ACADEMIC CURRICULA 2018 - 2022

BACHELOR'S DEGREE PROGRAMME

B. Tech in Civil Engineering

Curricula & Syllabi

Kalinga Institute of Industrial Technology (KIIT)
Deemed to be University U/S 3 of UGC Act, 1956
Bhubaneswar, Odisha, India

ACADEMIC CURRICULA
2018 - 2022

B. TECH
CIVIL ENGINEERING

Course Structure and Detailed Syllabi
for students admitted in
2018 - 22
Academic Session

Kalinga Institute of Industrial Technology (KIIT)
Deemed to be University U/S 3 of UGC Act, 1956
Bhubaneswar, Odisha, India

B. TECH IN CIVIL ENGINEERING

Programme Educational Objectives (PEOs):

The B. Tech programme in Civil Engineering aims to prepare the graduates with the following objectives:

1. The graduates shall be able to provide to solutions to civil engineering problems and allied areas involving structural design, construction, geotechnical, environmental and water resources issues.
2. The graduates shall be able to perceive the limitation and impact of engineering solutions in social, legal, environmental, economical and multidisciplinary contexts.
3. The graduates shall demonstrate professional and ethical responsibilities and thrive to reinforce their knowledge being a part of higher educational programmes.

Programme Outcomes (POs):

The programme outcomes are:

a) Engineering knowledge: Ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b) Problem analysis: Ability to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c) Design/Development of solutions: Ability to 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.
d) Conduct investigations on complex problems: Ability to 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.
e) Modern tool usage: Ability to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
f) The engineer and society: Ability to 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.
g) Environment and sustainability: Ability to understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h) Ethics: Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i) Individual and team: Ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j) Communication: Ability to 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.
k) Project management and finance: Ability to 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.
l) Life-long learning: Ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs):

Programme Specific Outcomes are:

m) Ability to select and utilize sustainable low cost alternate materials contributing to environment friendly construction practices.
n) Ability to understand and adopt methodologies and actions for sustainable environment.
o) Ability to understand and develop strategies for sustainable water resources in the context of climate change.

Abbreviations used in describing the Category in all the courses are as follows:

BSC:	Basic Science Course
BSLC:	Basic Science Laboratory Course
ESC:	Engineering Science Course
ESLC:	Engineering Science Laboratory Course
HSMC:	Humanities, Social Science & Management Course
PCC:	Professional Core Course
PCLC:	Professional Core Laboratory Course
PEC:	Professional Elective Course
OEC:	Open Elective Courses
PROJ:	Project
IEC:	Industry Elective Course

COURSE STRUCTURE FOR B. TECH IN CIVIL ENGINEERING

SCHEME-II

SEMESTER-I

Theory							
Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	MA1003	Mathematics-I	3	1	-	4	4
2	CH1007	Chemistry	3	-	-	3	3
3	HS1005	Professional Communication	2	-	-	2	2
4	LS1001	Biology	2	-	-	2	2
Total of Theory						11	11
Practical							
1	CH1097	Chemistry Lab	-	-	3	3	1.5
2	CS1093	Computer Programming	-	2	4	6	4
Sessional							
1	HS1085	Language Lab	-	-	2	2	1
2	CE1083	Engineering Graphics	-	1	2	3	2
Total Practical & Sessional						14	8.5
Semester Total						25	19.5

SCHEME-II

SEMESTER-II

Theory							
Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	MA1004	Mathematics-II	3	1	-	4	4
2	PH1007	Physics	3	1	-	4	4
3	EE1003	Basic Electrical Engineering	3	-	-	3	3
4	ME1003	Engineering Mechanics	3	-	-	3	3
Total of Theory						14	14
Practical							
1	PH1097	Physics Lab	-	-	3	3	1.5
2	EE1093	Basic Electrical Engineering Lab	-	-	2	2	1
Sessional							
1	ME1083	Basic Manufacturing Systems	-	1	2	3	2
2	CH1081	Environmental Science	-	-	2	2	1
Total Practical & Sessional						10	5.5
Semester Total						24	19.5

SEMESTER-III

Theory							
Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	CE2101	Fluid Mechanics	3	1	0	4	4
2	CE2103	Mechanics of Material	3	1	0	4	4
3	CE2105	Environmental Engineering-I	3	0	0	3	3
4	CE2107	Surveying & Geomatics	3	0	0	3	3
5	CE2109	Civil Engineering Materials & Construction	3	0	0	3	3
6		HS Elective-I	3	0	0	3	3
Total of Theory						20	20
Practical							
1	CE2191	Environmental Engg. Lab.	0	0	2	2	1
2	CE2193	Surveying Field Work	0	0	3	3	1.5
3	CE2195	Material Testing Lab.	0	0	2	2	1
Sessional							
1	HS2081	Business Communication	0	2	0	2	1
Total Practical & Sessional						9	4.5
Semester Total						29	24.5

SEMESTER-IV

Theory							
Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	MA2005	Mathematics –III (Civil & Mechanical)	3	1	0	4	4
2	CE2104	Structural Analysis	3	1	0	4	4
3	CE2102	Surface Hydrology & Hydraulics	3	0	0	3	3
4	CE2100	Geotechnical Engineering-I	3	0	0	3	3
5	CE2106	Environmental Engineering-II	3	0	0	3	3
6	CE2108	Construction Planning & Management	3	0	0	3	3
Total of Theory						20	20
Practical							
1	CE2190	Geotechnical Engineering Lab.	0	0	3	3	1.5
2	CE2192	Fluid Mechanics Lab.	0	0	2	2	1
Sessional							
1	CE2180	Structural Analysis Applications	0	2	0	2	1
2	CE2182	Hydraulics & Hydrologic Design	0	2	0	2	1
Total Practical & Sessional						9	4.5
Semester Total						28	24.5

SEMESTER-V

Theory							
Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	CE3101	Design of Concrete Structures	3	1	0	4	4
2	CE3103	Transportation Engineering-I	3	0	0	3	3
3	CE3105	Water Resources Engineering	3	0	0	3	3
4	CE3107	Geotechnical Engineering-II	3	0	0	3	3
5		Department Elective-I	3	0	0	3	3
6		Department Elective-II	3	0	0	3	3
Total of Theory						19	19
Practical							
1	CE3191	Transportation Engg. Laboratory	0	0	2	2	1
Sessional							
1	CE3181	Structural Design (RCC)	0	2	0	2	1
2	CE3183	Geotechnical Design	0	2	0	2	1
3	CE3185	Water Resources Design	0	2	0	2	1
Total Practical & Sessional						8	4
Semester Total						27	23

SEMESTER-VI

Theory							
Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	CE3100	Design of Steel Structures	3	0	0	3	3
2	CE3102	Transportation Engineering-II	3	0	0	3	3
3		Department Elective-III	3	0	0	3	3
4		Department Elective-IV	3	0	0	3	3
5		Department Elective-V	3	0	0	3	3
6		Open Elective-I / (Minor-I)	3	0	0	3	3
Total of Theory						18	18
Practical							
1	CE3190	Structural Engg. Lab.	0	0	2	2	1
Sessional							
1	CE3180	Estimating & Costing	0	2	0	2	1
2	CE3182	Computer Aided Building Drawing	0	2	0	2	1
3	CE3184	Structural Design (Steel)	0	2	0	2	1
4	CE3082	Minor Project	0	4	0	4	2
Total Practical / Sessional						12	6
Semester Total						30	24

SEMESTER-VII

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	HS4001	Professional Practice, Law & Ethics	2	0	0	2	2
2		Open Elective-II / (Minor-2)	3	0	0	3	3
(3)		(Minor-3)	(3)	(0)	(0)	(3)	(3)
(4)		(Minor-4)	(3)	(0)	(0)	(3)	(3)
(5)		(HO-I)	(3)	(0)	(0)	(3)	(3)
Total Theory						5	5
Sessional							
1	CE4081	Project – I / Internship	-	-	-	-	3
2	CE4083	Practical Training	-	-	-	-	2
(3)		(Project-Minor/Lab)	(0)	(0)	(4)	(4)	(2)
Semester Total							10

SEMESTER-VIII

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1		HS Elective-II	3	0	0	3	3
2		(M1-5)	(3)	(0)	(0)	(3)	(3)
3		(M1-6)	(3)	(0)	(0)	(3)	(3)
4		(HO-2)	(3)	(0)	(0)	(3)	(3)
5		(HO-3)	(3)	(0)	(0)	(3)	(3)
Total of Theory						3	3
Sessional							
1	CE4082	Project/Internship	-	-	-	-	10
Semester Total							13

LIST OF HS ELECTIVES

HS Elective- I

Sl. No.	Course Code	Course Title	Credit
1	HS 2002	Engineering Economics	3
2	HS 2008	Economic Environment of India	3
3	HS 2010	Financial Institutions, Markets and Regulations	3
4	HS 2012	Development Economics	3

HS Elective- II

1	HS 3006	Entrepreneurship	3
2	HS 3008	Management Concepts & Practices	3
3	HS 3002	Organizational Behaviour	3
4	HS 3004	Human Resource Management	3

LIST OF DEPARTMENT ELECTIVES

Dept. Electives - I & II

1	CE 3021	Advanced Solid Mechanics	3
2	CE 3023	Concrete Technology	3
3	CE 6103	Construction Finance Management	3
4	CE 3027	Engineering Geology	3
5	CE 3035	Hydraulic Machines	3
6	CE 3039	Pavement Materials	3
7	CE 6136	Building Services Planning	3
8	CE 4057	Drainage Engineering & Design	3
9	CE 6134	Project Quality and Safety Management	3
10	CE 3131	Transport of Water and Wastewater	3
11	CE 3133	Air and Noise Pollution Control	3
12	CE 6443	Rock Mechanics	3
13	CE 6303	Open Channel Hydraulics	3
14	CE 6431	Soil Exploration and Field test	3

Dept. Electives- III, IV & V

1	CE 6449	Advanced Foundation Engineering	3
2	CE 4069	Cost Effective Housing	3
3	CE 6241	Design of Bridges	3
4	CE 4077	Earth & Earth Retaining Structures	3
5	CE 4061	Earthquake Engineering	3
6	CE 6435	Finite Element Method in Geo-mechanics	3
7	CE 4051	Flood and Drought Estimation and Management	3
8	CE 6437	Geo-synthetics & Reinforced Earth Structures	3
9	CE 4065	Infrastructure Planning	3
10	CE 4067	Offshore Geotechnical Engineering	3
11	CE 6248	Pre-stressed Concrete	3
12	CE 4059	Reinforced Concrete Repairs and Maintenance	3

13	CE 6235	Soil-Structure Interaction	3
14	CE 4053	Solid and Hazardous Waste Management	3
15	CE 4033	Structural Dynamics	3
16	CE 6445	Pavement Analysis & Design	3
17	CE 6238	Composite Structures	3
18	CE 6446	Geotechnical Earthquake Engineering	3
19	CE 4044	Ground Improvement Engineering	3
20	CE 4030	Machine Foundation Engineering	3
21	CE 6436	Tunnel Engineering	3
22	CE 6342	Water Power Engineering	3
23	CE 6332	River Engineering & Sediment Transport	3
24	CE 6142	Contract Laws & Regulations	3
25	CE 6306	Groundwater Engineering	3
26	CE 6347	Advanced Irrigation Engineering	3
27	CE 3130	Water and Air quality Models	3
28	CE 3041	Traffic Engineering & Transportation Planning	3
29	CE 6307	Remote Sensing & GIS	3
30	CE 3134	Deep Excavation Planning and Design	3

HONORS COURSES OFFERED BY SCHOOL OF CIVIL ENGINEERING

Area: Construction Planning & Management

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 6102	Construction Engineering Practices	Civil Engineering Materials and Construction, Concrete Technology
2	CE 6113	Construction Contract Management & Quantity Surveying	Civil Engineering Materials and Construction, Construction Planning and Management
3	CE 6106	Construction Methods & Equipment	Construction Planning and Management

Area: Transportation Engineering

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 4131	Fundamentals of Traffic Flow	Transportation Engineering-I
2	CE 4020	Pavement Management System	Transportation Engineering-I
3	CE 4132	Urban Transportation Systems and Planning	Transportation Engineering-I

Area: Geotechnical Engineering

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 6405	Advanced Soil Mechanics	Geotechnical Engineering I and Geotechnical Engineering II
2	CE 6407	Foundation Engineering: Principles and Practices	Geotechnical Engineering I and Geotechnical Engineering II
3	CE 6412	Geotechnical Stability Analysis	Geotechnical Engineering I and Geotechnical Engineering II

Area: Structural Engineering

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 6209	Advanced Structural Analysis	Mechanics of Materials and Structural Analysis
2	CE 6211	Finite Element Method	Engineering Mechanics & Mechanics of Materials
3	CE 6208	Stability of Structures	Structural Analysis

Area: Environmental Engineering

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 6501	Physico-chemical Processes for Water and Wastewater Treatment	Environmental Engineering-I and Environmental Engineering-II
2	CE 6503	Biological Process Design for Wastewater Treatment	Environmental Engineering-I and Environmental Engineering-II
3	CE 6500	Environmental Impact Assessment and Auditing	Environmental Engineering-I and Environmental Engineering-II

Area: Water Resources Engineering

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 6309	Advanced Hydrology	Fluid Mechanics, Surface Hydrology & Hydraulics
2	CE 6305	Advanced Fluid Mechanics	Fluid Mechanics, Mathematics-I, Mathematics-II
3	CE 6310	Water Resources Systems Analysis	Water Resources Engineering

LIST OF OPEN ELECTIVES OFFERED BY CIVIL ENGINEERING

Open Elective: I

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 3070	Fundamentals of Project Management	Nil
2	CE 3072	Bio-remediation	Nil
3	CE 3074	Construction Materials & Specifications	Nil
4	CE 3076	Tropical Hydrology & Water Resources	Nil
5	CE 4092	Global Warming & Climate Change	Nil
6	CE 4094	Green Buildings	Nil
7	CE 4096	Environmental Chemistry	Nil

Open Elective: II

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 4029	Disaster Management	Nil
2	CE 4089	Coastal Management	Nil
3	CE 4071	Basic Transportation Engineering	Nil
4	CE 4073	Fundamentals of RCC Structure	Nil
5	CE 4075	Fundamentals of Soil Physics	Nil
6	CE 4079	Water Resources Management	Nil

MINOR IN CIVIL ENGINEERING

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 3150	Fundamentals of Structural Analysis & Design	Nil
2	CE 4151	Theory & Applications of Soil Mechanics	Nil
3	CE 4153	Hydraulics & Water Resources Engineering	Nil
4	CE 4155	Fundamentals of Environmental Engineering	Nil
5	CE 4150	Transportation & Traffic Engineering	Nil
6	CE 4152	Construction & Management of Projects	Nil
7	CE 4191	Civil Engineering Laboratory	Nil

MINOR IN WATER RESOURCES DEVELOPMENT & MANAGEMENT

Sl. No.	Course Code	Course Title	Prerequisite/s
1	CE 3152	Surface & Groundwater Hydrology	Nil
2	CE 4157	Systems Approach in Water Resources Management	Nil
3	CE 4159	Soil Mechanics in Water Resource Projects	Nil
4	CE 4161	RS & GIS For Water Resources	Nil
5	CE 4154	Gender & Legal Aspects In Water Resources	Nil
6	CE 4156	Environmental Impact Assessment of Water Resource Projects	Nil
7	CE 4193	GIS Laboratory on Water Resources	Nil

COURSES OF FIRST YEAR

MA 1003 Mathematics-I

Credit: 4
Category: BSC
Prerequisite(s): Nil

Course Description:

The laws of nature are expressed as differential equations. The construction of mathematical models to address real-world problems has been one of the most important aspects of each of the branches of science. This course is designed to familiarize the prospective engineers with techniques in ordinary differential equations, multivariate calculus and solution for ODEs numerically. This course also focuses on Linear algebra that covers system of linear equations and properties of matrices. The objective of the course is to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced levels of mathematics and applications that they would find useful in their disciplines.

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

CO1: model and formulate differential equation of Physical problems
CO2: apply different methods to solve 1st and 2nd order ODEs
CO3: apply numerical methods to solve ODEs
CO4: study differential calculus in engineering problems
CO5: use the essential tool of matrices and linear algebra
CO6: analyze Eigen-value problems

Topics:

- Ordinary Differential Equations.
- Linear differential equations of 2^{nd} order.
- Differential calculus and Numerical methods to solve ODEs
- Vector space and system linear of equations
- Matrix-eigenvalue Problems

Textbook(s):

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley, INC, (online) 10^{th} Edition.
2. Differential Calculus, Shanti Narayan and P. K. Mittal, S. Chand, reprint 2009.

Reference Book(s):

1. Higher Engineering Mathematics, Grewal B.S., Khanna Publishers, 36th edition.
2. Introduction to engineering Mathematics, Dass H.K., S.Chand & Co Ltd, 11^{th} edition.
3. Higher Engineering Mathematics, Ramana B.V., TMH, 2007.
4. A course on ordinary & Partial Differential Equation, Sinha Roy and S Padhy, Kalyani Publication, 3rd edition.

CH 1007 Chemistry

Credit: 3
Category: BSC
Prerequisite(s): Nil

Course Description:

The course depicts the basic concepts in Chemistry to strengthen fundamentals for pursuing education and research in engineering. It will help to develop the idea on feasibility and mechanism of different chemical processes, kinetics of complex reactions, idea on alternate sources of energy, modern batteries, exposure to use spectroscopic techniques for exploring structure of organic molecules and idea of different methods for synthesis of nano materials.

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

CO1: rationalize bulk properties and processes using thermodynamic consideration and apply the knowledge to decide the feasibility of a given process
CO2: analyze the kinetics of simple and multistep reactions as well as theories of reaction rates
CO3: evaluate some properties such as pH, solubility product etc. by using electrochemical cell and understand the working of modern batteries
CO4: understand the mechanism of corrosion and its different controlling measures
CO5: distinguish the different electromagnetic radiations used for exciting different molecular energy levels in various spectroscopic techniques to evaluate the structure of molecules
CO6: get an exposure to different methods used for synthesis of nanostructured materials

Topics:

- Chemical equilibrium and thermodynamics
- Chemical kinetics
- Electrochemistry
- Spectroscopy
- Chemistry of nano materials

Textbook(s):

1. Engineering Chemistry: Fundamentals and Applications- Shikha Agarwal, Cambridge University Press, 2016

Reference Book(s):

1. Textbook of Engineering Chemistry: Sashi Chawala, Dhanpat Rai and Co, 2016
2. Principles of Physical Chemistry- B.R. Puri, L.R Sharma, M.S. Pathania; 42nd Edition, Vishal Publishing Co.
3. Spectrometric Identification of Organic compaunds,7th Edition -Robert M. Silverstein, Fransis , Webster, Dravid j. Kiemle; Jhon Wiley& Sons, INC.
4. Nanostructures &Nanomaterials: Synthesis, Properties and Applications- G. Cao and Y. Wang, World Scientific Pvt. Ltd.; 2nd Edition

HS 1005 Professional Communication

Credit: 2
Category: HSMC
Prerequisite(s): Nil

Course Description:

Professional Communication is more emphasized on enhancing the four LSRW skills like Listening, Speaking, Reading and Writing in order to improve students' professional communication. It is basically designed to enhance speaking skills through pronunciation, stress and tone. This course is prepared to improve reading skills through reading, comprehending and retaining information.This course is basically expected to provide the learner an approach to communicate using all the four skills

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

CO1: understand the communication process and practical implementations in the workplace
CO2: apply verbal and non-verbal modes of communication effectively in practical situations
CO3: apply effective conflict management strategies
CO4: use English grammar correctly and unambiguously in technical writing
CO5: bridge the gap between native language and target language i.e. English
CO6: retain a logical flow while drafting reports and other technical pieces of writing

Topics:

- Communication: Process and Methods of Communication
- Basics of Grammar: Time & Tense, Subject-Verb Agreement, Analogy, Active & Passive Voice, Error Detection in Sentences
- Writing Skills: Paragraph Writing-Techniques & Skills, Use of Punctuation, Business Letter-Enquiry, Claim/ Complaint, Order
- Basic Sounds of English: Hearing & Listening, Introduction to Basic Sounds of IPA, Problem Sounds & MTI

Textbook(s):

1. Technical Communication Principles & Practices. Meenakshi Raman and Sangeeta Sharma OUP. Second Edition-2011

Reference Book(s):

1. A Communicative English Grammar. Geoffrey Leech and Jan Svartvik. Third Edition. Routledge Publication.New York.2013.
2. Effective Technical Communication. MAshraf Rizvi TMH 2005
3. The Oxford Grammar (English) Sidney Greenbaum, Oxford University Press India. 1st Edition. 2005
4. Verbal Ability and Reading Comprehension for the CAT. Arun Sharma and Meenakshi Upadhyay, TMH,New Delhi,2007
5. Better English Pronunciation, Cambridge University Press, J D O'Connor, 2nd Edition (Paper Back) 2013

LS 1001 Biology

Credit: 2
Category: BSC
Prerequisite(s): Nil

Course Description:

Biology is important to everyday life because it allows humans to better understand their bodies, their resources and the potential threats existing in the environment. The engineering undergraduates need to be suitably exposed to the biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

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

CO1: comprehend the typical characteristics which distinguish life forms and analyze life process at cellular level
CO2: apply concepts on structure and function of simple biomolecules in life processes
CO3: comprehend different biological process involved in life and to analyze their effect
CO4: understand different biological phenomenon and then relate it with engineering application domains
CO5: comprehend different physiological functions and then relate it to computer based techniques
CO6: understand biology and its relevance to engineering and technology

Topics:

- The Cellular organization of a living Organism
- The molecular and biochemical basis of an organism
- Enzymes, photosynthesis, metabolism and bioenergetics
- Molecular machines, biosensor and bioremediation
- Nervous system, immune system and cell signaling

Textbook(s):

1. Biology for Engineers. S. Thyagarajan, N. Selvamurugan, M.P Rajesh, R.A Nazeer, Richard W. Thilagarajan, S. Bharathi, M.K. Jaganathan. McGraw Hill Education (India) Ed., 2012

Reference Book(s):

1. Biology (Indian Edition), P.H. Raven and G.B. Johnson. McGraw Hill Education (India) Private Limited.
2. Concepts of Biology, Eldon D. Enger, Feederick C, Ross and David B. Bailey. TMH Publications.
3. Biology. Neil A. Campbell and Jane B. Recee, Pearson Education.
   Biology Concepts and Application, Cecie Starr, Thomson Books.

CS 1093 Computer Programming Laboratory

Credit: 4
Category: ESLC
Prerequisite(s): Nil

Course Description:

The course aims to provide exposure to problem-solving through programming. It aims to train the student to the basic concepts of the C-programming language. This course involves lab component which is designed to give the student hands-on experience with the concepts.

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

CO1: have fundamental knowledge on basics of computers hardware and number systems with concept on basics commands in Linux
CO2: write, compile and debug programs in C language
CO3: design programs involving decision structures, loops, and functions
CO4: understand the dynamics of memory by the use of pointers
CO5: use different data structures and create/update basic data files

Topics:

- Basic linux commands
- Operators and Expressions
- Branching statements (if-else, switch).
- Control statements (looping - for, while, do-while).
- Arrays
- Character Arrays (strings).
- Functions.
- Pointers and Dynamic Memory Allocation.
- Structures and Unions
- File Handling

CH 1097 Chemistry Laboratory

Credit: 1.5
Category: BSLC
Prerequisite(s): Nil

Course Description:

The Chemistry laboratory course is designed to develop basic concepts of quantitative analysis by using volumetric as well as instrumental methods. It includes classical titrations to estimate hardness, alkalinity, dissolved oxygen, ferrous ion content, chloride content in water/solution samples. It also gives hands on training to use advanced titration techniques such as potentiometric, pH metric and conductometric titrations which can be used with turbid and colored solutions in incredibly low concentrations. The course also gives an exposure to extensive use of UV-Vis spectroscopy for estimation of different ions in solution phase.

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

CO1: understand the significance of quantitative chemical analysis
CO2: prepare solutions of different concentrations and do their standardization
CO3: get an exposure to different instrumental techniques such as Conductometry, pH-metry, Potentiometry and Colorimetry
CO4: evaluate the rate constant of pseudo first order reactions
CO5: analyse basic water quality parameters like hardness, dissolved oxygen, alkalinity, ferrous iron contents
CO6: rationalize chemical handling and chemical safety in an advanced modern laboratory

Topics:

- Hardness of water sample
- Alkalinity of water
- Estimation of Fe^{2+} iron
- Dissolved Oxygen
- Potentiometric Titration
- Kinetics of Ester Hydrolysis
- Chloride Estimation
- pH metric Titration
- Conductometric Titration
- Concentration of $KMnO_4$ by Visible spectroscopy

HS 1085 Language Laboratory

Credit: 1
Category: HSMC
Prerequisite(s): Nil

Course Description:

Language Lab is more practical oriented which is designed with an objective to make the learner practice the skills which he/she has learnt in the theory I.e Listening, Speaking, Reading and Writing in order to improve their communication skills. It is basically designed to engage the students to learn to perform group activity or an individual activity. This course is prepared to improve the listening reading, speaking and writing skills . It is expected to orient the students with vocabulary, analogy, sentence completion and sentence correction.

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

CO1: use English grammar correctly and unambiguously in technical writing
CO2: apply verbal and non-verbal modes of communication effectively in practical situations
CO3: have a basic understanding of the communication process and to know the practical implementations in the workplace
CO4: retain a logical flow while drafting reports and other technical pieces of writing
CO5: develop competence in reading and comprehension
CO6: be familiar with English pronunciation and use neutral accent successfully

Topics:

- Reading & Comprehension
- Skit/ Role-Play Practice
- Listening Comprehension
- Time & Tense
- Business Letter
- Business Report
- Subject-Verb Agreement
- Visual Elements in Writing:
- Gadget-Supported Textual Formatting
- Attendance + Lab Record Checking
- Viva Voce

CE 1083 Engineering Graphics

Credit: 2
Category: ESLC
Prerequisite(s): Nil

Course Description:

The course of Engineering Graphics comprises of basics of drafting, projection of points & lines, line inclined to both the planes, projection of planes, Computer Aided Drafting, projection of solids and development of surfaces.

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

CO1: use common drafting tools properly
CO2: select, construct and interpret appropriate drawing scale as per the situation
CO3: draw orthographic projections of points, lines and planes
CO4: draw orthographic projection of solids like cylinders, cones, prisms and pyramids including sections
CO5: develop the sections of solids for practical situations
CO6: communicate ideas effectively using Computer Aided Drafting

Topics:

- Introduction to Engineering graphics
- Lettering
- Projection of points & lines
- Line inclined to both the planes
- Projection of planes
- Introduction to Computer Aided Drafting
- Projection of solids
- Section of solids
- Development of surface

Textbook(s):

1. Engineering Drawing + AutoCAD by K. Venugopal, New Age Publishers, 1st edition, 2011

Reference Book(s):

1. Engineering Drawing with an Introduction to AutoCAD by S. N. Lal, Cengage India Private Limited, 1st edition, 2017

MA 1004 Mathematics-II

Credit: 4
Category: BSC
Prerequisite(s): Nil

Course Description:

The course is to familiarize the students with series solutions of ODEs, Laplace Transforms, Fourier series, vector calculus, and numerical integration. For the ODEs with variable coefficients, the situation is more complicated to get their solutions in elementary functions. Legendre and Bessel's equations are important ODEs of this kind and their solutions, the Legendre polynomials and Bessel functions play an important role in engineering applications. Laplace transforms can be used as a mathematical toolbox for engineers to solve linear ODEs and related initial value problems. The Fourier series and vector calculus play a very important role in many engineering areas such as solid mechanics, aerodynamics, fluid flow, heat flow, quantum physics. The applied mathematician, engineer, physicist, or scientist must become familiar with the essentials of numerics and its ideas, such as interpolation and numerical integration.

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

CO1: understand application of Power series and solution of ODEs
CO2: use Power series solutions to Legendre and Bessel's equations
CO3: comprehend Laplace transform and IVPs
CO4: study periodic and non-periodic functions and their Fourier series expansion
CO5: develop vector differential and integral calculus and the applications of Green's theorem, Gauss Divergence Theorem & Stokes Theorem
CO6: apply numerical techniques in interpolation and evaluation of the definite integral

Topics:

- Series Solution of Differential Equations
- Laplace Transforms
- Fourier Series
- Vector Differential and Integral Calculus
- Interpolation and Numerical Integration

Textbook(s):

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley, INC, 10^{th} Edition.

Reference Book(s):

1. Higher Engineering Mathematics, Grewal B.S., Khanna Publishers, 36th edition.
2. Introduction to engineering Mathematics, Dass H.K., S.Chand& Co Ltd, 11^{th}edition.
3. Higher Engineering Mathematics, Ramana B.V., TMH, 2007.
4. A course on ordinary & partial differential Equation, Sinha Roy and S Padhy, Kalyani Publication, 3rd edition.

