Sections)

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

Course objectives:

1. To design welded plate girder and gantry girder
2. To design welded and bolted connections
3. To design roof trusses
4. To design light gauge sections
5. To design structural steel and concrete composite beams

Course outcomes:

1. Learn the design of welded plate girder and gantry girder
2. Able to design welded and bolted connections
3. Able to design roof trusses
4. Learn the design of light gauge sections
5. Able to design concrete composite beams

UNIT – I

Gantry girder

Introduction; Loads on gantry girder; Web buckling and Crippling; Deflection, Check; Design of gantry girder

UNIT -II

WeldedPlate girder

Introduction ; Behavior of transversely stiffened plate girder panels in shear ; Design methods for transversely stiffened web panels ; Design of end panels ; Other design specifications ; Design of stiffeners ; Design of welded plate girder

UNIT - III

Connections

Introduction; Bracket connections using welding/bolting; Simple beam end connections-Web connections using welding/bolting, Seat-angle connection using welding/bolting, Stiffened seat angle connection using welding/bolting; End plate connection, Fin-plate connection; Moment resistant beam end connection- Extended end plate connection; Splicing of beams /girders using bolts

UNIT - IV

Light-gauge steel sections

Introduction; Types of sections; Design of light gauge sections; Design of axially loaded columns; Design of beams which do not buckle laterally.

Composite Construction

Introduction; Composite beam ; Method of construction ; Limit states of collapse; Limit states of serviceability – Deflection

UNIT -V

Roof Trusses

Components of a trussed roof; Types of trusses; Dead, Live and wind loads on trussed roof; Design of tubular purlins ; Design of members of a roof truss using tubes; Design of connections using welding

NOTE

Two questions of 10 marks each will be given from each unit out of which one is to be answered. Ten questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1.Design of steel structures by K.S.Sai Ram, Pearson Education, 2015

REFERENCE BOOKS

1. Steel Structures - Design and Practice by N. Subramanian, Oxford University press, 2010.
2. Limit state design of steel structures by M.R.Shiyekar , PHI Learning,2017.
3. Limit state design of steel structures by S.K.Duggal, McGraw-Hill,2017.

WEB REFERENCES: http://nptel.iitm.ac.in

CE 311 ENVIRONMENTAL ENGINEERING – II

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To introduce water carriage systems of sanitation and their relative merits.
2. To estimate quantities of sewage and drainage and to learn procedures for sewer design and to discuss the importance of various sewer appurtenances like manholes etc.
3. To discuss cycles of decomposition and methods for determining the quality and characteristics of waste water.
4. To discuss theoretical aspects and design procedures for primary and secondary wastewater treatment units – grit chambers, sedimentation tanks, Trickling Filters and Activated Sludge Process , Oxidation ponds.
5. To discuss various stages and factors affecting anaerobic sludge digestion and to design anaerobic sludge digester and to learn methods of sludge handling and disposal.
6. To introduce sanitary fittings and plumbing systems of drainage and to discuss principles governing house drainage.
7. To design wastewater treatment and disposal in un-sewered areas using septic tanks and to learn concepts of biogas generation.

COURSE OUTCOMES:

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

1. Determine the quantity of drainage and sewage and design sewers along with suitable location of various sewer appurtenances.
2. Ascertain the quality and characteristics of wastewater.
3. Design various primary treatment units, biological treatment units.
4. Design anaerobic digester for primary and secondary sludge and to select suitable method for disposal of wet or conditioned sludge
5. Plan plumbing system for various types of residential buildings
6. Design septic tanks and its effluent disposal methods understand the biogas production concepts.

UNIT I

Introduction to Sanitary Engineering : Sanitation; Sewerage systems; Relative merits and Suitability. Sanitary Sewage and Storm Sewage : Sanitary Sewage: Factors affecting sanitary sewage; Determination of quantity of sanitary sewage; Storm Water Sewage: Factors affecting storm water sewage; Determination of quantity of storm water sewage.

Sewers design and construction : Types of sewers; Design of sewers; Construction; Testing; Maintenance of sewers.

UNIT II

Sewer Appurtenances and Sewage Pumping : Sewer appurtenances – Man holes, Drop man holes, Inverted siphons; Street inlets; Catch basins; Storm water regulators; Sewage pumping; Types of pumps.

Quality and Characteristics of Sewage : Characteristics of sewage; Decomposition of sewage; Carbon, nitrogen and sulphur cycles of decomposition; BOD; COD; Physical and chemical analysis of sewage.

Primary Treatment of Sewage : Screens; Grit chamber; Grease traps; Skimming tanks; Sedimentation tanks.

UNIT III

Secondary Treatment of Sewage : Trickling filters: Principles of action; Filter types; Recirculation; Operational problems and remedies; Activated sludge process: Principle of action; Features of operation; Organic loading parameters; Methods of aeration; Diffused air system; Mechanical aeration; Combined

system; Activated sludge process vs Trickling filter process; Sludge bulking; Sludge volume index, Secondary Settling Tanks.

UNIT IV

Miscellaneous treatment methods : Oxidation Ponds - Working principle and design; Oxidation ditches and aerated lagoon (theoretical aspects only)

Sewage Disposal : Objects; Methods; Disposal by dilution; Disposal by irrigation; Sewage sickness.

Sludge Treatment and Disposal : Characteristics of sewage sludge; Anaerobic sludge digestion process; Stages of sludge digestion; Factors affecting sludge digestion; Sludge digestion tank; Methods of de-watering the sludge; Methods of sludge disposal.

UNIT V

House Plumbing : House drainage - Sanitary fittings, Traps; Plumbing system of drainage – Single stack, One pipe and Two pipe systems; Principles governing design of building drainage.

Septic Tank : Septic tank design; Septic tank effluent disposal, soak pits, leaching cess pools;

Biogas Generation : Introduction; uses of biogas; biogas plants: KVIC model and Janata model, digested slurry handling

LEARNING RESOURCES:

TEXT BOOKS

1. Elements of Environmental Engineering by K. N. Duggal, S. Chand & Company Ltd., 2010.
2. Environmental Engineering vol. II – Sewage disposal and air pollution engineering by S. K. Garg; Khanna Publishers, Delhi., 2010.

REFERENCE BOOKS

1. Wastewater Engineering : Treatment, Disposal & Reuse by Met Calf ,McGraw-Hill.
2. Environmental Engineering by Peavy and Rowe, McGraw-Hill (India), 2013.
3. Water & Wastewater Technology by Hammer and Hammer, PHI, 2010.
4. Water Supply and Sewerage by E.W. Steel and Terence J. Mc Ghee, McGraw-Hill,1991.
5. Manual on Sewerage & Sewage treatment; CPH and EEO, Ministry of Works and Housing; Govt. of India; New Delhi.

WEB REFERENCES:

1. www.nptel.iitm.ac.in

CE 312 DESIGN OF CONCRETE STRUCTURES - II

Lectures / Tutorials	: 3/1 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

Course objectives:

1. Course is designed to shape the concrete and use the steel bars for external loads on different building elements.
2. To understand the codal recommendations for methods of design.
3. To understand the design of continuous beams.
4. To understand the design of continuous slabs.
5. To understand the design of two way slabs, and flat slabs.
6. To understand the design of columns.
7. To understand the design of retaining walls and foundations

Course outcomes:

1. Students can handle the isolated design of individual elements independently.
2. Indian Standards of approach can be practiced by the student.

UNIT - I

Continuous Beam and Slabs (Limit State Method)

Design of continuous beam

Design of Continuous slabs

UNIT- II

Two Way Slabs (Limit State Method)

Design and detailing of two way slabs

Flat Slabs (Limit State Method)

Design and detailing of flat slabs by direct design method.

UNIT- III

Columns (Limit State Method)

Assumptions; Design of axially loaded columns ; Design of rectangular columns (short and Long) subjected to axial load and bending moment using Interaction diagrams (SP-16 Charts)

UNIT- IV

Foundations (Limit State Method)

Design and detailing of rectangular Isolated footing, Combined footing for two columns and pile foundation.

UNIT-V

Retaining Walls (Limit State Method)

Types of retaining walls, Forces on retaining walls; Stability requirements; Design and detailing of cantilever type retaining wall, Counterfort retaining wall theory and design procedure only.

NOTE:

Two questions of 10 marks each will be given from each unit out of which one is to be answered. Ten questions of 1 mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1. Reinforced concrete , Vol.1 & 2 by H. J. Shah, Charotar publishing house Pvt. Ltd.,2011.

REFERENCES

1. Reinforced Concrete (limit state design) by Ashok K. Jain; 6th Edition, NemChand & Bros., Roorkee
2. Reinforced concrete design by Pillai and Menon, 2nd Edition,Tata Mc Graw- Hill

WEB REFERNCES: https://www.youtube.com/watch?v=pIdaC_I6H_M&list=PL51300B0778FB5784

CE 354 Professional Communication Skills Lab.

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

The Professional Communication Skills Lab prepares students:

1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read news paper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for employable ready skills and win in the job interviews
6. Build confidence to handle professional tasks.

COURSE OUTCOMES:

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

1. Develop effective communication and presentation skills.
2. Learn corporate etiquette - organizing and managing professional events.
3. Understands how reading enhances their communicative competency.
4. Conduct effective correspondence and prepare reports which produce results.
5. Develop all-round personalities with a mature outlook to function effectively in different circumstances.
6. Know his/her skills and abilities for better career plans.

List of Excercises / Activities:

1) Presentation skills:

Key presentation skills inspired by Steve Jobs – You Tube.
Personality & finishing skills training videos.
How to make Effective Presentations, Methodology, Structure, using Technology and Conclusion.

2) Speech writing:

Welcoming guests on to the stage.
Proposing vote of thanks.
Invite and thank people with professional etiquette

3) Reading skills:

News paper reading
Reading and interpretation
News paper reading – loud reading within the groups.
Reporting the news with one another without the help of the news paper.
(Besides this, motivate students to read News Paper every day without fail.)

4) Writing Skills:

Report writing
Feasibility report
Project report

a) Writing an Abstract
b) Parts of a report
c) Title page
d) Declaration
e) Acknowledgements
f) Table of contents
g) Introduction

h) Conclusion
i) Citations
j) References
k) Appendices.

5) Career skills:

Resume & Cover letter.
Interview – The purpose & preparation for an interview.

Discover Oneself – Self Introduction – Social background (family, home and town) – interests, Hobbies, likes & dislikes (persons, places, food, music, etc) – Strengths, Weaknesses, Skills, Qualities, Achievements – Opinions (love, life, marriage, politics, India, etc) what is life according to me? A creative narration with factual information is expected.

Effective Resume writing: Structure and Presentation – Planning and defining the career objective – strengths and skills, set – format & cover letter

Facing Interviews: Interview Process – Understanding employer expectations – Pre- interview planning – Opening strategies – Answering strategies, Frequently Asked Questions(FAQs).

LEARNING RESOURCES:

1 Business Communication, II Ed, OUP, by Meenakshi Raman & Prakash Singh , 2012.
2 Technical Communication – English Skills For Engineers, II Ed, OUP, by Meenakshi Rama & Sangeetha Sharma-(Unit –IV). , 2011.
3 Technical Communication- Principles and Practice, II Ed, OUP, by Meenakshi Raman & Sangeetha Sharma-(Unit –V), 2015.

SUGGESTED SOFTWARE:

1 TOEFL Mastery, Rosetta Stone, TED Talks, Globarena , Clarity.

WEB RESOURCES:

1 www.esl-lab.com, www.eslgold .com

CE 355 COMPUTER PROGRAMMING IN CIVIL ENGINEERING LABORATORY

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To write programmes for design of various structural elements like beams, slab, steel structural connections, slab base, open channel etc using C or C++ programming languages
2 To write programmes for determining various properties of soils using C or C++ programming languages
3 To write programmes for solving different problems in surveying

COURSE OUTCOMES :

By the end of this course students will have the capability/knowledge of

1 Writing programmes for design of various structural elements like beams, steel structural connections, slab base, open channel etc using C or C++ programming languages
2 Writing programmes for determining various properties of soils using C or C++ programming languages
3 Writing programmes for solving different problems in surveying

Note: A minimum of ten (10 Nos) shall be done and recorded Students are required to write and execute programmes to solve the following problems. Programmes shall be in C or C++ language or MATLAB/JAVA. or MS-Office Softwares

CYCLE-1 :

(Write any FIVE programmes)

1 Design of Reinforced Beam for flexure by limit state method.
2 Design of T- Beam for flexure by limit state method.
3 Design of Reinforced beam for Shear by limit state method.
4 Design of steel tension member
5 Design of steel compression member
6 Design of slab base for a steel column
7 Design of laterally supported steel beam
8 Design of beam to column framed connection using bolts

CYCLE-2 :

(Write any THREE programmes)

1 Classification of soil by Indian standard classification system.
2 Stresses due to applied loads both Boussinesq and Westerguard analysis
   a) Concentrated load b) circular loaded area c) Rectangular loaded area
3 Determination of permeability coefficient by constant head and fall-ing permeability tests.
4 Determination of index properties of soil.

CYCLE-3 :

(Write any THREE programmes)

1 Design of an open channel
2 Analysis of water distribution networks (Hardy cross method).
3 Determination of the height of the building when base is accessible.
4 Determination of included angles from the given bearing and check for local attraction.

CE 356 **HIGHWAY ENGINEERING LABORATORY**

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 This course presents the major strength and shape parameters involved in selection of aggregate for various types of construction works
2 This course exhibits various tests conducted on aggregate in order to propose it for suitable construction work
3 This course later presents the detail investigation on sub-base course (soil) by conducting a laboratory test for evaluation of pavement thickness
4 This course also deals with the various properties of bitumen and the tests required to determine them

COURSE OUTCOMES:

At the end of the laboratory course every student

1 Know the important parameters for selection of aggregate for different construction components
2 Student can evaluate and conduct the required tests on the given aggregate and propose the suitable inference
3 Student can evaluate the grade of bitumen by conducting the required tests and propose it for suitable region and place of pavement construction

Note: A minimum of twelve (12No) shall be done and recorded

1) Tests On Aggregates

Aggregate Crushing value test.
Aggregate impact value test.
Los Angele's abrasion test.
Deval's attrition value test.
Shape test a) Flakiness index test b) Elongation index test c) Angularity number test. .
Specific gravity Test.

2) Tests On Bituminous Materials

Penetration test.
Softening point test.
Flash and fire point test.
Ductility test.
Viscosity test.
Bitumen Extractions Test.
Specific gravity of Bitumen.

3) Test On Bituminous Mixes

Marshall Stability test.

4) Test On Soil Subgrade

California bearing ratio test.

CE 401 **BRIDGE ENGINEERING**

(Using Working Stress Method)

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To explain various investigations to be conducted before constructing a bridge
2 To introduce various types of RC bridges and IRC loadings
3 To design slab culvert and T-beam bridge
4 To design substructure for bridges
5 To explain various types of bearings and design of elastomeric bearing
6 To explain various types of foundations and design of well foundation

COURSE OUTCOMES:

1 Learn about the various investigations to be conducted before constructing a bridge
2 Know about various types of RC bridges and IRC loadings
3 Able to design slab culvert and T-beam bridge
4 Able to design substructure like piers and abutments
5 Know various types of bearings and able to design elastomeric bearing
6 Know the various types foundations used for bridges and able to design well foundation

UNIT I

Introduction & Investigation For Bridges: Components of a Bridge; Classification; Standard Specifications; Need for Investigation; Selection of Bridge Site; Preliminary Data to be Collected; Preliminary Drawings; Determination of Design Discharge; Economical Span; Location of Piers and Abutments; Vertical clearance above HFL; Scour depth; Traffic Projection; Choice of Bridge type; Importance of Proper Investigation.

