#### Semester I

	Sub. Code	Subject Title	L	T	Р	C	CE	SE	Т
1	14MA1101	Linear Algebra and Differential Equations	4	1		4	30	70	100
2	14CH1102	Engineering Chemistry	3	1		3	30	70	100
3	14CS1103	Introduction to Computing	2			2	30	70	100
4	14ME1104	Basics of Civil Engineering	2			2	30	70	100
5	14HS1105	Professional Ethics	2			2	30	70	100
6	14ME1106	Basics of Mechanical Engineering	2			2	30	70	100
7	14ME1107	Mechanics for Engineers	4	1		4	30	70	100
8	14CH1151	Engineering Chemistry Lab			3	2	30	70	100
9	14CS1152	Basic Computing Lab			3	2	30	70	100
10	14ME1153	Workshop Practice			3	2	30	70	100
		Total	19	3	9	25	300	700	1000

#### Semester II

S.No	Sub. Code	Subject Title	L	Т	Р	С	CE	SE	Т
1	14MA1201	Calculus	4	1		4	30	70	100
2	14PH1202	Engineering Physics	3	1		3	30	70	100
4	14CS1203	Programming in C	3	1		3	30	70	100
3	14HS1204	Technical English and Communication Skills	2		2	2	30	70	100
5	14ME1205	Advanced Mechanics for Engineers	4			4	30	70	100
6	14ME1251	Engineering Graphics	2		6	5	30	70	100
7	14CS1252	C-Programming Lab			3	2	30	70	100
8	14PH1253	Engineering Physics Lab			3	2	30	70	100
		Total	18	3	14	25	240	560	800

 $L-Lecture, \ T-Tutorial, \ P-Practical, \ C-Credits, \ CE-Continuous \ Evaluation, \ SE-Semester-end \ Evaluation, \ T-Total \ Marks$ 

	Sub. Code	Subject Title	Faculty						
			L	Т	Р	C	CE	SE	Т
1	14MA1301	Complex Analysis and Numerical Methods	4	1		4	30	70	100
2	14CE3302	Mechanics of Materials	4	1		4	30	70	100
3	14CE3303	Engineering Geology	3			3	30	70	100
4	14CE3304	Concrete Technology	3			3	30	70	100
5	14EC1305	Basics of Electronics Engg.	2			2	30	70	100
6	14CE3306	Fluid Mechanics	4	1		4	30	70	100
7	14CE3351	Engineering Geology Lab			3	2	30	70	100
8	14CE3352	Concrete Lab			3	2	30	70	100
9	14HS1353	Communications Skills Lab			3	2	30	70	100
		Total	20	3	9	26	270	630	900

#### **Semester III**

#### Semester IV

S.No	Sub. Code	Subject Title	L	Т	Р	С	CE	SE	Т
1	14CE3401	Surveying	4			4	30	70	100
2	14CE3402	Advanced Mechanics of Materials	4	1		4	30	70	100
3	14CE3403	Building Materials and Building Construction	3			3	30	70	100
4	14HS1404	Environmental studies	3			3	30	70	100
5	14EE1405	Basics of Electrical Engineering	2			2	30	70	100
6	14CE3406	Hydraulics and Hydraulic Machines	4			4	30	70	100
7	14CE3451	Fluid Mechanics and Hydraulic Machines Lab			3	2	30	70	100
8	14CE3452	Survey Lab			3	2	30	70	100
9	14CE3453	Strength of Materials Lab			3	2	30	70	100
		Total	20	1	9	26	270	630	900

L – Lecture, T – Tutorial, P – Practical, C – Credits, CE - Continuous Evaluation, SE -Semester-end Evaluation, T – Total Marks

	Semester	V
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	Sub. Code	Subject Title	L	Т	Р	С	CE	SE	Т
1	14CE3501	Structural Analysis-I	3	1		3	30	70	100
2	14CE3502	Water Resources Engineering-I	3	1		3	30	70	100
3	3 14CE3503 Design of Concrete Structures -I					3	30	70	100
4	14CE3504	Environmental Engineering-I	3	1		3	30	70	100
5	14CE2505	Institutional Elective	4			4	30	70	100
6	14CE5506	Independent Learning (Moocs)				_		_	
		Advanced Geomatics (OR)				3	30	70	100
		Modern Construction Materials							
7	14CE3507	Geotechnical Engineering	4	1		4	30	70	100
8	14CE3551	Building Planning & Design Lab	1		3	2	30	70	100
9	14CE3552	Geotechnical Engineering Lab			3	2	30	70	100
		Total	21	5	6	27	270	630	900

#### Semester VI

S.No	Sub. Code	Subject Title	L	Т	Р	C	CE	SE	Т
1	14CE3601	Structural Analysis-II	4	1		4	30	70	100
2	14CE3602	Water Resources Engineering- II	3	1		3	30	70	100
3	14CE3603	Design of Concrete Structures -II	3	1		3	30	70	100
4	14HS1604	Engineering Economics and Finance	3	0		3	30	70	100
5	14CE3605	Environmental Engineering-II	3	1		3	30	70	100
6	14CE3651	Computer Application in Civil Engg Lab-I			3	2	30	70	100
7	14CE3652	Environmental Engineering Lab			3	2	30	70	100
8	14CE3653	Term Paper		1		2	30	70	100
		Total	16	5	6	22	240	560	800