PH 1007 Physics

Credit: 4
Category: BSC
Prerequisite(s): Nil

Course Description:

This course includes the fundamentals of different types of oscillations and its applications; mathematical expression of waves and its physical interpretation; the concept of interference, diffraction and their applications; the principle, construction and working of different Lasers. The course also gives a flavour of Quantum mechanics, which is the founding stone to the state of the art in modern techniques and paves the way towards the world of nano devices. It covers the formulation of Maxwell's electromagnetic equations, and verification of different properties of electromagnetic waves. Mechanical and magnetic properties of different materials and their applications are also covered in this course.
Course Outcomes: At the end of the course, the students will be able to:

CO1: utilize the concept of waves and intensity modulation in day to day life through various applications
CO2: apply the mechanism of LASER technology in different fields
CO3: formulate and solve engineering problems of electricity and magnetism using Maxwell's electromagnetic equations
CO4: apply the principles of quantum mechanics to related problems
CO5: apply the knowledge of magnetic materials in related applications
CO6: analyze the macroscopic behavior of solids and utilize them in future applications

Topics:

- Oscillation and wave
- Interference and diffraction
- LASER
- Quantum mechanics
- Electromagnetism
- Properties of matter (mechanical)
- Magnetism

Textbook(s):

1. Engineering Physics, B. K. Pandey and S. Chaturvedi, Cengage Publication, New Delhi

Reference Book(s):

1. Introduction to Electrodynamics, D J Griffiths, Pearson Education
2. Quantum Mechanics, L. I. Schiff, Tata McGraw-Hill Publications
3. Optics, A K Ghatak, Tata McGraw-Hill Publications
4. Concepts of Modern Physics, A. Beiser, Tata McGraw-Hill Publications
5. Engineering Physics, R K Gaur and S. L. Gupta, Dhanpat Rai Publications, New Delhi.

EE 1003 Basic Electrical Engineering

Credit: 3
Category: ESC
Prerequisite(s): Nil

Course description:

This course depicts on generating stations (Thermal, Hydro, Nuclear and Solar Photovoltaic Stations), transmission of powers (overhead transmission lines and underground cable); distribution system (AC and DC), types of wiring, types of batteries, safety measures, necessity of earthing and fuse. The basic concepts of DC and AC (Single Phase and Three Phase Circuits) network analysis, DC transients, AC networks (1-Phse and 3-Phase), AC series circuit resonance and magnetic circuits. This course will also cover single phase transformers, three Phase Induction machines, measuring Instruments and illumination.

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

CO1: explore the electric supply systems, safety measures and illumination
CO2: solve the different parameters in the DC circuits
CO3: solve the different quantities of 1-Phase and 3-Phase AC circuits
CO4: interpret the behavior of magnetic circuits
CO5: illustrate the application of transformer and induction motors
CO6: demonstrate electrical instruments for measurement

Topics:

- Introduction to electrical energy
- Safety measures in electrical system
- Types of wiring, batteries
- DC circuits
- Network theorems
- AC circuits
- Magnetic circuits
- Transformer and induction motors
- Measuring instruments
- Illumination

Textbook(s):

1. Basic Electrical Engineering by D.C. Kulshreshtha, Tata Mcgraw publication, 1st Edition 2011.
2. Basic Electrical Engineering, T.K. Nagasarkar and M.S. Sukhija, Oxford University press, 3rd Edition 2017.

Reference Book(s):

1. Basics Electrical Engineering Sanjeev Sharma, I.K.International, New Delhi (Third Reprint 2010).
2. Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand and Company, New Delhi (Revised Edition 2013).

ME 1003 Engineering Mechanics

Credit: 2
Category: ESC
Prerequisite(s): Nil

Course Description:

The course on Engineering Mechanics is a specialized need-based extension of applied physics which is aimed at developing an understanding of the principle of statics and dynamics. The course focuses on learning methodical and logical idealization and subsequent implementation of corresponding procedures for analysis of rigid body, frame and machine under the action of force system which is highly essential for effective design. The course intends to develop the ability of drawing and analyzing the free body diagram of a system when at rest or motion using scalar/vector techniques. Further, the course serves as a prerequisite to fundamental machine design courses such as mechanics of solids and design of machine elements.

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

CO1: draw complete and correct free-body diagrams and write the appropriate equilibrium equations from the free-body diagram
CO2: use scalar analytical techniques for analyzing forces and moments in mechanical systems
CO3: analyzing forces in statically determinate structures such as trusses, frames and problems related to friction
CO4: determine the centroid and second moment of area
CO5: apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple and practical problems
CO6: solve real-life problems by using mathematics, physical laws and theorems

Topics:

- Concurrent Forces in a Plane
- Friction
- Parallel Forces in a Plane
- Moment of Inertia
- Force analysis of Plane Trusses
- Principle of Virtual Work
- Kinematics of Rectilinear Motion
- Kinematics of Curvilinear Motion
- Rotation of a rigid body

Textbook(s):

1. Engineering Mechanics (Revised 5th edition), TMH by S. Timoshenko, D.H. Young, J.V Rao and S. Pati.

Reference Book(s):

1. Engineering Mechanics (Statics and Dynamics) - Bear and Johnson, TMH
2. Engineering Mechanics (Statics and Dynamics) by I.H. Shames, Prentice Hall
3. Engineering Mechanics –S.S. Bhavikatti, New Age International
4. Engineering Mechanics (Statics and Dynamics)-S. Rajasekaran & G Sankarasubramanian, Vikas Publishing House.

PH 1097 Physics Laboratory

Credit: 1.5
Category: BSLC
Prerequisite(s): Nil

Course Description:

This lab course covers different measurement techniques of various parameters using the instruments i.e. interferometer, spectrometer, spherometer, Screw gauge, vernier calliper, microspope, and telescope. It includes the application of photoelectric effect and photovoltaic effect in photo cell and solar cell respectively. Evaluation of the mechanical strength of materials by calculating elastic constants such as Young's modulus, rigidity modulus and Poisson's ratio are also included. This course provides hands on training for the usage of electrical, optical and mechanical systems for various measurements with precision and analysis of the experimental data by graphical interpretation and error calculation.

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

CO1: calculate appropriate structural members using the fundamental concepts of the elastic behavior of materials
CO2: use the principles of interference and diffraction to find out the wavelength of an unknown monochromatic source of light
CO3: apply the concept of photoelectric emission to calculate the Planck's constant and analyze some aspects of electron-photon interaction through characteristic curves
CO4: explore the efficiency in terms of power output of a green energy source i.e. solar cell
CO5: calculate the acceleration due to gravity 'g' by using the concept of a compound pendulum

Topics:

- Estimation of elastic constants such as Young's modulus, rigidity modulus and Poisson's ratio
- Determination of wavelength of unknown source using Newton's rings and Michelson's interferometer
- Precision length measurement up to the order of 6 A° (distance between sodium D-lines) using Michelson interferometer
- Determination of grating element using a diffraction grating
- Study of photo cell and solar cell by analyzing their characteristic curves
- Determination of acceleration due to gravity using a bar pendulum

EE 1093 Basic Electrical Engineering Laboratory

Credit: 1
Category: ESLC
Prerequisite(s): Nil

Course Description:

The course of Basic Electrical Engineering lab comprises of various equipments and loads i.e voltmeters, ammeters, wattmeters, single phase and three phase transformer, induction motors etc. It is a specialized practical oriented course which intends to develop and understand various principles like Ohm's law and Kirchoff's law. The course focused on learning methodical and logical idealization of various theorems which is highly essential for solving a network. The course intends to make the students familiar with various parts of DC machines and AC machines. The course intends to develop the ability of problem solving by analyzing RL and RLC series circuits. This lab helps the students to understand the principle of operation of a single phase transformer with its no load calculation.

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

CO1: recall the safety practices in the laboratory and the associated work areas
CO2: comprehend the skills for working in a team with common objective
CO3: apply different theorems to find the parameters in DC and AC circuit
CO4: analyse the different parts of DC and AC machines to describe operational features thereof
CO5: apprise the experimental results in systematic manner
CO6: discuss about determination of resistance in incandescent lamp and power factor in fluorescent lamp

Topics:

- measurement of resistance of tungsten filament lamp
- measurement of inductance of a choke coil
- study and use of megger
- study of different parts of dc machine and three phase induction motor
- layout of power system analysis
- determination of voltage ratio of a single phase transformer
- measurement of no load current and core loss of a single phase transformer
- verification of KCL and KVL
- verification of voltage and current ratio of star and delta connection
- study & determine the power factor of the RLC series circuit
- study, connection & determine the power factor of fluorescent tube
- verification of the superposition theorem
- transient analysis of series RL and RC circuit using matlab-simulink with dc excitation

Textbook(s):

1. Basic Electrical Engineering by D.C. Kulshreshtha, Tata Mcgraw publication, 1st Edition 2011.
2. Basic Electrical Engineering, T.K. Nagasarkar and M.S. Sukhija, Oxford University press, 2nd Edition 2011.

Reference Book(s):

1. Basics Electrical Engineering Sanjeev Sharma, I.K. International, New Delhi (Third Reprint 2010).
2. Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand and Company, New Delhi (Revised Edition 2013)

3. Basic Electrical Engineering Abhijit Chakrabarti,Sudip Nath,Chandan Kumar Chnada,Tata McGraw Hill Publishing Limited,New Delhi, 2007

ME 1083 Basic Manufacturing Systems

Credit: 2
Category: ESLC
Prerequisite(s): Nil

Course Description:

This laboratory practice is designed to impart students the basic knowledge on manufacturing or developing a given object irrespective of their branch of engineering. While furnishing the given object, students will familiar with various mechanical operations and the respective tools or machines. This course involves four different sections namely Fitting, Welding, Turning and Sheet metal which covers both conventional and advanced tools to provide students the updated manufacturing experience. Students are also advised with various safety precautions to be followed during a specific manufacturing practice. At the end, students will also gain knowledge on different advanced machines such as CNC and 3D printing.

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

CO1: practice different operations related to fitting shop
CO2: use different welding tools to prepare a given type of joint
CO3: demonstrate various turning operations including taper turning and knurling using a conventional lathe machine
CO4: design a tray and prepare it using sheet metal equipment involving soldering
CO5: appraise different operations using a CNC machine
CO6: interpret different advanced machines such as 3D printing/additive manufacturing

Topics:

- Turning operations
- Sheet metal operations
- Fitting
- Welding

CH 1081 Environmental Science

Credit: 1
Category: BSLC
Prerequisite(s): Nil

Course Description:

The course is designed to make the students aware of different environmental components and their composition. It will make the students understand different pollutants, their sources and management. It will also help students to apply the principles of Green Chemistry and implement them in synthesis of advanced materials required for engineering applications. It also outlines the basic steps for developing the EIA statements

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

CO1: understand the different components and composition of the environment
CO2: rationalize the different pollutants, their sources, effects and controlling measures
CO3: quantify water quality parameters
CO4: apply the systematic environmental impact assessment (EIA) requirements before setup of any project
CO5: understand and implement the principles of solid waste management
CO6: conceptualize the principles of green chemistry and implement them in synthesis of advanced material, so as to reduce the pollution

Topics:

- Overview on environment
- Environmental pollution: air pollution, water pollution
- Pollution management

Textbook(s):

1. Environmental Chemistry, A. K. De, New Age International Publishers.

Reference Book(s):

1. Environmental Chemistry- S. Chakroborty, D. Dave, S.S. Katewa, Cengage Publishers
2. Environment Science and Engineering, Aloka Debi. Second Edition ;Universities Press
3. Text Book of Environment studies for under graduate courses, Erach Bharucha : 2nd Edition, Universities Press
4. Fundamentals of Environment and Ecology, D. De, D. De; 2013, S. Chand Group
5. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publishing Company

COURSES OF THE PROGRAMME

CE 2100 Geotechnical Engineering-I

Credit: 3
Category: PCC
Prerequisite(s): Mechanics of Materials (CE 2103)

Course Description:

Geotechnical Engineering defines soil properties and strength, as well as the mechanics of soil and rocks. It involves other important Earth materials like snow, clay, silt, and sand. Determine the seepage pressure in soil due to the groundwater using the graphical method. Also, determine the effective stress under various conditions to lead failure of hydraulic structures by piping. Evaluate various shear strength parameters of soil and evaluate the compaction methods and field compaction control. Determine the long-term settlement of foundation base on consolidation theory.

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

CO1: identify the soil types and classify based on index properties
CO2: evaluate the capillarity and permeability characteristics of soils
CO3: determine the seepage pressure in soil
CO4: estimate effective stress under various conditions to lead failures of hydraulic structures by piping
CO5: determine various shear strength parameters of soil
CO6: determine the long-term settlement of foundations based on one dimensional consolidation theory

Topics:

- Introduction and Classification
- Permeability of soils
- Effective stress principle
- Seepage analysis
- Compaction of Soils
- Consolidations of Soils

Textbook(s):

1. Soil Mechanics & Foundation Engineering by P. Purushothama Raj, Pearson Education India, 2013
2. Soil Mechanics & Foundation Engineering by B. C. Punmia, Ashok K. Jain & Arun Kumar Jain, 4th Edition, Laxmi Publication, New Delhi.
3. Soil Mechanics & Foundation Engineering by B.N.D Narasinga Rao, Wiley India Pvt Ltd, New Delhi, 1st Ed 2015.

Reference Book(s):

1. Principle of Geotechnical Engineering by B. M. Das & Khaled, 8th Edition, Global Engineering, USA.
2. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publisher, 2012
3. Soil Mechanics and Foundation Engineering by V.N.S. Murthy, CBS Publisher, 2012
4. Basic and applied soil mechanics by Gopal Ranjan & A. S. R. Rao, New age international publication, 2012

CE 2101 Fluid Mechanics

Credit: 4
Category: PCC
Prerequisite(s): Engineering Mechanics (ME 1003)

Course Description:

Learn and use the concept of fluid static, kinematics, dynamic behaviour; understand and apply the concept of laminar flow, dimensional and model analysis; and also understand the concept of boundary layer theory and pipe flow and its application.

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

CO1: apply the basic equations of fluid statics to manometers, planar and curved surfaces submerged in a static fluid for the determination of forces and also estimate the buoyancy and stability
CO2: know the concept of fluid kinematics, stream functions, velocity potentials and Laplace equation
CO3: use Euler's and Bernoulli's equations and the conservation of mass to determine velocities, pressures and accelerations for fluids
CO4: perform dimensional analysis problems in fluid mechanics
CO5: apply the concepts of laminar and turbulent boundary layer
CO6: determine the minor and major head losses for flows through pipes and design simple pipe systems to deliver fluids under specific conditions

Topics:

- Fluid-Statics
- Fluid Kinematics
- Fluid Dynamics
- Laminar Flow
- Dimensional Analysis & Model Analysis
- Boundary Layer Theory
- Pipe flow

Textbook(s):

1. Fluid mechanics by Frank M. White, 7th Edition, Tata McGraw-hill Publication, New Delhi.
2. Engineering Fluid Mechanics by R. J. Garde & A.G. Mirajgaonker, Scitech Publications (India) Pvt. Ltd.
3. Fluid Mechanics & Hydraulic Machines by Sukumar Pati, 1st Edition, Tata McGraw-hill Publication.

Reference Book(s):

1. Hydraulics & Fluid Mechanics by P. N. Modi & S. M. Seth, 19th Edition, Rajsons Publication Private Limited.
2. Fluid Mechanics by V.L. Streeter, E.B. Wylie & K.M. Bedford, 9th Edition, Tata McGraw-hill Publication, New Delhi.

CE 2102 Surface Hydrology & Hydraulics

Credit: 3
Category: PCC
Prerequisite(s): Fluid Mechanics (CE 2101)

Course Description:

Learn about different measurement, preparation and presentation of rainfall and various abstractions of precipitation, estimate the runoff and know the various aspects of hydrograph and explain the various types of flow and solve problems of uniform and gradually varied flow.

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

CO1: check the consistency of rainfall data and calculate the probability of rainfall over a given return period
CO2: explain the evaporation process, measurement and modeling of infiltration
CO3: estimate the runoff by various methods
CO4: understand the various aspects of hydrograph and develop unit hydrograph
CO5: explain the types of flows and analyze uniform flow calculations in open channels
CO6: solve problems for gradually varied flow in open channel

Topics:

- Precipitation
- Abstractions from Precipitation
- Runoff
- Hydrograph
- Uniform flow
- Gradually varied flow

Textbook(s):

1. Engineering Hydrology by K. Subramanya, Tata McGraw Hill, 4th Ed. End reprint 2016.
2. Flow in Open Channels by K. Subramanya, 4th Edition, TMH Education Pvt. Ltd, New Delhi

Reference Book(s):

1. Applied Hydrology by V.T. Chow, D.R. Maidment and L.W. Mays, Tata Mc. Graw Hill, 1st Ed., First Indian Reprint 2010.
2. Water Resources Engineering by L.W. Mays, Wiley Publication, 2nd Edition, First Indian Reprint 2001.
3. Irrigation and Water Power Engineering by B.C. Punmia, Pande B.B. lal, A.K. Jain and A.K. Jain, Laxmi Publishers, 16th Ed., End Reprint 2009.

CE 2103 Mechanics of Material

Credit: 4
Category: PCC
Prerequisite(s): Engineering Mechanics (ME 1003)

Course Description:

Determination of the stresses and strains of different types of structural members and drawing of bending moments and shear forces of simple beams

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

CO1: determine different stress and strain in materials under various loading conditions
CO2: select appropriate method to locate failure planes in materials for different loading condition
CO3: analyze bending and shear stresses and draw SF and BM diagrams of simple beams
CO4: analyze torsion in solid and hollow circular shafts
CO5: estimate critical load of compression members for different support conditions
CO6: determine different stress and strain in cylinders & shells

Topics:

- Simple Stresses and Strains
- Compound Stresses and Strains
- Bending Stress &Shear Stresses in Beams
- Torsion
- Columns & Struts
- Cylinders & Shells

Textbook(s):

1. Strength of Material by S. S. Ratan, Second Edition, TMH Education Pvt. Ltd, New Delhi
2. Strength of Material by R. K. Rajput, Fifth Edition, S. Chand and Co. Ltd.

Reference Book(s):

1. Strength of Materials‖ by G. H. Ryder, Third Edition, Macmillan Publisher India Ltd
2. Elements of strength of Materials‖ by S. Timoshenko & D. H. Yong, Fifth Edition, EWP an east-west edition
3. Engineering Mechanics of Solids by E. P. Popov, Second Edition, PHI Publisher Ltd
4. Mechanics of Materials‖ by Gere & Timoshenko Second Edition CBS Publisher.

CE 2104 Structural Analysis

Credit: 4
Category: PCC
Prerequisite(s): Engineering Mechanics (ME 1003), Mechanics of Materials (CE 2103)

Course Description:

Determine slope, deflection and internal forces in different types of structural members like determinate and indeterminate beams, plane and space truss, two hinge arches and suspension cables.

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

CO1: determine slope and deflection of determinate and indeterminate beams and frames
CO2: determine internal forces in members of plane, space truss, three, two hinged arches and suspension cables
CO3: determine absolute maximum internal forces due to Influence line diagrams, rolling or moving loads
CO4: determine the degree of static and kinematics indeterminacy of various types of structure and selection of method of analysis
CO5: determine the internal force components of beams and frames using slope deflection & moment distribution
CO6: determine the internal force components of beams and frame using strain energy and consistent deformation method

Topics:

- Slope and Deflection of Beams
- Analysis of Trusses
- Influence Lines and Rolling Loads
- Analysis of Redundant Structures
- Consistent deformation method / Force method
- Slope Deflection Method
- Moment Distribution Method
- Arches and Cables

Textbook(s):

1. Analysis of Structure Vol. I and Vol. II by V. N. Vazirani, M.M Ratwani and S.K Dugal, Khanna Publisher, New Delhi
2. Structural Analysis Vol. I and Vol. II by S.S. Bhavikatti, Fourth Edition, Vikas Publishing House Pvt, New Delhi.
3. Indeterminate Structural Analysis by C. K. Wang, 1st Eighth Edition, TMH Pvt Ltd. New Delhi.

Reference Book(s):

1. Theory of Structure‖ by S Ramamrutham and R Narayan, Dhanpat Rai, 1993
2. Structural Analysis by R C Hibbeler, Eighth Edition, Pearson Education India, 2012

CE 2105 Environmental Engineering-I

Credit: 3
Category: PCC
Prerequisite(s): Nil

Course Description:

The subject includes characteristics of water and wastewater, IS and WHO standards, general requirements of water supply, Pumping and Transportation of water, water treatment plant for groundwater and surface water, air pollution meteorology, air quality standards and limits, measurement of noise and control of noise pollution.

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

CO1: estimate the water demand for a particular area
CO2: characterize physical and chemical parameters responsible for water pollution
CO3: characterize biological parameters of water and its significance
CO4: design various units of a water treatment plant
CO5: identify and control the parameters responsible for air pollution
CO6: identify and control the parameters responsible for noise pollution

Topics:

- Water Supply Engineering
- Engineered systems for water treatment
- Air Pollution
- Noise Pollution

Textbook(s):

1. 1.Environmental Engineering (Vol. I) Water Supply Engineeringby S.K. Garg, Khanna Publishers, 2017.
2. 2.Environmental Engineering (Vol. II) Sewage Disposal and Air Pollution Engineering by S.K. Garg, Thirty Seventh edition, Khanna Publishers, 2017.
3. 3.Environmental Engineering, H.S. Peavy, D.R. Rowe, & G. Tchobanoglous, Seventh Edition, McGraw Hill, 1985.

Reference Book(s):

1. Process chemistry for water and wastewater treatment by L.D. Benefield, J. F. Judkins and B.L. Weand, 1st edition, Prentice - Hall Series, 1981.
2. Introduction to Environmental Engineering by M.L. Davis & D.A. Cornwell, Fourth Edition, Tata McGraw Hill, 2010.
3. Unit Operations and Processes in Environmental Engineering by T.D. Reynolds & P.A. Richards, Second Edition, PWS Publishing Company, CENGAGE Learning, 2009.
4. Manual on water supply and Treatment, CPHEEO, Ministry of Urban Development, GoI, New Delhi, 2009.
5. Water Supply Engineering by B.C. Punmia, A.K. Jain and A.K. Jain, Laxmi Publications (P) Ltd., 2016.
6. Wastewater Engineering (including air pollution) by B.C. Punmia, A.K. Jain and A.K. Jain, Laxmi Publications (P) Ltd., 2016.

CE 2106 Environmental Engineering-II

Credit: 3
Category: PCC
Prerequisite(s): Environmental Engineering-I (CE 2105)

Course Description:

The subject includes generation and collection of wastewater and design of sewerage system. It will provide insight of sewage treatment plant focusing on component parts. Apart from this the solid waste management portion covers characteristics, generation, collection and transportation of solid wastes and engineered systems for solid waste management.

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

CO1: estimate sewage and storm water discharge for designing of sewers
CO2: explain essential features of various types of sewer appurtenances
CO3: characterize physical, chemical and biological parameters of wastewater
CO4: design modern and low-cost wastewater treatment plants
CO5: assess the impact of sewage discharge on land and water bodies
CO6: characterize solid wastes and select proper methods for their collection, transportation and treatment

Topics:

- Wastewater Engineering
- Treatment of sewage
- Disposal of effluent and sludge in land and water bodies
- Sewer Appurtenances
- Municipal Solid Waste Management

Textbook(s):

1. Environmental Engineering (Vol. II) Sewage Disposal and Air Pollution Engineering by S.K. Garg, Thirty Seventh edition, Khanna Publishers, 2017.
2. Environmental Engineering, H.S. Peavy, D.R. Rowe, & G. Tchobanoglous, Seventh Edition, McGraw Hill, 1985.

Reference Book(s):

1. Wastewater Engineering: Treatment and Reuse by Metcalf & Eddy, Inc., 5th Edition, Tata McGraw-Hill, New Delhi, 2013
2. Process chemistry for water and wastewater treatment by L.D. Benefield, J.F. Judkins and B.L. Weand, 1st edition, Prentice - Hall Series, 1981.
3. Biological process design for wastewater treatment by C.W. Randall and L.D. Benefield, 1st edition, Prentice - Hall Series, 1980.
4. Unit Operations and Processes in Environmental Engineering T.D. Reynolds & P.A. Richards, Second Edition, PWS Publishing Company, CENGAGE Learning, 2009.
5. Manual on water supply and Treatment by CPHEEO, Ministry of Urban Development, GoI, New Delhi, 2009.

CE 2107 Surveying and Geomatics

Credit: 3
Category: PCC
Prerequisite(s): Nil

Course Description:

Survey for road and other construction project using chain, compass, theodolite, levelling instruments, tachometry, geodetic surveying.

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

CO1: apply the basic principles of surveying and carry out the survey using chain, compass, plane table and theodolite in the field
CO2: plan a survey for applications such as road alignment and height of the building
CO3: perform levelling and contouring of given ground
CO4: employ appropriate survey methods in land survey, construction projects and to generate maps
CO5: develop skill to carry out tachometry, geodetic surveying wherever situation demands
CO6: invoke advanced surveying techniques over conventional methods in the field of civil engineering

Topics:

- Chain and compass surveying
- Levelling
- Tacheometric surveying
- Trigonometrical levelling

Textbook(s):

1. A Textbook of Surveying and Leveling‖ by R. Agor; Khanna Publishers
2. Surveying Vol. I‖ by S. K. Duggal; McGraw Hill Education (India) Private Limited.

Reference Book(s):

1. Surveying Vol. I by B. C. Punmia, Ashok K. Jain & Arun K. Jain; Laxmi Publications (P) Ltd.
2. Surveying and Levelling by R. Subramanian; 2nd Edition, Oxford publications, New Delhi.
3. Plane Surveying by Alak De, Reprint 2016, S Chand & Company Pvt. Ltd.
4. Surveying and Leveling (Part 1) by T. P. Kanetkar & S. V. Kulkarni; Pune Vidyarthi Griha
5. Prakashan.
6. Surveying and Leveling by N. N. Basak; Tata McGraw-Hill Pvt. Ltd.
7. Surveying and Leveling by S.C. Rangwala, K.S. Rangwala & P.S. Rangwala; Charotar Publishing House Pvt. Ltd.

CE 2108 Construction Planning & Management

Credit: 3
Category: PCC
Prerequisite(s): Nil

Course Description:

The subject attempts to inculcate the fundamentals of construction management among undergraduate students. It aims to make student understand about how to manage construction projects, understand the phases of construction, managing resources in terms of implementing and executing construction projects.

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

CO1: understand the different parameters of construction management
CO2: optimize the cost and time of a Project by using CPM & PERT
CO3: understand various aspects of contract
CO4: describe material procurement method and control for a project
CO5: select appropriate construction equipment
CO6: identify different aspects of DPR preparation

Topics:

- Construction Management – Introduction and tools to manage projects
- Project planning – scheduling, resource levelling, costing
- Contracts – Bidding, award of contract, arbitration
- Method of construction- Construction equipment and its planning

Textbook(s):

1. Construction Planning & Management, by U. K. Shrivastava, Galgotia Publications Pvt. Ltd, 2010
2. Construction Project Management: Theory and Practice, by Kumar Neeraj Jha, Pearson Education, 2nd Edition, 2015.

Reference Book(s):

1. Basics of Construction Management by Ajay Kumar Singhal, Skill Enhancement Academy, 1st Edition, 2015
2. Construction Planning & Management, by P.S. Gahlot and B.M. Dhir, New Age International (P) Limited Publishers,2012
3. Estimating and costing, by B. N. Dutta, UBSPD, 2013
4. Construction Management & Planning, by B. Sengupta & H. Guha, TMH Education (P) Ltd, New Delhi.
5. Construction Planning Equipment and methods, by R.L. Peurifoy, McGraw-Hill Education (India) Pvt. Ltd, Latest Ed.
6. Construction Planning and Plant, by A. J. Ackerman & C.H. Locher, McGraw Hill Company,1940
7. Construction Equipment and its Planning and application, by M. Verma, Metropolitan Book Co. 1975.

CE 2109 Civil Engineering Materials & Construction

Credit: 3
Category: PCC
Prerequisite(s): Nil

Course Description:

This course includes determination of different properties of construction materials like stones, bricks and timber, different types of foundations, masonries, doors, windows and floors for construction.

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

CO1: understand the properties of stones and bricks
CO2: learn different properties of cement and concrete
CO3: acquire knowledge on properties of timber
CO4: learn about different types of foundations
CO5: identify different types of masonries
CO6: select different types of doors, windows and floors for construction

Topics:

- Stones, bricks and timber
- Cement and concrete
- Foundation
- Masonry
- Door & Windows
- Floors

Textbook(s):

1. Building Material by M. L. Gambhir, 1st Edition, TMH Education, New Delhi.
2. A Textbook of Building Construction by S. K. Sharma, Revised Edition, S. Chand Publication, Latest Edition.
3. Building Material by S. S. Bhavikatti, Latest Edition, Vikas Publication.

Reference Book(s):

1. Building Construction‖ by B.C. Punmia, Jain & Jain, 10th Edition, Laxmi Publication, New Delhi.
2. Building Material‖ by P.C. Verghese, PHI Learning (P) Ltd., New Delhi, 2005
3. Engineering Materials‖ by S.C. Rangwala, Charotar Publishing House, 2011.

CE 2180 Structural Analysis Applications

Credit: 1
Category: PCLC
Prerequisite(s): Engineering Mechanics (ME 1003), Mechanics of Materials (CE 2103)

Course Description:

Analysis of different kind of civil engineering structures like beam, frames, truss, arch and suspension cables.