UNIT II

Concrete Bridges: Various types of bridges; I. R. C. Specifications for road bridges.
Culverts: Design of R. C. slab culvert.

UNIT III

T–Beam Bridge: Pigeaud's method for computation of slab moments; Courbon's method for computation of moments in girders; Design of simply supported T – beam bridge.

UNIT IV

Sub Structure for Bridges: Pier and abutment caps; Materials for piers and abutments; Design of pier; Design of abutment; Backfill behind abutment; Approach slab.

UNIT V

Bearings for Bridges: Importance of bearings; Bearings for slab bridges; Bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.

Foundations for Bridges: Scour at abutments and piers; Grip length; Types of foundations; Design of well foundation.

LEARNING RESOURCES:

TEXT BOOK:

1 Essentials of Bridge Engineering by Dr. Johnson Victor; 6th Edition, Oxford & IBH Publishing Company Pvt. Ltd., 2007.

REFERENCE BOOKS:

1 Bridge Engineering by S Ponnuswamy, 2nd edition, Mc Graw Hill Education, 2009
2 Design of bridge structures by Jagadeesh and Jayaram, 2nd Edition, PHI Learning, 2009.

CE 402 **QUANTITY SURVEYING**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. Quantity estimation for different civil engineering works like single storey residential building, BT road, canal etc.
2. Cost estimation for different civil engineering works like single storey residential building, BT road, canal etc.
3. Rate analysis for different items of work
4. Quantity estimation and preparing schedule of bars of different items of RC works using software like MS Excel
5. To prepare project management report for different civil engineering projects like residential building, BT road, canal etc using software packages like Primavera/MS Project etc

COURSE OUTCOMES:

By the end of this course students will have the capability/knowledge of

1. Estimating quantities required for different civil engineering works like single storey residential building, BT road, canal etc.
2. Cost estimation of different civil engineering works like single storey residential building, BT road, canal etc.
3. finding the unit rate of different items of work
4. prepare schedule of reinforcement bars
5. preparing tender notice and various approvals needed for a project
6. Valuation of building and rent fixation

UNIT I

Procedure of Estimating : Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement.

Methods of building estimates : Individual wall method; Centre line method; Arch masonry calculation; Estimate of steps.

Estimate of Buildings : Estimate of residential building; Estimate of a building from line plan.

UNIT II

Estimate of RCC works : Standard hooks and cranks; Estimate of RCC slab; RCC beam; RCC T–beam slab and RCC column with foundation.

Canal estimate : Earthwork in canals–different cases; Estimate of earthwork in irrigation channels.

UNIT III

Road Estimating: Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections; Estimate of earthwork in hill roads; Estimate of metalled road.

Specifications: Purpose and method of writing specifications; General specifications. Detailed Specifications for Brick work; R.C.C; Plastering; Mosaic Flooring; R.R.Stone Masonary.

UNIT IV

Analysis of Rates : Task or out – turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work:
i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) CC flooring vi) White washing.

PWD Accounts and Procedure of Works : Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

UNIT V

Valuation: Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for Estimating cost depreciation; Valuation of building.

Miscellaneous Topics : Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.

LEARNING RESOURCES:

TEXT BOOKS:

1. Estimating & Costing in Civil Engineering by B.N. Dutta; UBS Publishers & Distributors, 2010.
2. Valuation of Real properties by S. C. Rangwala, 8th Edition, Charotar Publishing House, 2011.

REFERENCES:

1. Practical information for Quantity Surveyors, Contract Managers, Architects Engineers & Builders by P.T. Joglekhar.

CE 404/A **BASIC SURVEYING**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To study about the various surveying instruments.
2. To study the basics of chain survey in linear measurements.
3. To determine the relative positions of the existing features on the ground.
4. To obtain basic knowledge on Total Station.
5. To acquaint with procedures of leveling by dump level & auto level.

COURSE OUTCOMES:

By the end of the course surveying-I, the students will be able

1. To determine the relative positions of a point on the existing ground by conducting the survey.
2. To use all basic surveying instruments.
3. To operate Total Station instrument.
4. To take the levels of existing ground and to determine the reduced levels.

UNIT I

Surveying & Measurements: Definitions; Classification; Principles of Surveying; Basic measurements in surveying; Instruments used for different measurements; Units of measurement (linear & Angular); Plan and map; Scales used for Maps and plans; Phases of survey work and Duties of a surveyor. Procedures for distance measurement - Ranging, Chaining/taping a line.

UNIT II

Chain Surveying: Principle of Chain surveying; Basic definitions; Well-Conditioned & Ill-Conditioned triangles; Selection of stations and survey lines; Procedure of Field Work in Chain Surveying; Off-sets; Booking the survey (Field Book); Conventional Symbols; Problems encountered in chaining; Obstacles in chain Surveying.

UNIT III

Compass Surveying: Angles and Bearings; Instruments used to measure angles and bearings; Designation of Bearings; Fore and Back Bearings; Calculation of Included Angles from Bearings and Bearings from Included Angles; Prismatic & Surveyor's Compass; Magnetic Dip & Declination; Local Attraction and Corrections.

UNIT IV

Theodolite Surveying: Types of Theodolites; Vernier Theodolite - Essential Parts; Basic definitions; Temporary adjustments; Field operations - Measurement of horizontal angles(Repetition & Reiteration), vertical angles.

Total Station: Introduction; components of Total Station; Types of Prisms and targets used in total station; various advantages of Total Stations.

UNIT V

Simple Leveling: Basic definitions; Curvature and Refraction; Different methods of leveling; Levels - Dumpy level, Tilting level, Auto level; Leveling staff; Level field book; Booking and reducing levels; Classification of direct differential leveling methods -Fly leveling, Check leveling, Profile leveling and Cross sectioning, Reciprocal leveling and Precise leveling; Sources of errors & Difficulties in leveling.

LEARNING RESOURCES:

TEXT BOOKS:

1. Surveying Vol. I & II by Dr. K. R. Arora,11th Edition, Standard Book House,2012.
2. Surveying Vol. I & II by S K Duggal, 4th Edition, McGraw Hill Education (India) Private Limited, 2013.

REFERENCE BOOKS :

1. Surveying Vol. I&II by B.C. Punmia, Laxmi Publications,2005.
2. Surveying and Levelling by N.N Basak, McGraw Hill Education (India) Private Limited,2014.
3. Plane Surveying by AM Chandra, 2nd Edition, New Age International (P) Ltd.,2006.

WEB REFERENCES:

1. http://nptel.ac.in/courses/105104101/
2. http://nptel.ac.in/courses/105107121/
3. http://nptel.ac.in/courses/105107122/

CE 404/B **BUILDING MATERIALS & ESTIMATION**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To teach the basics involved in selection of good quality building materials for construction
2 To give knowledge about various building elements and their specifications
3 Presents the basics of planning strategies, building bye laws and acoustics of building
4 preparing tender notice and various approvals needed for a project
5 Valuation of building and rent fixation

COURSE OUTCOMES:

At the end of this course,

1 Students are familiar with various building materials
2 Students are familiar with types of masonry works and bonds used in construction
3 Students are capable of understanding building plan and have knowledge about building rules, bye-laws and building elements
4 Students will have knowledge about Valuation of building and rent fixation

UNIT I

Clay bricks: Brick clay, Preparation of bricks, Types of bricks, Dimensions of bricks, Weight of bricks, Storing of bricks, Brick substitutes, Classification of bricks, Tests for bricks.

Timber: Classification of trees, Structure of wood, seasoning and con-version of timber, Market forms of timber, Defects of timber, Treatment of timber, Classification of timber.

Glass: Manufacture and Classification, Treatment of glass, Uses of glass, testing for quality, Characteristics and Performance of glass, Glass fibre.

Plastics: Classification of plastics, Properties of plastics, Fabrication of plastic articles, some plastics in common use, Reinforced plastics.

UNIT II

Cement: General, Manufacture of Portland cement by dry process, Approximate oxide composition limits of OPC, Bogue's compounds, Hydration of cement, heat of hydration, structure of hydrated cement.

Types of Cements: Ordinary Portland cement, low alkali cement, Rapid hardening cement, Sulphate resisting cement, Portland blast furnace slag cement, Portland pozzolana cement, air entraining cement, white cement, hydro phobic cement, oil well cement, low heat Portland cement.

UNIT III

Building Rules and Bye-Laws: Zoning regulations; Regulations regarding layouts or sub-divisions; Building regulations; Rules for special type of buildings; Calculation of plinth, floor and carpet area; Floor space index.

Building Elements: Conventional signs; Guidelines for staircase planning; Guidelines for selecting doors and windows; Terms used in the construction of door and window; Specifications for the drawing of door and window.

UNIT IV

Analysis of Rates : Task or out – turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work:
i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) CC flooring vi) White washing.

PWD Accounts and Procedure of Works : Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

UNIT V

Valuation: Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for Estimating cost depreciation; Valuation of building.

Miscellaneous Topics : Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.

LEARNING RESOURCES:

TEXT BOOKS:

1 Building Materials by P.C. Vergese, 1st Edition,PHI,2009.
2 Building construction by P.C. Vergese, 1st Edition ,PHI, 2009.
3 Estimating & Costing in Civil Engineering by B.N. Dutta; UBS Publishers & Distributors, 2010.

REFERENCE BOOKS:

1 Engineering Materials by Rangawala, Charotar Publications, Fortieth Edition: 2013
2 Building construction by BC Punmia et al., 10th Edition,Laxmi Publications, 2008.
3 Building planning, designing and scheduling by Gurucharan Singh,Standard book House, 2006.

WEB REFERENCES:

1 http://nptel.iitm.ac.in/courses.php
2 http://freevideolectures.com/Course/86/Building-Materials-and-Construction
3 http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv053-Page1.htm
4 http://bookmoving.com/register.php?ref=Building%20materials%20rangwala
5 http://bookmoving.com/book/building-materials_654.html

CH 404/A **ENERGY ENGINEERING**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To provide the knowledge about formation, classification, ranking, analysis, testing, carbonization, gasification and liquefaction of coal, manufacture of cock.
2. To provide the knowledge about design, occurrence, composition, classification, exploration and production of petroleum, refining, testing and analysis of petroleum products.
3. To provide knowledge about the non -conventional energy resources sun and wind.
4. To provide knowledge about the non -conventional energy resources like ocean thermal, geothermal energy, biomass and fuel cells
5. To provide knowledge about the energy storage and related problems in the world and its solutions.

COURSE OUTCOMES:

1. An ability to understand the importance of environment and conservation of natural resources.
2. An ability to succeed in the competitive exams of energy industry.
3. An ability to utilize the non-conventional energies in place of conventional energies and its manufacture.
4. An ability to utilize the non- conventional energies in place of conventional energies and its manufacture.
5. An ability to maintain the sustainability in the environment

UNIT – I

Conventional energy resources, the present scenario, scope for future development.

Coal: Origin, occurrence and reserves, classification, ranking, analysis and testing, coal carbonization, manufacture of coke, coal gasification, coal liquefaction.

UNIT – II

Petroleum: Origin, occurrence and reserves, composition, classification, characteristics, explorationand production-.

Petroleum Refining:, petroleum products, testing and analysis of petroleum products, Refinery processes- Distillation, cracking, reforming and alkylation, polymerization& isomerization .

UNIT – III

Non- conventional energy sources:

Solar energy: Solar energy, solar radiation, solar collectors-flat plate, concentrating (focusing and non- focusing)collectors , principles of heating and cooling, photo voltaic cells.

Wind energy: Basic principles, basic components, classification of WECS, types of wind machines(horizontal, vertical axis machines) Wind energy conversion systems- horizontal and vertical systems. Applications.

UNIT – IV

Non- conventional energy sources:

Ocean thermal energy - introduction, OTEC (Closed and open OTEC cycles),applications. Geothermal energy- introduction, sources, hydrothermal resources (Liquid and vapor dominated systems), applications.

Bio-mass energy- Introduction, conversion techniques, classification and Types of biogas plants, Hydrogen energy-Introduction,hydrogen production,storage and applications. Fuel cells-introduction, classification, types, advantages and applications.

UNIT –V

Energy storage: introduction, storage systems. Mechanical energy storage- pumped hydroelectric, compressed air, fly wheel storage. Electrical storage- lead acid battery. Chemical storage- via hydrogen, ammonia, chemical reactions.Thermal energy storage- latent ,sensible heat storage. Solar pond

Energy Conservation: Conservation methods in process industries, Theoretical analysis, practical limitations, equipment for energy saving / recovery- recuperators, regenerators, pipes and pumps.

LEARNING RESOURCES:

TEXT BOOKS:

1 Non-conventional energy resources by G. D. Rai, Khanna Publishers(2004)
2 Engineering chemistry by Jain& Jain 15 th edition

REFERENCE BOOKS:

1 Conventional Energy technology by S.B.Pandy, Tata McGraw Hill (1987)
2 Elements of Fuels ,furnaces and refractories O.P.Gupta , Khanna publishers(2000)

CH 404/B BIO FUELS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To provide the knowledge about properties, composition, features of bio fuels and uses of biomass and their environmental impacts.
2. To provide the students a substantial knowledge of bio fuel production technologies.
3. To provide knowledge about the process of biogas production and methods of production of biodiesel and comparison of the standards to the conventional diesel.
4. To provide knowledge about the production of lipids, bio hydrogen from different bacteria and algae.
5. To provide knowledge about the fuel cell technology

COURSE OUTCOMES:

1. An ability to describe the functional principle of biofuel technologies in small and large scale.
2. An ability to describe the main steps and components in bioethanol, biodiesel and biogas production.
3. An ability to Participate actively in teamwork and work with case related problem solving.
4. An ability to work with professional problem solving in an industrial environment.
5. An ability to work in other fields of engineering.

UNIT – I

Types of biomass (e.g. wood waste, forestry residues, agricultural residues, perennial annual crops, organic municipal solid waste). Composition of lignocellulose (lignin, hemi cellulose, cellulose); energy crops; chemical pretreatment; enzymatic pretreatment; degradation of cellulose; trichodermacellulases; bacterial cellulases; and comparison with degradation of high starch crops.

Sources of energy, introduction of biofuels, availability of bio mass, composition of biomass, terrestrial biomass, aquatic biomass.Physical and chemical properties of biomass. Useful and undesirable features of biofuels.

UNIT – II

Biogas: The substrate, the digester, the microorganisms, the process of bio gas production, factors affecting bio gas yields, advantages, disadvantages.

Bioethanol: Bioethanol vs. Petrol, production of bio ethanol, ethanol recovery. Bio butanol.Properties and standards of bioethanol. Lignocellulosic biomass composition and characterizations.

UNIT –III

Sources and processing of biodiesel (fatty acid methyl ester); nature of lipids, especially fatty acids and triglycerides. Sources and characteristics of lipids for use as biodiesel feedstock; and conversion of feedstock into biodiesel (transesterification). Use of vegetable oil (SVO) and waste vegetable oil (WVO).