 $L-Lecture, \ T-Tutorial, \ P-Practical, \ C-Credits, \ CE-Continuous \ Evaluation, \ SE-Semester-end \ Evaluation, \ T-Total \ Marks$ 

#### **Semester VII**

	Sub. Code         Subject Title			Τ	P	C	CE	SE	Т
1	14CE3701	Transportation Engineering-I	3			3	30	70	100
2	14CE3702	Foundation Engineering	3			3	30	70	100
3	14CE3703	Estimation, Costing & Valuation	3	1		3	30	70	100
4	14CE3704	Design of Steel Structures	4	1		4	30	70	100
5	14CE4705	Program Elective – I	3	1		3	30	70	100
		1. Finite element analysis							
		2.Prestressed concrete							
		3.Advanced Environmental							
		Engineering							
		4.Advanced Geotechnical							
		Engineering	-						
		5.Building Services	-						
		6.Advanced Fluid							
6	14CE4706	Drogram Elective II	2	1		2	20	70	100
0	14CE4700	1 A dwar and Structural	- 3	1		5	50	70	100
		Analysis							
		2.Earthquake resistant	-						
		Design of Structures							
		3.Environmental Impact	-						
		Analysis							
		4. Urban Transportation							
		Planning	-						
		5.Advanced Surveying	-						
		6.Industry oriented subject							
7	14CE3751	Transportation Engineering			3	2	30	70	100
Q	14CE3752	Lab Survey Field Work			3	2	30	70	100
0	14CE6752/	Internation / Industry offered			2 2	2	30	100	100
7	14CE0753/ 14CE6754	Course				2		100	100
10	14CE5755	Mini Project		1		2	30	70	100
		Total	19	5	8	27	270	730	1000

 $L-Lecture, \ T-Tutorial, \ P-Practical, \ C-Credits, \ CE-Continuous \ Evaluation, \ SE-Semester-end \ Evaluation, \ T-Total \ Marks$ 

## **Semester VIII**

S.No	Sub. Code	Subject Title	L	Т	Р	С	CE	SE	Т
1	14CE3801	Transportation Engineering-II	4			4	30	70	100
2	14CE4802	Program Elective – III	3	1		3	30	70	100
		1.Structural Dynamics							
		2.Advanced Design Of Structures							
		3.Solid waste management							
		4.Ground improvement							
		5.Traffic Engineering							
		6.Irrigation and Hydraulic							
		structures -design					20	70	100
	14CE4803	Program Elective - IV	3	1		3	50	70	100
		1.Green Buildings & Sustainability							
		2.Repair and rehabilitation of Structures							
3		3.Remote Sensing and GIS							
		4.Industry oriented subject							
		5.Architecture and town							
		6 Construction Planning &							
		Management							
4	14CE3851	Computer Applications in Civil Engg Lab-II			3	2	30	70	100
5	14CE5852	Major Project			9	10	30	70	100
		Total	10	2	12	22	150	350	500

L – Lecture, T – Tutorial, P – Practical, C – Credits, CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

(All UG Engineering Programs)

#### **Institutional Electives**

S.No	Offering Department	Sub. Code	Subject Title	L	Т	Р	С	CE	SE	Т
1.	Civil Engineering	2501/1	Air Pollution & Its Control	4			4			
2.		2505/2	Natural Resource Management	4			4			
3.		2502/3	Building Services Engineering	4			4			
4.		2505/4	Building Materials and Building Construction	4			4			
5.		2505/5	Green Buildings and Sustainability	4			4			
6.		2505/6	Remote Sensing and GIS							

## **Total Credits distribution:**

Year	Odd Semester	Even Semester	Total Credits
I Year	25	25	50
II Year	26	26	52
III Year	27	22	49
IV Year	27	22	49
			200

# 14MA1101 LINEAR ALGEBRA& DIFFERENTIAL EQUATIONS

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial -	4 - 1 - 0
		Practice:	
<b>Prerequisites:</b>	Fundamentals of	<b>Continuous Evaluation:</b>	30
	Matrices, Integration,	Semester end Evaluation:	70
	Differentiation.	Total Marks:	100