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

CO1: determine slope and deflection of determinate and indeterminate beams and frames
CO2: determine internal forces in members of plane, space truss, three, two hinged arches and suspension cables
CO3: determine absolute maximum internal forces due to Influence line diagrams rolling or moving loads
CO4: determine the degree of static and kinematics indeterminacy of various types of structure and selection of method of analysis
CO5: determine the internal force components of beams and frames using slope deflection and moment distribution
CO6: determine the internal force components of beams and frames using strain energy and consistent deformation method

Topics:

- S.F.D and B.M.D
- Influence line diagram
- Arches and Cables
- Slope and deflection
- Three Hinged Arches

Textbook(s):

1. Analysis of Structure Vol. I and Vol. II by V. N. Vazirani, M.M Ratwani and S.K. Duggal, Khanna Publisher, New Delhi

Reference Book(s):

1. Structural Analysis Vol. I and Vol. II by S.S. Bhavikatti, Fourth Edition, Vikas Publishing House Pvt, New Delhi.
2. Indeterminate Structural Analysis by C. K. Wang, Eighth Edition, TMH Pvt

CE 2182 Hydraulics & Hydrologic Design

Credit: 1
Category: PCLC
Prerequisite(s): Fluid Mechanics (CE 2101)

Course Description:

This course includes evaluating the consistency of rainfall data, estimating the probability of rainfall, fitting various infiltration models, determining the surface runoff and deriving the unit hydrograph and analyzing problems of uniform and gradually varied flow in open channels.

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

CO1: check the consistency of rainfall data, develop DAD curves and calculate the probability of rainfall over a given return period
CO2: fit infiltration capacity models based on observed data
CO3: estimate the surface runoff by SCS-CN method
CO4: derive and apply the concept of unit hydrograph
CO5: analyze uniform flow calculations in open channels
CO6: solve problems for gradually varied flow in open channel

Topics:

- Double mass curve
- Probability analysis using Weibull's formula
- Infiltration Modeling
- Runoff estimation by SCS-CN method
- Unit and Flood Hydrograph
- Uniform flow
- Gradually varied flow

Textbook(s):

1. Engineering Hydrology by K. Subramanya, Tata McGraw Hill, 4th Ed. End reprint 2016.

Reference Book(s):

1. Flow in Open Channels by K. Subramanya, 4th Edition, TMH Education Pvt. Ltd, New Delhi

CE 2190 Geotechnical Engineering Laboratory

Credit: 1
Category: PCLC
Prerequisite(s): Nil

Course Description:

This laboratory encompasses basic tests to ascertain soil properties like atterberg limits, density, specific gravity. It also covers the determination of shear strength by direct shear, UCS, triaxial test. Students will also learn consolidation characteristics of soil.

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

CO1: identify the types of soil
CO2: determine the change in properties of soil with the water content
CO3: learn various laboratory test procedures normally used in geotechnical engineering
CO4: determine index and shear strength properties of soils
CO5: determine hydraulic properties of soils
CO6: determine compaction and consolidation properties of soils

Topics:

- Introduction to various tests of soil
- Determination of density of soil by core cutter method and by sand replacement method
- Determination of specific gravity of soil
- Grain size distribution using dry sieving and wet sieving
- Determination of relative density of soil
- Determination of liquid limit, plastic limit and shrinkage limit of a soil
- Determination of coefficient of permeability of soil (By Constant head)
- Determination of optimum moisture content and maximum dry density of soil by standard Proctor method
- Determination of shear strength of soil by direct shear apparatus, unconfined compressive strength test, vane shear apparatus and triaxial test
- Determination of consolidation parameter of soil

Textbook(s):

1. Soil Mechanics & Foundation Engineering by B. C. Punmia, Ashok K. Jain & Arun Kumar Jain, 4th Edition, Laxmi Publication, New Delhi.

Reference Book(s):

1. IS: 2720, (Part 1-30). Methods of Test for Soils. Bureau of Indian Standards, New Delhi.
2. Geotechnical Engg. Laboratory Manual, SCE, KIIT (DU).

CE 2191 Environmental Engineering Laboratory

Credit: 1
Category: PCLC
Prerequisite(s): Chemistry Laboratory (CH 1007)

Course Description:

This course includes the laboratory procedures for determination of physical, chemical and biological characteristics of water and wastewater. and assessment of noise pollution.

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

CO1: determine physical characteristics of water and wastewater
CO2: determine chemical characteristics of water and wastewater
CO3: determine biological characteristics of water and wastewater
CO4: determine optimum dosage of coagulant
CO5: assess the quality of water and wastewater
CO6: assess the noise pollution through measurement of sound pressure level

Topics:

- pH of the water sample
- Acidity of water sample
- Alkalinity of water sample
- Determination of Total Hardness of a given water sample
- Concentration of chlorides in given water sample
- Optimum coagulant dosage
- Total solids in water sample
- Determination of dissolved oxygen in water sample
- Determination of BOD of water sample
- Determination of COD of the water sample
- Sound intensity levels

Textbook(s):

1. IS: 3025 – 2019 Methods of sampling and test (Physical and Chemical) for water and wastewater
2. IS: 10500 – 2012 Indian Standard Drinking Water — Specification
3. Water Supply Engineering, Environmental Engineering I by S.K. Garg, Khanna Publishers, 2010.

Reference Book(s):

1. Chemistry for Environmental Engineering by C. N. Sawyer and Perry L. McCarty, McGraw-Hill Book Company.1988.

CE 2192 Fluid Mechanics Laboratory

Credit: 1
Category: PCLC
Prerequisite(s): Nil

Course Description:

Understand the theory and application of Bernouli's Theorem, determine the coefficient of discharge of venturimeter, orificemeter and notches, identify the different regimes of flow, estimate various losses through pipes and describe the impulse-momentum principle.

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

CO1: verify Bernoulli’s theorem
CO2: determine the coefficient of discharge of venturimeter, orificemeter and notches
CO3: determine the metacentric height of floating body
CO4: identify the types of flow using Reynold's apparatus
CO5: determine Darcy's friction factor and minor losses through pipes
CO6: verify the impulse-momentum principle

Topics:

- Verification of Bernoulli’s theorem
- Coefficient of discharge (Cd) of Venturi meter
- Coefficient of discharge (Cd) of Orifice meter
- hydraulic coefficients (Cc, Cv, Cd) of Circular Orifice
- metacentric height of a floating body
- different regimes of flow by Reynold’s apparatus
- Coefficient of Discharge (Cd) of Triangular and Rectangular Notch
- impulse momentum principle for impact of Jet on vane
- Darcy’s friction factor for different pipes
- Minor losses in pipes

Textbook(s):

1. Fluid Mechanics & Hydraulic Machines by R.K. Bansal, 9th Edition, Laxmi Publications (P) Ltd.

Reference Book(s):

1. Engineering Fluid Mechanics by R. J. Garde & A.G. Mirajgaonker, Scitech Publications (India) Pvt. Ltd.

CE 2193 Surveying Field Work

Credit: 1.5
Category: PCLC
Prerequisite(s): Nil

Course Description:

In this laboratory course, the students will perform experiments such as, conventional signs of survey, closed traversing using chain and prismatic compass, fly, profile and cross-sectional levelling by auto level, plotting of contour map, theodolite survey, road profile levelling using total station and preparation of the map using GPS.

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

CO1: perform closed traversing using metric chain and prismatic compass
CO2: carry out various types of levelling using auto level
CO3: prepare a contour map of a locality
CO4: determine horizontal and vertical angle using transit theodolite and determine horizontal distance using tacheometer
CO5: perform road profile levelling using Total Station
CO6: prepare a map using GPS

Topics:

- Conventional signs of Survey
- Closed traversing using metric chain and prismatic compass
- Fly, profile and cross-sectional levelling by Auto level
- Horizontal and Vertical angle by transit theodolite
- Total station operation
- Tacheometer
- GPS

Textbook(s):

1. Surveying Volume I by B. C. Punmia, Er. Ashok K. Jain, Dr. Arun K. Jain, Laxmi Publication (P) Ltd., New Delhi.

Reference Book(s):

1. A Textbook of Surveying and Levelling by R. Agor, Khanna Publishers, New Delhi.

CE 2195 Material Testing Laboratory

Credit: 1
Category: PCLC
Prerequisite(s): Civil Engineering Materials & Construction (CE 2109)

Course Description:

The laboratory course has been prescribed to enhance the understanding of the behaviour of basic construction materials like cement, sand, brick and concrete and their optimum usage and quality control in construction and field application. The course focuses on analyzing experimental data inferring material quality and readjustment required to meet the field requirements and precautions. The course emphasizes handling of equipment in experimental work consciously with possible minimization of experimental error following all safety measures and precautions.

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

CO1: learn the quality control and optimum usage of basic building materials in field
CO2: test and learn significant physical and mechanical properties of OP Cement
CO3: test and learn absorption and strength properties of standard clay brick
CO4: test and learn significant physical property of fine aggregate/natural sand
CO5: test and learn significant wet and hardened property of normal concrete
CO6: learn the efficient handling of equipment with safety regulations to minimize experimental error

Topics:

- Introduction of common construction materials: cement, sand, brick and concrete
- Fineness of cement (IS 4031, Part-1:1988)
- Specific gravity of cement (IS 4031, Part-11:1988)
- Consistency and Setting times tests of cement (IS 4031, Part-4:1988)
- Soundness of cement (IS 4031, Part-3:1988)
- Compressive strength of cement (IS 4031, Part-6:1988)
- Water absorption test of brick (IS 3495, Part-2:1992)
- Compressive strength test of brick (IS 3495, Part-3:1992)
- Fineness modulus of sand (IS: 383-1970)
- Water absorption and Bulking of sand (IS: 2386, Part-3:1963)
- Slump test of concrete (IS: 7320-1974)
- Compressive strength of concrete (IS: 516 - 1959)

Textbook(s):

1. Concrete Technology Theory and Practice by M S Shetty, S Chand & Company

Reference Book(s):

1. Laboratory Manual
2. BIS Codes

CE 3021 Advanced Solid Mechanics

Credit: 3
Category: PEC
Prerequisite(s): Mechanics of Materials (CE 2103), Structural Analysis (CE 2104)

Course Description:

The course includes determination of stress at any point, shear centre for symmetrical and un-symmetrical section with unsymmetrical bending and stresses in beams due to thermal loading.

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

CO1: understand different theories of failure
CO2: determine stress at any point in cross section of unsymmetrical bending
CO3: determine shear centre for symmetrical and un-symmetrical section
CO4: analyze curved beams and thin-walled cylinders
CO5: understand Lame‘s theory of thick walled cylinders
CO6: determine stresses in beams due to thermal loading

Topics:

- Theories of failures
- Unsymmetrical bending
- Flexural and Shear Centre
- Curved Beams
- Thick-Walled Cylinders
- Thermal Analysis

Textbook(s):

1. Strength of Materials, Part 2, by S. Timoshenko, 3rd Edition, CBS Publishers and Distributors Pvt. Ltd

Reference Book(s):

1. Advanced Mechanics of Material, by A. P. Boresi & R. J. Schmidt, 6th ed., Wiley, 2003

CE 3023 Concrete Technology

Credit: 3
Category: PEC
Prerequisite(s): Civil Engineering Materials & Construction (CE 2109)

Course Description:

Understand the concepts of concrete technology and procedure to determine various properties of concrete like workability, mechanical properties and design concrete mixes.

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

CO1: identify different types of concrete and its properties
CO2: determine the workability of concrete
CO3: determine strength and durability of concrete
CO4: design concrete mixes for the given conditions
CO5: perform destructive and non-destructive testing of hardened concrete
CO6: select types of admixture and special concrete for given condition

Topics:

- Concrete Materials
- Concrete
- Strength of concrete
- Durability of concrete
- Concrete Mix design
- Special Concrete

Textbook(s):

1. Concrete Technology‖ by M. S. Shetty, 4th Edition, S. Chand Publisher, New Delhi.
2. Properties of concrete‖, A.M. Neville, 4th Edition, Pearson Education Pvt. Ltd., New Delhi.
3. Concrete Technology‖, by M. L. Gambhir, McGraw Hill Education, New Delhi, 2013.

Reference Book(s):

1. Construction Safety‖, by Jimmy W. Hinze, Prentice Hall Inc 1997.
2. Concrete Technology‖ by S. Bhavikatti, I. K. International Pvt. Ltd.

CE 3027 Engineering Geology

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

The course introduces the concept on geology which includes earthquake and landslides, geological investigation including different surveys, preliminary and detailed geological investigation on dams and reservoirs and concept of tunneling.

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

CO1: acquire the knowledge about rocks and minerals
CO2: understand the process of rock formation
CO3: understand the role of geology in the design and construction process of underground opening in rocks
CO4: apply geology concepts and approaches on rock engineering projects
CO5: select the sites for reservoirs and dams based on geological aspect
CO6: identify and classify soil and rock using basic geological classification system

Topics:

- General Geology, Mineralogy, Petrology, Structural geology
- Earthquakes and landslides
- Geology of dams and reservoirs
- Rock mechanics and tunnelling

Textbook(s):

1. Engineering Geology, by Parbin Singh, S. K. Kataria and Sons, 2009
2. An introduction to Geology by V.S. Joji, I.K. International Publishing House Pvt. Ltd, Latest edition
3. Engineering Geology by S. K. Duggal, H. K. Pandey & N. Rawal, McGraw-Hill Education (India) Pvt. Ltd

Reference Book(s):

1. Structural Geology, by H. P. Billings, Prentice Hall Publishers, Third edition

CE 3035 Hydraulic Machines

Credit: 3
Category: PEC
Prerequisite(s): Fluid Mechanics (CE 2101)

Course Description:

Explain the principle of impact of jets, idea about the layout of hydro-electric power stations, understand the basic working principle of turbines and pumps, describe the operations of various types of turbines, centrifugal and reciprocating pumps and also know the working principle of press, accumulator and crane etc.

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

CO1: apply fundamental knowledge of the effect of hydrodynamic force on various types of vanes
CO2: develop basic knowledge on hydro-electric power stations
CO3: understand the concepts of the working and design aspects of hydraulic machines
CO4: explain about the various types of turbines and their components as well as characteristics
CO5: describe the operation of centrifugal and reciprocating pumps
CO6: understand the working principle of miscellaneous hydraulic machines like press, accumulator, crane etc. and their real-life applicability

Topics:

- Introduction to hydraulic machines
- Effect of hydrodynamic force on various types of vanes
- Hydro-electric power stations
- Working and design aspects of hydraulic machines
- Various types of turbines and their components
- Operation of centrifugal and reciprocating pumps
- Working principle of miscellaneous hydraulic machines

Textbook(s):

1. Fluid Mechanics & Hydraulic Machines by R.K. Bansal, 9th Edition, Laxmi Publications (P) Ltd.

Reference Book(s):

1. Engineering Fluid Mechanics by R. J. Garde & A.G. Mirajgaonker, Scitech Publications (India) Pvt. Ltd.

CE 3039 Pavement Materials

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

The subject deals with characterization of various pavement materials, basic concepts of resilient modulus of unbound and bound materials, various types of bituminous binders and bituminous mix design, characterization of use of non-conventional materials like, cement stabilized soils, cement stabilized aggregates, geosynthetics, distresses of flexible and rigid pavements.

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

CO1: understand the types and materials used in various types of pavements
CO2: know the basic soil properties related to pavement applications
CO3: identify properties of aggregate and bituminous binders used in pavement
CO4: design and evaluate bituminous mixes for non-stabilized and stabilized roads
CO5: explain cement concrete, semi rigid, non-conventional and new pavement materials
CO6: evaluate modern methods of testing of pavement materials

Topics:

- Pavement material and sections and soil properties
- Conventional aggregates
- Bitumen & bituminous binders
- Bituminous mixes
- Cement concrete pavement materials
- Flexible and rigid pavement distresses
- Non-conventional and new pavement materials

Textbook(s):

1. Principles of Transportation Engineering, by P. Chakraborty and A. Das, PHI Publication, 1st Ed. 2nd reprint 2005.

Reference Book(s):

1. Principles of Transportation and Highway Engineering, by G. V. Rao, Tata Mc. Graw Hill, 1st Ed. 1995.
2. Principles of Traffic and Highway Engineering by N. J. Garber, L. A. Hoel and R. Sarkar, Cengage Learning India Pvt. Ltd., First Indian Reprint 2009.
3. Pavement Engineering: Principles and Practice, Rajib B. Mallick, Tahar El-Korchi, Second Edition, CRC Press
4. Highway Engineering by S. K. Khanna & C. E. G. Justo, 10th Edition, Khanna Publishers, New Delhi.
5. Manual for Construction and Supervision of Bituminous works, by Indian Roads Congress, New Delhi, 2005.
6. Relevant IRC, ASTM and AASHTO codes and specifications.

CE 3070 Fundamentals of Project Management

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

Understand different concepts of project management and investigate complex business problems to propose project-based solutions

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

CO1: apply concepts to address specific management needs at the individual, team, division and/or organizational level
CO2: formulate strategies allowing organizations to achieve strategic goals
CO3: understand the concepts of team-building skills
CO4: investigate complex business problems to propose project-based solutions
CO5: manage creative teams and project processes effectively and efficiently
CO6: understand the requirements of different types of management for a project

Topics:
- Project Management
- Project Management Process
- Introduction, Integration Management

Textbook(s):
1. A Guide to the Project Management Body of Knowledge (Pmbok® Guide)—Fourth Edition, 2000

Reference Book(s):
1. Project Management, the Managerial Process, the McGraw-Hill Company, Clifford F. Gray, Erik W. Larson, 6th Edition, 2017

CE 3072 Bioremediation

Credit: 3
Category: OEC
Prerequisite(s) Nil

Course Description:

The course will cover basic information about microorganism and their roles in different waste by-product management including solid and liquid waste. Apart from this, different kind of bioremediation processes and various factors affecting the microorganism activities are also included. The course also deals the use of bioremediation process in laboratory scale and its application in field scale for waste management.

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

CO1: understand the fundamentals of microbial bioremediation
CO2: analyze and identify the various aspects of bioremediation
CO3: design of bioremediation systems or methods for soil, liquid and slurry phase remediation
CO4: optimally design hybrid need based remedial systems for better desired output
CO5: application of bioremediation in waste management
CO6: understand the various in-situ bioremediation technologies

Topics:

- Bioremediation Principles
- Bioremediation Systems and Processes
- Factors influencing bioremediation
- Genetics of Bioremediation
- Applications of Bioremediation
- In-situ Bioremediation

Textbook(s):

1. Baker, K H., and Herson, D. S., Bioremediation, McGraw-Hill Publishing Company, New York, 1994.
2. Eweis, J. B., Ergas, S. J., Chang D. P. Y., and Schroeder E. D., Bioremediation Principles, McGraw-Hill Publishing Company, Singapore, 1998.
3. Cookson, J.T. Jr., Bioremediation Engineering – Design and Application, McGraw Hill Publishing Company, New York, USA, 1995.

Reference Book(s):

1. Young, L.Y., and Cerniglia, C.E., Microbial Transformation and Degradation of Toxic Organic Chemicals, Wiley–liss Inc., New York, USA, 1995.
2. Microbial Bioremediation, by Rajedran, P., and Gunasekharan, P.,1st Edition, Mjp Publishers, India, 2011.

CE 3074 Construction Material and Specification

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

Understand the various type of construction materials such as bricks, cement, concrete, bitumen, geosynthetic along with non-structural materials used for construction purpose and their specifications.

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

CO1: know and understand the necessities of specifications of the materials with respect to quality and quantity for a construction work
CO2: know the engineering specifications containing detailed description of all workmanship and materials for a complete project in accordance with plan and drawings
CO3: know the specifications regarding the quality of workmanship to be achieved during construction. CO4: manage creative teams and project processes effectively and efficiently
CO5: understand the specification and applications of geosynthetic materials
CO6: know the specification of materials used for thermal insulation, acoustic, water proofing and flooring

Topics:

- Bricks
- Cement and concrete
- Bitumen
- Geosynthetics
- Non-structural materials

Textbook(s):

1. Building Material by M. L. Gambhir, 1st Edition, TMH Education, New Delhi
2. Building Material by P.C. Verghese, PHI Learning (P) Ltd., New Delhi, 2005.

Reference Book(s):

1. A Textbook(s) of Building Construction‖ by S.K. Sharma, Revised Edition, S. Chand Publication,
2. 1987.
3. Building Material‖ by S.S. Bhavikatti, 1st Edition, Vikas Publication.
4. Building Construction by B.C. Punmia, Jain and Jain, 10th Edition, Laxmi Publication, New Delhi.
5. Building Material‖ by P.C. Verghese, PHI Learning (P) Ltd., New Delhi, 2005.
6. Engineering Materials by S.C. Rangwala, Charotar Publishing House, 2011.

CE 3076 Tropical Hydrology & Water Resources

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

Requirement, types and methods of irrigation, design various surface and sub surface irrigation methods, idea of different flow measurement instruments, description of the principle of surface irrigation hydraulics, designing of the drainage system and understand the balance of salt and water within the root zone.

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

CO1: understand the role hydrological cycle in Engineering
CO2: check the consistency of rainfall data and calculate the probability of rainfall period
CO3: determine the evaporation evapo-transpiration and rate of infiltration
CO4: estimate runoff by different methods, know the various aspects of hydrograph and derive the unit hydrograph
CO5: explain various methods of estimation of flood and flood routing
CO6: understand the process of channel erosion and reservoir sedimentation

Topics:

- Hydrologic cycle
- Precipitation
- Abstracts from precipitation
- Runoff and Hydrograph
- Flood and Flood routing
- Erosion and Reservoir sedimentation

Textbook(s):

1. Engineering Hydrology by K. Subramanya, Tata McGraw Hill, 4th Ed. End reprint 2016.

Reference Book(s):

1. Applied Hydrology by V.T. Chow, D.R. Maidment and L.W. Mays, Tata Mc. Graw Hill, 1st Ed., First Indian Reprint 2010.
2. Water Resources Engineering Vol. 2, Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers, 33rd Ed. End reprint 2017.

CE 3100 Design of Steel Structures

Credits: 3
Category: PCC
Prerequisite(s): Structural Analysis (CE 2104)

Course Description:

Design of different components of steel structure as per limit state method and analysis of beams and frames using plastic theory.

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

CO1: understand the properties of different types of rolled steel structural members
CO2: design different types of connections (bolted & welded) as per Limit state design
CO3: design different types of steel structural members for axial (tension and compression) as per Limit state design
CO4: design of beams as per Limit state design
CO5: design beam-column and select appropriate column bases for steel columns
CO6: analyze beams and frames using plastic theory

Topics:

- Introduction
- Plastic analysis
- Connections
- Tension members
- Compression members
- Beams
- Beam-column
- Column bases

Textbook(s):

1. Design of Steel Structures‖, by S. K. Duggal, Mc Graw Hill Education Pvt. Ltd
2. Design of Steel Structures‖, by N. Subramanian, Oxford University Press, 2012

Reference Book(s):

1. Design of Steel Structures by Limit State Method as per IS 800-2007 by S. S. Bhavikatti, 2nd edition, I.K International publishing house Pvt. Ltd.
2. Design of Steel Structures V-II‖, by S. Ramchandra, Standard Pub

CE 3101 Transportation Engineering-I

Credit: 3
Category: PCC
Prerequisite(s): Nil

Course Description:

The subject attempts to inculcate the fundamentals of highway engineering and construction among undergraduate students. It covers almost all the areas of highway engineering starting with the geometric design to traffic engineering, traffic operations, management, and ends with the pavement materials and design of flexible and rigid pavements along with their distresses and maintenance.

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

CO1: know geometric design of highway
CO2: know characteristics of traffic flow required for transportation planning and design
CO3: know traffic control devices
CO4: know the characterization of various pavement materials
CO5: understand the principle of design of flexible and rigid pavements
CO6: understand the methods for construction of highways

Topics:

- Various modes of Transportation
- Highway Geometric Design
- Fundamentals of Traffic flow
- Traffic Operation and Control
- Pavement materials and design
- Pavement Distress and Maintenance

Textbook(s):

1. Principles of Transportation Engineering by Partha Chakroborty & Animesh Das, 1st Edition, PHI Learning Private Limited-New Delhi.
2. Highway Engineering by S. K. Khanna, C. E. G. Justo & A. Veeraragavan, 10th Edition (revised), Nem Chand & Bros., Roorkee, India.

Reference Book(s):

1. Principles, Practice and Design of Highway Engineering (Including Airport Pavements) by S. K. Sharma, Revised Edition, S. Chand Publishers.
2. Pavement Analysis and Design by Y.H. Huang, Pearson Prentice Hall, New Jersey, USA, 2004.
3. Transportation Engineering – An Introduction‖ by C.J. Khisty and B. K. Lall, 3rd Edition, Prentice Hall.
4. Traffic Engineering and Transport Planning‖ by Kadiyali L.R., Khanna Publishers, New Delhi, India, 1997
5. Guidelines for the design of plain jointed rigid pavements for Highways, Third Revision, IRC:58- 2011, Indian Roads Congress 2011.
6. Guidelines for the design of flexible pavements, Third Revision, IRC: 37-2012, Indian Roads Congress July 2012.

CE 3102 Transportation Engineering-II

Credit: 3
Category: PCC
Prerequisite(s): Nil

Course Description:

The subject deals with the technical aspects of railway, airport, and port and harbour engineering. The students are made familiar with the design of railway tracks, the concepts of gauges and elements of design. In airport engineering, the students learn the factors affecting site selection of airports, the design of runways, and taxiway.

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

CO1: know the function of various components of permanent way
CO2: understand the geometric design of railway track
CO3: know the layout and planning of airport
CO4: understand the geometric design of airport
CO5: know the components of ports and harbours
CO6: know the principles of layout of ports and harbours

Topics:

- Railways for urban transportation
- Geometric Design of Railway Track
- Airport planning, characteristics, & site selection
- Airport Runway Design
- Taxiway Design
- Port and Harbour Engineering
- Layout and Terminal Facilities of Port and Harbour

Textbook(s):

1. Railway Engineering‖ by Satish Chandra and M. M. Agarwal; Oxford Higher Education, New Delhi.
2. Airport Planing and Design, by S. K. Khanna , M. G. Arora , S. S. Jain, 6th edition, Nem Chand & Bros., Roorkee, India.
3. A Course in Docks and Harbour Engineering, Bindra S P, Dhanpat Rai and Sons, New Delhi, 2013

Reference Book(s):

1. A Textbook of Railway Engineering by S. C. Saxena and S. P. Arora, Dhanpat Rai Publications, New Delhi.
2. Planning and Design of Airports by R. M. Horonjeff & F. X. Mckelvey, 5th Edition, McGraw-Hill Professional.
3. Airport Systems - Planning, Design and Management by Richard L. de Neufville and Amedeo R. Odoni, McGraw Hill Professional, New York, United States.
4. Dock & Harbour Engineering by H.P. Oza & G.H. Oza; Charotar Publishers, Ahmedabad, 2013

CE 3103 Design of Concrete Structures

Credit: 4
Category: PCC
Prerequisite(s): Mechanics of Materials (CE 2103), Structural Analysis (CE 2104)

Course Description:

Design of different components of concrete structure like slab, beam, column footing using limit states method. Analyze beams and frames using plastic theory. Also, design staircases for different support conditions as per Limit state design.

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

CO1: understand the basic concepts of working stress and limit state methods
CO2: determine strength of reinforced concrete beams and slabs at various support conditions as per Limit state design
CO3: design reinforced concrete beams and slabs at various support conditions for different loadings as per Limit state design
CO4: design staircases for different support conditions as per Limit state design
CO5: design different types of reinforced concrete compression members as per Limit state design
CO6: design different types of footings as per Limit state design

Topics:

- Introduction
- Analysis & Design of R. C. Beams
- Design of Slabs
- Design of staircases
- Design of column
- Design of Footing

Textbook(s):

1. Reinforced Concrete Limit State Design‖ by A. K. Jain, Nem Chand & Bros, 2002
2. Design of Reinforced Concrete structure‖ by S. Ramamruthum, 17th Edition, Dhanpat Rai & sons, New Delhi.

Reference Book(s):

1. Limit state design of reinforced concrete‖, by P C Varghese, Prentice Hall of India pvt. ltd. New Delhi 2002
2. Design of Concrete Structures‖, U. Pillai & D. Menon, Tata Mcgraw Hill publishing company ltd. New Delhi 2003

CE 3105 Water Resources Engineering

Credit: 3
Category: PCC
Prerequisite(s): Surface Hydrology and Hydraulics (CE 2102)

Course Description:

Learn about the canal irrigation systems, diversion head works and design of weirs on permeable foundation, identification of sites for the construction of Reservoirs and Dams, explain the various forces, modes of failure and design of gravity dams, describe the various types of earthen dams and phreatic line determination and know about various types of spillway and design of Ogee spillway.

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

CO1: classify the canals, design irrigation channels and apply the concept of Kennedy and lacey theory
CO2: explain the theories of seepage and design of weirs on permeable foundation
CO3: select appropriate sites for construction of reservoirs and dams
CO4: design the gravity dam by considering various forces acting on it
CO5: describe the types, causes of failure and criteria for safe design of earthen dam
CO6: study about different types of spillways and design of Ogee spillway

Topics:

- Canal Irrigation Systems
- Diversion Head Works
- Reservoirs
- Dams
- Gravity dams
- Earth dams
- Spillways

Textbook(s):

1. Water Resources Engineering Vol. 2, Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers, 33rd Ed. End reprint 2017.

Reference Book(s):

1. Water Resources Engineering by Larry W. Mays, Willy Student Edition-2001

CE 3107 Geotechnical Engineering-II

Credit: 3
Category: PCC
Prerequisite(s): Geotechnical Engineering-I (CE 2100)

Course Description:

The objective of this course is to introduce the students to the principles and practices of geotechnical exploration, foundation engineering, and ground improvement methods, to Foundation Engineering, so that they apply these principles to plan and execute soil exploration programs, design of foundations etc.