Engineering, economics and environmental issues of biodiesel; major policies and regulations pertaining to the production, distribution, and use of biodiesel. Comparison of bio diesel with conventional diesel. Standards of bio diesel, current technologies and challenges.

UNIT – IV

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 –

Bio hydrogen: Production of bio hydrogen from anaerobic bacteria, photosynthetic algae, photosynthetic–hydrogenase system. Pyrolysis, bio-oil upgradation,

UNIT – V

Fuel cells: Enzymatic fuel cells, microbial fuel cells. Fuel Cell – Principle of working, construction and applications.

Fuels for Fuel Cells: Hydrogen, Hydrocarbon fuels, effect of impurities such as CO, S and others.

LEARNING RESOURCES:

TEXT BOOKS

1 Robert C. Brown, “Biorenewable Resources: Engineering,” New Products from Agriculture, Wiley Blackwell Publishing, 2003

REFERENCES:

1 Samir K. Khanal, “Anaerobic Biotechnology for Bioenergy Production: Principles and Applications,” Wiley-Blackwell Publishing 2008
2 Martin Kaltschmitt; Hermann Hofbauer.“Biomass Conversion and Biorefinery,” Springer Publishing, 2008.

CS 404/A **JAVA PROGRAMMING**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Understand the basic concepts and fundamentals of platform independent object oriented language.
2 Demonstrate skills in writing programs using exception handling techniques and multithreading.
3 Understand streams and efficient user interface design techniques.

COURSE OUTCOMES:

1 Use the syntax and semantics of java programming language and basic concepts of OOP.
2 Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
3 Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
4 Demonstrate how the java program communicates with the console and disk files using the concept of streams.
5 Design event driven GUI and web related applications which mimic the real word scenarios.

UNIT-I

Introduction: The History and Evolution of Java, an Overview of Java.

Data Types, Variables, and Arrays: The primitive types, variables, type conversion and casting, Automatic Type Promotion in Expressions, Arrays, Operators, Control statements.

Introducing Classes : Class fundamentals, Declaring the objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this keyword, Garbage Collection, the finalize() Method.

A Closer Look at Methods and Classes: Overloading Methods, Using objects as Parameters, Returning Objects, Introducing Access control, Understanding static and final keywords, Nested and Inner Classes.

UNIT-II

Inheritance: Inheritance Basics, Using super, Creating multilevel Hierarchy, When Constructors are executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, using final with Inheritance.

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Default Interface Methods, Use static Methods in an Interface.

UNIT-III

String Handling: String class, StringBuffer class.

Exception Handling: Fundamentals, Exception types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions , Creating Your Own Exception Subclasses.

Multithreaded Programming : The Java Threaded Model, The Main Thread , Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter Thread Communication.

UNIT-IV

I/O Basics: Streams, Byte streams, Character streams, Reading Console Input, Writing Console Output, Reading and Writing Files.

The Applet Class: Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repainting, The HTML APPLET Tag, Passing Parameters to Applets.

UNIT-V

Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, The KeyEvent Class, Sources of Events, Event Listener Interfaces, Using The Delegation Event Model, Adapter Classes.

Introducing the AWT: Working with Windows, Graphics and Text, Using AWT Controls, Layout Managers and Menus.

LEARNING RESOURCES:

TEXT BOOKS:

1 Java The Complete Reference 9th Edition, Herbert Schildt, Mc Graw Hill Education(India) Private Limited, New Delhi.

REFERENCE BOOKS:

1 Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2 Introduction to Java programming, By Y.Daniel Liang,Pearson Publication.

CS 404/B DATABASE MANAGEMENT SYSTEMS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of Databases.
2. To understand the types of integrity constraints in a relational database system and the concepts of SQL to create and access the database.
3. To understand basic concepts of ER model and database design using normalization process.
4. To understand concurrency, Recovery techniques.

COURSE OUTCOMES:

1. An understanding of basic concepts and use of various database systems.
2. An ability to enforce integrity constraints to maintain validity & accuracy.
3. An ability to write relational expressions for the queries.
4. An ability to design and develop a database using normalization theory.
5. An ability to use different concurrency control and Recovery techniques.

UNIT- I

Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach.

Database System Concepts and Architecture: Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs

UNIT- II

Data Modeling Using the Entity-Relationship (ER) Model: Using High- Level Conceptual Data Models for Database Design - An Example Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types

The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations.

UNIT-III

SQL-99: Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types - Specifying Constraints in SQL - Schema Change Statements in SQL - Basic Queries in SQL – More Complex SQL Queries - INSERT, DELETE, and UPDATE Statements in SQL - Views (Virtual Tables) in SQL.

UNIT- IV

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions – Characterizing Schedules Based on Recoverability -Characterizing Schedules Based on serializability.

UNIT – V

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering.

Database Recovery Techniques: Recovery Concepts – Recovery Techniques Based on Deferred Update - Recovery Techniques Based on Immediate Update - Shadow Paging.

LEARNING RESOURCES:

TEXT BOOK:

1 "Fundamentals of Database Systems", Ramez Elmasri and SHamKanth B.Navate Pearson Education, 5th edition.

REFERENCE BOOKS:

1 "Introduction to Database Systems", C.J.Date Pearson Education.
2 "Data Base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rdEdition.
3 "Data base System Concepts", Abraham Silberschatz, Henry.F.Korth, McGraw hill, 5th edition.

EC 404/A **APPLIED ELECTRONICS**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To understand about various modern electronic systems.
2 To provide clear explanation of the operation of all the important electronic devices and systems available.
3 To know about modern audio and video systems.
4 To know about various Telecommunication Systems.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1 Understand the working, types and applications of microphones and loudspeakers.
2 Understand the features of commercial, theatre sound recording and colour TV standards
3 Understand the working of various electronic systems, telecommunication and switching systems.
4 Understand the working of various applications like digital clocks, fiber optics, microprocessor and mobile radio systems.
5 Understand consumer electronic equipment and systems like washing machines.

UNIT I

Microphones: Characteristics of microphones, Types: Carbon microphones, moving coil microphones, ribbon microphones, electret microphones and wireless microphones. Headphones : Headphones and Headsets, Types of headphones. Loud Speakers : Ideal loudspeaker, Types: Crystal loudspeaker, electrostatic loudspeaker, permanent magnet loudspeaker, High frequency loudspeakers: Horn type tweeters, Equalizers and Mixers.

UNIT II

Commercial Sound: Recording, manual synthesizer, programmed synthesizer, public address systems, speaker matching systems, PA-system characteristics, Theatre Sound System. Color TV standards and Systems : Primary and secondary colors, Luminance signal, Chrominance signal, color TV camera tube, color TV picture tube, NTSC system PAL system SECAM system.

UNIT III

Audio systems, Video Systems, Remote Controls, Modulation Techniques, Carrier Systems, Telecommunication Systems: telephone receivers and handsets, signaling-CCITT NO7, modes of operation, Switching Systems : principle,Read relay and cross bar switching, PBX switching, stored program control.

UNIT IV

Fiber Optics, Data Services, digital clocks, microprocessor, microcontroller, Mobile radio systems: wireless local loop (WLL), role of WLL, radio paging service, digital cellular block diagram, establishing a call, Fascimile (FAX).

UNIT V

IN-CAR Computers : Electronic ignition, electronic ignition lock system, ABS, Electronically controlled suspension (ECS), instrument pannel display, air-bag system. Washing machines: Electronic controller for washing machine, washing machine hardware, washing cycle, software and hardware development, refrigeration systems.

LEARNING RESOURCES:

TEXT BOOK(s):

1 S.P.Bali - Consumer Electronics-Pearson Education, ISBN: 9788131717592, first impression-2008.

REFERENCE BOOK(s):

1 Philip Herbert Hoff -Consumer Electronics for Engineers -Cambridge University Press, 1998, ISBN-10: 0521582075
2 Ronald K.Jurgen -Digital Consumer Electronics Handbook -(Editor) by McGraw Hill Professional Publishing, 1997. ISBN-10: 0070341435

WEB RESOURCES:

1 http://nptel.iitm.ac.in/courses/
2 http://www.newagepublishers.com/samplechapter/000969.pdf
3 http://www.bits-pilani.ac.in:12354/qp1-9-10/EEE_C414_851_C_2009_1.pdf

EC 404/B **BASIC COMMUNICATION**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To understand an overview of communication systems.
2 To understand the modulation technique, need of modulation,Amplitude modulation.
3 To understand fundamentals of digital communications.
4 To understand broadband communication systems and Television fundamentals.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1 Understand transmission of analog signals using amplitude modulation.
2 Understand the transmission of digital signals through PCM, PAM, PPM and DELTA Modulation techniques
3 Know about various Broad band communication systems.
4 Know about the monochrome and colourTelevision fundamentals.
5 Know about Optical communication systems.

UNIT I

Communications: Communications systems, Information, Transmitter, Channel, noise, Receiver, Modulation, Description, Need for modulation, Bandwidth Requirements.

Amplitude Modulation: Amplitude Modulation Theory, Frequency spectrum of the AM wave, Representation of AM, Power relations in the AM wave, Generation of AM, Basic requirements, comparison of levels, Grid modulated class C amplifier, Plat modulated class C amplifier, Modulated transistor amplifiers.

UNIT II

Digital Communications: Digital Technology, Digital fundamentals, sampling theorem, aliasing effect, pulse amplitude modulation (PAM), synchronization in PAM systems, pulse time modulation, spectra of PDM and PPM systems, Elements of pulse code modulation (PCM), sampling and quantization, encoding, regeneration, decoding, DPCM, delta modulation.

UNIT III

Broadband Communications Systems: Multiplexing,Frequency division multiplex, Time â€“division multiplex, Short and Medium Haul Systems : Co-axial Cables, Fiber optic links, Microwave links, Long Haul Systems : Satellite Communications, Elements of Long-Distance Telephony, Routing codes and signaling systems, Telephone exchanges (switches) and routing.

UNIT IV

Television Fundamentals: TV transmitter and receivers, synchronization, image continuity, interlaced scanning, flicker, picture resolution, horizontal and vertical sync details, number of scanning lines, scanning sequence details.

Essentials of colour television: colour perception, three colour theory, luminance, hue, saturation, colour difference signals.

UNIT V

OPTICAL COMMUNICATIONS

History and development, nature of light: reflection, refraction, dispersion, diffraction, absorption, scattering, Optical fiber losses, fiber cables, types of fibers.

LEARNING RESOURCES:

TEXT BOOK(s):

1 George Kennedy-Electronic Communication Systems -Tata McGraw-Hill Publishing , 5th Edition,2011
2 Simon HykinS, Communication Systems, 2nd Edition-reprint 2010
3 R.R. Gulati - Modern Television Practice - Principles, Technology and Service- New Age International Publication, 2009.

REFERENCE BOOK(s):

1 Simon HykinS - Introduction to Analog and Digital Communication, 2007
2 John M Senior - Optical Fiber Communications - An imprint of Pearson Education, 3rd Edition, 2009

WEB RESOURCES:

1 http://nptel.iitm.ac.in/courses/
2 http://web.engr.oregonstate.edu/~magana/ECE461-561/index.htm
3 http://www.ensc.sfu.ca/~jiel/courses/327/index.html
4 http://www.ece.utah.edu/~npatwari/ece5520/lectureAll.pdf

EE 404/A NON-CONVENTIONAL ENERGY SOURCES

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To know the depletion rate of conventional energy resources and importance of renewable energy resources.
2 To know the importance of Energy Storage Devices.
3 To know alternate viable energy sources to meet the energy requirements.
4 To discuss about solar energy, wind energy, tidal energy and geothermal energy as alternate resources.

COURSE OUTCOMES:

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

1 Know the national scene of energy production, utilization, consumption and energy storage systems.
2 Understand about the basics of solar energy, collectors & generation of electricity from solar energy &photovoltaic's.
3 Understand the assessment of wind energy potential, wind turbines and wind generators.
4 Know about ocean energy, temperature differences & principles, extraction of energy from waves.
5 Understand about geothermal, types & how biogas is produced & digester for power generation.

UNIT - I

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - energy planning - energy efficiency and management.

Energy Storage Systems: Pumped Hydro- Compressed air storage-Energy storage by fly wheels-Electrical battery storage-Thermal sensible energy storage-Latent heat energy storage.

UNIT – II

Solar Energy: Extra terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion-solar thermal central receiver systems, Solar pond, Distributed systems.

Photovoltaic's: Photovoltaic energy conversion - solar cell- Construction- conversion efficiency & output-VI characteristics.

UNIT – III

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills.

Principles of wind power: maximum power – actual power - wind turbine operation - electrical generator.

UNIT – IV

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations.

Wave energy: devices for energy extraction - tides - simple single pool tidal system, two pool tidal system.

UNIT-V

Geothermal Energy: Origin and types: Hydrothermal, Geo-pressurized & Petro thermal.
Bio fuels: Classification – direct combustion for heat and electricity generator - anaerobic digestion for biogas - biogas digester - power generation.

LEARNING RESOURCES

TEXT BOOKS:

1 JohnTwidell& Toney Weir“**Renewable Energy Sources**” E&F.N. Spon
2 EL-Wakil“**Power Plant Technology**” McGraw-Hill Publications.

REFERENCE BOOKS:

1 G.D.Rai“**Non-Conventional Energy Sources**”Khanna Publishers.
2 Abbasi&Abbasi“**Renewable Energy Sources**” Their impact on global warming and pollution by – PHI.

WEB REFERENCES:

1 http://www.tn.gov.in/spc/tenthplan/CH_11_2.PD
2 http://bieap.gov.in/Nonconventionalenergysources
3 http://www.em-ea.org/Guide%20Books/book4/4.12App%20of%20Non%20conventional

EE 404/B UTILIZATION OF ELECTRICAL ENERGY

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To know about the different types of lamps & lighting schemes.
2 To know about the different types electric heating methods.
3 To know the design heating elements such as furnaces and ovens.
4 To know to utilize the electrical energy for production of heat and welding process.
5 To provide specific knowledge on Principles and characteristics of storage batteries.

COURSE OUTCOMES:

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

1 To give the overall idea for the different types of lamps & lighting schemes.
2 To know about the different types electric heating methods.
3 To know the designing of heat elements such as furnaces and ovens.
4 To know how to utilize the electrical energy for production of heat and welding process.
5 To gain knowledge on principles and characteristics of storage batteries.

UNIT – I

Illumination:

Introduction- terms used in illumination-laws of illumination-Square law methods of calculation.

Gas discharge lamps - Fluorescent lamps - Arc lamps - Filament lamps -Comparison between filament and fluorescent lamps.

UNIT – II

Lighting schemes & Introduction to Electric heating:

Factory lighting - flood lighting and street lighting-design of lighting schemes-introduction to Compact Fluorescent Lamps.

Introduction-Modes of heat transfer - Stefan's law-Classification of electric heating methods

UNIT – III

Electric Heating element Design and types of furnaces:

Design of heating element -Construction and working of different types of induction furnaces -resistance furnace - arc furnaces.

Dielectric heating, Dipole formation, generation of dielectric heat and applications.

UNIT – IV

Welding: Introduction- Types of welding - resistance and arc welding -Characteristics of Carbon and metallic arc welding – comparison, welding equipment.