Course outcomes	On successful completion of the course, the student will be able to:		
	CO1	Understand the concept of eigen values and eigen vectors and able to reduce a quadratic form to canonical form.	
	CO2	Able to solve the linear differential equations by using appropriate methods.	
	CO3	Able to form Partial Differential equations and solve Partial Differential equations.	
	CO4	Understand the concepts of Laplace Transforms and able to apply to solve Differential Equations, Integral Equations by Transform method.	
Course Content	UNIT Linear Inverse System Values (Witho quadrat Comple UNIT Differe Equatio Bernou Reduci Law of Linear Operate to Solv UNIT Linear Parame Coeffic Linear	I: Algebra: Rank of a Matrix, Elementary transformations, of a matrix (Gauss Jordan Method) Consistency of Linear of Equations, Linear Transformations, Vectors, Eigen Properties of Eigen Values, Cayley– Hamilton Theorem ut Proof), Reduction to Diagonal Form, Reduction of tic form to canonical form , Nature of a Quadratic Form, ex Matrices. II: Initial Equations of First Order: Formation of a Differential on, Solution of a Differential Equation, Linear Equations, lli's Equation, Exact Differential Equations, Equations ble to Exact Equations, Orthogonal Trajectories, Newton's Cooling, Rate of Decay of Radio-Active Materials. Differential Equations of Higher Order: Definitions, or D, Rules for Finding the Complimentary Function, Inverse or, Rules for finding Particular Integral, Working Procedure e the Equation. III: Dependence of Solutions, Method of Variation of ters, Equations reducible to Linear Equations With Constant cients: Cauchy's Homogeneous Linear Equation, Legendre's equation, Simultaneous linear differential equations with at coefficients.	

	<b>Partial Differentiation</b> : Total Derivative, Change of Variables, Jacobians.
	<b>Partial Differential Equations</b> : Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations Solvable by Direct Integration, Linear Equations of First Order.
	<b>UNIT – IV</b> <b>Laplace Transforms:</b> Introduction, Definition, Conditions for Existence, Transforms of Elementary Functions, Properties of Laplace Transforms, Transforms of Periodic Functions, Transforms of Derivatives, Transforms of Integrals, Multiplication by t <sup>n</sup> , Division by 't', Evaluation of Integrals by Laplace Transforms, Inverse Transforms, Method of Partial Fractions, Other Methods of Finding Inverse, Convolution Theorem, Application to Differential Equations, Unit Step and Unit Impulse Functions.
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. B.S.Grewal, "Higher Engineering Mathematics", 42<sup>nd</sup> Edition Khanna Publishers, 2012.</li> <li>Reference Books:</li> <li>1. Kreyszig, "Advanced Engineering Mathematics ", 8<sup>th</sup> Edition, John Wiley &amp; Sons.</li> <li>2. Peter V.O.Neil, "Advanced Engineering Mathematics ", Thomson, Canada.</li> <li>3. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics ", 3<sup>rd</sup> Edition Narosa Publishers.</li> <li>4. N.P.Bali, Manish Goyal, "A Text Book of Engineering Mathematics ", LaxmiPublications(P) Limited.</li> <li>5. B.V.Ramana, "A text book of mathematics ", Tata MC Graw Hill.</li> </ul>
E-resources and other digital material	<ul><li>[1] mathworld.wolfram.com</li><li>[2] http://www.nptel.iitm.ac.in</li></ul>

# 14CH1102 ENGINEEERING CHEMISTRY

Course	Institutional Core		Credits:	3
Category: Course Type:	Theory		Lecture-Tutorial-Practice:	3-1-0
Subjectcode- Subject name:	14CH1102, Chemistry	Engineering	Continuous Evaluation:	30

Prerequisites:	Knowledge	of	Chemistry	at	Semester end Evaluation:
Intermediate leve	el				

Total Marks:

Course	On suc	cessful completion of the course, the student will be able to:
Outcomes	CO1	Analyze various water treatment methods and boiler troubles
	CO2	Apply the knowledge of different phases in materials, working principle of electrodes and batteries and their application in chemical and other engineering areas.
	CO3	Evaluate corrosion processes as well as protection methods and apply the principles of UV-visible spectroscopy in chemical analysis.
	CO4	Apply the knowledge of nature of polymeric materials for their application in technological fields and of fuels for their conservation.
Course Content	UNIT Water treatme method salty w Water boiler method zeolite	<b>I:</b> <b>technology-I:</b> Sources and impurities of water, WHO standards - Water ont for drinking purpose - sedimentation, coagulation, filtration, various is of disinfection and concept of break-point chlorination - Desalination of ater - principle and process of electro dialysis and reverse osmosis. <b>technology-II:</b> Boiler troubles - scales, sludge, caustic embrittlement and corrosion – causes, disadvantages and prevention, Internal conditioning is – phosphate, calgon and sodium aluminate – External treatment methods – and ion-exchange methods.
	UNIT Phase definiti phase and silv	II: rule: Concept of phase, component, degree of freedom, Gibb's phase rule on - phase equilibrium of one component – water system - equilibrium of two component system – sodium chloride-water system ver-lead system – advantages, limitations and application of phase rule.
	Electro electro systems Advant	<b>ochemistry:</b> Calomel electrode, silver-silver chloride electrode and glass de, determination of pH using glass electrode - Electrochemical energy s - Zinc-air battery, Lead-acid battery, Ni-Cd battery, Li <sub>x</sub> C/LiCoO <sub>2</sub> battery – ages of lithium batteries.
	UNIT Corros electrod series corrosid electrod Instrum electrod princip substitu applica determit	<ul> <li>III:</li> <li>ion science: Introduction – chemical and electrochemical corrosion – chemical theory of corrosion – corrosion due to dissimilar metals, galvanic – differential aeration corrosion – cathodic protection, anodic protection, on inhibitors – types and mechanism of inhibition – principle and process of plating and electro less plating.</li> <li>mental techniques of analysis: Introduction of spectroscopy – interaction of magnetic radiation with matter - UV-visible spectroscopy: Frank-Condon le – types of electronic transitions. Lambert-Beer's law, numericals (simple attion) – Instrumentation - single beam UV-visible spectrophotometer - tions-qualitative analysis, quantitative analysis, detection of impurities and ination of molecular weight.</li> <li>IV:</li> </ul>