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

CO1: determine the vertical stress distribution below the ground surface due to various shapes of footing
CO2: evaluate the bearing capacity of shallow foundations
CO3: determine the load carrying capacity of pile foundations
CO4: identify type of earth pressures behind retaining structures and the intensity of earth pressure
CO5: identify failure mechanisms of cuttings and embankment using slope stability analysis
CO6: select appropriate soil exploration methods and field experimentation in geotechnical engineering

Topics:

- Stresses Distribution
- Bearing Capacity of Shallow Foundations
- Pile Foundations
- Earth Pressure and Retaining Structures
- Stability of Slopes

Textbook(s):

1. Foundation Engineering - Geotechnical Aspects by P.C. Varghese, 11th Printing, 2014, PHI Learning Pvt. Ltd, New Delhi.
2. Principles of Foundation Engineering by B. M. Das, 7th Edition, Cengage Learning India Pvt. Ltd, New Delhi.

Reference Book(s):

1. Foundation Analysis and Design by J. E. Bowls, TMH Education, New Delhi.
2. Basic and applied soil mechanics by Gopal Ranjan & A. S. R. Rao, New age international publication, 2012.
3. Soil Mechanics and Foundation Engineering‖ by K. R. Arora, Standard Publisher, 2012.
4. Soil Mechanics and Foundation Engineering‖ by V.N.S. Murthy, CBS Publisher, 2012.

CE 3130 Water and Air Quality Models

Credit: 3
Category: PEC
Prerequisite(s): Environmental Engineering - I (CE 2105), Environmental Engineering – II (CE 2106)

Course Description:

The subject includes introduction to mathematical modeling, basic knowledge about reactors, characteristics of estuaries, Micro meteorological processes, computational methods for air pollution.

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

CO1: appreciate the need for mathematical models in solving environmental problems
CO2: formulate and set-up different water quality models
CO3: solve different water quality models
CO4: formulate and set-up different air quality models
CO5: solve different air quality models
CO6: learn about air pollution meteorology

Topics:

- Introduction to Mathematical Modeling
- Water quality Models
- Physical, chemical and biological processes in estuaries
- Air quality models

Textbook(s):

1. Wastewater Engineering: Treatment and Reuse by Metcalf & Eddy Inc., Fourth Edition, McGraw Hill Education India Private Limited, 2015.
2. Foundation Course on Air Quality Management in Asia by Haq, Gary & Schwela, Dietrich, Stockholm Environment Institute, 2008.

Reference Book(s):

1. Surface water quality modeling by Chapra, Steven C., McGraw Hill Book Company, New York, 1997.
2. Introduction to Environmental Engineering and Science by Gilbert M. Masters, 3rd Edition, Pearson Education, 2015.

CE 3131 Transport of Water and Wastewater

Credit: 3
Category: PEC
Prerequisite(s): Environmental Engineering -I (CE 2105), Environmental Engineering – II (CE 2106)

Course Description:

The course includes water supply system, pipe materials, appurtenances, design for external loads, maintenance and operation, sanitary and storm water drainage system.

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

CO1: design water supply pipelines
CO2: understand the hydraulics of flow in sewers
CO3: design sewer network under various field conditions
CO4: explain the hydraulics of flow in storm water drains
CO5: design storm water drainage systems
CO6: know about drainage maintenance

Topics:

- Water Supply Systems
- Sanitary Sewerage Systems
- Storm water Drainage Systems

Textbook(s):

1. Manual on water supply and treatment, CPHEEO, 2009.
2. Manual on sewerage and sewage treatment systems, CPHEEO, 2013.

Reference Book(s):

1. Practical Handbook on Public Health Engineering by Bajwa, G.S., Deep Publishers, Shimla, 2003.
2. Water and Wastewater Technology by M.J. Hammer, Prentice Hall, New Jersey, 2001.

CE 3133 Air and Noise Pollution Control

Credit: 3
Category: PEC
Prerequisite(s): Environmental Engineering –I (CE 2105)

Course Description:

The subject includes air quality modeling, sources of air pollution and air pollution mitigation. It also covers sources of noise pollution, its control and management.

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

CO1: understand the importance of air quality and its impact on the environment and human health
CO2: evaluate the fate and transport of air pollutants
CO3: select different control methods and design principles for gaseous and particulate pollutant
CO4: explain the fundamentals of noise pollution
CO5: adopt suitable measures for noise pollution control
CO6: Knowledge about air pollution meteorology

Topics:

- Introduction to Air Pollution
- Air pollution monitoring and analysis
- Air Pollution Meteorology
- Air Quality Modelling
- Fundamentals of Noise Pollution
- Noise Control and Management

Textbook(s):

1. Fundamentals of Air Pollution by Daniel Vallero, 4th Edition, Elsevier's Science & Technology, 2008
2. Environmental Noise Pollution: Noise Mapping, Public Health, and Policy by Enda Murphy and Eoin A. King, 1st Edition, Elsevier's Science & Technology, 2014.

Reference Book(s):

1. Air Pollution Control Technology Handbook by Karl B. Schnelle, Jr. and Charles A. Brown, CRC Press, 2002.

CE 3134 Deep Excavation Planning and Design

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

Accelerating economic development and urbanization has led to engineers becoming increasingly ambitious, carrying out excavations in more difficult soils, so that excavations are deeper and more extensive. These complex conditions require advanced analysis, design methods and construction technologies. Most of the subjects on general foundation engineering introduce basic analysis and design of excavation, but do not usually deal with analysis and design in practice. This course covers both areas, introducing methods currently used in modern engineering, which can readily be applied to analysis and design in actual excavations.

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

CO1: know the need of deep excavation and related health and safety issues
CO2: learn about the various stages of planning for deep excavation
CO3: learn various methods to analysis soil settlement due to the deep excavation
CO4: learn design of commonly use lateral support for deep excavation
CO5: learn to asses effect of deep excavation to the adjacent structures
CO6: learn to introducing methods currently in modern engineering

Topics:

- Introduction: Excavation and their classification
- Excavation planning
- Methods and supporting system for excavation
- Analysis: settlement induces due to the installation of diaphragm wall, wall and ground movement induced by excavation, time dependent ground surface settlement by the excavation
- Design of retaining wall
- Protection of adjacent structures

Textbook(s):

1. Change-Yu Ou, Deep excavation theory and practice, Taylor & Francis, New

Reference Book(s):

1. J. M. Turner, Excavation systems planning, design and safety, Mc Graw Hill, New York

CE 3150 Fundamentals of Structural Analysis and Design

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

Overview of analysis and design of civil engineering structures using various methods.

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

CO1: understand different loads acting on civil structures
CO2: understand different types of structural forms
CO3: draw shear force and bending moment diagrams of beams
CO4: calculate deflection of beams using different methods
CO5: analyze continuous beams using various methods
CO6: design RCC beam for flexure using limit state method

Topics:

- Introduction to structural loads
- Shear force and bending moment diagram
- Methods to compute deflections
- Different methods of structural analysis
- Design of beam by LSM

Textbook(s):

1. Structural Analysis-1 by S.S. Bhavikatti, 4th Edition, Vikas Publishing House Pvt Ltd-India.
2. Reinforced Concrete Design by N. Krishna Raju and R.N Pranesh, First Edition (revised), New Age International Publishers, India.

Reference Book(s):

1. Structural Analysis by T.S Thandavamoorthy, Oxford University Press, First Edition, New Delhi.
2. Design reinforced Concrete Structures by N. Subramanian, First Edition, Oxford University Press, New Delhi.

CE 3152 Surface and Groundwater Hydrology

Credit: 3
Category: PEC
Prerequisite(s) Nil

Course Description:

Know about the hydrological cycle, measure, prepare and present the rainfall data, describe the processes of evaporation, evapo-transpiration rate of infiltration and runoff, derive the unit hydrograph, understand the properties of groundwater and analyze hydraulics of well for steady and unsteady flow.

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

CO1: check the consistency of rainfall data and calculate the probability of rainfall over a given return period
CO2: determine the evaporation, evapo-transpiration and rate of infiltration
CO3: estimate the runoff by various methods and derive the unit hydrograph
CO4: understand groundwater concept as well as properties
CO5: analyze well hydraulics for steady flow in aquifer
CO6: analyze well hydraulics for unsteady flow in aquifer

Topics:

- Precipitation
- Abstractions from Precipitation
- Runoff and Hydrograph
- Well hydraulics

Textbook(s):

1. Engineering Hydrology by K. Subramanya, Tata Mc-Graw Hill, 4th Ed., 2017

Reference Book(s):

1. Applied Hydrology by V.T. Chow, D.R. Maidment and L.W. Mays, Tata Mc. Graw Hill, 1st Ed., First Indian Reprint 2010.
2. Water Resources Engineering by L.W. Mays, Wiley Publication, 2nd Edition, First Indian Reprint 2001.
3. Groundwater Hydrology, by D. K. Todd and L.W. Mays, 3rd Edition, John Wiley and Sons, 2011.
4. Ground Water, by H. M. Raghunath, New Age International Publishers; 3rd edition, Dec 2007.

CE 3180 Estimating and Costing

Credit: 1
Category: PCLC
Prerequisite(s): Engineering Graphics (CE 1083)

Course Description:

Estimation and rate analysis of civil engineering items of residential buildings and steel truss.

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

CO1: know the unit of measurement of various civil engineering items
CO2: learn the approximate methods of estimating
CO3: estimate civil engineering items of residential building
CO4: prepare abstract of items and bill of quantities
CO5: estimate the civil engineering items of steel truss
CO6: carry out rate analysis of major items

Topics:

- Introduction: unit of measurement of various civil engineering items
- Approximate methods of estimating
- Estimating of a residential building
- Estimation of a steel truss
- Rate analysis of major civil engineering items

Textbook(s):

1. Estimation and Costing in Civil Engineering, by B. N. Dutta, UBS Publisher, 2012

Reference Book(s):

1. Estimating, Costing, Specification and Valuation in Civil Engineering by M. Chakraborti, 2010

CE 3181 Structural Design (RCC)

Credit: 1
Category: PCLC
Prerequisite(s): Engineering Mechanics (ME 1003), Structural Analysis (CE 2104)

Course Description:

Complete structural design of framed R. C. C building using Staad Pro. Software and limit state method of design.

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

CO1: idealize the RCC building frames to satisfy the functional requirement
CO2: determine the various loads on buildings as per relevant Indian Standards
CO3: model and analyse of building frame structure in STAAD PRO
CO4: prepare design table of the structural components of the building from STAAD PRO output
CO5: design structural components of a building
CO6: prepare a design report of the RCC framed buildings

Topics:

- Finalization of column and beam plan from an architectural plan
- Calculation of Dead load and live load on RCC frame manually
- Manual Design of Slab
- Modelling and, analysis of building frame in Staad Pro
- Preparation of Design table from Staad Pro
- Manual Design of Beam, column, footing and staircase
- Preparation Final Design Report

Textbook(s):

1. Design of Concrete Structures by U. Pillai & D. Menon, Tata Mcgraw Hill publishing company ltd. New Delhi 3rd edition 2009.

Reference Book(s):

1. Reinforced Concrete Limit State Design by A. K. Jain, Nem Chand & Bros, 7th edition 2012.
2. Design of Reinforced Concrete structure by S. Ramamruthum, Dhanpat Rai & sons, New Delhi, 17^{th} edition 2016.

CE 3182 Computer Aided Building Drawing

Credit: 1
Category: PCLC
Prerequisite(s): Engineering Graphics (CE 1083)

Course Description:

Fundamentals of plan and section of building drawing, finalizing the scale for plan and sections, detailed drawing of various components of building.

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

CO1: learn basic dimensions of building components and also the symbols, abbreviations used in building drawing
CO2: draft plan, elevation and sectional views of building of load bearing wall structure using AUTO CADD
CO3: draft plan, elevation and sectional views of building of framed structure building using AUTO CADD
CO4: draft plan, elevation of staircase depending on the floor height
CO5: draft plan and sectional detail of structural component like foundation, column, beam, slab and staircase
CO6: draft the details of a steel truss

Topics:

- Introduction: Auto CADD, Approximate size of rooms, doors, windows, wall thickness, tread and riser of staircase
- Architectural Plan, elevation and section of a double storied load bearing wall and framed structure building
- Plan and sectional drawing of structural components like foundation, column, staircase, slab etc. Detail drawing of a steel truss

Textbook(s):

1. Civil Engineering Drawing, by M Chakraborty, Oxford University Press, 2012
2. Civil Engineering Drawing, S. C. Rangwala, 2nd edition, 1991.

Reference Book(s):

1. Manual for Building Drawing prepared by School of Civil Engineering, KIIT Deemed to be University

CE 3183 Geotechnical Design

Credit: 1
Category: PCLC
Prerequisite(s): Geotechnical Engineering-I (CE 2100)

Course Description:

Preparation of borelog data, analysis of the observation and test results to determine the bearing capacity of soil, development of program for determination of pile capacity and pile design.

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

CO1: understand and efficiently represent data from geotechnical explorations with computer aid
CO2: analyse laboratory test observations and graphically represent the results using software tools
CO3: design foundation structures under varying field conditions
CO4: analyse the strength characteristics of soil
CO5: analyse the deformation characteristics of soil
CO6: apply different software tools to evaluate the strength and deformation characteristics of soil

Topics:

- Introduction to the use of software tools in geotechnical engineering design
- Preparation of Borehole log
- Analysis of the observations from liquid limit test and compaction test
- Analysis of UCS test observations and preparation of particle size distribution chart
- Preparation of a program to determine the UBC of soil in general conditions
- Preparation of a program to determine the UBC of soil with various water table conditions and load eccentricities
- Preparation of a program to design a friction pile group under pull out conditions
- Analysis of a rigid foundation on soil

Textbook(s):

1. Geotechnical Engineering by C. Venkatramaiah, New age international publishers.

Reference Book(s):

1. Principles of foundation engineering by B. M. Das, Cengage learning.

CE 3184 Structural Design (Steel)

Credit: 1
Category: PCLC
Prerequisite(s): Engineering Mechanics (ME 1003), Structural Analysis (CE 2104)

Course Description:

Analysis of steel industrial shed using Staad Pro. Software and design of its components by limit state method.

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

CO1: determine dead and live on Industrial shed as per standard codes
CO2: determine wind load on Industrial shed as per standard codes
CO3: model and analyse the Industrial shed in STAAD Pro Software
CO4: preparation of design member forces of the Industrial shed from STAAD Pro Software output
CO5: design of the members of the Industrial shed by limit state method
CO6: design and drawing of the connections

Topics:

- Calculation of Dead load and live load
- Calculation of wind load
- Analysis of Truss in Staad Pro
- preparation of design table
- Design of Axial Members
- Design of Purlin
- Connection Design
- Design of Beam-Column

Textbook(s):

1. Design of Steel Structures, by N. Subramanian, Oxford University Press, 2012

Reference Book(s):

1. Design of Steel Structure, by S.K. Duggal, Mc Graw Hill Education Pvt. Ltd
2. Design of Steel Structures by Limit State Method as per IS 800-2007 by S. S. Bhavikatti, 2nd edition, I.K International publishing house Pvt. Ltd.

CE 3185 Water Resources Design

Credit: 1
Category: PCLC
Prerequisite(s): Fluid Mechanics (CE 2101), Surface Hydrology and Hydraulics (CE 2102)

Course Description:

Scheduling of irrigation and design of canal irrigation networks, estimation of the capacity of reservoir and design of weir on permeable foundation and design of gravity and earthen dams.

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

CO1: schedule irrigation based on water requirement of crops and estimate the duty of canal irrigation network
CO2: design the canal using Kennedy and Lacey's theory
CO3: design of weirs on permeable foundation using Khosla's Theory
CO4: estimate the capacity of the reservoir
CO5: stability analysis of Low dam and Design of High Gravity Dams
CO6: determine the phreatic line of Earth dam

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Topics:

- Irrigation scheduling based on water requirement of crops
- Fixation of Design discharge with use of duty and Delta of the crops in the Project
- Fixing the dimensions of the Canals in alluvial regions using Kennedy's and Lacey's theory
- Design of weirs using Khosla's Theory
- Area-Elevation, Capacity-Elevation curves and capacity of reservoir
- Design of both low and high gravity dam
- Determination of phreatic line of Earthen Dam for understanding seepage flow and stability

Textbook(s):

1. Water Resources Engineering Vol. 2, Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers, 33rd Ed. End reprint 2017.

Reference Book(s):

1. Irrigation and Water Power Engineering by B.C. Punmia, Ashok K. Jain, Arun K. Jain, Pande B.B. Lal, Laxmi Publications, 16th Ed., End Reprint 2009.

CE 3082 Minor Project

Credit: 2
Category: PROJ

Course Description:

Students are required to undertake a minor project either as an individual or in a group in consultation with the project guide which may be completed in one semester. The project work is aligned with the discipline of the student and its allied areas. It is preferably related to certain research objective or advanced technical domain. Students will demonstrate higher level learning outcomes and cognitive skills in the implementation of the project.

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

CO1: perform a background study on certain technical aspect and formulate a project objective
CO2: outline a pathway for the implementation of the project within the time line
CO3: apply fundamental engineering concepts, advanced technical know-how, use modern engineering tools, perform experiments and critically analyze the data
CO4: provide engineering solutions, design system components or processes with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
CO5: function effectively as an individual, and as a member or leader in a team under multidisciplinary settings following ethical practices
CO6: communicate effectively with a range of audiences and prepare technical reports

CE 3190 Structural Engineering Laboratory

Credit: 1
Category: PCLC
Prerequisite(s): Structural Analysis (CE 2104), Design of Concrete Structures (CE 3103)

Course Description:

The laboratory course has been prescribed to enhance the understanding of the behaviour of concrete and use of it as construction material as RCC in basic structural element like beam as structural application. It aims at determining the load response behaviour of steel in the laboratory and its structural application in RCC beam understanding the failure of RCC beam under load. The course focuses extensively in mix designing of concrete covering different aspect in field application of concrete. The course emphasizes handling of equipment in experimental work consciously with possible minimization of experimental error following all safety measures and precautions.

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

CO1: learn the quality control aspects of concrete in field
CO2: link the theoretical aspects to practical applications of concrete design
CO3: learn the application and handling of equipment to minimize experimental error
CO4: have hands-on experiments and analyse the test data
CO5: solve design problems related to their course work
CO6: emphasize the knowledge and application of safety regulations

Topics:

- Introduction and equipment study
- Concrete mix design, Mix trials and cube testing (IS 10262 – 2019, IS 456 – 2000)
- Splitting tensile strength of cylindrical concrete specimens (IS 516 - 1959, IS 1199-1959, SP 23-1982, IS 10086-1982)
- Flexural tensile strength of prismatic concrete specimens (IS: 516-1959)
- Flexural test of reinforced concrete beam (IS 456 – 2000)
- Tensile strength of steel bar (IS 1608: Part 1 : 2018)

Textbook(s):

1. Concrete Technology Theory and Practice by M S Shetty, S Chand & Company
2. Reinforced Concrete Design By Devdas Menon, S. Unnikrishna Pillai by Mc GrawHill

Reference Book(s):

1. Laboratory Manual of School of Civil Engineering, KIIT, 2019

CE 3191 Transportation Engineering Laboratory

Credit: 1
Category PCLC
Prerequisite(s): Nil

Course Description:

The course is a laboratory course designed for students to perform experiments of transportation engineering and get a hands-on experience. Students are taught to test the characteristics and behaviour of pavement materials based on their properties. The students also learn the required quality of pavement materials for various types of roads, traffic conditions and environmental conditions. They also learn standard procedure for the selection of materials for the design of pavement according to the IS codes.

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

CO1: understand the field applications of Transportation Engineering
CO2: describe various parameters and standards for the selection of pavement materials
CO3: know the usage of test equipment/machines to determine engineering properties of pavement materials
CO4: write formal technical report & convey engineering message efficiently
CO5: understand the codes and specifications required for the tests to be conducted
CO6: perform the experiments to test properties of aggregates, soil, and bitumen by understanding the proper methodology

Topics:

- Experiments for testing Aggregate strength
- Experiments for testing soil subgrade strength
- Experiments for testing Bitumen properties

Textbook(s):

1. A Textbook of Transportation Engineering, by S.P. Chandola, 1st Edition, S. Chand (G/L) & Company Ltd.

Reference Book(s):

1. Transportation Engineering Vol. I & II, by V. N. Vazirani & S. P. Chandola, 5th edition & 8th edition, Khanna Publishers, New Delhi.
2. Roads, Railways, Bridges, Tunnels & Harbour Dock, by Amit Gupta & B.L. Gupta, 5th edition, Standard Publications.
3. Highway Engineering‖, by K. S. Rangwala, 10th edition, Charotar Publishing House Pvt. Limited
4. Airport Engineering‖ by S. C. Rangwala, K. S. Rangwala and P. S. Rangwala, Charotar Publishing House Pvt. Ltd., Anand, Gujarat.
5. Railway Engineering‖, by Rangwala, 25th edition, Charotar Publishing House Pvt. Ltd.
6. Harbour, Dock and Tunnel Engineering‖ by R. Srinivasan, Charotar Publishing House Pvt. Ltd., Anand, Gujarat.

CE 4020 Pavement Management System

Credit: 3
Category: PEC
Prerequisite(s): Transportation Engineering-I (CE 3101)

Course Description:

Principles of pavement management, techniques of functional and structural evaluation of pavement. life cycle cost analysis of pavement, network and project-level pavement management processes, incorporation of pavement preservation into pavement management systems, concepts related to routine maintenance, preventive maintenance, and minor rehabilitation.

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

CO1: evaluate functional health of pavement
CO2: evaluate the structural health of pavement by using BBD or FWD
CO3: collect data and develop models for pavement deterioration
CO4: design PMS and implement them
CO5: learn Lifecycle cost analysis of pavement
CO6: compare different strategies of pavement maintenance by LCCA tools

Topics:

- Pavement Surface Condition & Its Evaluation
- Pavement Structure & Its Evaluation
- Non-Destructive Tests such as FWD, Benkelman Beam, Rebound Deflection, Plate, Load Test, Wave Propagation and other methods of Load Tests
- Pavement Management Process & Data Requirements
- Project Level Design
- Steps in implementing PMS

Textbook(s):

1. Pavement Evaluation and Maintenance Management System, R Srinivasa Kumar, Universities Press (India), 2014

Reference Book(s):

1. Modern pavement management, Ralph Haas, W. Ronald Hudson, John P. Zaniewski, Krieger Pub Co, 1994.
2. Pavement Engineering: Principles and Practice, Rajib B. Mallick,Tahar El-Korchi, Second Edition, CRC Press, 2013.
3. Pavement Management for Airports, Roads and Parking Lots, M. Y. Shahin, 2nd edition, Springer Publication, 2011.
4. Pavement Analysis and Design, Y. H. Huang, 2nd edition, Pearson Education, 2004
5. The Design and Performance of Road Pavements, D. Croney & P. Croney, 3rd Edition, McGraw Hill Professional, 1991.
6. Deterioration and Maintenance of Pavements, Derek E. Pearson, ICE Publishing. OECD, Pavement Management Systems, O E C D, 2011.

CE 4029 Disaster Management

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

Natural and manmade disasters, identification of different management techniques during disasters and use of technologies to assess and mitigate disaster.

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

CO1: explain causes of different natural disasters
CO2: identify appropriate rehabilitation and retrofitting technique for structures
CO3: identify different management techniques during disasters
CO4: explain causes of manmade disasters
CO5: Perform vulnerability analysis and mitigation
CO6: Understand the importance of Community preparedness for disaster

Topics:

- Natural disaster management
- Manmade disasters management
- Role of technology in disaster management
- Community preparedness

Textbook(s):

1. Disaster Management - Future Challenges and Opportunities by Jagbir Singh, IK International Publishing House Pvt. Ltd. Latest edition
2. Disaster Management, Harsh K. Gupta, Universities Press (India) Pvt. Ltd.

Reference Book(s):

1. Engineering Hydrology, K. Subramanian, Tata McGraw Hill, New Delhi.
2. Elementary Hydrology, V. P. Singh, Prentice Hall of India.
3. Disaster Mitigation, Preparedness, Recovery and Response‖, V. P. Singh, SBS Publishers & Distributors Pvt. Ltd. Heinemann.
4. Practical Guide to Environmental Management‖, F. B. Friedman, McGraw Hill.

CE 4030 Machine Foundation Engineering

Credit: 3

Category: PEC

Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

Machine foundations are special types of foundations required for machines, machine tools and heavy equipment which have wide range of speeds, loads and operating conditions. These foundations are designed considering the shocks and vibrations (dynamic forces) resulting from operation of machines.

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

CO1: understand basic theory of vibrations of Single Degree of Freedom systems
CO2: undertake design and analysis problems related to machine foundations
CO3: calculate the stiffness and damping constants of different types of foundations
CO4: calculate the response of machine foundations under the effect of different types of dynamic loading
CO5: explain the guidelines for design and construction of machine foundation
CO6: learn to use machine tools and heavy equipment

Topics:

- Vibration of elementary Systems
- Single degree of freedom system
- Dynamics of soil-foundation System
- Dynamic soil testing techniques
- Vibration isolation and control

Textbook(s):

1. Foundation for Machine, by S. Prakash, Wiley, 1988.
2. Soil Dynamics and Machine Foundations, by Swami Saran, Galgotic Pulbication Pvt Ltd, New Delhi.
3. Vibrations of Soil and Foundations, by Richard, Hall & Wood, Prentice Hall, June 1970
4. Dynamics of Structures, by Anil K. Chopra Prentice Hall, 4th edition 2012.
5. Vibration Analysis and Foundation Dynamics, by N. S. V. Kameswara Rao, S. Chand New Delhi.

Reference Book(s):

1. Foundation for Machine, by S. Prakash, Wiley, 1988.
2. Soil Dynamics and Machine Foundations, by Swami Saran, Galgotic Pulbication Pvt Ltd, New Delhi.
3. Vibrations of Soil and Foundations, by Richard, Hall & Wood, Prentice Hall, June 1970
4. Dynamics of Structures, by Anil K. Chopra Prentice Hall, 4th edition 2012.
5. Vibration Analysis and Foundation Dynamics, by N. S. V. Kameswara Rao, S. Chand New Delhi.

CE 4033 Structural Dynamics

Credit: 3
Category: PEC
Prerequisite(s): Mechanics of Materials (CE 2103), Structural Analysis (CE 2104)

Course Description:

Introduction to structural dynamics, determination of frequencies and time periods of single degree of freedom (SDOF) system and multi degree of freedom (MDOF) systems

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

CO1: analyze single degree of freedom (SDOF) system for damped and undamped free vibration systems
CO2: analyze single degree of freedom (SDOF) system for undamped free vibration systems
CO3: analyze single degree of freedom system for damped and undamped forced vibration for harmonic, periodic, impulse and general dynamic loads
CO4: analyze multi degree of freedom (MDOF) system for damped and undamped free vibration systems
CO5: analyze free vibration of distributed mass system of Beam
CO6: analyze forced vibration of distributed mass system of Beam

Topics:

- Single degree of freedom system
- Multi degrees of freedom system
- Free and Forced vibration of distributed mass system

Textbook(s):

1. Dynamics of Structures: Theory and Applications to Earthquake Engineering‖, by A. K. Chopra, Prentice Hall of India.
2. Earthquake resistance design of structures‖, by Pankaj Agarwal & Manish Shikhande, Prentice hall (PHI)

Reference Book(s):

1. Dynamics of structures‖, by R. W. Clough and J. Penzien, McGraw-Hill Inc.

CE 4044 Ground Improvement Engineering

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

Improvement of bearing capacity and reduction in settlement of soft ground, prevention of earthquake liquefaction, control of groundwater, stabilization of excavation bottom, prevention of deformation of surrounding ground, or clean up contaminated ground.

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

CO1: apply the ground improvement technique using admixtures and advanced technique using grouting
CO2: identify the relevance of reinforcing elements to resist the lateral earth pressures
CO3: apply suitable techniques for the deep compaction of granular soils and improvement of cohesive soils
CO4: utilize ground anchors and soil nails for design of soil retained structures
CO5: identify methods to accelerate the consolidation settlement of cohesive soil using preloading methods and vertical drains
CO6: objective to improve bearing capacity and reduce settlement of soft ground

Topics:

- Introduction
- Drainage methods
- Chemical stabilization
- Grouting
- Earth Reinforcement
- Geotextiles

Textbook(s):

1. Geotechnical Engineering, by Shashi K Gulhati and Manoj Datta, 9th Reprint edition, TMH Education Pvt. Ltd.
2. Ground Improvement techniques, by P. Purushothama Raj, Laxmi publications Pvt. L, 2005.
3. Reinforced soil and its engineering application, by Swami Saran, Second Edition, I. K. International Publishing House Pvt. Ltd, 2011.
4. Principle and Practice of Ground Improvement, by Jie Han,1st Edition, Wily Publication.

Reference Book(s):

1. Foundation Analysis and Design‖ by J.E.Bowles, McGraw-Hill Higher Education, 5 Edition 1997
2. Soil Improvement techniques and their evolution, by Van Impe, CRC Press, Jan1989.

CE 4051 Flood and Drought Estimation and Management

Credit: 3
Category: PEC
Prerequisite(s): Surface Hydrology and Hydraulics (CE 2102), Water Resources Engineering (CE 3105)

Course Description:

Preparation of hydrograph and unit hydrograph, estimate the flood by various methods, various flood routing methods, hydrologic and hydraulic flood routing, river training works, describe about various methods of flood control as well management, know the flood monitoring and forecasting methods, understand the concept of drought and its classification and also explain about the management of drought.