Requirements of good weld, comparisons of A.C and D.C weld(Excluding electronic controls)

UNIT - V

Storage batteries:

Types of cells. Lead acid cell, Nickel Iron cell, Chemical changes during charging and discharging.Applications-rating-classification-dry cell and wet cells.

Methods of charging & common troubles: Charging and discharging of lead acid cells,-methods of charging lead acid batteries-over discharging common troubles with lead acid batteries and remedies-Nickel cadmium batteries.

LEARNING RESOURCES:

TEXT BOOKS:

1 J.B. Gupta -“Utilization Electric Power and Electric Traction”, Katson books publishers, Tenth Edition, 2012.
2 Utilization, generation & conservation of electrical energy by Sunil S Rao, Khanna publishers, Sixth Edition, 2005.

REFERENCE BOOKS:

1 Partab H –“Art and Science of Utilization of Electrical Energy”, Dhanpat Rai and Sons, New Delhi, Second Edition,2009.
2 R.K.Rajput-“Utilization of Electric Power”, Laxmi publications Private Limited, Second Edition, 2013.
3 G.C.Garg –“Utilization of Electric Power and Traction”, Kanna publishers, Ninth Edition, 2014.

WEB RESOURCES:

1 http://nptel.iitm.ac.in/video.php?subjectId=108105060.
2 http://web.mit.edu/lien hard/www/ahttv201.pdf..
3 http://www.comp-as.com/pdf/Article03.pdf.
4 www.srmuniv.ac.in/downloads/welding.doc.
5 http://www.freesunpower.com/batteries.php.
6 http://www.trifield.com/content/fixing-common-static-problems/

IT 404/A **SOFTWARE ENGINEERING**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

At the end of the course the students will understand

1 Basic concepts on Software Engineering methods and practices.
2 Software Process Models and Software Development Life Cycle.
3 Requirements analysis and design of software development.
4 Software Development life cycle for Web app.

COURSE OUTCOMES:

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

1 Identify, formulate, and solve Software Engineering problems.
2 Elicit, analyze and specify software requirements for various stakeholders.
3 Familiar with Design, development, deployment and maintenance of a software project.
4 Familiar with Architecture design and User Interface design
5 Apply software engineering paradigms to web apps.

UNIT-I

INTRODUCTION TO SOFTWARE ENGINEERING: The Evolving Role of Software, Software, The Changing Nature of Software, Legacy Software, Software Myths.

A GENERIC VIEW OF PROCESS: Software Engineering - A Layered Technology, A Process Framework, The CMMI, Personal and Team Process Models.

UNIT-II

PROCESS MODELS: The Waterfall Model, Incremental Process Models, Evolutionary, Agile Process Model.

SOFTWARE ENGINEERING PRACTICE: Software Engineering Practice, Communication Practices, Planning Practices, Modeling Practices, Construction Practice, Deployment.

UNIT -III

REQUIREMENTS ENGINEERING: A Bridge To Design and Construction, Requirements Engineering Tasks, Initiating the Requirements Engineering Process, Eliciting Requirements, Developing Use-cases, Building the Analysis Model, Negotiating Requirements, Validating Requirements.

DESIGN ENGINEERING: Design within the Context of Software Engineering, Design Process and Design Quality, Design Concepts, The Design Model.

UNIT -IV

CREATING AN ARCHITECTURAL DESIGN: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design.

PERFORMING USER INTERFACE DESIGN: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT -V

INITIATING A WEBAPP PROJECT: Formulating Web-Based systems, Planning for Web Engineering projects

ANALYSIS FOR WEBAPPS: Requirements Analysis for WebApps, Analysis Model for WebApps, The Content Model, The Interaction Model.

LEARNING RESOURCES:

TEXTBOOKS:

1 Roger S.Pressman, 'Software Engineering- A Practitioner's Approach', 6th Edition, McGraw- Hill International, 2009.

REFERENCE BOOKS:

1 Ian Sommerville, 'Software Engineering', 6th Edition, Pearson Education, 2014.
2 Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, 'Fundamentals of Software Engineering', 2nd Edition, PHI,2002.
3 RajibMall, 'Fundamentals of Software Engineering', 3rd Edition, PHI, 2013.

IT 404/B **WEB TECHNOLOGIES**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

At the end of the course the students will understand

1 Basic technologies to develop web documents.
2 Design web pages with css and apply scripting to web documents.
3 Design dynamic web pages with javascript.
4 Concepts of xml.
5 Concepts of php and database access.

COURSE OUTCOMES:

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

1 Apply technologies to develop web documents.
2 Design web pages with css and apply scripting to web documents.
3 Create dynamic web pages with javascript.
4 Create valid and well-formed xml documents.
5 Write server side scripts with php and database access.

UNIT-I

Fundamentals: A Brief introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, The HTTP.

Introduction to XHTML: Origins and evolution of HTML, and XHTML, Basic Syntax, Standard XHTML, Document structures, Basic Text markup, images, hypertext links, lists, tables, forms, frames, syntactic differences between HTML & XHTML.

UNIT-II

Cascading Style Sheets (CSS): Introduction, levels of style sheets, style specification formats, selector forms, property value forms, font properties, list properties, color, alignment text, The Box model, Background images, the span and div tags.

The Basics of JavaScript: Overview of JavaScript, Object orientation and JavaScript, General Syntactic characteristics, primitives, operations and expressions, Screen output and keyboard input, control statements.

UNIT-III

JavaScript: Object creation and modification, Arrays, Functions, An Example, Constructors, Pattern matching using regular expressions, Errors in scripts.

JavaScript and HTML Documents: The JavaScript Execution Environment, The Document Object Model, Element accessing in JavaScript, Events and Event Handling, Handling Events from Body elements, Handling events from Button elements, Handling Events from Text boxes and password elements, The DOM 2 Event model, The Navigator object.

UNIT-IV

Dynamic Documents with JavaScript: Introduction, Element Passing, Moving Elements, Element Visibility, Changing colors and Fonts, Dynamic Content, Stacking Elements, Locating the mouse cursor, Reacting to mouse click, slow movement of elements, dragging and dropping elements.

Introduction to XML: Introduction, The syntax of XML, XML document structure, Document Type Definition, Namespaces, XML Schemas, Displaying Raw XML documents, displaying XML documents with CSS, XSLT Style sheets.

UNIT-V

Introduction To PHP: Origins and uses of PHP, Overview of PHP, General Syntactic Characteristics, primitives, Operations and Expressions, Output, Control Statements, Arrays, Functions, Pattern Matching, Form Handling.

Database Access through the web: Relational Databases, An Introduction to the Structured Query Language, The MYSQL Database System, Database Access with PHP and MYSQL.

LEARNING RESOURCES:

TEXT BOOK:

1 Robert W. Sebesta "Programming the World Wide Web", 4/e Pearson Education.

REFERENCE BOOKS:

1 Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 5/e, Pearson Education.
2 Jeffrey C. Jackson Web Technologies - A Computer Science Perspective, Pearson Education, 1st Edition.
3 Jason Cranford Teague, Visual Quick Start Guide CSS, DHTML & AJAX, Pearson Education, 4th Edition.

WEB REFERENCES:

1 www.wikipedia.com
2 www.w3schools.com
3 http://nptel.iitm.ac.in

ME 404/A **ROBOTICS**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To provide an introduction to Robotics and Automation including robot classification, design and selection, analysis and applications in industry.
2. To provide information on various types of end effectors, their design, interfacing and selection.
3. To provide the details of operations for a variety of sensory devices that are used on robot , the meaning of sensing, classification of sensor, that measure position, velocity & acceleration of robot joint.
4. The goal of the course is to familiarize the students with the basic concepts of transformations performed by robot.
5. Familiarize students to perform kinematics and to gain knowledge on programming of robots.

COURSE OUTCOMES:

At the end of the course, students will be familiarized in

1. Basic components of robotics, classification of robots and their applications.
2. They will have knowledge on types of robot grippers, their usage and design considerations.
3. They attain knowledge on various types of sensory devices their working and applications.
4. Students will apply basic transformations related to the movement of manipulator.
5. An ability to design a robot mechanism to meet kinematics requirements and to write simple programs.

UNIT I

Basics of Robot: Introduction to Robotics, major component of a robot, robotic like devices, classification of robots - Classification by coordinate system and by control method, Specifications of robots, fixed versus flexible automation.

Applications of robot: Economic analysis, Robot applications in Material Handling, Processing and assembly.

UNIT II

Robot End Effectors: Introduction, end effectors, interfacing, types of end effectors, grippers and tools.

Selection: Selection and Design Considerations of End effectors, Remote Centre Compliance device.

UNIT III

Robotic Sensory Devices:

Position Sensors: Objective, Non-optical position sensors - potentiometers, synchros, inductocyn, optical position sensors – opto interrupters, optical encoders (absolute & incremental).

Proximity Sensors: Contact type, non-contact type – inductive, capacitive proximity sensors, optical proximity sensor, and scanning laser proximity sensor.

UNIT IV

Touch and Slip Sensors: Proximity rod & photo detector tactile sensor, slip sensors - Forced oscillation slip sensor, interrupted type slip sensors.

Transformations: Objectives, homogenous coordinates, basic transformation operations, fixed angle representation, Euler angle representation.

UNIT V

Forward Kinematics: Forward solution – Denavit Hartenberg procedure. Simple problems involving 2 and 3 DOF manipulators, SCARA manipulator.

Robot Programming: Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effecter commands, and Simple programs.

LEARNING RESOURCES

TEXT BOOKS:

1. Robotic Engineering by Richard D.Klafter, Prentice-Hall of India Pvt Ltd, 2010.
2. Industrial Robotics by Mikell P. Groover, Tata McGraw-Hill Int. Edition 2, 2012.
3. Robotics and Control, R.K. Mittal and I.J. Nagarath, TMH, 2005[4 UNIT- 1st chapter].

REFERENCE BOOKS:

1. Introduction to Robotics: Mechanics And Control, John J.Craig 3rd Edition, Pearson, 2008.
2. Robotics: Control, Sensing, Vision, and Intelligence, K. S. Fu, R. C. Gonzales, and C. S. G. Lee, Tata McGraw-Hill, NY, 2008.
3. Introduction to Robotics: Analysis, Systems, Applications, Saeed B. Niku, Prentice Hall, NJ, 2010.

WEB REFERENCES:

1. http://nptel.iitm.ac.in/courses.php?branch=Mechanical
2. http://academicearth.org/courses/introduction-to-roboticsVideo references:-

ME 404/B **OPERATIONS RESEARCH**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Grasp the methodology of OR problem solving and formulate linear programming problem.
2 Develop formulation skills in transportation models and finding solutions
3 Understand the basics in the field of game theory and assignment problems
4 Be able to know how project management techniques help in planning and scheduling a project
5 Be able to know the basics of dynamic programming and simulation

COURSE OUTCOMES:

1 Recognize the importance and value of Operations Research and linear programming in solving practical problems in industry
2 Interpret the transportation models' solutions and infer solutions to the real-world problems.
3 Recognize and solve game theory and assignment problems.
4 Gain knowledge of drawing project networks for quantitative analysis of projects
5 Know when simulation and dynamic programming can be applied in real world problems.

UNIT I

Linear Programming: Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique, dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution.

UNIT II

Transportation Problem: Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by MODI method, degeneracy, unbalanced transportation problem and Maximization in transportation model.

UNIT III

Assignment Problem: One to one assignment problem, optimal solutions, unbalanced assignment matrix, travelling sales man problem, maximization in A.P.

Theory of Games: Introduction, rectangular two person zero sum games, solution of rectangular games in terms of mixed strategies, solution of 2x2 games without saddle point, concept of dominance to reduce the given matrix, Graphical method for 2xn and nx2 games.

UNIT IV

Project Planning through Networks: Introduction, Basic steps in PERT/CPM techniques, Network diagram representation, Rules of drawing network diagram, Fulkerson's rule, Time estimates and Critical path in network analysis, floats, Project evaluation and review technique, Application areas of PERT/CPM techniques.

UNIT V

Dynamic Programming: Introduction, Characteristics of D.P. model, the recursive equation approach, Computational Procedure in dynamic Programming, solution of an L.P. by D.P

Simulation: Introduction, Monte-Carlo Simulation, Application to Inventory Control, Application to Queuing Problems

LEARNING RESOURCES

TEXT BOOKS:

1 Operations Research - S.D. Sharma, Kedar nath Ram nath & Co, 2008.
2 Operations Research - Theory and Applications ,J.K Sharma, Macmillan Publications India Ltd, 2013

REFERENCES

1 Operations Research - H.A. Taha , Pearson , 7th Edition, June 2002.
2 Introduction to Operations Research - Hiller and Liberman, MGH, 7th Edition, 2002.

WEB REFERENCES :

1 http://www2.informs.org/Resources/
2 http://www.mit.edu/~orc/
3 http://www.ieor.columbia.edu/
4 http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm
5 http://www.wolfram.com/solutions/OperationsResearch/

CE 405/A ECONOMICS AND MANAGEMENT ACCOUNTING FOR ENGINEERS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Engineering Economics: It provides the students with knowledge of basic economic problems and the relationship between engineering technology and economics.
2 Demand Theory: It alerts the students to understand the demand determinats and the methods of demand forecasting of a product.
3 Accounting: It guides the students about accounting concepts, proformas, and accounting for the depreciation and providing the funds for replacement of necessary and depreciated machinery and equipment.
4 Cost: It gives knowledge to the students about various costs for determining the manufacturing of a product.
5 Indian Economy: It is to sensitize the students to the changing environment of banking scenario and to understand the functions of RBI and about GATT,WTO,TRIPs etc.

COURSE OUTCOMES:

1 The course helps the students to understand the decision making objective of a firm.
2 The course helps the students to get knowledge about overall functions of Demand, Supply, Price, Income of the firms.
3 The course helps the students to get knowledge about how to use Accounting and Financial concepts in the changing society.
4 The course helps to linkage various cost concepts and to understand how to maintain break even scenario for a business.
5 The course helps the students to know the overview of Liberalization, Privatization and Globalization and the impact of them on economy.

UNIT I

ENGINEERING ECONOMICS – AN OVERVIEW

Economics definition, Functions and Scope of Engineering economics, Basic economic problems, relationship between Science, Engineering, Technology and Economics.

FIRMS OBJECTIVE : Theories of Maximization – Profit maximization, Growth maximization, Sales maximization, Utility maximization and Wealth maximization.

UNIT II

THEORY OF DEMAND : Demand schedule, Nature and characteristics of demand, Law of demand, Limitations to the law of demand, Elasticities of demand, Price, Income and Cross elasticity, Demand forecasting definition, factors determining demand forecasting, methods of demand forecasting.

UNIT III

ACCOUNTING CONCEPTS : Accounting concepts, Double Entry system, Journal, Ledger, Trial balance, preparation of Financial statements, Final Accounts (Proformas), Depreciation, functions, methods of depreciation – Straight line, Declining balance, Sum of the Years Digits method (Problems).

UNIT IV

COST AND MANAGEMENT ACCOUNTING CONCEPTS

Introduction: Origin nd purpose of cost and management accounting.

Classification of costs: Methods of Costing : Job Costing, Contract Costing, Process Costing, Unit Costing, Operational Costing, Departmental Costing.

Techniques: Marginal Costing, Cost – Volume profit analysis, make or buy decisions (problems), Break – Even analysis (problems).