	<b>Polymer technology:</b> Polymerization – Addition and condensation thermonlastics					
	and thermo settings - conducting polymers – examples classification-intrinsically					
	conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped, p-doped and n-doped poly-acetylenes – applications of conducting polymers, Fiber reinforced plastics (FRP) - composition and applications					
	<b>Fuel technology:</b> Fuels – classification, calorific value, coal – proximate analysis					
	and ultimate analysis. Petroleum – refining, concept of knocking, octane number					
	and cetane number flue gas analysis by Orsat's apparatus and numericals based on					
	combustion.					
Text books	Text Book(s):					
and	• P.C. Jain, Engineering Chemistry, 15 <sup>th</sup> edition, DhanpatRai Publishing Company					
Reference	(P) Limited, New Delhi.					
books	Reference Books:					
	• S.S. Dara, A text book of Engineering Chemistry, 10 <sup>th</sup> edition, S. Chand &					
	Company Limited, New Delhi.					
	• ShashiChawla, A text book of Engineering Chemistry, DhanpatRai& Company					
	Pvt. Ltd., New Delhi.					
	• Sunita Rattan, A Textbook of Engineering Chemistry, First edition, S.K.					
	Kataria& Sons, New Delhi,2012.					
	<ul> <li>B.S. Bahl, G. D. Tuli and ArunBahl, Essentials of Physical Chemistry, S. Chand and Company Limited, New Delhi.</li> <li>Y.Anjanevulu, Text book of Analytical Chemistry, K. Chandrasekhar and</li> </ul>					
	ValliManickam, Pharma Book Syndicate. Hyderabad.					
	• O. G. Palanna, Engineering Chemistry, Tata McGraw Hill Education Pvt.					
	Ltd., New Delhi.					
Е-	• http://www.cip.ukcentre.com/steam.htm					
resources	<ul> <li>http://corrosion-doctors.org/Modi;es/mod-basics.htm</li> </ul>					
and other	• http://chemwiki.ucdavis.edu/Analytical Chemistry.htm					
digital	• http://teaching.shu.ac.uk/hwb/chemistry/tutorials/molspec/uvvisabl.htm					
material	<ul> <li>http://www.prenhall.com/settle/chapters/ch15.pdf</li> </ul>					

# 14CS1103- INTRODUCTION TO COMPUTING

Course Category:	Institutional Core	Credits:	2
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	2 - 0 - 0
<b>Prerequisites:</b>	-	<b>Continuous Evaluation:</b>	30
-		Semester End Evaluation:	70
		Total Marks:	100

Course	On successful completion of the course, the student will be able to:			
outcomes	CO1	Understand the changes in hardware and software components.		
	CO2	Understand the concept of operating system and its functionalities.		
	CO3	Understand types of networks and most common ways of transmitting data via networks and internet.		
	CO4	Identify the ways in which a program can work towards a solution by using some processes and tools.		
	CO5	Develop algorithms and prepare flow charts to simple mathematics and logical problems		
Course	UNIT I:			
Content	ing Computers and their uses: Overview: Computers in our world, The ter defined, Computers for individual users, Computers for organizations, iters in society, Why are computers so important.			
	Looking inside the computer system Overview: Detecting the ultimate n chine, The parts of a computer system, The information processing cyc Essential computer hardware: processing devices, memory devices, Stora devices, System software, Application software, Computer data, Compu users.			
	Input a types o	and Output devices: Overview: Input devices and output devices, various f input/output devices.		
	UNIT II	[:		
	Transfe	orming data into information: Overview: The difference between data		
	and information, How computers represent data, How computers process data Machine cycles, Memory, Factors effecting processing speed, The computer's internal clock. The Bus, Cache memory			
	Types of	of storage devices: Overview: An ever-growing need, Categorizing		
	storage	devices, Magnetic storage devices-How data is stored on a disk, How		
	data 1s disk. D	iskettes, hard disks. Removable high-canacity magnetic disks. Tape drives		
	Optical	storage devices, Solid-state storage devices, Smart cards, Solid-state		
	disks. C	Operating systems basics: Overview, The purpose of operating systems,		

Networking Basics: Overview Sharing data anywhere anytime. The uses of a
network, Common types of networks, Hybrid networks, How networks are
structured, Network topologies and protocols, Network media, Network hardware.

## UNII III:

Data Communications: Overview, The local and global reach of networks, Data communications with standard telephone lines and modems, Modems, uses for a modem, Using digital data connections, Broad band connections, Wireless networks.