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

CO1: explain and develop about hydrograph and unit Hydrograph
CO2: explain and apply different flood estimation methods
CO3: explain and analyze flood routing methods of reservoir and channel both hydrologic and hydraulic methods
CO4: understand various classification of rivers and methods of river training works
CO5: explain flood control and forecasting methods
CO6: learn about drought classifications know various methods of drought assessment and management

Topics:
- Hydrograph and unit hydrograph
- Flood Estimation
- Flood Routing
- Hydrologic and hydraulic routing
- Rivers & River training works
- Flood Control and Management
- Drought Classification
- Drought Estimation
- Drought Monitoring

Textbook(s):
1. Irrigation Engineering & Hydraulic Structures by S. K. Garg, Khanna Publishers
2. Engineering Hydrology by K. Subhrmanya, TMH Education Pvt. Ltd, New Delhi

Reference Book(s):
1. Applied Hydrology, by VenTe Chow, David, R. Maidment, Lary, W. Mays., McGraw Hill Publications, 1995.
2. Elementary Hydrology, by Vijay P. Singh, Prentice Hall of India, 1994.
3. Hydrology, H.M. Ragunath, by Wiley Eastern Ltd. 1996.
4. Handbook of Applied Hydrology, by VenTe Chow, et al, McGraw Hill Publications, 1995.

CE 4053 Solid and Hazardous Waste Management

Credit: 3
Category: PEC
Prerequisite(s): Environmental Engineering-II (CE 2106)

Course Description:

The subject includes waste collection, storage, transport, disposal and processing techniques. Air emission during waste management and its control is also a major part of the subject. Introduction to hazardous waste management and integrated waste management are covered in the last section.

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

CO1: classify solid wastes and understand the functional elements of solid waste management
CO2: understand the aspects of waste generation and its effects on public health and environment
CO3: identify the strategies for waste collection, storage, processing, transport and disposal
CO4: identify proper ways of source reduction, product recycling and recovery of biological conversion products
CO5: explain various incineration technologies, estimate the energy generation potential of wastes and assess the environmental impacts of incineration
CO6: identify and classify hazardous wastes and select proper strategy for managing and treating them

Topics:

- Introduction to Solid and Hazardous waste management
- Waste Generation aspects
- Waste Processing techniques
- Incineration and energy recovery
- Hazardous waste
- Integrated Waste Management

Textbook(s):

1. Management of Municipal Solid Waste, by T.V. Ramachandra, Commonwealth of Learning, Canada and Indian Institute of Science, Bangalore, TERI Press, The Energy and Resources Institute, New Delhi, 2006.
2. Integrated Solid Waste Management, by Tchobanoglous, Thisen & Vigil, McGraw Hill International.

Reference Book(s):

1. Solid Waste Management in Developing Countries, by A.D. Bhide, Nagpur publications
2. Environmental Pollution Control Engineering, C.S. Rao, Wiley Eastern, Manual of solid waste of management, CPHEEO
3. Hazardous Waste Management by Lagrega, Buckingham & Evans, McGraw Hill International.

CE 4057 Drainage Engineering and Design

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

Understand the principle of draining the agricultural lands, types of drainage, plan and design of the agricultural lands drainage, know the drainage principle of urban lands and also plan as well as design of urban drainage system.

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

CO1: understand drainage of agricultural land
CO2: plan the drainage of agricultural land
CO3: design the drainage of agricultural land
CO4: understand the urban drainage system
CO5: plan the urban drainage system
CO6: design the urban drainage system

Topics:

- Drainage of Agricultural Land
- Urban Drainage

Textbook(s):

1. Land and Water Management Engineering by V.V.N Murthy and M.K. Jha; 6th Edition, Kalyani Publishers, Ludhiana, India.
2. Urban Drainage by D. Butler and J.W. Davis;3rd Edition, Spon Press, London and New York.

Reference Book(s):

1. Water Resources Engineering Vol. 2, Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers, 33rd Ed. End reprint 2017.

CE 4059 Reinforced Concrete Repairs & Maintenance

Credit: 3
Category: PEC
Prerequisite(s): Civil Engineering Materials & Construction (CE 2109)

Course Description:

Different methods of repair and maintenance of concrete structure. Evaluate and assess damage of concrete structure.

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

CO1: understand condition Survey
CO2: evaluate and Assess damage detection methods concrete structures
CO3: perform repair analysis and design using different materials and methodologies
CO4: understand various methods of protection of concrete structures and rebar corrosion
CO5: understand maintenance of concrete structures
CO6: corrosion analysis of concrete structure using different methods

Topics:

- Introduction
- Materials and Methodology of Repairs
- Protection of Concrete Structures
- Rebar Corrosion Protection
- Maintenance of concrete structures

Textbook(s):

1. Concrete Repair and Maintenance, by Peter H. Emmons & Gajanan M. Sabnis, Galgotia Publication.

Reference Book(s):

1. Repairs and Rehabilitation, by Compilation from Indian Concrete Journal-ACC Publication.
2. Guide to Concrete Repair and Protection, HB84-2006, A joint publication of Australia.
3. Concrete Repair Association, by CSIRO and Standards Australia.
4. CPWD hand book on Repairs and Rehabilitation of RCC buildings by DG (Works), CPWD, Government of India (Nirman Bhawan), http://www.cpwd.gov.in/handbook.pdf.
5. Guide to Concrete Repair, by Glenn Smoak, US Department of the Interior Bureau of Reclamation, Technical Service Center.
6. Management of Deteriorating Concrete Structures, by George Somerville, Taylor and Francis Publication.
7. Concrete Building Pathology, by Susan Macdonald, Blackwell Publishing.
8. Testing of Concrete in Structures, by John H. Bungey, Stephen G. Millard & Michael G. Grantham, Taylor & Francis Publication.
9. Durability of concrete and cement composites, by C.L. Page & M.M. Page, Woodhead Publishing.

CE 4061 Earthquake Engineering

Credit: 3
Category: PEC
Prerequisite(s): Mechanics of Materials (CE 2103), Structural Analysis (CE 2104)

Course Description:

Understand effect of earthquake on structure and use of standard codes to determine the earthquake force on structure.

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

CO1: identify the parameters of earthquake and seismic zones of India
CO2: determine dynamic responses of free vibration and forced vibration (un-damped & damped) for single degree of freedom systems
CO3: construct response spectra and select proper value for design from given dynamic properties.
CO4: determine dynamics responses of un-damped free vibration for multi degree of freedom systems
CO5: use standard earthquake codes for design of structure
CO6: understand different methods of Seismic retrofitting of RC and masonry buildings

Topics:

- Single degree freedom system
- Multi degree freedom systems
- Earthquake resistant design
- Seismic retrofitting of RC and masonry buildings

Textbook(s):

1. Earthquake resistance design of structures‖, by Pankaj Agarwal & Manish Shikhande, Prentice hall (PHI)

Reference Book(s):

1. Dynamics of structures (Theory and applications to Earthquake Engineering), by Anil K. Chopra PHI, New Delhi.

CE 4065 Infrastructure Planning

Credit: 3
Category: PEC
Prerequisite(s): Construction Planning and Management (CE 2108)

Course Description:

The subject deals with infrastructure management and its importance. The basic concepts of infrastructure and its different types with its role in development and crisis in India. Students will also be taught various method of analysis to justify the infrastructure requirement and making decisions based on the analysis. The students will also be made familiar with various financial parameters and its application with the help of various case studies.

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

CO1: understand the fundamental characteristics of infrastructure
CO2: understand past and contemporary challenges and trends in the theories and practice of mega infrastructure planning, appraisal and delivery
CO3: acquire basic knowledge of the international, national and regional policies and legislative frameworks
CO4: learn about market contexts that surround mega infrastructure development
CO4: understand the critical issues concerning sustainable infrastructure investment at all scales
CO5: apply innovative methods and techniques to infrastructure planning, appraisal and monitoring

Topics:

- Infrastructure – Introduction and its types
- Role of infrastructure
- Infrastructure crisis
- Economic Analysis
- Financial Evaluation
- Its application – Case studies

Textbook(s):

1. Infrastructure planning handbook: Planning, Engineering, and Economics, by A. S. Goodman and M. Hastak, McGraw-Hill, New York, 2006.
2. Infrastructure planning, by J. Parkin and D. Sharma, Thomas Telford, London, 1999.

Reference Book(s):

1. P. Chandra, Projects Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009.
2. J. D. Finnerty, Project financing - Asset-based financial engineering, John Wiley & Sons, New York, 1996.
3. L. Squire and H. G.van der Tak, Economic analysis of projects, John Hopkins University Press, London, 1975.
4. T. J. Webster, Managerial economics: Theory and practices, Elsevier, New Delhi, 2003.

CE 4067 Offshore Geotechnical Engineering

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

One of the most challenging and important in today's world is offshore geotechnical engineering, which involves designing, constructing, and maintaining man-made structures in the sea. Within the oil and gas industry, some of the most common structures include oil platforms and underwater pipelines.

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

CO1: learn about equipment and standard soil investigation methods used in offshore constructions
CO2: understand geotechnical problems related to offshore oil exploration and production
CO3: evaluate procedures relevant for foundations, piles and anchors subjected to cyclic loading
CO4: understand the anchor design
CO5: evaluate breakout resistance analysis and geotechnical aspects of offshore pipe line
CO6: understand Consolidation and shear strength characteristics of marine sediments

Topics:

- Classification; Consolidation and shear strength characteristics of marine sediments
- Planning and site exploration of offshore drilling, sampling, laboratory testing, in-situ testing methods and geophysical methods
- Current design practice of pile-supported and gravity offshore structures
- Dynamic analysis of offshore structures
- Anchor design, breakout resistance analysis and geotechnical aspects of offshore pipe line and cable design

Textbook(s):

1. G. Danton, Theory and Practice of Seamanship XI, Shroff Publishers Delhi, 4th Edition, 2002.
2. B.M. Das, Principles of Geotechnical Engineering, Thomson Brooks/Cole, 2002.

Reference Book(s):

1. Ramakrishna, T V, Marine and Offshore Engineering, Mahip Distributor Delhi

CE 4069 Cost Effective Housing

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

This subject explains the need of cost-effective housing for lower income group people, traditional materials, traditional techniques, alternative materials, cost effective techniques for cost effective housing.

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

CO1: classify the population based on income
CO2: identify the need and problems of lower income and economically weaker section regarding shelter
CO3: identify different low-cost materials and use them to build a low-cost house
CO4: learn the cost-effective technologies used in building construction
CO5: understand the cost-effective housing for natural disaster mitigation
CO6: understand the technique of modular construction

Topics:

- Income based classification of population
- Basic shelter issues in India; Recommendation of housing and urban development corporation
- Traditional materials and techniques; Alternate and developed methods / materials of construction
- Laurie Baker's experiments in low-cost housing; Modular constructions. Experimental observations/findings of CBRI
- Use of cost-effective technologies (CECT) in building constructions
- Cost effective housing for natural disaster mitigation

Textbook(s):

1. Low-cost Housing Technology, L. J. Goodman, R. P. Lama, R. Rajani, F. J. Burian, Pergamon Press, 1979.
2. International Association for Earthquake Engg. Guidelines for Earthquake Resistant Non-Engineered Construction.

Reference Book(s):

1. Are slums inevitable, L. Baker, Centre of science & technology for Rural Development, (COSTFORD) Ayanthple, Thrissur, Kerala.
2. Houses - How to reduce the building cost, L. Baker, Centre of science & technology for Rural Development, COSTFORD Ayanthple, Thrissur-68003, Kerala.

CE 4071 Basic Transportation Engineering

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

This course gives a fundamental knowledge of various transportation systems, and knowledge regarding road safety signals, signs, and markings.

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

CO1: understand highway system & design
CO2: understand railway and airport system
CO3: understand other modes of transportation engineering
CO4: learn the elements of highway geometric design
CO5: gain knowledge on various materials used for pavement construction
CO6: learn the basics of road signs and markings

Topics:

- Introduction to Transportation Systems
- Road cross-section & basics of geometric design
- Highway Materials
- Road signs, markings & signals
- Introduction to Railway Engineering
- Introduction to Airport Engineering
- Introduction to Docks and Harbour Engineering

Textbook(s):

1. A Textbook of Transportation Engineering, by S.P. Chandola, 1st Edition, S. Chand (G/L) & Company Ltd.

Reference Book(s):

1. Transportation Engineering Vol. I & II, by V. N. Vazirani & S. P. Chandola, 5th edition & 8th edition, Khanna Publishers, New Delhi.
2. Roads, Railways, Bridges, Tunnels & Harbour Dock, by Amit Gupta & B.L. Gupta, 5th edition, Standard Publications.
3. Highway Engineering‖, by K. S. Rangwala, 10th edition, Charotar Publishing House Pvt. Limited
4. Airport Engineering‖ by S. C. Rangwala, K. S. Rangwala and P. S. Rangwala, Charotar Publishing House Pvt. Ltd., Anand, Gujarat.
5. Railway Engineering‖, by Rangwala, 25th edition, Charotar Publishing House Pvt. Ltd.
6. Harbour, Dock and Tunnel Engineering‖ by R. Srinivasan, Charotar Publishing House Pvt. Ltd., Anand, Gujarat.

CE 4073 Fundamentals of RCC Structure

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

Different properties, types & test of cement, concrete and reinforcement steel, designing of simple R. C. C beams & columns.

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

CO1: know the different properties, types & test of cement
CO2: know the different gradation of coarse aggregate, test of fine & coarse aggregate, types
CO3: know the manufacturing process & different grades of steel
CO4: know the different behavior of concrete
CO5: understand the concept of stress and strain
CO6: design simple beams & columns

Topics:

- Materials for Concrete – Cement, Aggregate, Concrete
- Concept of Stress and strain
- Bending Stresses & Shear Stresses in Beams
- Basic Design Concept

Textbook(s):

1. Reinforced Concrete Design by N. Krishna Raju and R.N Pranesh, First Edition (revised), New Age International Publishers, India.

Reference Book(s):

1. Reinforced Concrete Limit State Design‖ by A. K. Jain, Nem Chand & Bros, 2002
2. Design of Reinforced Concrete structure‖ by S. Ramamruthum, 17th Edition, Dhanpat Rai & sons, New Delhi.

CE 4075 Fundamentals of Soil Physics

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

The course includes the index properties of soil, Field Water Cycle and Soil–Plant–Water Relationships., Groundwater Drainage and Pollution.

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

CO1: understand the three phase and two-phase systems in soil engineering
CO2: understand the index properties of soil
CO3: understand permeability and seepage in soil
CO4: know the Field Water Cycle
CO5: understand Soil–Plant–Water Relations
CO6: understand Groundwater Drainage and Pollution

Topics:

- Introduction & Basic Relationships
- Index Properties
- The Field Water Cycle
- Groundwater Drainage and Pollution
- Soil–Plant–Water Relations

Textbook(s):

1. Environmental Soil Physics by Daniel Hillel, 1st Edition, Academic Press, 2013.

Reference Book(s):

1. Principles of Soil Physics by Rattan Lal & Manoj K. Shukla, Marcel Dekker, Inc. New York, Basel, 2004.

CE 4077 Earth & Earth Retaining Structures

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

Retaining structures are engineered to retain soil and/or rock. There are several types of retaining structures, including gravity, sheet pile, cantilever, and anchored earth/ mechanically stabilized earth (reinforced earth) walls and slopes.

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

CO1: describe potential applications for Earth Retaining Structures (ERS)
CO2: explain the mechanical stability of Earth retaining walls
CO3: understand the applications, advantages and limitations of soil nailing
CO4: select appropriate material properties, soil design parameters, and earth pressure diagrams
CO5: perform design analysis and prepare conceptual designs
CO6: learn about several types of retaining structures

Topics:

- Earth and Rock Fill Dam
- Mechanically Stabilized Earth retaining walls
- Soil nailing
- Reinforced Soil
- Reinforced Earth wall
- Foundation on Reinforced Soil Bed

Textbook(s):

1. Reinforced Soil and its Engineering Application, by Swami Saran, Second Edition, I. K. International Publishing House Pvt. Ltd, 2011.
2. Soil Mechanics and Foundation Engineering, by V N S Murthy, CBS Publisher, 2009.
3. Analysis and Design of Foundation, by J. E. Bowles, TMH Education, New Delhi.

Reference Book(s):

1. Reinforced Soil and its Engineering Application, by Swami Saran, Second Edition, I. K. International Publishing House Pvt. Ltd, 2011.
2. Soil Mechanics and Foundation Engineering, by V N S Murthy, CBS Publisher, 2009.
3. Analysis and Design of Foundation, by J. E. Bowles, TMH Education, New Delhi.

CE 4079 Water Resources Management

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

In this course, surface and groundwater concepts of hydrological cycle, estimation of the surface runoff, management of the urban water, water conflicts in India are covered considering impact of climate change.

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

CO1: understand the basic concepts of surface components of Hydrological cycle
CO2: understand the basic concepts of groundwater components of Hydrological cycle
CO3: estimate the surface runoff by various methods and idea about water for various sectors
CO4: demonstrate familiarity in urban water and water quality management
CO5: identify and critically review the conflicting interests to be considered in making water resource management decisions
CO6: integrate information from a range of disciplines into a comprehensive picture of a water resource management issue considering impact of climate change

Topics:

- Surface water and Groundwater
- Urban water management
- Remote sensing and GIS applications
- Water conflicts in India
- Climate change and water resources

Textbook(s):

1. Engineering Hydrology by K. Subramanya, Tata McGraw Hill, and 4th Ed. End reprint 2016.
2. Water Resources Engineering Vol. 2, Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers, and 33rd Ed. End reprint 2017.

Reference Book(s):

1. Groundwater Hydrology, David Keith Todd, 2nd edition, 1976, John Wiley and Sons, New York.
2. Ground Water, H. M. Raghunath., Third edition, 2009, Wiley Eastern Ltd.

CE 4081 Project-I

Credit: 3
Category: PROJ

Course Description:

Students are required to undertake a final year major project either as an individual or in a group in consultation with the project guide which may be completed in one year. The project should be related to certain research objective or advanced technical domain. The work encompasses two semesters and to be carried out in two phases (Project-I and Project-II). In Project-I, students are expected to complete detailed literature review, identify their objective and start working on the same; perform experiments, carry out analyses and report their findings to their supervisors and the panel.

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

CO1: conduct a detailed research survey or background study and summarize the theory and findings
CO2: formulate a research question or a general objective of the project
CO3: propose and outline the solution to the research question or a pathway for the implementation of the project with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
CO4: conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
CO5: function effectively as an individual, and as a member or leader in a team under multidisciplinary settings following ethical practices
CO6: communicate effectively with a range of audiences and prepare technical reports

CE 4082 Project-II

Credit: 10
Category: PROJ

Course Description:

Project-II is a continuation of Project-I, the second phase of final year major project. Students should complete all related experiments, develop a final solution, product or system and validate the applicability of the same under real time scenario with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. They produce a detailed technical report on their work as well as individual contribution reports. Throughout the implementation of the major final year project, students should demonstrate all cognitive skills and attainment of all program outcomes and student outcomes.

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

CO1: readily apply fundamental concepts in their area of study for executing the projects
CO2: demonstrate skill in using modern technical tools, apply advanced technical knowledge, integrate information from different sources, perform complex experiments and critically analyze the findings to draw conclusions
CO3: provide engineering solutions to predefined research question or project objective; design system components or processes with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
CO4: function effectively as an individual, and as a member or leader in a team under multidisciplinary settings following ethical practices
CO5: communicate effectively with a range of audiences and prepare detailed technical reports
CO6: demonstrate knowledge and understanding of the management principles in executing their project as a member or leader of the team, and willingness to engage in life-long learning

CE 4089 Coastal Management

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

Coastal zone and Coastal Zone Management considering coastal erosion & protection, environmental impact assessment along with use Remote Sensing & GIS Applications.

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

CO1: learn about estuaries, wetlands, lagoons, and of the uses of and stresses on the coastal zone
CO2: study the classification, characteristics, and theories of waves, tides and currents
CO3: learn about coastal erosion, sea level change, and coastal structures
CO4: study sea water intrusion, desalination, and anthropogenic impacts on wetlands, mangroves and coral reefs
CO5: learn about coastal zone management and the applications of remote sensing and geographical information systems in coastal zone management
CO6: understand the concept of coastal eco-systems, coastal pollution and its implications

Topics:

- Coastal process
- Coastal erosion & protection
- Coastal Zone Management
- Environmental impact assessment

Textbook(s):

1. Harbour and Coastal Engineering, Volume I & II, 2002, Editors S. Narasimhan, S. Kathiroli,
2. Nagendra Kumar B., National Institute of Ocean Technology, NIOT, Chennai, Ocean and Coastal Engineering Publications.

Reference Book(s):

1. Coastal Structures, 2002, Proceedings of short-term course by the Department of Ocean Engineering, I.I.T. Madras, Chennai, India
2. Coastal Erosion Areas–Protection and Management, 2003, Proceedings of short-term course by the Dept. of Applied Mechanics and Hydraulics, NITK Surathkal, India
3. Handbook of Coastal and Ocean Engineering, 1990, by Herbich, Gulf publishing Co.
4. Coastal Engineering Manual, (CEM), 2006, U.S. Army Corps of Engineer, Vicksburg, Miss.
5. Port Engineering, 1981, Brunn P., Gulf publishing Company

CE 4092 Global Warming and Climate Change

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

The course deals with various environmental issues and their adverse effects on ecosystem. It also includes basics of atmosphere, atmospheric stability assessment, pollution dispersion and the radiative effects of air pollutants (gases and particulate matter). In addition to that it covers greenhouse gases, global warming phenomenon, causes and effects of global warming, climate change consequences and mitigation measures.

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

CO1: understand the importance of global warming
CO2: model and apply the techniques of 'measuring' the Earth's temperature
CO3: assess the 'best predictions' of current climate models
CO4: understand the concept of mitigation measures against global warming
CO5: explain the factors forcing climate change and the extent of anthropogenic influences.
CO6: analyze the global warming impacts through various metrics

Topics:

- Environmental Issues
- Atmospheric stability assessment
- Atmospheric pollution dispersion models
- Radiative forcing greenhouse gases and particulate matter
- Global warming: effects and causes
- Global warming metrics of greenhouse gases
- Climate change consequences

Textbook(s):

1. Gopal Bhargava, Global Warming and Climate Changes Transparency and Accountability (Vol. 3), Gyan Publishing House 2004.

Reference Book(s):

1. Environmental Engineering Vol-II by S. K. Garg, Revised Edition, Khanna Publisher, New Delhi.
2. Environmental Engineering, Peavy H.S., Rowe, D.R. and Tchobanoglous, G.. Seventh Edition, Tata McGraw Hill, 1985.
3. Climate change science: A Modern Synthesis Vol.1- The Physical Climat, G. Thomas Farmer and John Cook, Springer Dordrecht Heidelberg New York London, 2013.

CE 4094 Green Buildings

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

Concepts of green buildings, different rating systems and components of green buildings.

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

CO1: understand necessity and role of green buildings
CO2: design green buildings considering water, site and material parameters
CO3: understand passive solar design
CO4: handle construction and maintenance of green buildings
CO5: explain the factors forcing climate change and the extent of anthropogenic influence
CO6: identify factors affecting Indoor Environmental Quality

Topics:

- Introduction
- Indian Green Building Council
- Green Building Design Site issues
- Passive Solar Design
- Indoor Environmental Quality
- Economics of Green Homes

Textbook(s):

1. Green homes by R.K .Gautham, BS publications.
2. Sustainable building technical manual- Green building design, constructions and operation‖, Produced by Public Technology Inc., US Green Building Council.
3. IGBC Green homes rating system. Version 1.0 – A bridged reference guide

Reference Book(s):

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 Rob Harrison; E & FN Spon, an imprint of Thomson Science & Professional.

CE 4096 Environmental Chemistry

Credit: 3
Category: OEC
Prerequisite(s): Nil

Course Description:

The course will cover general Introduction to environmental chemistry and global biogeochemical cycles. Basic concepts of atmospheric chemistry, soil chemistry and water chemistry are given in the subject. The subject also includes green chemistry for sustainable future and its principle and application.

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

CO1: knowledge of global biogeochemical cycles
CO2: understand the basic principles of atmospheric chemistry
CO3: basic idea about climate change
CO4: understand the principles of soil chemistry
CO5: know the physico-chemical properties of water
CO6: recognize the importance of green chemistry

Topics:

- Introduction to environmental chemistry
- Atmospheric chemistry
- Soil chemistry
- Water chemistry

Textbook(s):

1. Environmental Chemistry, by V. Subramanian, IK International Publishing House Pvt. Ltd., 2011.
2. Environmental Chemistry, by De, A.K., New Age International (P) Ltd, Publishers, 4th Edition, 2001.
3. Chemistry for Environmental Engineering and Science, by Sawyer, C.N., MacCarty, P.L. and Parkin, G.F., Tata McGraw-Hill, 5th edition, 2003.

Reference Book(s):

1. Environmental Chemistry– A Global perspective, by Vanloon, G.W. and Duffy, S.J., Oxford University Press, 1999.
2. Chemistry Theory and Practice, Anastas, P.T. and Warner, J.C., Green Oxford University Press: New York, 1998.

CE 4131 Fundamentals of Traffic Flow

Credit: 3
Category: PEC
Prerequisite(s): Transportation Engineering-I (CE 3101)

Course Description:

The course includes various models with respect to speed, density, and flow, concept of PCU, capacity, and LOS for various traffic facilities.

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

CO1: describe the main characteristics of traffic flow
CO2: represent traffic phenomena using different methods and tools
CO3: recognize how traffic congestion starts and propagates
CO4: select and apply appropriate methods and techniques for analyzing traffic-related problems
CO5: interpret and elaborate different type of traffic data
CO6: learn the elements of design of various traffic facilities

Topics:

- Traffic stream characteristics and models
- Statistical theories of traffic flow (Poisson arrivals, binomial and negative binomial distributions)
- Traffic data collection methods
- Capacity and LOS of freeway and multilane highways
- Parking studies
- Analysis & design of signals

Textbook(s):

1. R. Kadiyali, Traffic Engineering and Transport Planning, Khanna Publishers.

Reference Book(s):

1. Khisty & Lal, Transportation Engineering, Prentice Hall India.
2. Khanna S.K. and Justo C.E.G. Highway Engineering, Nem Chand & Bros.
3. C. S. Papacostas and P. D. Prevedouros, Transportation Engineering & Planning
4. Introduction to Traffic Engineering by R Srinivasa Kumar, Universities Press
5. P. Chakraborty and A. Das, Principles of Transportation Engineering, PHI.

CE 4132 Urban Transportation Systems and Planning

Credit: 3
Category: PEC
Prerequisite(s): Transportation Engineering-I (CE 3101)

Course Description:

The course deals with the different types of rapid transit system and public transportation systems, detailed planning strategies which are employed for the selection of schedule for any public transit system, various mathematical models for urban transportation planning.

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

CO1: justify the need for urban transportation system planning
CO2: undertake transport surveys followed by a report
CO3: plan the process of trip generation and distribution
CO4: justify the need of a modal split
CO5: prepare the transportation plans for urban mass rapid transit systems
CO6: prepare an optimal bus schedule according to demand of the locality

Topics:

- Introduction to BRTS, MRTS, ITS
- Modelling demands for urban goods transport
- Types of urban road systems
- Trip generation analysis
- Trip distribution methods
- Route assignment models
- Modal split models

Textbook(s):

1. Traffic Engineering & Transportation Planning, by L. R. Kadyali, 4th Ed, Khanna Publishers, 2003
2. Transportation Planning and Planning‖, by C. S. Papacostas and P. D. Prevedouros, 3rd Ed, PHI, 2002

Reference Book(s):

1. Transportation Engineering: An introduction‖, by C. J. Khisty & B. K. Lall, 3rd Edition, PHI, 2006.
2. Principles of Transportation Engineering, by P. Chakraborty and A. Das, 1st Edition, 2nd reprint
   2005.PHI,
3. Highway Traffic Analysis and Design‖, by R. J. Salter, ELBS Macmilan, 2nd Edition, 1990.

CE 4151 Theory & Applications of Soil Mechanics

Credit: 3
Category: PEC
Prerequisite(s): Engineering Mechanics (ME 1003)

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

CO1: identify the soil types and classify based on index properties
CO2: evaluate the capillarity and permeability characteristics of soils
CO3: determine the seepage pressure in soil
CO4: understand the concept of shear strength of soil
CO5: understand the compaction parameters of soil
CO6: evaluate the bearing capacity of shallow foundations

Topics:

- Classification of Soil
- Seepage analysis
- Shear strength
- Compaction of Soils
- Bearing Capacity

Textbook(s):

1. Basic & Applied Soil Mechanics‖ by Gopal Ranjan & ASR Rao, Latest Edition, New Age International Publishers.
2. Soil Mechanics & Foundation Engineering‖ by B.N.D Narasinga Rao, Wiley India Pvt Ltd, New Delhi, 1st Ed 2015

Reference Book(s):

1. Principle of Geotechnical Engineering by B. M. Das & Khaled, 8th Edition, Global Engineering USA.
2. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publisher, 2012
3. Soil Mechanics and Foundation Engineering by V.N.S. Murthy, CBS Publisher, 2012

CE 4152 Construction & Management of Projects

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

The subject deals with management theories to deal with construction projects. The students will learn how to apply modern management system to manage people and resources. The students are made familiar with planning and scheduling method. The students will learn to monitor and control construction projects with various tools. Student will the risk involved in different construction projects, how to access and identify.