UNIT V

INDIAN ECONOMY – AN OVERVIEW :

Nature and characteristics of Indian economy, Banking – Meaning and functions of Commercial banks, Functions of RBI, Globalization, Privatization – Meaning, merits and de-merits, elementary concepts like WTO, GATT, TRIPS, Monetary Policy and Fiscal Policy.

LEARNING RESOURCES:

TEXT BOOKS:

1 Riggs, Bedworth and Randhwa, Engineering Economics, MsGrawhill Education India.
2 S.C.Sharma and T.R.Banga, Industrial Organization and Engineering Economics, Khanna Publishers.
3 S.K.Misra and V.K.Puri, Economic Environment of Business, Himalaya Publishing House, 2003.
4 K.Rajeswara Rao and G.Prasad, Accounting and Finance, Jai Bharat Publishers, 2014 edition.
5 Francis Cherunilam, Business Environment Text and Cases, Himalaya Publishing House, 2014 edition.

REFERENCE BOOKS:

1 Singh A and Sadh A.N., Industrial Economics, Himalaya publishing house, Bombay.
2 H.L.Ahuja, Managerial Economics, S.Chand publishing, 2007 edition.
3 Datt & Sundharam, Indian Economy, S.Chand publishing, 2014 edition.

WEB REFERENCES :

1 www.managementstudyguide.com: Describes about the Amalgamation of Economic theory with business practices.
2 www.tutorialspoint.com: Provides a platform to learn various courses discussed in the syllabus.

CE 405/B **ADVANCED SURVEYING**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To develop the fundamental concepts of Photogrammetry including Aerial Photographs.
2 To make the student to understand the various Civil engineering applications of Photogrammetry and Map Projections.
3 To familiarize the students in the GIS based analytical and problem solving techniques for Sustainable planning and management of civil Engineering projects.

COURSE OUTCOMES:

1 Students will be Familiar with Photogrammetry by overlapping Aerial Photographs.
2 Understand the importance of Remote sensing and GIS application in civil engineering.
3 Students can layout Triangulation figures for large countries.

UNIT I

Photogrammetry : Introduction; Basic Principles; Types of Photographs; Photographic Devices; Aerial Photogrammetry; Definitions of Technical terms; Scale of a vertical & tilted photographs - Ground coordinates, Relief Displacement; Flying height of a vertical photograph; Flight Planning; Required number of photographs; Horizontal and Vertical angles; Limitations & Uses of Photogrammetry.

UNIT II

Triangular and Trilateration : Principle and objective of triangular surveys; Classification of triangulation system; Layout of Triangulation figures for large countries; Selection of the layout of triangles; Accuracy of Triangulation; Trilateration - Introduction; Advantages and disadvantages of trilateration; Comparison of Trilateration with Triangulation; Reduction of slope distance by vertical angles and elevations.

UNIT III

Map Projections: Introduction; Types of maps; Scale factor; Characteristics of maps; Geometries of plane and solid figures; Basis of Map Projections; Ideal Map Projection; Types of map projections; Problems.

UNIT IV

Remote sensing :

Applications and importance of remote sensing; Basic concepts and fundamentals of remote sensing; Elements involved in remote sensing; electromagnetic spectrum; remote sensing terminology and units.

Image Interpretation : Energy resources, energy interactions with earth surface features and atmosphere, resolution, visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies.

UNIT V

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

Data representation : Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS - Advantages and disadvantages; Applications of GIS for land use and housing management; Assessment of physical transformation in an urban area.

LEARNING RESOURCES:

TEXT BOOKS:

1. Surveying Vol. III by Dr. K. R. Arora,Latest Edition, Standard Book House.
2. Higher Surveying by AM Chandra, Latest Edition, New Age International (P) Ltd.
3. Surveying Vol. III by B.C. Punmia ,Laxmi Publications,2008

REFERENCES:

1. Advanced Surveying by Sateesh Gopi & R.Sathikumar, Pearson, 2012.
2. Surveying Theory and Practise 7th edition by James M. Anderson & Edward M. Mikhail, McGraw Hill Education (India) Private Limited,2012.

WEB REFERENCES:

http://nptel.ac.in/courses/105104100/

CE 405/C **REMOTE SENSING AND GIS**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

Enhance the students:

1. To develop the fundamental concepts of GIS and remote sensing including the electromagnetic Spectrum, and nature of geospatial data.
2. To know about satellites, types of remote sensing and digital image processing
3. To make the student to understand the various Civil engineering applications of remote sensing.
4. To familiarize the students in the GIS based analytical and problem solving techniques for Sustainable planning and management of civil Engineering projects.
5. To know about applications of GIS in various services.

COURSE OUTCOMES:

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

1. Demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves
2. Apply the concepts of satellite and sensor parameters and characteristics of different platforms
3. Compute an image visually and digitally with digital image processing techniques.
4. Analyze raster and vector data and modelling in GIS
5. Understand the importance of remote sensing and GIS application in civil engineering.

UNIT I

Remote Sensing – I : Introduction to Remote Sensing; Remote Sensing terminology and units; Applications of Remote Sensing; Importance of Remote Sensing; Advantages and Limitations of Remote Sensing; Ideal Remote Sensing system; Remote Sensing process; Concepts of Nadir and Swath; Types of Remote Sensing.

UNIT II

Remote Sensing – II : Electromagnetic spectrum; Energy interactions with earth's surface materials; Interactions with atmosphere; Interactions with target; Spectral reflectance curves for water, soil and vegetation; Transmission, Reception and Processing; Types of resolutions; Interpretation and Analysis.

UNIT III

Image Analysis: Introduction; Elements of Visual Interpretation; Digital Image Processing – Image preprocessing, Image enhancement, Image classification**.**

Geographic Information System (GIS): Introduction; GIS definition and terminology; GIS categories; Components of GIS; Fundamental operations of GIS; A theoretical framework for GIS.

UNIT IV

Types of Data Representations: Data input and output; Data editing; Types of data entry – Keyboard entry, Coordinate geometry procedure, Manual digitizing and Scanning; Types of GIS – Raster GIS and Vector GIS; Advantages and Disadvantages of Raster and Vector GIS.

GIS Spatial Analysis : Spatial Data – Layer based GIS and Feature based GIS; Computational Analysis Methods (CAM); Visual Analysis Methods (VAM); Data Storage – Vector data storage and Attribute data storage; Data integration- Map overlay.

UNIT V

Applications of GIS : Application areas and user segments; Guide lines for preparation of GIS; Applications of GIS for land use and housing management; Assessment of physical transformation in an urban area.

Water Resources Applications: Land use/Land cover in water resources; Watershed management for sustainable development; Reservoir sedimentation; Ground Water Targeting and Identification of sites for artificial Recharge structures.

LERANING RESOURCES:

TEXT BOOKS:

1. Text Book of Remote Sensing and Geographical Information systems by M.Anji Reddy, 4th Edition, B.S.Publications, 2012.
2. Text Book of Remote Sensing and Geographical Information systems by Basudeb Bhatta, Oxford University Press.
3. Text Book of Remote Sensing and Geographical Information systems by A M Chandra and S K Ghosh, Narosa Publishing House.

REFERENCE BOOKS:

1. Geographic information Systems by Kang- tsung Chang, McGraw-Hill, 2003.
2. Basics of Remote sensing & GIS by S.Kumar, USP, 2005.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Indian_Institute_of_Remote_Sensing
2. http://nptel.ac.in/downloads/105108077/
3. http://nptel.ac.in/courses/105102015/28

CE 405/D ENVIRONMENTAL IMPACT ANALYSIS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To be introduced to environmental impact assessment and the current legislation covering it.
2. To understand Prediction and Assessment of Impact.
3. To learn planning for mitigation of adverse impact on environment.
4. To analyse case studies.
5. Through case studies, learn to present and explain the components and decision making processes involved in environmental assessment.
6. To introduce environmental auditing procedure and relative legislation.

COURSE OUTCOMES:

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

1. Review the key concepts of environmental impact assessment and the current legislation covering it
2. Understand the Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna and Socio Economics
3. Plan options for mitigation of adverse impact on environment
4. Present and explain the components and decision making processes involved in environmental assessment through various case studies.
5. Prepare Environmental Audit report

UNIT I

Basic concepts of EIA : Initial Environmental Examination; Elements of EIA; Factors affecting EIA; Impact evaluation and analysis; Preparation of Environmental Base map; Classification of Environmental parameters.

UNIT II

EIA Methodologies : Introduction; criteria for the selection of EIA Methodology; EIA Methods: Ad-hoc methods, Matrix methods, Network method, Environmental media quality index method; Overlay methods; Cost/benefit Analysis.

UNIT III

Impact of Developmental Activities and Land Use : Introduction and Methodology for the assessment of soil and ground water; Delineation of study area; Identification of activities; Procurement of relevant soil quality; Impact prediction; Assessment of Impact significance; Identification and Incorporation of mitigation measures.

EIA in surface water, Air and Biological Environment: Methodology for the assessment of Impacts on surface water environment; Air pollution sources; Generalized approach for assessment of Air pollution Impact.

UNIT IV

Assessment of Impact of Development activities on vegetation and wildlife

Environmental Impact of Deforestation; Causes and effects of deforestation.

Case Studies : Preparation of Environmental Impact Assessment statement for thermal power plants, mining industry; river valley projects etc.

UNIT V

Environmental Audit and Environmental legislation : Objectives of Environmental Audit; Types of Environmental Audit; audit protocol; stages of Environmental Audit; On-site activities; Evaluation of Audit data and preparation of Audit report.

Post Audit activities : The Environmental Pollution Act, The Water Act; The Air (Prevention and Control of Pollution) Act; Mota Act; Wild life Act.

LEARNING RESOURCES:

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies by Y. Anjaneyulu; B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.

REFERENCE BOOKS:

1. Environmental Science and Engineering by Suresh K. Dhameja, S.K. Kataria & Sons Publications, New Delhi.
2. Environmental Pollution and Control by Dr. H.S. Bhatia, Galgotia Publications Pvt. Ltd. Delhi

CE 406/A **PRESTRESSED CONCRETE**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To introduce pre-stressed concrete and its materials
2 To explain the various pre-stressing techniques
3 To analyse a pre-stressed concrete beam
4 To study the losses in pre-stress
5 To determine the deflection of a pre-stressed concrete beams
6 To design pre-stressed concrete beam for bending moment and shear force
7 To determine bond and anchorage stresses and to design end block

COURSE OUTCOMES:

1 Learn the basic concept of pre-stressing of concrete and various pre-stressing systems
2 Able to analyse and design pre-stressed concrete beams
3 Able to estimate the losses in pre-stressing
4 Able to design pre-stressed concrete beams including the end block

UNIT I

Introduction: Basic concepts of prestressing; Historical development; Need for High strength steel and high strength concrete; Advantages of prestressed concrete.

Materials for Prestressed Concrete: High strength concrete; High tensile steel

Pretressing Systems: Tensioning devices; Hoyer's long line system of pretensioning; Post tensioning systems; detailed study of Freyssinet system, Lee-McCall System and Gifford – Udall system

Analysis of Prestress and Bending Stresses: Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.

UNIT II

Losses of Prestress: Nature of losses of prestress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.

UNIT III

Flexural strength of prestressed concrete sections: Types of flexural failure; Flexural strength of prestressed concrete sections as per IS1343: 2012

Design of sections for flexure as per IS1343: 2012: Introduction; Design loads and strengths; Strength and serviceability limit states; Minimum section modulus; Prestressing force; Limiting zone for the prestressing force; Design of rectangular and I sections for the limit state of collapse in flexure.

UNIT IV

Shear Resistance: Shear and Principal Stresses; Ultimate shear resistance of prestressed concrete members and design of shear reinforcement as per IS1343:2012

Deflections of Prestressed Concrete Members: Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members

UNIT V

Transfer of Prestress In Pre–Tensioned Members & Flexural Bond Stresses

Transmission of prestressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre–tensioned and post–tensioned grouted beams.

Anchorage Zone Stresses In Post-Tensioned Members: Stress distribution in end block; Anchorage zone stresses and Anchorage zone Reinforcement as per IS1343: 2012

LEARNING RESOURCES:

TEXT BOOK:

1 Prestressed Concrete by N. Krishna Raju; 4th Edition, Tata Mc Graw - Hill Publishing Company Limited, 2012.

REFERENCE BOOKS:

1 Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns,3rd Edition, John Wile & Sons, 2010.
2 Prestressed Concrete by Pandit & Gupta , CBS Publishers, 1995.
3 Fundamentals of Pre-stressed concrete by NC Sinha and SK Roy, 3rd Edition, S.Chand Publishers, 1985.
4 Prestressed Concrete by N.Raja Gopalan ,2nd Edition,Narosa Publishing House, 2008.

WEB REFERNCES

1 www.iitm.ac.in

CE 406/B WATER RESOURCES SYSTEMS ANALYSIS

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To study types of systems and systems approach to water resources planning and management.
2 To understand role of optimization in water resource planning, economy and management.
3 To study various linear programming models and their applications in water resources.
4 To study the concept of dynamic programming and its applications in water resources problems.
5 To understand various simulation techniques and to develop simulation models for various water resources problems.
6 To study techniques for operation and management of available water resources.

COURSE OUTCOMES:

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

1 Understand concept of systems approach to water resources planning and management.
2 Formulate and solve LP models various water resources optimization problems.
3 Develop and solve forward and backward recursive dynamic programming models.
4 Apply simulation techniques in water resources problems
5 Plan for optimal operation of a single reservoir system.
6 Able to develop models for allocation of water resource for optimal crop yields.

UNIT I

Concept of System and System Analysis

Introduction, Definition of a system, Types of systems, Systems approach to water resources planning and Management

Optimization: Definition, role of optimization models, objective function and constraints, Types of optimization techniques

UNIT II

Linear Programming –I

General formulation of Linear Programming models, Graphical Method, Simplex method, Application of Linear Programming in Water Resources.

UNIT III

Linear Programming –II

Revised Simplex method, The Dual problem, Sensitivity Analysis, Post optimality Analysis.

UNIT IV

Dynamic Programming

Introduction; Characteristics of a DP problem; Belman's principle of optimality; Forward and Backward recursive dynamic programming, Application of DP to water resources problems.

UNIT V

Simulation

Definition, Concepts of a simulation model, steps in simulation, Application of simulation techniques in water Resources.

Water Resources Management

Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, Conjunctive use of surface and sub surface water resources.

LEARNING RESOURCES:

TEXT BOOK

1. Water Resources Systems by S.Vedula and P.P. Majumdar, Tata McGraw-Hill,2005.

REFERENCE BOOKS:

1. Water Resources Systems Planning and Analysis by D.P. Loucks, J.R. Stedinger and D.A. Haith, Prentice-Hall, 1983.
2. Operations Research : An Introduction by H.A.Taha, 8th Edition,Pearson Education, 2008.
3. Analysis of water distribution networks by Bhave and Gupta, Narosa Publishing House, 2011.
4. Engineering Optimization : Theory and Practice by SS Rao, 3rd Edition, New Age International, 2010.