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Productivity Software: Overview: Software to accomplish the work of life, Acquiring software, Commercial software, Freeware and public domain software, Open-source software, Word processing programs, Spreadsheet programs, Presentation programs, Presenting information managers.

Database management Systems: Overview, The mother of all computer applications, Databases and Database Management Systems, Flat-File and Relational Database Structure, DBMS, Working with a database.

#### UNIT – IV:

Programming languages and the programming process: Overview, The keys to successful programming, The evolution of programming languages, World wide web development languages, The Systems development life cycle for programming. Creating Computer programs: Overview: What is a computer program, Hard- ware/Software interaction, Code, machine code, programming languages, Compilers and interpreters, planning a computer program, How programs solve problems, Purpose of flowcharts and algorithms, flow chart symbols, drawing flow charts, developing algorithms.

Textbooks and	<b>Text Book:</b> 1.Peter Norton, Introduction to Computers, sixth Edition, Tata McGraw Hill		
Reference books	<ol> <li>Computer Fundamentals and C Programming by ReemaThareja.</li> <li>Web Resources:         <ol> <li>Lecture Series on Computer Organization by Prof.S. Raman, Department</li> </ol> </li> </ol>		
	of Computer Science and Engineering, IIT Madras https://www.youtube.com/watch?v=leWKvuZVUE8		
	Lecture Series on Data Communication by Prof.A. Pal, Department of Computer Science Engineering,IIT Kharagpur. https://www.youtube.com/watch?v=sG6WGvzmVaw		

## 14CE1104/14CE1204: BASICS OF CIVIL ENGINEERING

Course Category:	Institutional Core	Credits:	2
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	2 - 0- 0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
-		Semester end Evaluation:	70
		Total Marks:	100

	On successful completion of the course, the student will be able to:		
	CO1	Attain basic knowledge on civil engineering materials ar civil engineering structures.	
<b>Course Outcomes</b>	CO2	Attain basic knowledge on sub-structure and super structure of a building.	
	CO3	Attain basic knowledge on principles of surveying, various types of surveying and various types of transportation systems.	
	CO4	Attain basic knowledge on water supply, sewage.	
Course Content	<ul> <li>UNIT - I</li> <li>Building Materials: Introduction - Civil Engineering - Materials: Bricks - composition - classifications - properties -uses. Stone - classification of rocks - quarrying - dressing - properties -uses. Timber - properties -uses -ply wood. Cement - grades -types - properties -uses. Steel - types - mild steel - medium steel - hard steel - properties - uses - market forms. Concrete - grade designation - properties - uses.</li> <li>UNIT - II</li> <li>Building Components: Building - selection of site - classification - components. Foundations -functions - classifications - bearing capacity. Flooring - requirements - selection - types - cement concrete marble - terrazzo floorings. Roof - types and requirements</li> </ul>		
	Survey classifie cross s Railway Water v compor UNIT - Water site - objectiv distribut tank - c	<ul> <li>And Transportation: Surveying - objectives - cation - principles of survey. Transportation - classification - section and components of road - classification of roads.</li> <li>y - cross section and components of permanent way -functions.</li> <li>way - docks and harbor - classifications - components. Bridge - nents of bridge.</li> <li>IV</li> <li>Supply And Sewage Disposal: Dams - purpose - selection of types -gravity dam (cross section only). Water supply - we - quantity of water - sources - standards of drinking water - nents of bridge - classification - technical terms - septic components and functions.</li> </ul>	

Text books and Reference books	<ul> <li>Textbooks</li> <li>1. Raju .K.V.B, Ravichandran .P.T, "Basics of Civil Engineering", Ayyappa Publications, Chennai, 2012.</li> <li>2. Rangwala .S.C," Engineering Material"s, Charotar Publishing House Anand 2012</li> </ul>	
	3. Basic Civil Engineering by M.S.Palanichamy, Tata McGraw-Hill	
	Publishing Company limited. Reference Books	
	1. Elements of Environmental Engineering, by Dr. K.N. Duggal, S.	
	Chand and company LTD. Ram Nagar, New Delhi.	
	2. R.Shiniyaas, Chartor Publishing House, Arand, 2012	
E-resources and other	Web Resources	
digital material		
	1. ncees.org/exmas/fe-exma/	
	2. www.aboutcivil.com/	