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

CO1: understand and apply, basic project management concepts and techniques to achieve project goals
CO2: learn the optimization of resources in a project
CO3: familiar with the project stakeholders and their roles
CO4: understand the risk assessment and risk analysis
CO5: learn the tools for scheduling, monitoring & Controlling the construction projects
CO6: schedule direct and indirect cost of a project

Topics:

- Scientific management system
- Mobilization of resources
- Project Planning and scheduling
- Project monitoring and control
- Risk assessment and identification

Textbook(s):

1. Kumar Neeraj Jha, Construction Project Management, Pearson Publication, 2011
2. Project Management by K. Nagarajan, New Age International Pvt. Ltd. 2011

Reference Book(s):

1. Construction Project Management – Planning, Scheduling and Controlling by Chitkara K.K., Tata McGraw Hill, New Delhi, 2000.
2. Professional Construction Management, Barrie D.S., McGraw Hill, New York , 1999.

CE 4153 Hydraulics and Water Resources Engineering

Credit: 3
Category: PEC
Prerequisite(s): Engineering Mechanics (ME 1003)

Course Description:

Learn and use the concept of fluid static, kinematics, dynamic behaviour, understand different measurement, preparation and presentation of rainfall and various abstractions of precipitation, estimate the runoff and know the various aspects of hydrograph.

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

CO1: understand the fundamental concepts of fluid mechanics and apply the basic equations of fluid statics to determine forces on planar and curved surfaces
CO2: know the concept of fluid kinematics, use Bernoulli's equations and estimate the energy losses in pipes
CO3: explain the types of flows and analyze uniform flow calculations in open channels
CO4: learn about various ways of presentation of rainfall data
CO5: understand the rainfall abstraction processes, measurement and modeling of infiltration
CO6: calculate the runoff by various methods and derive the unit hydrograph

Topics:

- Fluid Statics, Kinematics and Dynamics
- Urban water management
- Remote sensing and GIS applications
- Hydrologic cycle
- Precipitation
- Abstractions from Precipitation
- Runoff and Hydrographs

Textbook(s):

1. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications (P) Ltd., 9th Edition, End reprint 2017.
2. Engineering Hydrology by K. Subramanya, Tata McGraw Hill, 4th Ed. End reprint 2016.

Reference Book(s):

1. Applied Hydrology by V.T. Chow, D.R. Maidment and L.W. Mays, Tata Mc. Graw Hill, 1st Ed., First Indian Reprint 2010.
2. Water Resources Engineering by L.W. Mays, Wiley Publication, 2nd Edition, First Indian Reprint 2001.
3. Hydraulics & Fluid Mechanics by P. N. Modi & S. M. Seth, 19th Edition, Rajsons Publication Private Limited.

CE 4154 Gender & Legal Aspects in Water Resources

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

Understand the historical background and current challenges in legal aspects, describe the water legislation, water governance, policy and water conflicts in India.

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

CO1: learn the basics of water law, in a context of historical development and evolving recognition of issues related to human and ecological needs of water
CO2: understand how the policies, laws and judicial approaches tackle the recent water Issues
CO3: help formulate recommendations/responses that could resolve/avoid disputes
CO4: emphasize water as a finite common property resource that must be used in public interest
CO5: understand the legal perspective of Water Resources Management
CO6: undertake critical analysis of water conflict

Topics:

- Gender Approach to Water Management
- Historical Background and Current Challenges on Legal Aspects
- Water Legislation in India
- Water Governance
- Water Policy
- Water Conflicts in India

Textbook(s):

1. Singh, Chhatrapati Water Rights in India, Ed: Chhatrapati Singh. Water Law in India: The Indian Law Institute, New Delhi,1992.
2. Law for Water Management – A Guide to Concepts and Effective Approaches, Ed: Jessica Vapnek, Brace Aylward, Christie Popp and Jamie Bartram, FAO, Rawat Publications, New Delhi, 2011.

Reference Book(s):

1. Water Conflicts in India – A Million Revolts in the Making, Ed: K. J. Joy, Biksham Gujja, Subas Paranjape, Vinod Goud, Shruti Vispute, Rourledge, New Delhi, 2008.
2. Irrigation Management Transfer in India – Policies and Performance, Brewer, J., S. Kolavalli, A. H. Kalru, G. Naik, S, Ramnarayan, K.V. Raju and R. Sakthivadivel, Oxford and IBH Publishing Company, New Delhi,1999.
3. The Politics of Irrigation Reform – Contested Policy Formulation and Implementation in Asia, Africa and Latin America, Mollinga, Peter P., and Alex Bolding, Ashgate, England, 2004,

CE 4155 Fundamentals of Environmental Engineering

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

The subject includes fundamentals of water and wastewater treatment, municipal solid waste management, air and noise pollution.

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

CO1: characterize physical, chemical and biological parameters of water and wastewater
CO2: prepare layout plan and design various units for treatment of water
CO3: select and design various units for treatment of wastewater
CO4: characterize solid wastes and select proper methods for their collection, transportation and treatment
CO5: categorize, identify and control the parameters responsible for air pollution
CO6: identify and control the parameters responsible for noise pollution

Topics:

- Water and wastewater treatment
- Wastewater treatment
- Municipal Solid Waste Management
- Air Pollution
- Noise Pollution

Textbook(s):

1. Environmental Engineering (Vol. I) Water Supply Engineering by S.K. Garg, Khanna Publishers, 2017.
2. Environmental Engineering (Vol. II) Sewage Disposal and Air Pollution Engineering by S.K. Garg, Thirty Seventh edition, Khanna Publishers, 2017.
3. Environmental Engineering, H.S. Peavy, D.R. Rowe, & G. Tchobanoglous, Seventh Edition, McGraw Hill, 1985.

Reference Book(s):

1. Wastewater Engineering: Treatment and Reuse by Metcalf & Eddy, Inc., 5th Edition, Tata McGraw-Hill, New Delhi, 2013
2. Process chemistry for water and wastewater treatment by L.D. Benefield, J.F. Judkins and B.L. Weand, 1st edition, Prentice - Hall Series, 1981.
3. Biological process design for wastewater treatment by C.W. Randall and L.D. Benefield, 1st edition, Prentice - Hall Series, 1980.
4. Manual on water supply and Treatment by CPHEEO, Ministry of Urban Development, GoI, New Delhi, 2009.

CE 4156 Environmental Impact Assessment of Water Resource Projects

Credit: 3
Category: PEC
Prerequisite(s) Nil

Course Description:

This course introduces the field of integrated environmental management focusing on procedures, tools and techniques for Environmental Impact Assessment (EIA) with a special emphasis on impacts caused by human interventions on the multiple dimensions of environment and means of regulating them.

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

CO1: understand the purpose and processes of environmental impact assessment (EIA)
CO2: appreciate the purpose and role of EIA in the decision-making process
CO3: interpret options for evaluating environmental and social impacts
CO4: appreciate the importance of EIA for water resource projects
CO5: conduct EIA studies for different water resource projects
CO6: formulate appropriate environment management plan for sustainable water resources management

Topics:

- EIA, its importance in evaluating environmental impacts
- Concept of EIA in water resource projects
- Environmental Management Plan

Textbook(s):

1. Environmental Impact Assessment of Water Resources Projects, by Canter, L., Lewis Publishers, 1986.
2. Introduction to Environmental Impact Assessment: A Guide to Principles and Practice, by B.M. Noble, Oxford University Press, USA, 2005.

Reference Book(s):

1. Methods of Environmental Impact Assessment (The Natural and Built Environment Series), by P. Morris, 2nd edition, Spon Press, USA, 2001.
2. Environmental Assessment, by R.K. Jain, L.V. Urban, G.S., Stacey, Harold, E. Balbach, 2 edition, McGraw-Hill Professional; 2001.

CE 4157 Systems Approach in Water Resources Management

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

Know the scopes and steps of system engineering with respect to water resources, investigate the financial aspects of water resources system, understand, solve and formulate the problems of linear and dynamic programming in water resources system.

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

CO1: understand the classification and characteristics of systems in water resources management
CO2: analyze the financial aspects of WR system
CO3: understand the concept of linear programming
CO4: formulate and solve the problems of linear programming
CO5: know the concept of dynamic programming
CO6: explain the application of dynamic programming in water resources

Topics:

- System Concepts
- Financial Analysis of WR System
- Linear Programming
- Dynamic Programming
- Simulation

Textbook(s):

1. Water Resources Systems, Vedula S, Mujumdar P. P., Tata McGraw-Hill, 2005
2. Water Resources Systems Planning & Management, Jain S. K., Singh V. P., Elsevirer B. V., 2003

Reference Book(s):

1. Operations Research CBS Publications and distributions, Hiller F.S and Liebermann G.J., New Delhi, 1992.

CE 4159 Soil Mechanics in Water Resource Projects

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

Learn about the types and classification of soils based on index properties, evaluate the permeability as well as consolidation characteristics of soils, estimate the seepage pressure of soil, know the concept of shear strength of soil and compute the bearing capacity of shallow foundation and load carrying capacity of soils.

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

CO1: identify the soil types and classify based on index properties
CO2: evaluate the permeability and consolidation characteristics of soils
CO3: determine the seepage pressure in soil
CO4: understand the concept of shear strength of soil
CO5: evaluate stability of earthen slope
CO6: determine the bearing capacity of shallow foundations and load carrying capacity of piles

Topics:

- Soil formulation
- Interrelationship and characterization of soil strata
- Seepage analysis
- Shear strength
- Stability of Slopes
- Foundation Engineering

Textbook(s):

1. Basic & Applied Soil Mechanics by Gopal Ranjan & ASR Rao, Latest Edition, New Age International Publishers.
2. Soil Mechanics & Foundation Engineering by B.N.D Narasinga Rao, Wiley India Pvt. Ltd., New Delhi, 1st Ed 2015

Reference Book(s):

1. Principle of Geotechnical Engineering by B. M. Das & Khaled, 8th Edition, Global Engineering USA.
2. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publisher, 2012
3. Soil Mechanics and Foundation Engineering by V.N.S. Murthy, CBS Publisher, 2012

CE 4161 Remote Sensing & GIS for Water Resources

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

Learn about the concept, principle and application of remote sensing, idea about different types of platforms as well as sensors used in remote sensing, interpretation of satellite images, describe the fundamental principle and operation of GIS.

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

CO1: understand the concept and principle of remote sensing
CO2: describe the application of remote sensing
CO3: know about different types of remote sensing satellites and their features.
CO4: explain the fundamental operations of GIS.
CO5: manage GIS data files and also analyze the spatial and attribute data.
CO6: interpret the application of remote sensing and GIS in various water resources applications.

Topics:

- Remote Sensing
- Geographic Information System
- Water Resources Applications

Textbook(s):

1. Remote Sensing and Geographical Information systems by M. Anji Reddy, 3rd Edition, B.S. Publications,2006.
2. Remote Sensing and Geographical Information System by A.M. Chandra, S.K. Ghosh, 1st Edition, Narosa Publishing house,2007.
3. Remote Sensing and Image Interpretation by T.M. Lillesand, R.W. Kiefer and J.W. Chipman, 5thEdition, John Wiley and Sons, 2008.

Reference Book(s):

1. Fundamental of GIS by M.N. Demers, 3rd Edition, John Wiley & Sons,2008.
2. Concepts and Techniques of GIS by C.P. Lo Albert and K.W. Yonng, 2nd Edition, Prentice Hall (India) Publications, 2008.
3. Aerial Photography and Image Interpretation by D.P. Paine, 2nd Edition, Wiley, Higher Education,2006.
4. Basics of Remote Sensing and its applications by LRA Narayana, 1st Edition, Universities press, 2001.

CE 4191 Civil Engineering Laboratory

Credit: 2
Category: PCLC
Prerequisite(s): Nil

Course Description:

Laboratory procedures for determination of properties of water, cement, concrete, soil and aggregates related to Civil Engineering. Also, preparation of road profile levelling using Total Station and Determine the coefficient of discharge of venturimeter and orificemeter.

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

CO1: determine physical and chemical characteristics of water
CO2: perform road profile levelling using Total Station
CO3: determine physical and mechanical properties of OP Cement and concrete
CO4: determination of density of soil by core cutter method and by sand replacement method.
CO5: determine the coefficient of discharge of venturimeter and orificemeter
CO6: determine strength of different aggregates used for road construction

Topics:

- physical characteristics of water
- chemical characteristics of water
- Total station operation
- physical and mechanical properties of OP Cement
- physical and mechanical properties of concrete
- Introduction to various tests of soil
- density of soil by core cutter method and by sand replacement method.
- Coefficient of discharge (Cd) of Venturi meter
- Coefficient of discharge (Cd) of Orifice meter
- Experiments for testing Aggregate strength

Textbook(s):

1. IS: 3025 – 2019 Methods of sampling and test (Physical and Chemical) for water and wastewater
2. A Textbook(s) of Surveying and Levelling' by R. Agor, Khanna Publishers, New Delhi.
3. Concrete Technology Theory and Practice by M S Shetty, S Chand & Company
4. Fluid Mechanics & Hydraulic Machines by R.K. Bansal, 9th Edition, Laxmi Publications (P) Ltd.
5. Hydraulics and Water resources Engineering, Laboratory manual, SCE, KIIT (DU).
6. A Textbook(s) of Transportation Engineering, by S.P. Chandola, 1st Edition, S. Chand (G/L) & Company Ltd.

Reference Book(s):

1. IS: 10500 – 2012 Indian Standard DRINKING WATER — SPECIFICATION
2. IS: 2720 (Part 1-30). Methods of Test for Soils. Bureau of Indian Standards, New Delhi.

CE 4193 GIS Laboratory on Water Resources

Credit: 2
Category: PCLC
Prerequisite(s): Nil

Course Description:

Understand the theory and application of GIS, prepare the study area, interpolation map, land use and land cover map and estimate surface temperature.

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

CO1: understand the basic operations of GIS
CO2: know about the basic commands of Arc-GIS
CO3: prepare the layout of the study area using Arc-GIS
CO4: prepare the interpolation map using Arc-GIS
CO5: develop the land use and land cover map from satellite images
CO6: estimate the surface temperature from satellite images using Arc-GIS

Topics:

- GIS basics
- Arc-GIS commands
- Study area preparation using Arc-GIS
- Interpolation map
- Land use and land cover map
- Surface temperature estimation from satellite images

Textbook(s):

1. Remote Sensing and Geographical Information systems by M. Anji Reddy, 3rd Edition, B.S. Publications, 2006.

Reference Book(s):

1. Remote Sensing and Image Interpretation by T.M. Lillesand, R.W. Kiefer and J.W. Chipman, 5th Edition, John Wiley and Sons, 2008.

CE 6102 Construction Engineering Practices

Credit: 3
Category: PEC
Prerequisite(s): Civil Engineering Materials and Construction (CE 2109), Concrete Technology (CE 3023)

Course Description:

The primary goal of this subject is to educate the students about construction industry. To familiarize them about the works that is executed in construction projects. This subject gives understanding about the methods of construction and challenges during execution. It was also aimed to make student aware about the latest technology used for construction and its significance.

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

CO1: understand the different formwork systems and its design
CO2: understand Fabrication and erection of structures by special construction methodology
CO3: understand construction of special structures
CO4: understand challenges in executing construction projects in special structures
CO5: learn methods of concreting in extreme conditions
CO6: understand the prefabrication technology and its need

Topics:

- Formwork Design.
- Method of concreting in different climate
- Different method of curing
- Fabrication and erection of steel
- Special construction methods and its challenges

Textbook(s):

1. Formwork for Concrete Structures, by Robert L Peurifoy & Garold D.Oberiender, McGraw-Hill, 1996.

Reference Book(s):

1. Formwork for Concrete, by M.K Hurd, Fifth Edition, Special Publication No-4, (American Concrete Institute, Detroit, 1980).
2. Guide for Concrete Formwork, American Concrete Institute. Box No 19150, Detroit, Michigan-48219.

CE 6103 Construction Finance Management

Credit: 3
Category: PEC
Prerequisite(s): Engineering Economics (HS 2002)

Course Description:

The subject attempts to give student understanding of economics and finance in managing construction projects. It is aimed to make student capable to analyse and understand income statement and balance sheet of the companies. Students are given exposure on different financial analysis method to make decision making easy for the management. Different analytical methods are taught to understand student the effect of finance in construction projects.

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

CO1: make balance sheet of construction accounting
CO2: choose best alternatives for financial investments and assess financial health of organization in a given environment
CO3: explain the depreciation, taxation and inflation of any construction project
CO4: understand capital budgeting and working capital management parameters, risks, financial ratios, international finance
CO5: explain the cost elements associated with the contract bidding and tendering
CO6: understand project cash flow

Topics:

- Construction accounting
- Decision making methods
- Work pricing
- Budget planning and control
- Case studies

Textbook(s):

1. Engineering Economics by R. Pannerselvam P.H.I, N.D. 2012.
2. Engineering Economics by J.L. Riggs., Mc Graw Hill, 1976.

Reference Book(s):

1. Construction Planning & Management by U. K. Shrivastava, Galgotia N.D, 2012.
2. Project Planning, Analysis, Selection, Implementation & Review by Prasanna Chandra (Tata McGraw Hill Publishing Co Ltd.), 2010.
3. Essentials of Management by Harold Koontz and Heinz Weihrich (McGraw Hill).
4. Principles of Management by Dr. M.M. Verma and Agarwal, Himalaya Publisher, 2008.
5. Essentials of Management by B.P. Singh and J.N Chhabra, South Western College Publishing-1991.
6. Industrial Engg and Management by O.P. Khanna, Khanna Publisher - 2008.
7. Construction Management and Planning by B. Sengupta and H. Guha Tata Mc Graw Hill, ND 1995.
8. Principle of Construction Management by Pilcher, McGraw Hill, 1981.

CE 6106 Construction Methods & Equipment

Credit: 3
Category: PEC
Prerequisite(s): Construction Planning and Management (CE 2108)

Course Description:

The subject gives knowledge about machines available in the market and its utilization. The students with learn how to select equipment for constructions jobs. The students are made familiar with concept of productivity of machines and plants. The students will learn to measure the utilization and their performance in different jobs, also identify reasons of underperformances of the plant & machineries.

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

CO1: prepare owning and operating cost of any construction equipment
CO2: select appropriate construction equipment for different purpose and environments
CO3: measure the output/ production of equipment
CO4: understand the equipment and its application for different construction methods
CO5: take decisions on improving the productivity of equipment
CO6: identify reasons of underperformance of the plant & machineries

Topics:

- Right selection of equipment
- Classification of equipment
- Performance of equipment
- Equipment for special constructions

Textbook(s):

1. Construction Planning, Equipment and Methods, R. L. Peurifoy, P. E Clofford ,J Sehexnayder, P.E., Tata Mc Graw Hill Publishing ,N.D

Reference Book(s):

1. Construction Equipment and Management by S.C. Sharma, Khanna Publishers, New Delhi.
2. Construction Equipment and its Planning and Application, by Mahesh Verma, Metro Politan Book Company, New Delhi.
3. Construction Planning and Equipment, by Satyanarayana & Saxena, Standard Publishers Distributors, Edition 3, 1985.
4. Heavy Construction, by Vazirani & Chandolu, Khanna Publisher Delhi.

CE 6113 Construction Contract Management & Quantity Surveying
Credit: 3
Category: PEC
Prerequisite(s): Civil Engineering Materials and Construction (CE 2109), Construction Planning and Management (CE 2108)

Course Description:

The subject deals with mainly two aspects in construction project, contract management and quantity surveying. The students will learn contract agreement and the interpretation of clauses in dealing the projects between client and contractor. The students are made familiar with tendering and bidding process. The students will learn to estimate quantity and cost for the project.

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

CO1: understand the types of contract and common contract clauses
CO2: understand the roles and responsibilities of employer, engineer/consultant and contractor
CO3: learn the process of tendering including evaluation of the bid
CO4: read working drawings for civil engineering items
CO5: evaluate the quantity of major civil engineering items
CO6: understand and carry out rate analysis of civil engineering item

Topics:

- Types of Contracts
- Clauses under contracts
- Arbitration and dispute settlement
- Quantity estimation of structure
- Cost estimations
- Tendering and bidding process

Textbook(s):

1. Dutta B.N., Estimating and Costing in Civil Engineering – Theory and Practical , UBS Publishers Distributors Pvt. Ltd. , New Delhi, 2002.
2. Patil, B.S., Civil Engineering Contracts And Estimates, University Press , 4th Edition 2015.

Reference Book(s):

1. Singhal Ajay Kumar, Basics of Construction Management, SEA, 2014.
2. McCaffer R. & Baldwin A.N., Estimating & Tendering for Civil Engineering Works, Thomas Telford, London, 1991.
3. Chakraborti M., Estimating, Costing Specification & Valuation in Civil Engineering, S. Chand Publisher, Calcutta 1999.

CE 6134 Project Quality and Safety Management

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

This subject deals with quality and safety related to projects. Specifically, it covers various quality control tools, preparation of quality manuals and concept of total quality management. It also deals with the planning of safety prior to and during various construction activities.

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

CO1: identify different techniques of quality control and select the appropriate one for given conditions
CO2: use different quality standards/ codes in design and construction
CO3: understand total quality management
CO4: explain safety and various parameters of safety construction
CO5: manage accident/injuries during construction according to safety standards
CO6: understand the safety legislation, standards/codes with regard to construction

Topics:

- Introduction to quality planning and control of quality during design of structures
- Quantitative techniques in quality control, Quality assurance during construction
- Preparation of quality manuals, check list and inspection report
- Quality standards/ codes in design and construction
- Philosophy of total quality management (TQM)
- Structural safety, Safety consideration during construction, demolition and during use of equipment
- Management of accidents/ injuries at site
- Training for safety awareness and safety manual

Textbook(s):

1. Construction Safety by Jimmy W. Hinze, Prentice Hall Inc, 1997.
2. Construction Safety and Health Management by Richard j.coffe, jimmie Hinze and Theo C.Haud Prentiee Hall Inc, 2001.

Reference Book(s):

1. Tamilnadu Factory Act Construction Planning and Management by UK Shrivastav, Galgotia Publication – 2000.

CE 6136 Building Services Planning

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

Student will be taught to carry out the functional planning of the building by optimizing the space, determine the fire rating. Students will also be taught the escape plan of lift, staircase as per the safety regulations of building code

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

CO1: explain urban planning
CO2: explain functional planning of buildings
CO3: understand different techniques used for optimization of space
CO4: determine fire rating of building construction
CO5: prepare the layout plan of lift & escalator in building
CO6: prepare the layout plan to satisfy the fire safety rules

Topics:

- Components of urban forms and their planning
- Concepts of neighborhood unit, Street system and layout in a neighborhood
- Functional planning of buildings
- Optimization of space
- Space requirements and relationships for typical buildings, like residential offices, hospitals, etc. Standard fire, fire resistance
- Classification of buildings, means of escape, alarms

Textbook(s):

1. Environmental Control Systems, by Mooref, McGraw Hill, Inc 1994

Reference Book(s):

1. Building Services, by Peter R. Smith & Warren G. Jullian, Applied Science Publisher ltd, London.
2. Hand book of Buildings and Enclosure, by A. J. Elder & Martix Vinder Bary, McGraw Hill Book Co, 1982.
3. The fire Precautions Act in Practices 1987, by Jane Taylor & Gordon Cooke, Architectural Press, June 1978.

CE 6142 Contract Laws & Regulations

Credit: 3
Category: PEC
Prerequisite(s): Nil

Course Description:

The subject attempts to inculcate understanding about all the essential elements of a valid contract in detail, Quasi Contracts, Contingent Contract, Breach of Contract, Bailment and Pledge, Contract of Agency. It is aimed to make student capable of explaining what contracts are. Understand how to form legally binding contracts, analyze terms of a contract, effect of contract on costing and budget of the construction project.

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

CO1: understand contract, contractual procedures & tendering
CO2: know contract laws
CO3: understand about claim, compensation, and disputes
CO4: understand arbitration and conciliation
CO5: understand claim settlement and dispute resolution
CO6: perform estimates and costing of any Civil Work

Topics:

- Definition of contract and its significance.
- Tendering process.
- Different clauses in the construction contract.
- FIDIC
- Estimation of the project

Textbook(s):

1. Contracts and the Laws environment for the Engineers and Architects by Joseph T. Bockrath.
2. Laws relating to Building & Engineering Construction in India by Gajaria G.T.

Reference Book(s):

1. Construction Planning & Management by U.K. Shrivastava.
2. Construction, Planning & Management by P.S. Galhot.
3. Estimation, Costing & Valuation by B.N. Dutta.
4. Estimation, Costing, Specification & Valuation by M. Chakraborti.
5. Textbook(s) on Estimation & Costing by G.S. Birde.

CE 6208 Stability of Structures

Credit: 3
Category: PEC
Prerequisite(s): Structural Analysis (CE 2104)

Course Description:

Stability analysis of thin plates and determination of critical loads for column and frames.

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

CO1: analyze and find the critical state of thin plates
CO2: determine critical state of the structural system
CO3: understand the enhance the design analysis process
CO4: evaluate the structural stability of columns, frames
CO5: analyze Beam-columns on rigid supports
CO6: approximate calculation of critical loads for bar structures by energy method

Topics:

- Torsion
- Lateral Buckling of beams
- Beam-columns on rigid supports
- Approximate calculation of critical loads
- Effects of shearing force on the critical load

Textbook(s):

1. Theory of Elastic Stability by S.P. Timosheko & Gere, McGraw-Hill, 1961

Reference Book(s):

1. Structural Members and Frames by T.V Galambos Prentice-Hall INC, 1968.
2. The stability of Frames by M.R.Horns and W.Merchang Porgamon press, 1965.
3. Elastic Instability by M.Gregory, Spon‘s Civil Engineering series,1967.
4. Buckling Strength of Metal structures by F.Bleich, Mc Graw Hill Book co.,1952
5. Structural Stability (Theory and implementation) by W.F. Chen and EM Lui, Elsevier NY

CE 6209 Advanced Structural Analysis

Credit: 3
Category: PEC
Prerequisite(s): Mechanics of Materials (CE 2103), Structural Analysis (CE 2104)

Course Description:

Analysis of different types of structures using matrix methods and plastic analysis. Also, draw influence line diagrams for indeterminate structure.

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

CO1: understand and apply the concept of energy theorems to solve practical problems
CO2: draw influence line diagrams for indeterminate structures
CO3: analyze beams, trusses and frames using flexibility Matrix methods
CO4: analyze beams, trusses and frames using stiffness Matrix methods
CO5: understand concepts of plastic analysis
CO6: perform plastic analysis of frame structures

Topics:

- Energy Theorems
- Influence line for Redundant Structures
- Matrix Method of Analysis
- Plastic Analysis

Textbook(s):

1. Matrix Analysis, by Pandit and Gupta, TMH Company Limited
2. Matrix and Finite Element Analyses of Structures, by Madhujit Mukhopadhyay and Sheikh Abdul
3. Hamid, ANE Books

Reference Book(s):

1. Indeterminate Structures, by J. S. Kinney, Addition Wesley Publication Co.
2. Fundamental of Limit Analysis of Structures, by Manick Selvam, Dhanpat Rai Publication.
3. Matrix Analysis of Framed Structures, by W. Weaver and J. M. Gere, CBS Publishers

CE 6211 Finite Element Method

Credit: 3
Category: PEC
Prerequisite(s): Engineering Mechanics (ME 2003), Mechanics of Materials (CE 2103)

Course Description:

Formulate finite element models and determine forces and deformations of structure.

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

CO1: understand the fundamentals of finite element method
CO2: derive and know various types of finite elements and its application
CO3: analyze various structures using finite element method
CO4: understand different Formulation Techniques
CO5: apply finite element method to structural and geotechnical engineering
CO6: develop computer program for finite elements

Topics:

- Fundamentals of finite element
- Formulation Techniques
- One Dimensional Element
- Two-Dimensional Element
- Three-Dimensional Element

Textbook(s):

1. Introduction to Finite Elements in Engineering‖, T. R. Chandrupatla and A. D. Belegundu, 4th Edition, Pearson,2012
2. Concepts and Applications of Finite Element Analysis‖, by R. D. Cook, 4th Edition, John Wiley & Sons, 2003.

Reference Book(s):

1. The Finite Element Method: Its Basics and Fundamentals ‖, by O. C. Zienkiewicz, Elsevier; Seventh edition, 2013
2. Finite Element Procedures‖, by K. J. Bathe, Prentice Hall, Second edition, 2007

CE 6235 Soil-Structure Interaction

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100)

Course Description:

Soil-Foundation Interaction, Beam on Elastic Foundation, Elastic Analysis of Pile

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

CO1: understand various theories applicable to SSI
CO2: calculate Contact pressure and settlement under foundations
CO3: calculate earth pressure on different retaining structures
CO4: understand the theories and application methods for modelling the soil structure interaction for various typical field situations
CO5: know the elastic analysis of pile
CO6: analysis of beam on elastic foundation

Topics:
- Soil foundation interaction problems by different models
- Analysis of finite and infinite beams on elastic foundation
- Elastic analysis of single and group of piles

Textbook(s):
1. Foundation Analysis and Design by J E Bowles- Tata-McGraw Hill
2. Elastic Analysis of Soil-Foundation Interaction by Selvadurai, A.P.S. Elsevier

Reference Book(s):
1. Pile Foundation Analysis and Design by Poulos H. G. and Davis E. H.- John Wiley,1980.
2. Design Analysis of Beams, Circular Plates and Cylindrical Tanks on Elastic Foundation by E.S. Melersk.
3. Beams of Elastic Foundation by M. Hetenyi, University Michigan Press 1946

CE 6238 Composite Structures

Credit: 3
Category: PEC
Prerequisite(s): Civil Engineering Materials & Construction (CE 2109), Mechanics of Materials (CE 2103)

Course Description:

Understand the concepts of composite structure and methods of analysis.