CE 406/C **URBAN TRANSPORTATION PLANNING**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Imparting knowledge and understanding of urban transportation problems in planners' perspective, definition of the problem, setting clear goals and objectives to serve as guiding factors in the planning process, identification of the causal factors influencing the demand for urban travel and development of relationship between the factors and the travel demand.
2 Provides adequate exposure to travel demand forecasting and application of the results of the forecasting to identify the right type of the transportation system needed to cater to the future demand and quantify the same.
3 Knowledge of methodologies for planning multi-modal transportation systems, and developing feasible alternatives. Emphasis is placed on developing insight into the transportation phenomena and the planning process as well as solving specific problems of limited scope.

COURSE OUTCOMES:

Student will be able to

1 Validate and source of information that comes from a sequence of travel.
2 Forecast models.
3 Knowledge of data required for transportation planning.
4 Able to make tradeoffs with multiple factors in project planning and design.

UNIT I

Introduction and Urban Transportation System Planning-Conceptual Aspects:

Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation, Future Developments. Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation.

UNIT II

Trip Generation Analysis and Mode Choice Modelling:

Four step Travel Demand forecasting approach,Trip Production Analysis, Zonal models, Category Analysis, Trip Attraction Modelling. : Influencing Factors, Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode Choice, Binary Choice Situations, Multinomial Logit Model, Model calibration, Case studies.

UNIT III

Trip Distribution Models: PA Matrix, OD Matrix, Basis of Trip Distribution, Gravity Model, Calibration of Gravity Model, Singly and Doubly Constrained Gravity Models. Growth Factor Methods of Trip Distribution, Uniform Factor Method, Average Factor Method, Fratar Growth-Factor Method, and Disadvantage of Growth Factor Method.

UNIT IV

Route Assignment: Description of transport network, Route Choice Behaviour, The Minimum Path, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity Restrained Traffic Assignment. Definition of Study Area, Zoning, Types of Movements.

UNIT V

Transportation Surveys : Types of Surveys, Home-Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-Interview Survey, Cordon-Line Survey, Post-Card Questionnaire Survey, Registration-Number Survey, Tag-on-Vehicle Survey

LEARNING RESOURCES:

TEXT BOOKS:

1 Adib Kanafani(1983). Transportation Demand Analysis, McGrawHill
2 John W Dickey (1986), Metroolitan Transportation Planning, Tata Mc Graw Hill
3 Juan De Dios Dios Ortuzar & Luis G Wilumsen (1996), Modeling Transport, 2nd Edition, John Wiley.

Special note: NPTEL online material will be more helpful containing all the above features.

WEB REFERENCES:

1 NPTEL-Video lectures for “Urban Transportation Planning” by Dr.V. Thamizh Arasan
2 NPTEL-Material for “Transportation Engineering I” by Dr.Tom.V.Mathew

CE 406/D GROUND WATER DEVELOPMENT AND MANAGEMENT

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To provide knowledge on groundwater availability and distribution in different types of rocks
2 To demonstrate the groundwater movement and groundwater reservoir parameters
3 To develop the skills needed for ground water investigation
4 To study the concept of artificial recharge of ground water
5 To introduce groundwater management concepts

COURSE OUTCOMES:

The student will be able to

1 Understand the location of ground water and the relationship with the rock type.
2 Assess the ground water movement and reservoir parameters
3 Use of the different techniques of ground water investigation
4 Apply RS & GIS techniques for artificial recharge of groundwater.
5 Apply conjunctive use technique for effective management of groundwater.

UNIT I

Introduction: Ground Water Occurrence, Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

Ground Water Movement: Permeability, Darcy's law, storage coefficient, Transmissivity, differential equation governing ground water flow in three dimensions derivation, Ground water flow contours and their applications.

UNIT II

Analysis of Pumping Test Data – Steady flow

Steady flow towards a well in confined and unconfined aquifers – Dupit's and Theim's equations, Assumptions, Formation constants, yield of an open well and well tests.

UNIT III

Analysis of Pumping Test Data- Unsteady flow

Unsteady flow towards a well – Non equilibrium equations – Theis solution – Jocob and Chow's simplifications, Leaky aquifers.

UNIT IV

Surface and Subsurface Investigation

Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

Artificial Recharge of Ground Water

Concept of artificial recharge – recharge methods, relative merits. Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

UNIT V

Saline Water Intrusion in aquifer

Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion.

Groundwater Basin Management

Concepts of conjunctive use, Case studies.

LEARNING RESOURCES:

TEXT BOOKS

1 Groundwater by H.M. Raghunath, New Age International, 2008.
2 Ground water Hydrology by David Keith Todd, John Wiley & Sons, 1980

REFERENCES:

1. Fundamentals of Ground Water by Franklin W. Schwartz and Hubao Zhang, Wiley India Pvt.Ltd.,2012.
2. Groundwater System Planning & Management by R. Willis & W.W.G. Yeh, Printice Hall,1987.

WEB REFERENCE:

1. http://www.fs.fed.us/biology/resources/pubs/watershed/groundwater/ground_water_technical_guide_fs-881_march2007.pdf

CE 452 QUANTITY SURVEYING AND PROJECT MANAGEMENT LAB

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1. Enhance the students to learn
2. Quantity estimation for different civil engineering works like single storey residential building, BT road, canal etc.
3. Cost estimation for different civil engineering works like single storey residential building, BT road, canal etc.
4. Rate analysis for different items of work
5. Quantity estimation and preparing schedule of bars of different items of RC works using software like MS-Excel
6. To prepare project management report for different civil engineering projects like residential building, BT road, canal etc using software packages like Primavera/MS Project etc

COURSE OUTCOMES:

By the end of this course students will have ability to

1. Estimate the quantities required for different civil engineering works like single storey residential building, BT road, canal etc.
2. Astract of Cost for different civil engineering works like single storey residential building, BT road, canal etc.
3. Prepare schedule of reinforcement bars.
4. Scheduling a project using software packages like Primavera/MS Project etc.
5. Analyzing a project and finding critical activities and hence allocate resources as per the schedule.

Note: A minimum of ten (10 Nos) shall be done and recorded

CYCLE-1

Quantity Surveying

(At least SIX of the following using softwares like MS Excel/ Qty./Road Estimate/Super Rate analysis etc.)

1. Quantity estimation of a single storey residential building (different items).
2. Cost estimation of a single storey residential building.
3. Quantity estimation of a B.T.Road (different items).
4. Cost estimation of a B.T.Road.
5. Quantity estimation of a Canal (different items).
6. Cost estimation of a Canal.
7. Find out the labour requirement and preparing the Rate Analysis for different items of work.
8. a) C.C b) R.C.C c) Brick work d) Flooring

CYCLE-2

Project Management

(Any THREE of the following using softwares like MS Project / Primavera etc.)

1. Preparing the Project management report for a single storey residential building/Road/Canal by using the Bar Chart/Mile stone chart.
2. Preparing the Project management report for a single storey residential building by using the network technique (PERT/CPM).

3. Preparing the Project management report for a B.T.Road by using the network technique (PERT/CPM).
4. Preparing the Project management report for a Canal by using the network technique (PERT/CPM).

CYCLE-3

(At least THREE of the following by using softwares like MS Excel)

1. Quantity estimation of RCC roof slab and preparing schedule of bars
2. Quantity estimation of RCC beam and preparing schedule of bars
3. Quantity estimation of RCC Column with foundation footing and preparing schedule of bars
4. Quantity estimation of RCC retaining wall and preparing schedule of bars

CE 453 CAD LAB - ANALYSIS, DESIGN OF STRUCTURES

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To analyse the structures like beams, frames for different loading combinations of dead, live and earthquake loading using softwares.
2 To design the structures like beams, columns, footings and slabs using softwares.
3 To learn the reinforcement and other details of various reinforced concrete and steel structural elements like beams, footings, steel structures connections, welded plate girder and steel and reinforced concrete buildings.

COURSE OUTCOMES:

By the end of this course students will have the capability/knowledge of

1 Analysing and designing the structures using computer softwares like STAAD Pro/STRUDS/STRAP/MSEXCEL
2 Analysing and designing the structures like beams, frames for different loading combinations of dead, live and earthquake loading using computer software

Note: A minimum of eight (8No) shall be done and recorded

PART-A

(At least four of the following shall be done and recorded)

1 Students are required to analyse and design the following structures using software packages like STAAD Pro/STRUDS/STRAP/MSEXCEL etc.
2 Analysis and design of a two span continuous beam with one side fixed and other side overhang
3 Analysis and design of a single bay single storeyed plane frame with vertical legs subjected to gravity and lateral loads
4 Analysis and design of a plane frame (2D) of a five storeyed RCC residential building subjected to 1.2(DL+LL+/-EQX)
5 Analysis and design of a two storeyed RCC framed building (3D) subjected to 1.5(DL+LL)
6 Analysis and design of a steel roof truss of an industrial shed subjected to (DL+/-WL)

PART-B

(At least four of the following)

1 Design of one way RC slab.
2 Design of two way RC slab.
3 Design of isolated RC footing.
4 Design of short RC columns.
5 Design of steel welded plate girder.
6 Design of members of a roof truss

CE 407 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Can able to plan different stages in construction project, project duration and job layout
2 Using PERT and CPM able to determine critical path for projects.
3 Optimization of project cost using cost control techniques.
4 Learn importance of man power, materials and machinery in construction project.
5 Optimization of man power; total quality management, safety measures in construction projects, utilization of Management Information System.
6 Learn economic terms like assets, capital, annuity, project profitability useful for planning project

COURSE OUTCOMES:

Student able to :

1 Planning for any project and its duration.
2 Optimization of men, material and project cost.
3 Know the importance of machinery and its working conditions.
4 Implementation of quality management, safety measures and best utilization of Management Information system.
5 Assessing project profitability

UNIT I

Introduction: Significance of Construction Management, Objectives and functions of construction management.

Planning and Scheduling: Planning techniques - Bar charts; Limita- tions of Bar Charts; Mile stone charts.

UNIT II

Project Management through Networks: Objectives of network tech-niques; Events; Activities; Time estimates; Float and Slack; Critical path, near critical path; CPM and PERT and their use in Construction Planning; Difference between CPM and PERT; Probability of completion time for a project.

UNIT III

Cost Control: Direct cost; indirect cost; Total project cost; Optimization of cost through networks.
Resource Management (Manpower): Introduction; Resource smoothing; Resource leveling.

UNIT IV

Construction Equipment: Different types of construction equipment and their use in Constriction Industry; Factors affecting selection of Equipments; Owning and operating the equipment; Equipment maintenance.

Quality Control: Importance of quality; Elements of quality; Quality as-surance techniques; Documentation; Total quality management.

UNIT V

Safety Management: Importance of safety; Approaches to improve safety in construction industry; Safety benefits to employers, employees and customers.

Project Economics: Time value of money; discounted cash flow analy-sis; Payback period; Return on investment; Benefit cost analysis, re-placement analysis, Inflation.

LEARNING RESOURCES:

TEXT BOOKS:

1 Fundamentals of PERT/CPM and Project Management by S. K. Bhattacharjee; Khanna Publishers, 2004.
2 Construction Engineering and Management by Dr. S. Seetharaman, 4th Edition, Umesh Publications, 2008.
3 PERT & CPM Principles and applications by L. S. Srinath, 3rd Edition, Affiliated East West Press.

REFERENCE BOOKS:

1 Project Planning and Control with PERT & CPM 4th edition - Dr. B.C. Punmia & K. Khandelwal – Laxmi Publications (P) LTD, 2002
2 Construction Planning, Equipment & Methods by Peurifoy R. L.; Tata McGraw-Hill, 2008.
3 Construction Project Management: Theory and Practice - Kumar Neeraj Jha - Pearson Education India, 2011 - Construction industry

CE 408/A EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To teach the basic concepts of vibration of single degree of freedom systems
2 To explain the elements of earthquake ground motion characteristics
3 To calculate the lateral forces on a building using equivalent static method
4 To analyse and design single storey, single bay RC framed building subjected to an earthquake
5 To introduce architectural features of buildings to resist earthquakes
6 To introduce Geo-technical earthquake engineering

COURSE OUTCOMES :

1 Learn the fundamentals vibration of single degree freedom systems
2 Learn the earthquake ground motion characteristics
3 Able to calculate the lateral forces on a building using equivalent static method
4 Can analyse and design a single storey and single bay RC framed building
5 Know the architectural features of buildings to resist earthquakes
6 Understand the behavior of soil beneath a foundation during an earthquake

UNIT I

Elements of structural dynamics : Sources of vibrations; Types of vibrations; Degrees of freedom; Spring action and damping; Free vibration of undamped system having single degree of freedom; Free vibration of viscous damped system having single degree of freedom; Forced vibration of a viscous damped single degree freedom system subjected to harmonic excitation; Earthquake excitation (Base excitation) of a single degree freedom system.

UNIT II

Elements of Earthquake Ground motion: Earthquake size - Intensity and magnitude; Seismic Zoning-Introduction; Strong Motion Earthquakes - Introduction; Response spectrum (elastic); Local site effect (Effect of type of soil).

Seismo-resistant building architecture: Introduction; Lateral load resisting systems- moment resisting frame, Building with shear wall or bearing wall system, building with dual system; Building configuration-Problems and solutions; Building characteristics - Mode shape and fundamental period, building frequency and ground period, damping, ductility, seismic weight, hyperstaticity/redundancy, non-structural elements, foundation soil/ liquefaction. Foundations; Quality of construction and materials - quality of concrete, construction joints, general detailing requirements.

UNIT III

Analysis of single storey and single bay RCC Plane Frame (Columns vertical): (As per IS:1893(part-I)-2002) Calculation of lateral force due to earthquake using equivalent static method ; Analysis for different load combinations; Design forces and moments in beam and columns.

UNIT IV

Design of single storey and single bay RCC plane frames (Columns vertical) (As per IS:456-2000 and IS13920-1993) Design of column; Design of beam; Design of footing ; Detailing of entire frame.

UNIT V

Elements of Geotechnical Earthquake Engineering: Liquefaction - Definition and types, Effect of liquefaction on built environment, Evaluation of liquefaction susceptibility, Liquefaction hazard mitigation ; Seismic slope stability - Introduction, Pseudo-static analysis, Sliding block methods.

LEARNING RESOURCES:

TEXT BOOKS :

1 Earthquake Resistant Design of Structures by Pankaj Agarwal, and Manish Shrikhande, PHI Learning, 2006 .
2 Geotechnical Engineering by S.K.Gulhati & Manoj Datta, Tata McGraw-Hill, 2010

REFERENCE BOOKS:

1 Elements of Earthquake Engineering by Jai Krishna, A.R.Chandrasekaran and Brijesh Chandra, Second Edition, South Asian Publishers, 1994.
2 Dynamics of Structures by A.K.Chopra, 3rd Edition, Person Education, 2007.

CE 408/B ADVANCED FOUNDATION ENGINEERING

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To determine bearing capacity of shallow foundations for special cases like layered soils, sloping ground, uplift etc.
2 To introduce settlements shallow foundations and determination of allowable bearing capacity.
3 To determine allowable bearing pressure of mat foundations.
4 To introduce design and construction of sheet pile walls, coffer dams and braced cuts.

COURSE OUTCOMES:

1 Equip the student with knowledge of how to determine bearing capacity of shallow foundations in special cases
2 Settlement analysis of shallow foundations & assessing allowable bearing capacity of shallow foundations
3 Design of sheet pile walls
4 Design of coffer dams
5 Design of braced cuts.