## 14HS1105/14HS1205: PROFESSIONAL ETHICS

<b>Course Category:</b>	<b>Institutional Core</b>	Credits:	2
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	2-0-0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On successful completion of the course, the student will be able to:	
	CO1	Know the moral autonomy and uses of ethical theories.
	CO2	Understand morals, Honesty & character.
	CO3	Understand about safety, risk and professional rights.
	CO4	Know the Ethics regarding Global Issues like Environment, Computers & weapon's development.
Course Content	UNIT Engine issues Kohlbo Model interes UNIT Human Service Peacef Co-ope - Spirit UNIT Engine experin ethics Respon and ris island for au interess Intelled UNIT Global compu consul moral	<ul> <li>I bering Ethics: Senses of 'Engineering Ethics' - variety of moral - types of inquiry - moral dilemmas - moral autonomy - erg's theory - Gilligan's theory - consensus and controversy - s of Professional Roles - theories about right action - Self-t - customs and religion- uses of ethical theories.</li> <li>II n Values: Morals, Values and Ethics - Integrity- Work Ethic - e Learning - Civic Virtue - Respect for Others - Living fully - caring - Sharing - Honesty - Courage - Valuing Time - eration - Commitment -Empathy - Self-Confidence - Character tuality.</li> <li>III beering as Social Experimentation: Engineering as mentation - engineers as responsible experimenters - codes of - a balanced outlook on law - the challenger case study, Safety, nsibilities and Rights: Safety and risk - assessment of safety sk - risk benefit analysis and reducing risk - the three mile and chernobyl case studies. Collegiality and loyalty - respect thority - collective bargaining - confidentiality - conflicts of t - cupational crime - professional rights - employee rights - ctual Property Rights (IPR) - discrimination.</li> </ul>

	Engineering Discipline).
Text books and	Textbooks
Reference books	<ol> <li>Mike Martin and Roland Schinzinger. (1996), "Ethics in engineering", McGraw Hill, New York.</li> <li>Govindarajan M, Natarajan S, Senthil Kumar V. S. (2004), "Engineering Ethics", Prentice Hall of India, New Delhi. Reference Books:</li> <li>Baum, R.J. and Flores, A., eds. (1978), "Ethical Problems in Engineering, Center for the studyof the Human Dimensions ofScience and Technology", Rensellae Polytechnic Institute, Troy, New York, 335 pp.</li> <li>Beabout, G.R., Wennemann, D.J. (1994), "Applied Professional Ethics: A Developmental Approach for Use with Case Studies", University Press of America Lanham, MD, 175 pp</li> </ol>

## 14ME1106: BASICS OF MECHANICAL ENGINEERING

Course Category:	Institutional Core	Credits:	2
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	2-0-0
<b>Prerequisites:</b>	Mathematics, Physics,	<b>Continuous Evaluation:</b>	30
	Chemistry of	Semester end Evaluation:	70
	Intermediate	Total Marks:	100

Course	On successful completion of the course, the student will be able to:		
outcomes	CO1	Understand the basic manufacturing methods and power transmission in mechanical engineering	
	CO2	Attain basic knowledge of simple stress and strain	
	CO3	Realize the importance of energy and identify various sources of energy	
	CO4	Understand the principle of operation of different I.C. engines and their applications	
	CO5	Describe the performance of different types of refrigeration systems	
Course Content	UNIT I Man Advantages & G LATHE : Des Lathe (Turning, WELDING : Welding, Appli Soldering (5) UNIT II Sim Elasticity, Hook TRANSMISSI drive and cross drive & Cross b UNIT III Classification o principle of Ste Non-convention Wind power pla UNIT IVIN Classification, I Stroke and Four	<ul> <li>nufacturing Methods : CASTING: Principles of Csating, disadvantages, Applications of casting, Green sand moulds (7) cription, Main components, Basic operations performed on a , Taper turning, Thread cutting, Drilling) (3)</li> <li>Types : Equipments, Principles of Gas Welding and Arc ications, Advantages &amp; disadvantages of welding, Brazing &amp; aple STRESS and STRAIN: Stress and Strain, definitions, ce's Law, Relation between elastic constant (5)</li> <li>ON : Belt Drives Introduction, Types, Length of Open Belt s belt drive, Velocity ratio and difference between open belt orive, Power transmission by belts (10)</li> <li>ENERGY RESOURCES Introduction, Energy Scenario, f Energy Resources, Conventional Energy Resources : working am power plant, Nuclear Power plant (6) and Energy Resources : Working principle of Solar Power plant, ant, Geo-Thermal and OTEC plant (9)</li> <li>TERNAL COMBUSTION ENGINES Introduction, Main components of an I.C. engine, Working principle of Two r Stroke Petrol and Diesel engine (8)</li> </ul>	

	<b>REFRIGERATION:</b> Introduction, Classification, Types of Refrigeration, Units of Refrigeration, C.O.P., working of vapour compression refrigeration system, applications of refrigeration (7)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Basic Mechanical Engineering by T.S. RAJAN 3<sup>rd</sup> Edition, New Age International Ltd, First Reprint 1999</li> <li>2. Machine Design by R.S. KHURMI &amp; J.K. GUPTA, Eurasia Publications House 2005</li> <li>3 Basic Mechanical Engineering by T.J. PRABHU &amp; V. Jaiganesh, S.JebarajSCI Tech Publications (India) Pvt. Ltd.</li> <li>Reference Books:</li> <li>1. Thermal Engineering by R. Rudramoorthy, 4<sup>th</sup> Reprint 2006 Tata Mc-Graw Hill Publishing Company Ltd, New Delhi (2003)</li> <li>2. Manufacturing Process by R.K. Rajput, Firewall media(2007)</li> <li>3. Power Plant Engineering by P.K. Nag Tata Mc Graw Hill Publishing Company Ltd, New Delhi (2011)</li> </ul>
E-resources and other digital material	<ol> <li>www.engliblogger.com/mechanical/mechan</li> <li>www.indiastudychannel.com/resources</li> <li>www.result.khatana.net/2010/07/ge2152</li> <li>www.scribd.com/doc/15653381/basic-mech</li> </ol>