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

CO1: know the classifications of composite material and its applications
CO2: know the method of manufacturing processes of composite
CO3: know macro and micro-mechanics of composite material
CO4: learn the failure theories of composite material
CO5: design a laminate based on the application
CO6: understand design requirements of composite structures

Topics:

- Introduction to composite materials
- Macromechanical behaviour of lamina
- Micromechanical behaviour of lamina
- Micromechanical behaviour of laminate
- Strength criterion for an orthotropic lamina
- Bending of laminated plate

Textbook(s):

1. Mechanics of Composite Materials, by Robert M. Jones, CRC Press, Second edition, 2015

Reference Book(s):

1. Mechanics of Composite Materials, by A. K. Kaw, Taylor& Francis-India, Second edition, 2006

CE 6241 Design of Bridges

Credit: 3
Category: PEC
Prerequisite(s): Structural Analysis (CE 2104), Design of Concrete Structures (CE 3103)

Course Description:

Understand different types and components of bridges and methods of design construction of different types bridges.

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

CO1: understand various requirements of bridge design
CO2: select appropriate site for Bridge
CO3: understand different types of sub structure for bridges
CO4: explain construction methods for different types of bridges
CO5: design bearings for bridges
CO6: understand different types of construction joints

Topics:

- Introduction
- Site investigation and planning
- Bridge foundations
- Girder bridges
- Pre-stressed concrete bridges and steel bridges

Textbook(s):

1. Design of Bridge Structures‖, by T. R. Jagadeesh & M. A. Jayaram, 2nd Edition, PHI Learning Pvt. Ltd.
2. Design of Concrete Bridges‖, by M. G. Aswani, V. N. Vazirani & M. M. Ratwani, 2nd Edition, Khanna Publishers, New Delhi, 2004.
3. Essentials of Bridge Engineering‖, D. J. Victor, Oxford and IBH

Reference Book(s):

1. Design of Bridges‖, N. Krishna Raju, Oxford and IBH.
2. Concrete bridge Practice: Analysis, Design and Economics‖, V. K. Raina, Tata McGraw Hill.
3. Dynamics of Railway Bridges‖, L. Fryba, Thomas Telford Ltd, April 1996.
4. Concrete Bridges‖ by P.E. Mondorf, Taylor & Francis.
5. Bridge Engineering‖ by S. Ponnuswamy, Tata Mc Graw Hill.

CE 6248 Pre-Stressed Concrete

Credit: 3
Category: PEC
Prerequisite(s): Structural Analysis (CE 2104), Design of Concrete Structures (CE 3103)

Course Description:

Understand the concepts of prestressed concrete and design of prestressed concrete members.

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

CO1: determine the prestressing force required in beam for a prestressing system
CO2: compute losses and deflections of prestressed concrete members
CO3: compute flexural strength & torsional resistance of prestressed concrete members
CO4: design End Blocks of a post tensioned prestressed concrete member
CO5: design continuous prestressed concrete beams
CO6: design prestressed concrete pipes, mast and railway sleepers

Topics:

- Different systems of pre-stressing
- Analysis and design of section
- Stress distribution in end-block of post tensioned section
- Deflection of prestressed structures
- Indeterminate structures
- Design of special structures

Textbook(s):

1. Prestressed Concrete‖, by N. Krishna Raju, TMH, New Delhi.
2. Design of Prestressed Concrete Structure‖, by T.Y. Lin, Asia Publishing House.

Reference Book(s):

1. Limit State Design of Prestressed Concrete‖, by Y. Guyan, Applied Science Publishers.
2. Prestressed Concrete, by Raja Gopala N., Narosa Publishing House, New Delhi.
3. Design of Prestressed Concrete Structures‖ by T.Y. Lin & Ned H. Burns; John Wiley & Sons.

CE 6303 Open Channel Hydraulics

Credit: 3
Category: PEC
Prerequisite(s): Fluid Mechanics (CE 2101)

Course Description:

Various types of flows encountered in open channels, analysis of uniform flow, various types of flow profiles in gradually varied flow, problems of gradually and spatially varied flow, analysis of the rapidly varied flow calculations and the dynamics of gradually and rapidly varied unsteady flow.

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

CO1: analyze uniform flow calculations in open channels
CO2: solve problems on dynamics of gradually varied flow
CO3: solve problems on spatially varied flow
CO4: analyze rapidly varied flow calculations in open channels
CO5: understand the dynamics of gradually varied unsteady flow
CO6: understand the dynamics of rapidly varied unsteady flow

Topics:

- Uniform flow
- Gradually varied flow
- Rapidly varied flow
- Unsteady flow

Textbook(s):

1. Open Channel Flow, by F. M. Henderson, MacMillan Publishing Company, 1996.
2. Flow in Open Channel, by K. Subramanya, Tata McGraw Hill, New Delhi.

Reference Book(s):

1. Flow through Open Channel, K. G. Rangaraju, Tata McGraw Hill, New Delhi.
2. Open Channel Hydraulics, by V.T Chow, McGraw-Hill Publishing Company, New Delhi, 1993.
3. The Hydraulics of Open Channel Flow An Introduction, by H. Chanson, Elsevier.
4. River Hydraulics, Technical Engineering and Design Guides as adapted from the U.S. Army Corps of Engineers, No. 18, New York, ASCE Press.
5. Engineering Hydraulics, by H. Rouse, John Wiley & Sons.

CE6305 Advanced Fluid Mechanics

Credit: 3
Category: PEC
Prerequisite(s): Fluid Mechanics (CE 2101)

Course Description:

Differentiate between flow and fluid properties, apply the potential flow theory for the determination of lift force of an aerofoil, explain the distribution of velocity in viscous flow, solve laminar boundary layer equations, carry the linear stability analysis and identify the causes of turbulence.

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

CO1: determine magnitudes of various types of deformations of a fluid element
CO2: apply the potential flow theory to determine the lift force on an object (aerofoil)
CO3: obtain the velocity distribution in viscous flow through parallel plates, pipes and calculate the shear stress
CO4: solve laminar boundary layer equations for flow over a flat plate and compute the drag force experienced by the plate
CO5: carry out a linear stability analysis and can establish the criteria for a flow to be in stable condition
CO6: identify the causes of turbulence and controlling factors; determine the velocity distribution in turbulent flow and find the drag in turbulent boundary layer flow

Topics:

- Potential flow theory
- Viscous flow
- Boundary layer theory
- Stability analysis of laminar flow
- Turbulent flow

Textbook(s):

1. Viscous Fluid Flow, F. M. White, 2011, Third Edition, Tata McGraw Hill, New Delhi.

Reference Book(s):

1. Fluid Mechanics by V.L. Streeter, 1971, New York, McGraw-Hill Book, New York.

CE 6306 Ground Water Engineering

Credit: 3
Category: PEC
Prerequisite(s): Water Resources Engineering (CE 3105)

Course Description:

Understand the occurrence of groundwater, explain the hydraulics of well for steady and unsteady flow, describe the procedure of shallow and deep well construction, know the modern methods of groundwater exploration, describe the various ways of artificial recharge and management of groundwater.

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

CO1: know the groundwater concept
CO2: analyze well hydraulics for steady and unsteady flow in aquifer
CO3: explain the construction of shallow and deep wells
CO4: identify modern methods of groundwater exploration
CO5: describe various methods of artificial recharge of ground water
CO6: explain the concept of ground water management

Topics:

- Hydrologic cycle, Water balance, Occurrence of ground water
- Well Hydraulics
- Methods of constructions of deep and shallow wells
- Surface and Subsurface investigations of groundwater
- Groundwater management

Textbook(s):

1. Groundwater Hydrology, by D. K. Todd, John Wiley and Sons.

Reference Book(s):

1. Groundwater and Tube Wells, by S. P. Garg, Oxford and IBH Publishing Co., New Delhi.
2. Handbook of Applied Hydrology, by V. T. Chow, McGraw-Hill Publishing Company, New York.
3. Ground Water, by H.M. Raghunath, New Age International Publishers; 3rd edition, Dec 2007.

CE 6307 Remote Sensing & GIS

Credit: 3
Category: PEC
Prerequisite(s): Surveying and Geomatics (CE 2107)

Course Description:

Learn about the concept, principle and application of remote sensing, idea about different types of platforms as well as sensors used in remote sensing, interpretation of satellite images, describe the fundamental principle and operation of GIS.

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

CO1: understand the concept and principle of remote sensing
CO2: know the application of remote sensing
CO3: describe the various types of platforms and sensors used in remote sensing
CO4: interpret satellite images
CO5: explain the fundamental operations of GIS
CO6: manage GIS data files and also analyze the spatial and attribute data

Topics:

- Physical Basis of Remote Sensing
- Platform and Sensors
- Resolution
- Image Interpretation
- Geographical Information systems
- GIS analysis functions

Textbook(s):

1. Remote Sensing and GIS, by Basudev Bhatta, Oxford, 2013
2. Remote Sensing and GIS, by M. Chandra and S. K. Ghosh, Narosa Pub, 2007.
3. Surveying Volume -2 by S. K. Duggal, Third Edition, Tata Mecgraw Hill- 2011.

Reference Book(s):

1. An Introduction to GIS, by I. Heywood, S. Cornelius and S. Carver, 2nd Ed, Pearson Education, 2002.
2. Fundamentals of Remote Sensing, by George Joseph, Universities Press, Second Edition-2011.
3. Advanced Surveying- Total station, GIS, Remote Sensing by Satheesh Gopi, R. Sathikumar, N. Madhu, Pearson Eduction-2007
4. Remote Sensing and Image Interpretation, by T. M. Lillisand, R. W. Kaifer & J. W. Chipman, 6th Edition, John Wiley and sons Inc, Nov 2007.

CE 6309 Advanced Hydrology

Credit: 3
Category: PEC
Prerequisite(s): Fluid Mechanics (CE 2101), Surface Hydrology and Hydraulics (CE 2102)

Course Description:

Learn about various hydrological processes for tackling the engineering problems, derive the unit and synthetic hydrograph, computation of flood, describe various flood routing methods, know about hydrological statistics and apply computer models for the hydrological prediction.

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

CO1: gain an understanding of advanced hydrological processes and techniques necessary for tackling engineering and environmental problems, such as predicting design floods
CO2: analyze hydrographs and derive unit and synthetic unit hydrograph
CO3: explain various methods of flood estimation
CO4: describe the different methods of flood routing
CO5: understand the hydrological statistics
CO6: apply advanced computer models for hydrological prediction.

Topics:

- Hydrologic Principles
- Hydrograph
- Flood
- Flood routing
- Hydrologic Statistics

Textbook(s):

1. Applied Hydrology by Ven Te Chow, David R. Maidment and Larry W. Mays, Tata McGraw Hill Education (India) Private Limited.
2. Engineering Hydrology by K. Subramanya, 4th Edition, Tata Mc-Graw hill, New Delhi.

Reference Book(s):

1. Principles of Hydrology by R.C. Ward and M. Robinson, 4th Edition, Mc-Graw Hill, New Delhi.
2. River Hydraulics, (Technical Engineering and Design Guides as adapted from the U.S. Army Corps of Engineers, No. 18) New York, ASCE Press.
3. Engineering Hydraulics, by H. Rouse, John Wiley & Sons.

CE 6310 Water Resources System Analysis

Credit: 3
Category: PEC
Prerequisite(s): Water Resources Engineering (CE 3105)

Course Description:

Know the fundamentals of water resources system analysis, analyze the financial aspects of water resources projects, explain the various techniques of optimization and application of water resources system concepts in irrigation, flood control, hydropower generation, water supply and drainage.

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

CO1: understand the fundamentals of water resources system analysis
CO2: analyze the financial aspects of water resources projects
CO3: explain the various optimization techniques
CO4: develop a simulation model related to water resources planning
CO5: explain reservoir operation, planning and management of water resources projects
CO6: explain economics for hydro-systems, water pricing and allocation policies

Topics:

- Water Resources System
- Linear Programming
- Dynamic Programming
- Systems concepts and its application

Textbook(s):

1. Water Resources Systems Planning & Management, S. K. Jain & V. P. Singh, Elsevier Science B.V

CE 6332 River Engineering & Sediment Transport

Credit: 3
Category: PEC
Prerequisite(s): Surface Hydrology and Hydraulics (CE 2102), Water Resources Engineering (CE 3105)

Course Description:

Know the morphology of river with respect to engineering and sedimentation, understand the river morphology and sediment transport modelling, explain the governing equations and various models of sediment transport, describe the measurement of sediment transport and reservoir sedimentation.

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

CO1: know about river morphology in respect of engineering, sediment and river regulation systems
CO2: understand analytical and numerical modeling of river morphology and sediment transport
CO3: explain the design of stable channels and river engineering works
CO4: governing equations of sediment transport
CO5: explain about various models of sediment transport
CO6: understand sediment transport measurement, sedimentation in reservoirs and its computational methods

Topics:

- River Flow hydrology
- Sediment Sources and Sediment Characteristics
- Design of Stable Channels
- Modelling of Sediment Transport and River Morphology
- Sedimentation in Reservoirs

Textbook(s):

1. River Engineering by K.D. Gupta, Vayu Education of India, 2014.
2. Sediment Transport: Monitoring, Modeling and management by A.A. Khan and W. Wu, Earth Sciences in the 21st Century, NOVA Science Publishers, 2013.

Reference Book(s):

1. River Mechanics, by P.Y. Julien, Cambridge University Press, 2002.
2. Sediment Transport: Theory and Practice, by C.T. Yang, McGraw-Hill, 1996.

CE 6342 Water Power Engineering

Credit: 3
Category: PEC
Prerequisite(s): Fluid Mechanics (CE 2101), Water Resources Engineering (CE 3105)

Course Description:

Describe the water power plants classification, plan and site selection of hydropower projects, design the various components of hydroelectric scheme economically, explain the working principle of hydro power projects, know about the water hammer and surge tanks and choose various types of turbines.

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

CO1: explain the classifications of water power plants based on various parameters
CO2: identify the sites for the hydropower projects
CO3: design different components of hydroelectric scheme effectively and economically
CO4: explain the construction process of hydro power development project
CO5: understand the theory of water hammer and types of surge tanks
CO6: select different types of turbines according to head, specific speed and casing

Topics:

- Concepts of Water power Engineering
- Hydropower projects
- Intake structure
- Water Hammer
- Selection of turbine

Textbook(s):

1. Water Power Engineering, by M. M. Dandikar & K. N. Sharma, Vikas Publication.

Reference Book(s):

1. Water Power Engineering, by H.K. Barrows 2nd Edition, McGraw-Hill, London.
2. Irrigation Water Resource & Water Power Engineering, by P. N. Modi, Standard Book House Dec 2008.

CE 6347 Advanced Irrigation Engineering

Credit: 3
Category: PEC
Prerequisite(s): Water Resources Engineering (CE 3105)

Course Description:

Know about the requirement, types and methods of irrigation, design various surface and sub surface irrigation methods, idea of different flow measurement instruments, describe the principle of surface irrigation hydraulics, design the drainage system and understand the balance of salt and water within the root zone.

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

CO1: understand and identify different types and methods of irrigation
CO2: design different surface and sub-surface irrigation methods
CO3: use different types of flow measurement instruments
CO4: explain the fundamentals of surface irrigation hydraulics
CO5: design drainage system
CO6: know salt and water balance within the root zone

Topics:

- Irrigation requirement
- Crop evaporative and drainage requirements
- Field measurement techniques
- Infiltration
- Fundamentals of surface irrigation hydraulics
- Drainage

Textbook(s):

1. Irrigation Engineering and hydraulics structures by S. K. Garg, Khanna Publishers, 25th Edition.
2. Irrigation theory and practice, A.M. Michael, Vikas Publishing House Pvt. Ltd, 2nd Edition, 2009.

Reference Book(s):

1. Irrigation Water Management Principles and Practices, by Majumdar D. P., Prentice Hall of India, New Delhi, 2004.

CE 6405 Advanced Soil Mechanics

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

This course explores the engineering mechanics of soil. The topics covered include: basic elasticity and plasticity theory, anisotropy and strain-rate effects, laboratory and in situ measurement of soil properties, basic constitutive models, critical state soil mechanics, and applied soil mechanics

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

CO1: know the fundamental concepts of soil formation and its subsequent effect on soil
CO2: understand clay behavior in terms of its mineralogy
CO3: understand cohesionless soil and its properties in terms of its composition
CO4: perform seepage analysis
CO5: interpret consolidation test data and subsequent analysis of one dimensional vertical settlement
CO6: Know laboratory and in situ measurement of soil properties

Topics:

- Introduction: Origin of soil and its types, mineralogy and structure of clay minerals, X-ray and Differential
- Thermal Analysis
- Consolidation
- three-dimensional consolidation theories; Sand drains
- Critical state soil mechanics
- Soil Stabilization
- Strength improvement characteristic of soft and sensitive clay, Marine clay and waste material

Textbook(s):

1. Das & Sobhan, Principles of Geotechnical Engineering, 8th Edition, 2016
2. Holtz,Kovacs & Sheahan, An Introduction to Geotechnical Engineering, 2nd Edition,2011

Reference Book(s):

1. R.O. Davis and A.P.S. Selvadurai, Elasticity and Geomechanics, Cambridge University Press, New
2. York, 2002
3. Mitchell, James K, Fundamentals of Soil Behaviour, John Wiley and Sons, 2005.
4. D.M. Wood, Soil Behaviour and Critical State Soil Mechanics, University of Glasgow, 1991 CE

CE6407 Foundation Engineering: Principles And Practices

Credit: 3
Category: PEC
Prerequisite: Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

The course includes investigation, design, contracting, and construction of shallow, intermediate, and deep foundations, including remediation of soft, wet, expansive, and frost-prone soils.

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

CO1: understand the concepts of deformations and strains in a body when subjected to stresses
CO2: learn about stress and strain transformations in a 3D field
CO3: understand the results using theory of elasticity approach and compare with SOM approach for different types of structural problems
CO4: understand the fundamentals of plasticity theory
CO5: learn the principles and practices for the investigation and design
CO6: motivation for using Different Foundation Types

Topics:

- Introduction to Foundation Design
- Motivation for using Different Foundation Types
- Bearing Capacity Analysis, Concept of upper and lower bound solutions
- Structural and Geotechnical design of spread footings and mat foundations
- Shallow Foundations
- Deep Foundations

Textbook(s):

1. P.C. Varghese, Foundation Engineering, Ninth Edition, 2012

Reference Book(s):

1. H. G. Poulos, E. H. Davis, Pile foundation analysis and design, Wiley, 1980.

CE6412 Geotechnical Stability Analysis

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering- I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

This course includes study of landslide phenomenon, analysis of slope stability, seismic slope stability and slope stabilization.

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

CO1: understand the types and causes of slope failures
CO2: analyze the stability of infinite slopes with or without water pressures
CO3: apply various methods to analyze the stability of slopes
CO4: carry out seismic slope stability
CO5: learn the methods of selection for slope stabilization
CO6: understand the methods of slope stabilization

Topics:

- Landslide phenomenon: Types and causes of slope failures, Practical applications, case studies
- Analysis of slope stability: Stability analysis of infinite slopes with or without water pressures; Stability analysis of finite and Infinite slopes: concept of factor of safety, pore pressure coefficients, important details of stability analysis, Mass analysis, Wedge methods, friction circle method; Method of slices, Bishop's method, Janbu's method; Effect of seepage, submerged and sudden draw down conditions
- Seismic slope stability: pseudo-static screening analysis, determination of peak acceleration, shear strength for pseudo-static analysis, post-earthquake stability analysis
- Slope stabilization: factors governing selection of method of stabilization, drainage, retaining structures, reinforcing piles and drilled shafts, injection methods, vegetation, repair of failed slopes

Textbook(s):

1. Chowdhury R.& Bhattacharya, Geotechnical Slope Analysis, CRC press, 2009
2. L. W Abramson, T. S Lee, S Sharma and G M Boyce, Slope Stability and Stabilization Methods,
3. Willey Inter science publications, 2002

Reference Book(s):

1. T W Lambe and R V Whitman, Soil Mechanics, John Wiley & sons, 1979
2. Soil Strength & slope Stability, Duncan, Wright & Brandon, 2nd Edition, 2016

CE 6431 Soil Exploration and Field Test

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100)

Course Description:

The course includes method of exploration, different types of borings based on types of soil strata, method of sampling from bore holes, pore pressure measuring devices in laboratory and field, Load and settlement measurement devices in the field.

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

CO1: identify sources of subsurface information
CO2: knowledge about different types of borings in field
CO3: report relevant field reconnaissance information for soil investigation
CO4: perform all the relevant laboratory and field test on soil
CO5: prepare log soil samples and prepare bore-hole logs for civil engineering projects
CO6: perform plate load test for settlement of footing in field and in laboratory

Topics:

- General principles of exploration
- Soil profile, Pore pressure measurement devices
- types of borings and sampling methods

Textbook(s):

1. V.N.S. Murthy, Principles of Soil Mechanics and Foundation Engineering, UBS Publishers Private Ltd, 2002.

Reference Book(s):

1. B M Das, Principles of Geotechnical Engineering, Thomson Brooks/Cole, 2002.

CE 6435 Finite Element Method in Geo-Mechanics

Credit: 3
Category: PEC
Prerequisite(s): Mechanics of Materials (CE 2103), Structural Analysis (CE 2104), Geotechnical Engineering-I (CE 2100)

Course Description:

Strain relationship and problems, structural analysis on different numerical methods, one- and two-dimensional problems with detailed formulation, isoparametric elements, numerical integration, plate bending concept and analysis by 3D modelling.

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

CO1: understand the importance of numerical modeling in geotechnical engineering
CO2: learn to solve the solution of linear and non-linear systems of equations
CO3: learn finite element formulation, discretization and meshing.
CO4: model soil response
CO5: model soil by considering compressibility, yielding, hysteresis
CO6: concept of 3D modelling and analysis on plate bending

Topics:

- Introduction
- One- and Two-Dimensional Problems
- Isoparametric Elements
- Plate Bending

Textbook(s):

1. R. D. Cook, Concepts and Applications of Finite Element Analysis, John Wiley 2002(4th)
2. O. C. Zienkiewicz and R. L. Taylor, Finite Element Method, McGraw Hill- 1977

Reference Book(s):

1. D. L Logan, A First Course in the Finite Element Method, PWS Publishing, Boston-1997
2. C. S. Krishnamoorthy, Finite Element Analysis-Theory and Programming, Tata McGraw Hill-1995.

CE 6436 Tunnel Engineering

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Design of Concrete Structure (CE 3103)

Course Description:

Tunnel Engineering covers the site investigations required for planning, design and construction of tunnels. It also covers structural design of tunnels and techniques required for construction various types of tunnels in hard rock, soft ground,

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

CO1: evaluate soil or rock properties required for tunnel planning and design
CO2: know various methods of tunnel construction in rock and soft grounds
CO3: design the tunnel structure
CO4: understand the micro tunneling techniques
CO5: plan the ventilation of tunnels
CO6: determine the long-term settlement of foundations based on one dimensional consolidation theory

Topics:

- Site investigations, Geotechnical Considerations of tunneling
- Design of Tunnels
- Construction & Excavation methods, soft ground tunnels, Rock tunnels
- Micro tunneling techniques, Tunnel support design
- Ventilation of tunnels, tunnel utilities, safety aspects

Textbook(s):

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel, Chapman & Hall, New York, 2nd edition,1996.

Reference Book(s):

1. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski, Balkema Publication, Sept 1989.
2. Engineering in Rocks for Slopes, Foundations and Tunnels by T. Ramamurthy, PHI Learning Pvt. Limited, 2014.
3. Tunnel Engineering by Asheesh Kumar, Vayu Education of India, Jan 2013

CE 6437 Geosynthetics & Reinforced Earth Structures

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

Fundamental concepts on geosynthetic, design guidance for different lay-out of reinforcement, application of geosynthetic in reinforced structure, analysis of different case study on slopes and retaining walls.

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

CO1: develop an understanding of the fundamental concepts that govern the behavior of soils reinforced with geosynthetics
CO2: provide design guidance for allowable tensile strength, vertical reinforcement spacing, length of reinforcement, drainage, seismic loading issues, and different facing systems
CO3: know the composition, properties and functions of Geosynthetics
CO4: understand the applications of Geosynthetics in reinforced earth structures
CO5: design geosynthetic-reinforced steep slopes and walls
CO6: apply the knowledge for analysis of different case history

Topics:

- Earth and Rock Fill Dam
- Mechanically Stabilized Earth retaining walls
- Soil nailing
- Reinforced Soil
- Reinforced Earth wall
- Foundation on Reinforced Soil Bed

Textbook(s):

1. Clayton, C.R.I., Milititsky, J. and Woods, R.I., Earth Pressure and Earth Retaining Structures, Blackie Academic & Professional, 1993.
2. Ingold, T, Reinforced Earth, Thomas Telford Ltd., 1982.
3. G. L. Sivakumar Babu, An Introduction to Soil Reinforcement and Geosynthetics, Universities Press, India, 2006
4. Swami Saran, Reinforced Soil and Its Engineering Applications, I. K. International Pvt Ltd, 2005

Reference Book(s):

1. Jones, C.J.F.P, Earth Reinforcement and Soil Structures, Butterworth, 1985.
   Koerner, R.M, Designing with Geosynthetics, Prentice Hall, 1993

CE 6443 Rock Mechanics

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100)

Course Description:

The course is objecting to know laboratory testing on rock sampling, factors affecting strength and deformation of rocks, classification of rock mass and different field tests on rock mass, Concept on stability of rock slopes, fundamental on foundations constructed on rock

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

CO1: critically review rock mechanics principles and methods and their applications to engineering practices
CO2: measure the physical characteristics of rock masses, including the engineering description of rocks, discontinuities and rock mass; the strength of rock substance, defects and rock mass; laboratory testing of rock, data presentation
CO3: analyze stresses under gravitational and imposed loads for rock engineering applications.
CO4: predict the response of rock masses to loading (and unloading)
CO5: analyze rock slope stability and foundations on rock
CO6: analyze foundations (shallow and deep) on rock

Topics:

- Laboratory Testing and Classification
- Field Testing of Rock Masses
- Methods of Improving Rock Properties
- Stability of rock slopes
- Foundation on Rocks

Textbook(s):

1. Introduction to rock Mechanics by R .E .Goodman; John Wiley & Sons.
2. Manual on Rock Mechanics by Central Board of Irrigation and Power.

Reference Book(s):

1. Hand Book Mechanics properties of Rock By R . D. Lama and V. S. Vulukuri Vol. I to IV.
2. Rock Mechanics for Engineers – B. P. Varma, Khanna Publications
3. Rock Mechanics and Hydraulic Structures – Obert and Duvall (1967) John Viley and Sons Ind.
4. Rock Mechanics in Engineering Practice – Stag and Zienkiewec (1968) John Viley and Sons Ind.
5. Foundation Engineering Hand Book by Winterkorn H.F. and Fang H.Y , Van Nostand Reinhold Company, 1975
6. Relevant Indian Standards

CE 6445 Pavement Analysis & Design

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100) / Transportation Engineering-I (CE 3101)

Course Description:

The subject deals with structural analysis and design of flexible pavement and rigid pavement using relevant codes of Indian Road Congress. The students will be made familiar with the concepts and procedures mechanistic –empirical design of flexible pavement using IRC 37:2012. They will be taught the basic concept and detailed step by step approach of rigid pavement design. The course will cover the structural health evaluation using FWD and strengthening of pavement.

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

CO1: understand the principles and factors affecting pavement design
CO2: know the traffic considerations in pavement design
CO3: analyze and design flexible pavement using empirical and mechanistic empirical methods
CO4: design rigid pavements using IRC, AASHTO and other important methods of design
CO5: structural evaluation of existing pavement using BBD and FWD
CO6: design overlay on existing pavement based on the structural evaluation

Topics:

- Principles of Pavement Design
- Traffic Considerations in Pavement Design
- Analysis of Flexible Pavements
- Flexible Pavement Design Methods
- Analysis of Concrete Pavements
- Concrete Pavement Design Methods
- Structural Evaluation and Strengthening

Textbook(s):

1. Pavement Analysis and Design‖ by Y. H. Huang, Dorling Kindersley (India) Pvt. Ltd., New Delhi, India

Reference Book(s):

1. Principles of Pavement Design‖ by E. J. Yoder and M. W. Witczak, Wiley and Sons, New York, USA, 1975.
2. Specifications for Roads and Bridge Works‖, Ministry of Road Transport and Highways, Indian Road Congress, New Delhi, India.
3. IRC: 37 (2018) ―Guidelines for Design of Flexible Pavements‖, Indian Road Congress, New Delhi.
4. IRC: 58 (2011) ―Guidelines for Design of Plain Jointed Rigid Pavements for Highways‖, Indian Road Congress, New Delhi.
5. IRC: 81 (1997) ―Guidelines for Strengthening of Flexible Road Pavements using Benkel man Beam Deflection Technique‖, Indian Road Congress, New Delhi.
6. IRC: 115 (2014) ―Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements using Falling Weight Deflectometer (FWD) Technique‖, Indian Road Congress, New Delhi.

CE 6446 Geotechnical Earthquake Engineering

Credit: 3
Category: PEC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

This course on Geotechnical Earthquake Engineering introduces the fundamental concepts of earthquake engineering related to geotechnical problems, principles of earthquake, wave propagation, dynamic soil properties, liquefaction and seismic design of various geotechnical structures.