UNIT I

Bearing Capacity of Shallow Foundations: Special Cases

Introduction, Foundation supported by a soil with a rigid base at shallow depth, Bearing capacity of layered soils-Stronger soil underlain by Weaker soil, Weaker soil underlain by Stronger soil; Closely spaced foundations-Effect on Ultimate Bearing Capacity; Bearing capacity of foundations on top of a slope; Uplift capacity of foundations.

UNIT II

Settlement Analysis of Shallow Foundations

Introduction, Elastic settlement of foundations on saturated clay; Settlement based on the theory of elasticity;Improved equation for elastic settlement; Settlement of sandy soil-Use of strain influence factor; Settlement of foundation on sand based on standard penetration resistance; Settlement in granular soil based on pressure meter test(PMT); Primary consolidation settlement relationships; Three-dimensional effect on primary consolidation settlement; Tolerable settlement of buildings.

UNIT III

Combined Footings and Mat Foundations

Introduction, Combined footings-Rectangular combined footing, Trapezoidal combined footing, Cantiver footing; Common types of Mat foundations; Bearing capacity of mat foundations; Differential settlement of mats; Field settlement observations for mat foundations; Compensated foundation.

UNIT IV

Sheet Pile Walls and Coffer dams

Introduction; Construction methods; Cantilever sheet pile walls; Cantilever sheet piling penetrating sandy soils; Cantilever sheet piling penetrating clay; Anchored sheet pile walls; Free earth support method for penetration of sandy clay; Fixed earth support method for penetration into sandy soil; Free earth support method for penetration of clay; Coffer dams-types with relative merits and demerits.

UNIT V

Braced cuts: Introduction; Pressure envelope for braced cut design; Pressure envelope for cuts in layered soil; Design of various components of a braced cut; Bottom heave of a cut in clay; Stability of the bottom of a cut in sand.

LEARNING RESOURCES

TEXT BOOKS :

1. Principles of Foundation Engineering, Braja M. Das.,Cengage Learning

REFERENCES:

1 Foundation Analysis & Design by Bowles, J.E., McGraw- Hill Book Company.
2. Basic and Applied Soil Mechanics by Gopal Ranjan and ASR Rao, Wiley Eastern Limited, New Delhi.
3. Foundation Engineering by Varghese,P.C.,Printice Hall of India.,New Delhi
4. Geotechnical Engineering by SK Gulati & Manoj Datta, Tata McGraw- Hill Publishing Company Limited.

CE 408/C **DISASTER MANAGEMENT**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To increase the knowledge and understanding capacity of the basic concepts of disaster management
2 To install an understanding of the disaster situations in India
3 To impart knowledge on problems associated with earthquakes in India.
4 To provide knowledge on problems associated with landslides.
5 To provide knowledge on problems associated with cyclones.

COURSE OUTCOMES:

On completion of the course, the student will able to

1 Apply the basic concepts of disaster management
2 Analyze and manage disaster situations in India.
3 Distinguish problems associated with earthquakes and its effects on urban areas.
4 Analyze, manage and communicate information on landslide situations.
5 Analyze and manage cyclones in coastal areas.

UNIT I

Concept of disaster management: Types of disasters. Disaster mitigating agencies and their organizational structure at different levels.

UNIT II

Overview of Disaster situations in India: Vulnerability of profile of India and Vulnerability mapping including disaster-Pone areas, communities, places, Disaster preparedness-ways and means, skills and strategies; rescue, relief reconstruction and rehabilitation. Case studies: Lessons and Experiences from various important Disasters in India.

UNIT III

Seismic vulnerability of urban areas: Seismic response of R.C frames buildings with soft first storey. Preparedness for natural disasters in urban areas. Urban earthquake disaster risk management. Using risks-time charts to plan for the future. Lateral strength of masonry walls. A numerical model for post earthquake fire response of structures.

UNIT IV

Landslide hazards zonation mapping and geo-environmental problems associated with the occurrence of landslides. A statistical approach to study landslides. Landslide casual factors in urban areas. Roads and landslide hazards in Himalaya. The use of electrical resistivity method in the study of landslide. Studies in rock-mass classification and landslide management in a part of Garhwal-Himalaya, India.

UNIT V

Cyclone resistant house for coastal areas. Disaster resistant construction role of insurance sector. Response of buried steel pipelines carrying water subjected to earthquake ground motion. Preparedness and planning for an urban earthquake disaster. Urban settlements and natural hazards. Role of knowledge based expert system in hazard scenario.

TEXT BOOKS:

1. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill.
2. Natural Disaster Management, Jon Ingleton (Ed), Rulor Rose, 1999.
3. Disaster Management, R.B.Singh (Ed), Rawat Pubications, 2000
4. Disaster Management by Ramakant Gaur, Authorpress, 2008.
5. Anthropology of Disaster Management, Sachindra Narayan, Gayan Publishing House, 2000.

CE 408/D FIBRE REINFORCED CONCRETE

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To explain Interaction between fibres and matrix
2 To explain Interaction basic concepts of fibre reinforced concrete
3 To explain mechanical properties of fibre reinforced concrete
4 To explain properties of constituent materials
5 To explain Mixture Proportioning , Mixing and Casting procedures
6 To explain Properties of Hardened FRC

COURSE OUTCOMES:

1 Understand Interaction between fibres and matrix
2 Know basic concepts of fibre reinforced concrete
3 Learn mechanical properties of fibre reinforced concrete
4 Know the properties of constituent materials
5 Learn Mixture Proportioning , Mixing and Casting procedures
6 Know Properties of Hardened FRC

UNIT I

Introduction: Historical development; Specifications and recommended procedures

Interaction between fibres and matrix: Fibre interaction with homogeneous uncracked matrix; Fibre interaction in cracked matrix; Interpretation of test data and analytical models; Composition of the matrix

UNIT II

Basic concepts and mechanical properties: Tension Basic concepts; Strong brittle fibres in ductile matrix; Strong fibres in a brittle matrix; Tension behaviour of fobre cement composites; Experimental evaluation of conventional fibre-cement composites; Elastic response in tension; Prediction of composite strength based on empirical approaches; Experimental evaluation of highvolume fraction fibre composites; Fracture mechanics approach; Apllications based on linear elastic fracture mechanics

UNIT III

Basic concepts and mechanical properties: Bending Mechanism of fibre contribution to bending; Flexural toughness; Prediction of load deflection response

Properties of constituent materials: Cement; aggregates; water and water-reducing admixtures; Mineral admixtures; Other chemical admixtures; Special cements; Metallic fibres; Polymeric fibres; Carbon fibres; Glass fibres.

UNIT IV

Mixture Proportioning, Mixing and Casting procedures: Mix proportions for FRC containing coarse aggregates; Mixing and casting procedures.

Properties of freshly mixed FRC Containing coarse aggregates: Workability tests; Tests for air content; Yield and unit weight; Steel fibre-reinforced concrete; Polmeric fibre-reinforced concrete; Other fibres

UNIT V

Properties of Hardened FRC :

Behaviour under compression –FRC with steel fibres and FRC with polymeric fibres;
Behaviour under tension – FRC with steel fibres and FRC with polymeric fibres;
Behaviour under flexure – FRC with steel fibres and FRC with polymeric fibres;
Behaviour under shear, torsion and bending – FRC with steel fibres and FRC with polymeric fibres

LEARNING RESOURCES:

TEXT BOOKS :

1 Fibre reinforced cement composites by P.N.Balaguru and S.P.Shah, McGraw-Hill, 1992.
2 Fibre reinforced cementious composites by A. Benturand and S.Mindess, Taylor &Francis, 1990.

REFERENCE BOOK:

1 Structural applications of fibre reinforced concrete , SP-182, ACI, 1998.

WEB REFERNCES

1 www.iitm.ac.in

CE 409/A DESIGN AND DRAWING OF HYDRAULIC STRUCTURES

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

The main objective of the course is to study the theory, design and drawing of the following irrigation structures:

1. Irrigation canal
2. Notch type canal drop
3. Canal regulator
4. Vertical drop weir on permeable foundations
5. Direct sluice
6. Surplus weir of a tank
7. Type III Aqueduct and
8. Ogee spillway profile

COURSE OUTCOMES:

At the end of the course the student will be able to Design and draw the following irrigation structures with the given data:

1. Irrigation canal
2. Notch type canal drop
3. Canal regulator
4. Vertical drop weir on permeable foundations
5. Direct sluice
6. Surplus weir of a tank
7. Type III Aqueduct and
8. Ogee spillway profile

Design and Drawing of the Following

UNIT I

1 Irrigation canal.
2 Canal drop – Notch type.
3 Cross regulator.
4 Vertical drop weir on permeable foundations.

UNIT II

1 Direct sluice.
2 Surplus weir of a tank.
3 Syphon Aqueduct (Type – III).
4 Profile of a Ogee spillway.

LEARNING RESOURCES:

TEXT BOOK

1 Water Resources Engineering - Principles and Practice by C. Satyanarayana Murthy; New age international publishers, New Delhi, 2003.

REFERENCE BOOKS:

1 Irrigation and Water Power Engineering by B.C.Punmia and Pande B.B. Lal, 16th Edition, Laxmi Publications, New Delhi,2009.
2 Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers,2011.

CE 409/B PAVEMENT ANALYSIS AND DESIGN

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

After completing this course student will be able to:

1 To study about the types and components of pavements
2 To learn about the stresses in flexible pavements and design of flexible pavements
3 To learn about the stresses in rigid pavements
4 To study the design of rigid pavements

COURSE OUTCOMES:

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

1 Identify the pavement components and compare highway and airport pavements
2 Calculate and Analyze stresses in flexible and Rigid pavements
3 Design the flexible pavement using IRC & AASHO methods
4 Design rigid pavements by IRC method and evaluate the pavements

UNIT I

Types of pavements – Functions of individual layers, design factors -wheel loads, tyre pressure, contact pressure, Material characteristics, Environmental and other factors. Traffic factors- ADT, AADT, Lane distribution factor, Vehicle damage factor.

UNIT II

Stresses in flexible pavement- layered systems concept-one layer system- Boussinesq Two layer system. Triaxial Method of pavement Design, AASHO Flexible pavement design. IRC method of flexible pavement design,

UNIT III

Westergaard's Theory and assumptions, Stresses in rigid pavement- relative stiffness of slab, modulus of sub-grade reaction- stresses due to loads, temperature and friction. Stresses in dowel bars and tie bars

UNIT IV

Types of pavement distress, techniques for functional and structural evaluation of pavements, pavement rehabilitation techniques.

UNIT V

PCA method of rigid pavement, IRC method of Concrete pavement design, Design of joints-Dowel & Tie bar. Over lay- methods of overlay design by Benkelman Beam Deflection method.

LEARNING RESOURCES:

TEXT BOOKS:

1 Highway Engineering-S.K.Khanna & C.J.Justo, Nemchand & Bros.,7th Edition (2000).
2 Principles and Practices of highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers- (2003).

REFERENCE BOOKS:

1 Principles of Pavement Design-Yoder & Wit Zorac- John Willey & Sons.
2 Pavement analysis & design by Y.H. Huang, Pearson Education.

CE 409/C ADVANCED ENVIRONMENTAL ENGINEERING

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1. To explain the importance of self-purification of streams and to derive Streeter- Phelps equation and to discuss the effects of various pollutants on receiving streams.
2. To introduce new concepts in biological treatment like nitrogen and phosphorous removal, anaerobic filters, RBC and U-tube aeration systems, their working principles and suitability.
3. To understand the characteristics and the treatment and disposal methods of liquid wastes produced in Dairy industry, Sugar industry and Pulp & paper industry.
4. To discuss sources, global effects and the effects on human health, plants and materials of air pollution.
5. To discuss the effects of various meteorological parameters on air pollution, and to explain various equipment for controlling particulate pollution and their suitability.
6. To introduce sources, effects and controlling measures of noise pollution and to discuss noise rating systems and acceptable noise levels for various zones.
7. To introduce various functional elements of urban solid waste management and to introduce various methods of solid waste disposal methods with special emphasis on recovery and reuse of solid waste.

COURSE OUTCOMES:

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

1. understand the importance of self-purification and determine the critical D.O. deficit in a polluted stream and degree of treatment required.
2. Update his knowledge in biological treatment with new and more advanced treatment methods.
3. suggest suitable methods for treatment and disposal of industrial wastewater of selected industries - Dairy industry, Sugar industry and Pulp & paper industry, based on their characteristics.
4. asses global and local implications of air pollution and suggest suitable methods of control of particulate matter and design required stack height based on meteorological conditions.
5. suggest suitable noise control techniques according to the situation and to calculate statistical parameters like L_N and L_{eq}.
6. Suggest suitable methods for collection, transport, recovery, reuse and disposal of urban solid waste.

UNIT I

Stream Sanitation : Introduction; Self-purification in streams; factors affecting self-purification; Dissolved Oxygen Balance in streams; Streeter-Phelps's Dissolved Oxygen Model; Zones of Self-purification; Impact of pollutants on stream waters and usage of stream water with special reference to flora and fauna.

New Concepts in Biological Waste Treatment (theory only) :

Introduction; Nitrogen removal by biological nitrification and de-nitrification; Phosphate removal from the activated sludge process; Rotating Disc Biological Contactor; Anaerobic filters; U-Tube aeration systems.

UNIT II

Industrial Wastewater Treatment : Introduction to Industrial Wastewater treatment;

Sugar Plant: Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

Dairy Industry: Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

Pulp and Paper Industry: Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

UNIT III

Sources and Classification of Air Pollution : Natural and Man-made sources, Stationary and mobile sources; Point, line and area sources, Primary and secondary pollutants; Natural contaminants; Aerosols; Gaseous pollutants.

Meteorology and Air Pollution : Atmospheric stability and temperature inversions; Maximum Mixing Depth; Wind direction and speed; Plume behaviour; Gaussian Dispersion Model; Plume rise; Design of stack height, Wind rose.

Effects of Air Pollution : Global Effects: Global warming; Ozone depletion; Acid rains; Effects of air pollutants on human health; Effects on plants; Economical effects.

UNIT IV

Control of Air Pollution : Objectives; Types of collection equipment: Settling chamber; Inertial separators; Cyclones; Filters; Electrostatic Precipitators; Scrubbers.

Automobile Pollution : Introduction; vehicular emissions; fuel combustion, automobile emission control

UNIT V

Noise Pollution : Introduction; Levels of noise; Noise rating systems; Measurement of noise; Sources of noise and their noise levels; Acceptable noise levels; Effects of noise; Control of noise.

Urban Solid Waste Management: Sources; Quantities and characteristics; Classification; Collection and transportation; Recovery and reuse; Treatment methods such as compositing, incineration and pyrolysis, sanitary landfill.

LEARINING RESOURCES:

TEXT BOOKS:

1. Wastewater Treatment by M.N. Rao and A.K. Datta; Oxford & IBH Publishing Co. Pvt. Ltd., 2008.
2. Environmental Pollution Control Engineering by C.S. Rao, New Age International, 2006.
3. Air Pollution by M.N. Rao and H.V.N. Rao, Tata Mc Graw-Hill,1989.

REFERENCES:

1. Wastewater Engineering : Treatment, Disposal and Reuse by Metcalf & Eddy , 3rd Edition, Mc Graw- Hill, 1991.
2. Water Supply and Wastewater Disposal by G.M. Fair et. al., John Wiley & Sons, 1971.
3. Sewage Disposal and Air Pollution Engineering by S.K. Garg; Khanna Publications, 2010.
4. Environmental Engineering by Peavy and Rowe, Mc Graw Hill, 7th Edition, 1987.