## 14ME1107/14ME1207: MECHANICS FOR ENGINEERS

<b>Course Category:</b>	<b>Institutional Core</b>	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4-1-0
Prerequisites:	Basics of Mathematics	<b>Continuous Evaluation:</b>	30
	and physics	Semester end Evaluation:	70
		Total Marks:	100

<b>Course outcomes</b>	On successful completion of the course, the student will be able to:		
	CO1	Construct free body diagrams and develop appropriate equilibrium equations	
	CO2	Locate Centroids and simplify the system of forces and moments to equivalent systems	
	CO3	Analyze the systems with friction	
	CO4	Determine the kinematic relations of particles	
	CO5	Apply equations of motion to particle motion	
	CO6	Analyze motion of a particle using principle of energy and momentum methods	
	<ul> <li>COO momentum methods</li> <li>UNIT I : Concurrent Forces in a Plane: Principles of statics, Force, Addition of two forces: parallelogram Law – Composition and resolution of forces – Constraint, Action and Reaction. Types of supports and support reactions. Free body diagram, Equilibrium of concurrent forces in a plane – Method of projections – Moment of a force, Varignon's Theorem, Method of moments. Parallel Forces in a plane: Introduction, Types of parallel forces, Resultant, couple, Resolution of Force into force and a couple, General case of parallel forces in a plane. Centroids: Determination of Centroids by integration method, Centroids of composite plane figures.</li> <li>UNIT II : General Case of Forces in a Plane: Composition of forces in a plane – Equilibrium of forces in a plane. Friction: Introduction, Classification Of Friction, Laws Of dry Friction, Co- Efficient Of Friction, Angle Of Friction, Angle Of Repose, Cone Of Friction, Wedge Friction.</li> <li>Kinematics of rectilinear translation: Introduction, Displacement, Velocity, Acceleration (uniform).</li> </ul>		

	<ul> <li>Kinetics of rectilinear translation:</li> <li>Equations of motion, dynamic equilibrium, D'Alemberts principle- related problems</li> <li>Work and energy principle, conservation of energy.</li> <li>Impulse and momentum: principle of impulse and momentum, conservation of linear momentum.</li> <li>Impact-direct, central impact, coefficient of restitution, elastic and plastic impact, loss of kinetic energy during impact, energy and momentum.</li> <li>UNIT IV :</li> <li>Kinematics of curvilinear translation:</li> <li>Introduction, components of velocity and acceleration, Normal and Tangential acceleration, Motion of projectiles</li> <li>Kinetics of curvilinear translation:</li> <li>D'Alemberts principle, rectangular components, Normal and Tangential components, work-energy principle.</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. 1. Engineering Mechanics by S.Timoshenko &amp; D.H.Young, McGraw Hill International Edition (For Concepts and Symbolic Problems).</li> <li>2. Engineering Mechanics Statics and Dynamics by A.K.Tayal, Umesh Publications, Delhi, (For numerical problems using S.I.System of units).</li> </ul>
	<ul> <li>Reference Books:</li> <li>1. Vector Mechanics for Engineers Statics and Dynamics by Beer and Johnson, Tata McGraw Hill publishing company, NewDelhi.</li> <li>2. Engineering Mechanics by SS Bhavikatti and KG Rajasekharappa.</li> <li>3. Singer's Engineering Mechanics: Statics and Dynamics by K.Vijaya Kumar Reddy and J.Suresh Kumar (Third Edition SI Units- BS Publications).</li> </ul>
E-resources and other digital material	<ul> <li><u>http://openlibrary.org/books/OL22136590M/Basic</u> _engineering_mechanics</li> <li><u>http://en.wikibooks.org/wiki/Engineering_Mechanics</u></li> <li><u>http://nptel.iitm.ac.in/video.php?courseID=1048</u></li> <li><u>http://imechanica.org/node/1551</u></li> <li><u>http://emweb.unl.edu/</u></li> </ul>

## 14CH1151-ENGINEEERING CHEMISTRY LAB

Course	Institutional Core	Credits:	2
Category:			
<b>Course Type:</b>	Lab	Lecture-Tutorial-	0-0-3
		Practice:	
Subject code-	14CH1151, Engineering Chemistry	Continuous	30
Subject name:	Lab	Evaluation:	
Prerequisites: C	hemistry Practical of Intermediate	Semester end	70
-		<b>Evaluation:</b>	
		Total Marks:	100