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

CO1: know the concept of Geotechnical Earthquake Engineering
CO2: understand seismic design concepts and current practices for shallow and deep foundations, slopes and retaining walls to enable them to plan and direct the construction activity appropriately
CO3: understand the soil dynamic testing procedure and methodology of seismic design to be able to execute a proper design
CO4: explain design methodology and the interpretation in the seismic codes while designing foundations, slopes and retaining walls
CO5: know the performance of Earthquake Geotechnics
CO6: understand the fundamental concepts of earthquake engineering related to geotechnical problem

Topics:

- Introduction to Geotechnical Earthquake Engineering
- Seismology and Earthquakes, Strong Ground Motion
- Seismic Hazard Analysis
- Dynamic Soil Properties
- Liquefaction
- Seismic Response Analysis of Slopes, Retaining Walls and Shallow Foundations, Case Studies in Earthquake Geotechnics
- Performance-based Earthquake Geotechnics – An Introduction, Usage of Softwares

Textbook(s):

1. Kramer, S. L. (1996). Geotechnical Earthquake Engineering, Prentice Hall, New Jersey, Seventh
2. Impression
3. Bolt, B. A. (2005). Earthquakes: 2006 Centennial Update, W. H. Freeman, New York.
4. Stein, S. and Wysession, M. (2003). An Introduction to Seismology, Earthquakes, and Earth Structure, Blackwell Publishing, Oxford.

Reference Book(s):

1. Towhata, I. (2008). Geotechnical Earthquake Engineering, Springer, Berlin.
2. Ishihara, K. (1996). Soil Behaviour in Earthquake Geotechnics, Clarendon Press, Oxford.
3. Srbulov, M. (2008). Geotechnical Earthquake Engineering Simplified Analyses with Case Studies and Examples, Springer, Dordrecht

CE 6449 Advanced Foundation Engineering

Credit: 3
Category: PCC
Prerequisite(s): Geotechnical Engineering-I (CE 2100), Geotechnical Engineering-II (CE 3107)

Course Description:

The fundamentals of machine foundation and discussion on liquefaction phenomena. Design of foundation on expansive soils and Stabilization of soil by adding admixtures and vibration control methods.

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

CO1: know the concept of machine foundation
CO2: determine the soil parameters for foundations subjected to dynamic loads and its control measures
CO3: assess the liquefaction potential of soil strata under earthquake condition
CO4: identify the swelling potential of cohesive soil and its effect on the building, measures to prevent the swelling using various ground improvement and design methods
CO5: identify the ground improvement techniques to make the soil suitable for the construction of structures
CO6: get the concept of use of geotextile in reinforced earth wall and modern materials, ground anchors & soil nails

Topics:

- Machine Foundations
- Liquefaction of foundation soils under earthquakes
- Foundations on Expansive soils
- Foundation Soil Improvement techniques

Textbook(s):

1. “Advanced Foundation Engineering”, by V. N. S, Murthy, First Edition, CBS Publishers & Distributors.
2. “Foundation Analysis and Design”, by J.E. Bowles, 5th Edition, McGraw Hill Higher Education, 1997

Reference Book(s):

1. “Soil mechanics and foundation Engineering”, by K.R.Arora. Standard Publisher, 2005.
2. "Geotechnical engineering handbook" by B.M.Das, J.Ross Publishing, Cengage learning, 2009.
3. "Principles of Foundation Engineering" by B.M.Das, 7th Edition, Cengage Learning India Pvt. Ltd, New Delhi, 2013.
4. “Reinforced soil and its engineering application" by Swami Saran, Second Edition, I. K. International Publishing House Pvt. Ltd, 2011.
5. “Geotechnical Engineering”, by Shashi K. Gulhati & Manoj Datta, Tata Mcgraw Hill Publishing Co Ltd, 2014.
6. “Foundation Engineering”, by P.C.Verghese, PHI Learning Private Limited, July 2013.
7. “Ground Improvement Techniques” by P. Purushothama Raj, Laxmi publications Pvt. L, 2005.

CE 6500 Environmental Impact Assessment and Auditing

Credit: 3
Category: PEC
Prerequisite(s): Environmental Engineering-I (CE 2105), Environmental Engineering-II (CE 2106)

Course Description:

The course includes the requirement of EIA, national policy, procedure of EIA and environmental auditing. Other aspects like environmental risk analysis, economic valuation methods, cost-benefit analysis, GIS applications, different case studies of EIA and environmental auditing are also included.

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

CO1: identify the roles of EIA and environmental audits
CO2: prepare an EIA Report required to evaluate the environmental sustainability of any project
CO3: prediction and assessment of impacts on physical, biological and socio-economic environment
CO4: legislative and environmental clearance procedures in India and other countries
CO5: requirement of public participation in EIA
CO6: conduct an environmental audit and evaluate its result

Topics:

- Requirement of EIA in a project
- Screening and Scoping criteria
- Application GIS in EIA
- Environmental management plan
- Environmental auditing

Textbook(s):

1. Introduction to Environmental Impact Assessment: A Guide to Principles and Practice, by B. M. Noble, Oxford University Press, USA, 2005.
2. Introduction to Environmental Impact Assessment: Principles, and Procedures, Process, Practice and Prospects (The Natural and Built Environment Series), by J. Glasson, Routledge; 3rd edition, 2005.

Reference Book(s):

1. Methods of Environmental Impact Assessment (The Natural and Built Environment Series) , by P. Morris, 2nd edition, Spon Press, USA, 2001.
2. Environmental Assessment, by R. K. Jain, L. V. Urban, G. S., Stacey, Harold, E. Balbach, 2 edition, McGraw-Hill Professional; 2001.

CE 6501 Physico-Chemical Processes for Water and Wastewater Treatment

Credit: 3
Category: PEC
Prerequisite(s): Environmental Engineering-I (CE 2105), Environmental Engineering-II (CE 2106)

Course Description:

The course includes physical, chemical and biological characteristics of water and wastewater, standards for effluent discharge from various industries as well as for drinking water, various physio-chemical processes for wastewater treatment like sedimentation, filtration, coagulation, membrane process and disinfection.

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

CO1: identify various physical, chemical and biological parameters responsible for water pollution
CO2: know the potable water and wastewater effluent standards
CO3: categorize various unit operations and processes required for water purification
CO4: evaluate physical and chemical treatment options for treatment of water and wastewater
CO5: explain the mechanism behind the treatment processes and their advantages and disadvantages
CO6: design various physico- chemical units for the treatment of water and wastewater

Topics:

- Physical, chemical and biological parameters of water and wastewater
- Water purification systems
- Mixing, clarification and sedimentation
- Filtration
- Membrane process and electrodialysis

Textbook(s):

1. Weber, W.J. Physicochemical processes for water quality control, John Wiley and sons, Newyork, 1983.
2. Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.

Reference Book(s):

1. Metcalf and Eddy, Wastewater engineering, Treatment and Reuse, Tata McGraw-Hill, New Delhi, 2003.

CE 6503 Biological Process Design for Wastewater Treatment

Credit: 3
Category: PEC
Prerequisite(s): Environmental Engineering-I (CE 2105), Environmental Engineering-II (CE 2106)

Course Description:

The course includes basic principles of biological wastewater treatment, Design and performance of different bioreactors like UASB, EFBR, MBR and SBR, sludge dewatering and various sludge treatment methods.

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

CO1: identify conventional and advanced biological treatment processes for the treatment of wastewater
CO2: design the biological reactors based on biokinetics
CO3: select and design appropriate aerobic treatment unit for removal of BOD
CO4: select and design appropriate anaerobic unit for removal of BOD
CO5: design proper biological nitrogen and phosphorus removal system
CO6: adopt and design proper sludge treatment and disposal process

Topics:

- Basic principles of biological wastewater treatment
- Aerobic activated sludge process
- Aerobic biofilm process
- Biological nitrogen and phosphorus removal process
- Sludge treatment and disposal process

Textbook(s):

1. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy Inc., Fourth Edition, McGraw Hill Education India Private Limited, 2015.
2. Biological Processes Design for wastewaters by Benefield, L.D. and Randall C.W., Prentice-Hall, Inc. Eaglewood Cliffs, 1989.

Reference Book(s):

1. Introduction to Environmental Engineering and Science by Gilbert M. Masters, 3rd Edition, Pearson Education, 2015.
2. Environmental Engineering by Peavy, H.S., Rowe, D.R., Tchobanoglous, G., McGraw Hills, New York, 2013.

COURSES OF OTHER PROGRAMMES

HS 2002 Engineering Economics

Credit: 3
Category: HSMC
Prerequisite(s): Nil

Course Description:

The course on Engineering Economics is a specialized need-based extension of applied Economics which is aimed at developing an understanding of the principles governing Economy's vital parameters like market, finance, Production,consumption and distribution.. The course focuses on learning methodical and rational conceptualization and developing the knowledge for effectively implementing these market principles in actual organizational activities and forums. The course intends to develop the ability of taking decisions related to project selection and implementation, optimization of market vitals like sales, revenue, profit, cost etc. It serves as the base of learning all Economics related elective papers offered in higher semesters as well as preparation for any competitive exams like civil services, MAT etc.
Course Outcomes: At the end of the course, the students will be able to:

CO1: apply economic theory for optimisation of the economic variables of demand, supply,sales,profit, cost and revenue
CO2: apply the budgeting principles in making economic decisions during project appraisals
CO3: develop awareness towards all the economic issues related to the financial market, Budget, Money, Credit and Fiscal Policies etc.
CO4: relate and apply theoretical concepts in Economics with contemporary/modern business practices
CO5: understand the vitals of the financial market, know the source and methods of raising capital for an organization
CO6: understand the depreciation of asset principles and efficient inventory/resource management

Topics:

- An Introduction to Economics and Engineering Economics
- Basic Concepts of Economics: Market equilibrium and Consumers and Producer's equilibrium
- Elasticity and Demand Forecasting
- Optimization of Profit and cost
- Break Even Analysis
- Evaluation of Projects: Economic Appraisal Techniques
- Depreciation calculation and Inventory management
- Vitals of Money and capital market

Textbook(s):

1. Managerial Economics: Principles and Worldwide Applications. Dominick Salvatore,Siddartha K.Rastogi,8th Edition,Pub.Oxford University Press.ISBN: 9780199467068.
2. Engineering Economics –James L.Riggs, DavidD.Bedworth and Sabah U.Randhawa,4th Edition, McGraw Hill Education(India) Private Limited, New Delhi,2016.

Reference Book(s):

1. Principles of economics, Deviga Vengedasalam and Karunagaran Madhavan, Oxford University Press, New York,3rd Edition,2013.

2. Managerial Economics-Principles and Worldwide Applications-Dominick Salvatore, Adapted by Ravikesh Srivastava,7thEdition, Oxford University Press,2012.
3. Micro ECON-A South-Asian Perspective-by William A. McEachern and Simrit Kaur, Cengage Learning, 2013.
4. Engineering Economy-Zahid A. Khan, Arshad Noor Siddiquee, BrajeshKumar, Pearson Publication, 2012.
5. Engineering Economics – R.Panneerselvam, Pub: PHI Learning Private Limited, New Delhi, 9thEdition, 2008.

HS 2008 Economic Environment of India

Credit: 3
Category: HSMC
Prerequisite(s): Nil

Course Description:

The Course on Economic Environment of India is designed to cater encompassing discernment of Indian Economy to the students. The course precisely highlights the role of different sectors in Indian economy and also touches upon the normative aspect of striking balance among different sectors. It covers the status of public economics in Indian context. Besides, it ensures the students to have knowledge on the role of foreign sector.

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

CO1: develop the analytical understanding of the economic situation of the country
CO2: develop the skill to interpret the economic indicators during steady growth path and economic crisis
CO3: acknowledge the role of different policy making bodies in India related to economic affairs
CO4: develop the ability to analyze the occupational structure of the country and sectoral contribution to growth
CO5: examine the extent and role played by foreign sector in the form of exchange rate, FDI etc in the domestic economy
CO6: develop a critical understanding of the fiscal position of the country

Topics:

- Economic Crises and Way out: Economic Crisis of early 1990s-Macro Economic Reforms since 1991
- Primary Sector and Secondary Sector: Agriculture during the Reform Period; New Industrial Policy
- Tertiary Sector and Foreign Sector: Service sector as the engine of growth in India; Trade reforms
- Public Finance: Fiscal reforms in India post 1991; Centre-State Fiscal relationship

Textbook(s):

1. Dutt and Sundaram.Indian Economy. latest edition.

Reference Book(s):

1. Uma Kapila (2019), Indian Economy since Independence, New Delhi, Academic Foundation.
2. Balakrishnan, P. (2010): 'Economic Growth in India: History and Prospect'. Oxford
3. University Press, New Delhi.
4. Bhagwati Jagdish and Arvind Panagariya(2012): ' India's Tryst with Destiny'. Collins Business, Noida, India.
5. Jean Dereze and Amartya Sen (1996): 'Indian Development: Selected Regional
6. Perspectives'. Oxford University Press, New Delhi.
7. Ajijava Raychaudhuri and Prabir De (2012), International Trade in Services in India, New Delhi, Oxford University Press.

HS 2010 Financial Institutions, Markets and Regulations

Credit: 3
Category: HSMC
Prerequisite(s): Nil

Course Description:

The course on Financial Institutions, Markets and Regulations is a specialized need-based extension of Financial Economics. This course is designed to present the fundamental concepts and theories in financial market and promote the application to the workplace and professional practice. It introduces current financial concepts and tools towards money management in organizations participating in the local and global economies. The course covers the current best practices in financial analysis and planning through the application of financial concepts in a nutshell. These include financial vitals relate to money and capital markets, time value of money, cost of capital, risks and return, long-term financial budgeting. Inaddition, the course also introduces topics on lease financing, hybrid securities and derivatives, trust funds, mergers and acquisitions and related issues in current financial sector.

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

CO1: have comprehensive understanding of the nature and functions of the several types of financial institutions operating in the market
CO2: develop critical skills in applying the principles of finance and financial inter-mediation to the real world situations
CO3: effectively interact with the financial markets they need to approach for their future economic endeavors and/or in their place of employment
CO4: make economic decisions and analysis of issues related to security market transactions and policies
CO5: develop the understanding of the structure and functions of Indian financial institutions, instruments and policies
CO6: take decisions regarding saving, investments, portfolio contents and diversification to maximize their return and reduce associated risks

Topics:

- Financial systems: Significance of banks and all other Financial institutions
- Financial Innovations
- Overview of Structure of Financial Debts and Equity markets
- Functions of Financial Intermediaries
- Monetary authority: Reserve Bank of India: Its role, structure and functioning
- Subprime crisis
- Derivative markets
- Capital market authority: structure and functions
- Regulation of Capital market, Role of SEBI

Textbook(s):

1. Madura, Jeff (2008), Financial Markets and Institutions, 8th edition, Thomson Publications.

Reference Book(s):

1. Fabozzi, Frank, Modigliani, Franco, Jones, Frank (Feb 2009), Foundations of Financial Markets.
2. Eakins, Stanley G. (2005), Financial Markets and Institutions (5th Edition), Addison Wesley.
3. Howells, Peter, Bain, Keith (2007), Financial Markets and Institutions, 5th Edition.

4. Barth, James R., Caprio, Gerard, and Levine, Ross (2008), Bank Regulations are Changing: For Better or Worse?, Association for Comparative Economic Studies.
5. Goldstein, Morris (2006), Financial Regulation after the Subprime and Credit Crisis, Washington: Peterson institute.

HS 2012 Development Economics

Credit: 3
Category: HSMC
Prerequisite(s): Nil

Course Description:

The course on Development Economics is a specialized need-based extension of Economics dealing with issues related to economic growth and development. It provides an in depth discussion of the different economic description of development and underdevelopment. It will put a deep insight into the most challenging economic issues of poverty, inequality and underdevelopment faced by the humanity. It will deal with the various existing, modern and developing strategies and policies to tackle these issues and foster the economy onto the path of development. The students will be able to assess the pros and cons of a proposed development intervention and its likely impact on the target population.

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

CO1: develop the understanding of issues related to economic growth and economic development
CO2: relate and apply the major growth theories in their related academic projects
CO3: develop the familiarity with major economic issues faced by the country like poverty, inequality, underdevelopment etc.
CO4: analyse and compare the development paths adopted across countries of the globe
CO5: analyse the empirical evidence on the pattern of growth and development
CO6: develop critical understanding of the existing, adopted and needed policies and strategies for sustainable growth and development

Topics:

- Concepts and difference between growth and development.
- Measures of growth and development
- Models of growth and development
- Poverty and Inequality : Perceptions, estimation and measures of improvement
- Impact of poverty and inequality on growth and development
- Cross country perspectives of development

Textbook(s):

1. Todaro, M. P. & Smith, S. C. (2015), Economic Development, Pearson (12^{th} Edition).
2. Thirlwall A. P. Growth and Development (6 th and 7 th edition)

Reference Book(s):

1. Debraj Ray : Development Economics
2. Meier and Rauch,: Leading Issues in Economic Development, OUP, Latest Edition
3. Kaushik Basu :Analytical Development Economics , OUP
4. Human Development Reports, various years
5. Bagchi A. K. The Political Economy of Underdevelopment, Cambridge University Press 1982.

HS 2081 Business Communication

Credit: 1
Category: HSMC
Prerequisite(s): Nil

Course Description:

This course is designed to give students a comprehensive view of communication, its scope and importance in business. This is an interactive course with a view to enhance language and soft skills with the aid of live demonstration within the framework of the syllabus. It is a foundation building measure to enable the students to excel in the corporate world and in day to day life.

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

CO1: develop competence in reading and comprehension, develop skimming skills for extracting the main idea(s) from the text, and scanning for keywords
CO2: enrich the fluency of the students with Collocations and Phrasal Verbs
CO3: use Email effectively and efficiently as per the organization hierarchy. To retain a logical flow while drafting emails, make aware students about the importance of succinct written expression in modern Business Communication
CO4: write standard and effective Cover Letters and Resume
CO5: bridge the gap between native language and target language i.e. English, make students communicative competent and develop their fluency in public speaking
CO6: prepare effective Power Point Slides. Maintain and arrange proper data structure in presentations. To learn skills of making effective presentation (verbal and non-verbal aspects)

Topics:

- Reading Comprehension – Activity based on BEC Training – Matching, Multiple Choice Questions, Open Close, Giving Appropriate Headings
- Collocation – Activity based on Word-Stock, Phrasal Verbs & Vocabulary Building
- E-mail – Activities based on Writing Appropriate Salutation, Paragraphs & Conclusion
- Resume Writing
- Thematic Discussions
- Speaking in Pairs – Everyday Activities & Detailed Introduction
- Activity based on PowerPoint Presentation

HS 3006 Entrepreneurship

Credit : 3
Category : HSMC
Prerequisite(s): Nil

Course Description :

The course has been designed for the students in order to provide basic knowledge of an entrepreneur and opportunities for new entrepreneurship. To provide idea about various financial sources available for small and medium enterprise by different financial institutions. To provide knowledge how to manage working capital of an organization in an efficient manner. To have an idea about motivational tools for increasing the productivity of employees in an enterprise.

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

CO1: know the contribution of an entrepreneur in growth and development of socioeconomic condition of our country
CO2: understand the role of SSI units in growth and development of socioeconomic condition of our country
CO3: learn market survey, sales promotions and management of working capital through costing and book keeping
CO4: know different decision making technique and benefit of personal management system.
CO5: learn motivational methods of an enterprise
CO6: learn how to prepare a project report and knowledge about different tax system of an enterprise

Topics:
- Introduction to entrepreneurship
- SSI Units
- Market survey and research
- Marketing mix
- Financial management
- Working capital management
- Personnel management
- Motivation

Textbook(s):
1. Entrepreneurial Development, S.S.Khanka, S.Chand

Reference Book(s):
1. Industrial Organisation and Engg. Economics, Sharma & Banga, Khanna Publication
2. Entrepreneurship New Venture Creation, David H. Holt, Prentice Hall, PHI

HS 3008 Management Concepts And Practices

Credit: 3
Category: HSMC
Prerequisite(s): Nil

Course Description:

The course curriculum is designed for student in order to provide fundamental knowledge in management area. The students will be able to know about general management concepts and various specialization in management area like marketing, finance, production and strategy management. The marketing management portion of the course will benefit the students to develop their career in marketing line, as most of the organisations give priority for marketing skills. Finance and production management will help the students in their respective domain and serve as a guide in their corporate career. The strategy management portion of this course will serve as a guide for the students to contribute in strategy formulation of the organization and how to achieve that strategy within a stipulated time period.

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

CO1: perform the critical management functions effectively and develop ideas about implementing principles and theories of management in organizations efficiently
CO2: develop various marketing skills in order to be successful in corporate world
CO3: utilize different financial techniques for better management and control of organisational financial resources
CO4: take strategic decision for day to day operation through proper working capital management.
CO5: have competency in production planning as well as control measures will become easy in their professional career
CO6: do strategy formulation of the organization and how to achieve that strategy within a stipulated time period

Topics:

- Introduction to management
- Marketing mix
- Market research
- Financial management
- Working capital management
- Production planning and control
- Inventory management
- Strategy management

Textbook(s)

1. Modern Business Organisation and Management. Sherlekar & Sherlekar, Himalaya Publishing House.
2. Business Organisation and Management. M. C. Shukla, S. Chand

Reference Book(s)

1. Principles & Practices of Management. L. M Prasad
2. A framework for marketing management, Philip Kotler
3. Financial Management. I. M Panday
4. Production and Operation Management, Everett E. Adam Jr. Ronald J. Ebert

HS 3002 Organisational Behaviour

Credit: 3
Category: HSMC
Prerequisite(s): Nil

Course Description:

The course has been designed for the students to provide an understanding about the behaviour of individuals, groups and the system in the organization. The course will help the students how to develop personality and leadership style for achievement of individual and organizational objective. To know about the benefit of motivation for increasing individual and organizational productivity. To Provide knowledge to work in groups and develop techniques for group decision making for organizational development.

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

CO1: know about organization, organizational behaviour its nature, scope and significance
CO2: develop their personality as per industry requirement
CO3: apply motivational techniques to make the employees work with confidence and satisfaction
CO4: develop different leadership style to adjust themselves in different organizational situations
CO5: improve the knowledge of group behaviour and techniques of group decision making
CO6: apply the concepts for managing changes in organization as well as the development of an organization's human resources

Topics:

- Introduction to Organisation and organisational behaviour
- Personality
- Motivation
- Leadership
- Group dynamics
- Organisational change
- Organisational development

Textbook(s) :

1. Organisational behaviour. Stephen P. Robbins, Timothy A. Judg, S. Sanghi, Pearson
2. Organizational Behaviour and Work, F. M. Wilson, Oxford University Press.

Reference Book(s):

1. Organizational Behaviour, Dipak Kumar Bhattacharya, Oxford University Press
2. ORGB, Organizational Behaviour, Nelson, Quick, Khandelwal, Cengage
3. Organisational Behaviour. Dr. S. S Khanka, S. Chand
4. Managing Organisational Behaviour, Moorhead & Griffin, Cengage Learning.

HS 3004 Human Resource Management

Credit: 3
Category: HSMC
Prerequisite(s): Nil

Course Description:

The course has been designed in order to provide knowledge and idea about human resource management and how to become a professional human resource manager. It will help the students to follow different HR processes like recruitment, training, performance appraisal effectively in organizational level. The students will able to learn how to manage industrial dispute and develop industrial relation in corporate sector. The course will enable the students to understand the workers participation in management concept through employee discipline and the process of effective bargaining system in the organisation.

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

CO1: develop personal and professional qualities of a manager in order to manage human resource of an organization effectively
CO2: meet the human resource requirement of the organization for achieving its objective effectively
CO3: follow different HR processes like recruitment, selection, training, performance appraisal effectively in organizational level
CO4: inculcate the sense of inter personal relation required in professional front in handling employer-employee relation effectively for achievement of organizational objectives
CO5: achieve strategic objectives of the organizations, by optimizing the potentiality of the human resource through workers participation in management
CO6: know the technique of managing and being managed by the organisation

Topics:

- Human resource management
- Human resource planning
- Recruitment
- Selection
- Training
- Performance appraisal
- Industrial relation
- Industrila dispute
- Collective bargaining
- Workers participation in management

Textbook(s):

1. Human Resource Management, P. Jyoti & D. N. Venkatesh, Oxford Publication, 2016
2. Human Resource Management, B. Varkkey & G. Dessler, Pearson, 2017

Reference Book(s):

1. Human Resource Management. K. Aswathappa, Mc Graw Hill Education, 2013.
2. Human Resource Management. S. S. Khanka, S. Chand, 2019
3. Human Resource Management. P. Subba Rao, Himalaya Publishing House, 2018.

HS 4001 Professional Practice, Law and Ethics

Credit: 2
Category: HSMC
Prerequisite(s): Nil

Course Description:

The course on Professional Practice, Law and Ethics is designed to cater comprehensive insight of law and ethics to the students for practicing in their professional life. The course incisively highlights the role of morals and ethics in leading a sustainable profession. Besides, by containing different relevant laws like laws of contracts, intellectual property law and information technology law, the course provides foundation in law to the students which will help them a lot to face the real life situations with ease.

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

CO1: select appropriate engineering decisions in consideration of professional ethics in realization of more critical impact of engineering compared to general experiments
CO2: evaluate and prescribe risk reducing measures
CO3: comprehend the dynamics in engineers' roles and responsibilities with emerging issues in global scene
CO4: know the various compliance requirements and the regulatory bodies to protect environment
CO5: have a fair idea to protect their engineering inventions from unauthorized exploitation under intellectual property rights system and laws relating to information communication technologies
CO6: understand, analyze and prevent misuse of IT related transactions

Topics:

- Morals and ethics in engineering
- Engineering as social experimentation
- Engineer's responsibility for safety
- Global issues
- Law of contracts and law of torts
- Environmental laws
- Intellectual property law
- Information technology law

Textbook(s):

1. R. Subramaniam, Professional Ethics, Oxford University Press, 2013
2. Indian Contracts Act 1872
3. Patents Act 1970 (Unit-3)
4. Designs Act 2000 (Unit-3)
5. Information Technology Act 2000 (Unit-4)

Reference Book(s):

1. Mike Martin and Ronald Schinzinger, "Ethics in Engineering", McGraw Hill New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thomson Learning, 2000

HS 4003 Legal Issues and Requirements in Engineering

Credit: 1
Category: HSMC
Prerequisite: Nil

Course description:

It depicts on law of contracts and law of torts, Consumer Protection Act 1986, Environmental Protection Act 1986, Environmental Impact Assessment 2006, standards for emission, discharge of environmental pollutants from various industries, Intellectual Property Law, Protecting engineering invention, the U.S Utility model approach and need for Utility model in India, Protecting Software and other engineering technologies in cyberspace, maintaining data security and technological privacy in Cyberspace, e-contracts, electronic and digital signatures.

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

CO1: understand the various legal requirements in terms of contracts
CO2: interpret the product liability which an engineer is required to take care while processing his engineering innovations
CO3: illustrate the various compliance requirements and the regulatory bodies to protect the environment
CO4: demonstrate to protect their engineering inventions from unauthorised exploitation under intellectual property rights system and laws relating to information communication technologies
CO5: identify Legal Issues in a given case
CO6: analyse and prevent misuse of IT related transactions

Topics:

- Law of contracts and law of torts
- Environmental Laws
- Intellectual Property Law
- Information Technology Law

Textbook(s):

1. Gurdeep Singh “Environmental Laws” Eastern Book Company,2nd Edition 2016.
2. V K Ahuja “Law Relating To Intellectual Property Rights”Lexis Nexis, 3rd Edition. July 2017.
3. Pavan Duggal “Cyber Law”-Indian Perspective”. 2nd Edition 2016.
4. Avtar Singh” Law of Contracts” Eastern Book Company,12th Edition, Reprinted 2020.
5. Dr. R K Bangia “Law of Torts”. Allahabad Law Agency; 24th 2019 edition (2019).

Reference Book(s):

1. Rosencranz “Enviromental Law and policy in india”.Oxford University Press, 2001.
2. Howard b rockman “Intellectual Property Law for engineers and scinentists”.ISBN: 978-0-471-69740-4, Wiley-IEEE Press, June 2004.
3. Mireille Hidebrant “ smart technologies and the end of law”. ISBN: 978 1 78643 022 9.

MA 2005 Mathematics-III

Credit: 4
Category: BSC
Prerequisite(s): Nil

Course Description:

Students are taught Partial differential equations based on the propagation of heat, wave etc. Numerical analysis is included to get approximate solutions to those problems for which analytical solution is difficult to obtain. Students are given fundamental Probability and Statistical knowledge to use statistical analysis of data.

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

CO1: solve problems on Partial Differential Equation by separable method
CO2: analyze two dimensional wave and heat equations problems with boundary conditions and solve
CO3: determine roots of algebraic/transcendental equations through Newton and Lagrange method and obtain interpolating Polynomials
CO4: evaluate differentiation and integration and solve ODE and PDE through numerical technique
CO5: use the concepts of regression and co-relation and curve fitting by least square method
CO6: work out problems related to probability distribution and hypothesis testing

Topics:

- Partial Differential Equation
- Numerical Analysis
- Probability
- Statistics

Textbook(s):

1. Grewal B. S., Higher Engineering Mathematics, Khanna Publishers, 44th edition

Reference Book(s):

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley, INC, 10th Edition.
2. Engineering Mathematics by S. Pal and S. C. Bhunia, Oxford University Press.

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