CE 409/D **EARTH RETAINING STRUCTURES**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To understand lateral earth pressure theories and pressure theories and design of retaining walls.
2 To design anchored bulkheads by different methods.
3 To understand pressure envelops and design of various components in braced cuts and cofferdams.
4 To understand stability of earth dams and its protection and construction.

COURSE OUTCOMES:

1 Equip the student with knowledge of how to determine lateral earth pressure to design retaining walls
2 Design of sheet pile walls
3 Design of braced cuts.
4 Earth dams stability analysis
5 Earth dams protection and construction

UNIT-I

Lateral Pressure: Basic concepts, Rankine and Coulomb earth pressure theories, graphical methods. Determining active and passive pressures: Culmanns, Rebhan's, logarithmic spiral methods, friction circle method. Consideration of surcharge, seepage, earth quake, wave effect, stratification, type of backfill, wall friction and adhesion.

Unit-II

Retaining walls: Uses, types, stability and design principles of retaining walls, backfill drainage, settlement and tilting.

Unit-III

Anchored bulkheads : Classification of anchored bulkheads, free and fixed earth support methods. Rowe's theory for free earth supports and equivalent beam methods for fixed earth supports. Design of anchored rods and dead man

Braced cuts and Cofferdams: Braced excavations and stability of vertical cuts, lateral pressures in sand and clay, Braced and cellular cofferdams: uses, types, components, stability, piping and heaving. Stability of cellular cofferdams, cellular cofferdams in rock and in deep soils.

UNIT-IV

Earth dams- Stability analysis : Classification, seepage control in embankments and foundations, seepage analysis, stability analysis: upstream and down stream for steady seepage, rapid draw down, end of construction, method of slices and Bishop's method.

UNIT-V

Earth dams -Protection & Construction: Slope protection, filters, embankment construction materials and construction, quality control, grouting techniques. Instrumentation and performance observations in earth dams.

LEARNING RESOURCES

TEXT BOOKS:

1. Basic & Applied soil mechanics - Gopal Ranjan & ASR Rao, New Age International Publishers, 2011.
2. Embankment Dams by Sharma Hd, Publisher: India Book House(IBH) Limited,1991.
3. Engineering for Embankment Dams By B. Singh & R. S. Varshney, A A Balkema Publishers,1995.

REFERENCE BOOKS:

1. Foundation design by W. C. Teng, Prentice Hall,1962
2. Analysis and design of foundations by Bowles. J. W McGraw Hill, 4th edition, 1955.
3. Earth and Rock-Fill Dams: General Design and Construction Considerations by United States Army Corps of Engineers, University Press of the Pacific,2004
4. Soil mechanics in engineering and practice by Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri,3rd Edition. Wiley India Pvt Ltd,2010.

CE 410/A REPAIR AND REHABILITATION OF STRUCTURES

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To learn various distress and damages to concrete and masonry structures
2 To understand the importance of maintenance of structures
3 To study the various types and properties of repair materials
4 To assess the damage to structures using various tests
5 To learn the importance and methods of substrate preparation
6 To learn various repair techniques of damaged structures, corroded structures

COURSE OUTCOMES:

By the end of this course students will have the capability/knowledge of

1 Various distress and damages to concrete and masonry structures
2 The importance of maintenance of structures, types and properties of repair materials etc
3 Assessing damage to structures and various repair techniques

UNIT I

Introduction: Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures.

Cracks in R.C. buildings: Various cracks in R.C. buildings, causes and effects.
Maintenance : Maintenance, Importance of maintenance, routine and preventive maintenance.
Damages to masonry structures : Various damages to masonry structures and causes

UNIT II

Repair materials: Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials

Special mortars and concretes: Polymer Concrete and Mortar, Quick setting compounds

Grouting materials: Gas forming grouts, Salfoalumate grouts, Polymer grouts, Acrylate and Urethane grouts.

Bonding agents: Latex emulsions, Epoxy bonding agents.

Protective coatings: Protective coatings for Concrete and Steel

FRP sheets

UNIT III

Damage diagnosis and assessment: Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement

UNIT IV

Substrate preparation : Importance of substrate/surface preparation, General surface preparation methods and procedure, Reinforcing steel cleaning
Crack repair : Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks.

UNIT V

Corrosion of embedded steel in concrete: Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns)

Jacketing: Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing.

Strengthening: Strengthening, Beam shear strengthening, Flexural strengthening

LEARNING RESOURCES:

TEXT BOOKS:

1 Repair and protection of concrete structures by Noel P.Mailvaganam, CRC Press,1991.
2 Concrete repair and maintenance Illustrated by Peter.H.Emmons, Galgotia publications Pvt. Ltd., 2001.

REFERENCES:

1 “Earthquake resistant design of structures” by Pankaj agarwal, Manish shrikande, PHI, 2006.
2 Failures and repair of concrete structures by S.Champion, John Wiley and Sons, 1961.
3 Diagnosis and treatment of structures in distress by R.N.Raikar Published by R & D Centre of Structural Designers and Consultants Pvt.Ltd, Mumbai.
4 Handbook on repair and rehabilitation of RCC buildings, CPWD, Government of India.
5 Handbook on seismic retrofit of buildings, A. Chakrabarti et.al., Narosa Publishing House, 2010.

WEB REFERNCES

1 www.iitm.ac.in

CE 410/B **DESIGN OF TALL BUILDINGS**

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 Ability to apply general considerations and wind effects of tall buildings.
2 Understand and distinguish between various lateral systems for steel buildings
3 Understand and distinguish between various lateral systems for concrete buildings
4 Understanding gravity systems of structural elements
5 To install knowledge on structural analysis techniques.

COURSE OUTCOMES:

On completion of the course, the student will able to

1 Assess general considerations and wind effects of tall buildings.
2 Analyze and design various lateral systems for steel buildings
3 Analyze and design various lateral systems for concrete buildings
4 Analyze and design various gravity systems of structural elements
5 Implement structural analysis concepts

UNIT – I

General Considerations: Introduction; Definition of a tall building; Lateral load design philosophy; Concept of premium for height; Factors responsible for slimming down the weight of structural frame; Development of high-rise architecture.

Wind Effects: Design considerations; Nature of wind; Extreme wind conditions; Characteristics of wind; Provisions of IS875(Part3); Wind tunnel engineering-Introduction, Description of wind tunnels; Objective of wind tunnel tests, Rigid model studies, Aeroelastic study.

UNIT – II

Lateral systems for Steel Buildings: Introduction; Rigid frames; Braced frames; Staggered truss system; Eccentric bracing systems; Outrigger and belt systems; Framed tube systems; Interacting system of braced and rigid frames.

UNIT – III

Lateral systems for Concrete Buildings: Introduction; Frame action of column and slab systems; Flat slab and shear walls; Flat slab, Shear walls and columns; Coupled shear walls; Rigid frame; Widely spaced perimeter tube; core-supported structures; Shear wall frame interaction.

UNIT – IV

Gravity systems: Concrete floor systems; Prestressed concrete systems; Composite metal decks.

UNIT – V

Structural Analysis: Introduction; Preliminary hand calculations; General computer analysis techniques.

LEARNING RESOURCES:

TEXT BOOKS:

1. Structural Analysis and design of tall buildings by B.S.Taranath, McGraw-Hill, 1988.

REFERENCE BOOKS:

1 Reinforced concrete design of tall buildings by B.S.Taranath by B.S.Taranath, CRC Press, 2010.
2 Structural analysis and design of tall buildings- Steel and Composite Construction, by B.S.Taranath, CRC Press, 2012.
3 Tall building structures by B.S.Smith and A.Coull, John Wiley & Sons, 1991.

CE 410/C **GREEN BUILDINGS**

Lectures / Tutorials :	4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

Course Objectives:

1. Describe green building and the role of USGBC and LEED
2. Recognize the intents of each LEED credit category
3. Explain key sustainability terms and concepts
4. Identify green building best practices
5. Recognize cutting-edge examples
6. Discuss cost considerations of green building

Course Outcomes:

Student will be able to

1. Describe the green building & sustainable design concepts.
2. Comprehend properties of green building construction materials and their qualitative input to design.
3. Begin to formulate a personal attitude toward green building design.
4. Describe the requirements for LEED

UNIT- I

Introduction to green building: Introduction to the ideas, issues and concepts of sustainable planning, global environment and the built environment, principles of environmentally and ecologically supportive planning.

Building Science Fundamentals : General features- Use of energy, materials, health and global environment, indoor air quality as related to the construction and operation of buildings.

UNIT- II

Green materials: Traditional and Recycled Materials in context of Sustainability

Green Design: Sustainable and conservation practices – water conservation, harvesting and recharge - Traditional and Modern Methods sewerage treatment, solid waste treatment-Solid and Liquid Waste Management, (with special reference to energy efficiency, recycling and re-use) , economics and management.

UNIT- III

Energy Auditing: Low energy design, hybrid systems, modeling and simulation of energy systems, integration of PV and wind systems in the building, wind solar and other non conventional energy systems, solar thermal applications for heating and cooling, electricity generation in buildings

UNIT - IV

Overview of Green Building rating systems: USGBC, TERI-GRIHA and LEED rating systems Case studies on specific contemporary sustainable practices:

UNIT - V

Case studies on green practices: Abroad countries, India, contemporary and famous examples of sustainable / energy efficient architecture / settlement planning across the world.

Books/Manuals:

1. Green homes : Efficient,Healthyand Smart by R.K .Gautham, BS publications,2009.
2. Sustainable Building Technical Manual - Green Building Practices for Design, Construction andOperations, US Green Building Council, 2011.
3. IGBC Green Homes - Rating System (Version 1.0) – Abridged reference guide, 2009.

References:

1. Green Building A Basic Guide to Building and Remodeling Sustainably; Tree Hugger Consulting.
2. Green Building Handbook, Volume 1, Tom Woolley, Sam Kimmins, Paul Harrison and RobHarrison; E & FN Spon, an imprint of Thomson Science & Professional.

Web References:

WWW.IGBC.in
WWW.sbtmanual.in

CE 410/D GROUND IMPROVEMENT TECHNIQUES

Lectures / Tutorials	: 4 Periods/Week	Sessional marks	: 40
Semester End Exam. :	3 Hours	Semester End Exam. marks	: 60
		Credits	: 3

COURSE OBJECTIVES:

1 To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques.
2 To bring out concepts of reinforced earth.
3 Applications of geotextiles in various civil engineering projects.

COURSE OUTCOMES :

1 Will gain competence in properly devising alternative solutions to difficult and earth construction problems and in evaluating their effectiveness before, during and after construction.
2 A study of the many different approaches to the ground modification by Mechanical modification like Dynamic compaction, deep compaction,hydromechanical compaction etc.
3 Hydraulic modification like dewatering methods, use of geosynthetics,preloading techniques etc.
4 Physical and chemical modification by use of cement,lime,emulsions,industrial wastes etc.
5 Modification by inclusions like metallic strips and geotextiles and In-situ Ground reinforcement by ground anchors, rock bolts and soil nailing.

UNIT-I

Introduction to Engineering ground modification:

Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique;objectives of improving soil.

UNIT-II

Mechanical Modification :

Terminology and aims of mechanical modification,compaction purposes and strategies,Methods of compaction: Laboratory procedures-Dynamic compaction, kneading compaction, static compaction;shallow surface compaction-static rollers,impact and vibratory equipment,operational aspects of shallow compaction; Deep compaction techniques: precompression,explosion,heavy tamping,vibration,compaction grouting;Hydromechanical compaction-hydraulic fill,dry fill with subsequent spraying or flooding,compaction of rock fill with water jets.

UNIT-III

Hydraulic Modification:

Objectives and techniques, traditional dewatering methods-open sumps and ditches,vacuum dewatering wells; Filtration,drainage and seepage control with geosynthetics-Geotextilesdefinition and types,geotextile applications,Basic functions of geotextiles;Preloading and use of vertical drains-Purpose of preloading and vertical drains,Methods of providing vertical drains-cylindrical sand drains,geosynthetic drains,Pre loading with vertical drains-radial consolidation,combined radial and vertical consolidation

UNIT-IV

Physical and chemical modification:

Terminology, construction techniques,and typical uses;Types of admixtures and their effect on soil properties-Granular admixtures, Cement stabilization and cement columns, Lime stabilization and lime columns, Stabilization using bitumen and emulsions, Stabilization using industrial wastes.

UNIT-V

Modification by inclusions and confinement:

Concept of soil reinforcement; Reinforced soil as a homogeneous composite material-Elastic theory, strength theories; Discrete soil-reinforcement action; Reinforced earth and other strip reinforcing methods-standard materials and dimensions, failure modes;

Development of design procedures-Original standard analysis, Tieback analysis-Rankine type analysis, Coulomb type analysis.

Retaining walls with metallic strip reinforcement; step-by-step-design procedure using metallic strip reinforcement; Retaining walls with geotextile reinforcement; Retaining walls with Geogrid reinforcement-General,design procedure for geogrid-reinforced retaining wall.

In-situ Ground reinforcement: Ground Anchors-Typical applications, types and components; Rock bolts- Typical applications, types and components; Soil nailing-Different soil nailing systems and applications, The importance of construction sequence, Analysis of nailed soil, Special considerations for slope stabilization.

LEARNING RESOURCES

TEXT BOOK:

1 Hausmann M.R(1990) Engineering Principles of ground modification, McGraw-Hill Education(India) Private Limited,New Delhi.

REFERENCE:

1 Ground improvement Techniques, P.Purushothama Raju, Laxmi Publications Pvt. Ltd.,New Delhi.

CE 454 COMPUTER AIDED DETAILING OF STRUCTURES LAB

Practicals	: 3 Periods/Week	Sessional marks	: 40
Semester End Exam.	: 3 Hours	Semester End Exam. marks	: 60
		Credits	: 2

COURSE OBJECTIVES:

1 To understand the various code requirements and provisions for reinforcement detailing
2 To draw the reinforcement and other details of various structural elements like beam, slab, footing, retaining wall etc using computer software packages like Auto CAD,RIVET etc.

COURSE OUTCOMES:

By the end of this course students will have the capability/knowledge of

1 Reinforcement and other details of various structural elements like beam, slab, footing, retaining wall etc. Presenting various structural elements details for the purpose of field execution as per code requirements.
2 Drawing each and every details of various structural elements using computer software packages

Note: A minimum of ten (10No) shall be done and recorded

UNIT-I

(At least SIX of the following)

a) Detailing of continuous beam with both ends fixed.
b) Detailing of continuous beam with one end overhang.
c) Detailing of pile cap.
d) Detailing of isolated footing.
e) Detailing of two way and one way slab.
f) Detailing of Flat slab interior panel.
g) Detailing of cantilever retaining wall.
h) Typical detailing of R.C.C. footing with steel column.

UNIT-II

(At least THREE of the following)

a) Detailing of beam to column framed connection (using bolts).
b) Detailing of beam to column moment resistant connection (using bolts).
c) Detailing of welded plate girder.
d) Detailing of welded column base.

UNIT-III

(At least ONE of the following)

a) Typical detailing elements in Two-storied R.C.C. Framed building.
b) Typical detailing of Industrial steel building.