Course	On suce	cessful completion of the course, the student will be able to:		
Outcomes	CO1	Analyze quality parameters of water samples from different		
		sources.		
	CO2	Perform quantitative analysis using instrumental methods.		
	CO3	Apply the knowledge of mechanism of corrosion inhibition,		
		metallic coatings and photochemical reactions.		
Course	List of	Experiments:		
Content				
	1. Dete	ermination of total alkalinity of water sample		
	2. Dete	ermination of chlorides in water sample		
	3. Dete	ermination of hardness of water sample		
	4. Dete	ermination of available chlorine in bleaching powder		
	5. Dete	ermination of copper in a given sample		
	6. Estin	6. Estimation of Mohr's salt – Dichrometry		
	7. Estin	7. Estimation of Mohr's salt – Permanganometry		
	8. Dete	Determination of zinc in a given sample		
	9. Con	. Conductometric determination of a strong acid using a strong base		
	10. pH 1	0. pH metric titration of a strong acid vs. a strong base		
	11. Dete an ir	11. Determination of corrosion rate of mild steel in the absence and presence of an inhibitor		
	12. Che	mistry of Blue Printing		
	13. Colo	primetric determination of potassium permanganate		
	14. Prep	paration of Phenol-Formaldehyde resin		
	15. Spec	ctrophotometry		
Text books	Text Bo	ook(s):		
and	Referer	nce Books:		
Reference	• S.K.	Bhasin and Sudha Rani, Laboratory Manual on Engineering Chemistry,		
books	2 <sup>nd</sup> e	edition, Dhanpat Rai Publishing Company, New Delhi.		
	• Suni	itha Rattan, Experiments in Applied Chemistry, 2 <sup>nd</sup> edition, S.K. Kataria		
	& Se	ons, New Delhi.		

# 14CS1152- BASIC COMPUTING LAB

<b>Course Category:</b>	<b>Programme Core</b>	Credits:	2
<b>Course Type:</b>	Laboratory	Lecture - Tutorial - Practice:	0 - 0 - 3
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester End Evaluation:	70
		Total Marks:	100

Course outcomes	On successful completion of the course, the student will be able to:		
	CO1	Understand the changes in hardware and software components.	
	CO2	Understand the concept of operating system and its functionalities.	
	CO3	Understand types of networks and most common ways of transmitting data via networks and internet.	
	CO4	Identify the ways in which a program can work towards a solution by using some processes and tools.	
	CO5	Develop algorithms and prepare flow charts to simple mathematics and logical problems	
<b>Course Content</b>	CYCLE - I:Word Processing, Presentations and Spread Sheets		
	1.Word	l Processing:	
	(a)Create personal letter using MS Word. (b)Create a		
	resume using MS Word.		
	2.Spread Sheets:		
	(a)Create a worksheet containing pay details of the employees.		
	(b)Create a worksheet which contains student results.		
	(c)Create a worksheet importing data from database and calculate sum of all the columns.		
	3.Presentations:		
	i.Create a presentation using themes.		
	ii.Save, edit, print and import images/videos to a presentation. iii.		
	Adding	g animation to a presentation.	
	4.MS A i.Creat	Access: e simple table in MS Access for results processing. ii.Create a	
	query	table for the results processing table. iii.Create a form to	
	update	/modify the results processing table.	

	iv Create a report to print the result sheet and marks card for the result		
	wereate a report to print the result sheet and marks card for the result.		
	CYCLE - II: Hardware Experiments		
	<ol> <li>Identification of System Layout: Front panel indicators &amp; switches and Front side &amp; rear side connectors. Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards. Install Hard Disk. Configure CMOS-Setup. Partition and Format Hard Disk.</li> <li>Install and Configure a DVD Writer or a Blu-ray Disc writer.</li> <li>Install windows operating system and check if all the device (graph- ics, sound, network etc.) drivers are installed.</li> <li>Install Linux operating system and check the working of all devices (graphics, sound, network etc.) in the computer.</li> <li>Assemble a Pentium IV or Pentium Dual Core Pentium Core2 Duo system with necessary peripherals and check the working condition of the PC.</li> <li>PC system layout: Draw a Computer system layout and Mark the po- sitions of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVD- Drive add on cards in table top / tower model systems.</li> <li>Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual</li> </ol>		
	core or Pentium Core2 DUO mother board and mark Processor, Chip set ICs. RAM, Cache, cooling fan, I/O slots and I/O ports and various jumper settings.		
E-resources and other digital material	1. Numerical Methods and Programing by Prof.P.B.Sunil Kumar, De- partment of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-N1D4& list=PLC5DC6AD60D798FB7		
	<ol> <li>Introduction to Coding Concepts Instructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11</li> </ol>		

# 14ME1153/14ME1253: WORKSHOP PRACTICE

<b>Course Category:</b>	<b>Institutional Core</b>	Credits:	2
<b>Course Type:</b>	Laboratory	Lecture - Tutorial - Practice:	0-0-3
<b>Prerequisites:</b>	Nil	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On successful completion of the course, the student will be able to:	
	CO1	To model and develop various basic prototypes in the Carpentry trade such as Lap Joint
	CO2 To develop various basic prototypes in the trade of Weld such as Lap Joint	
	CO3	To develop various basic prototypes in the trade of Tin Smithy such as Saw Edge
	CO4	To understand various basic House Wiring techniques such as Connecting One lamp with one switch
<b>Course Content</b>	<b>I. Carpentry :</b> To Make the following Jobs with Hand Tools:	
	a. b. c. d. <b>e.</b>	Lap Joint. Lap Tee Joint. Dove Tail Joint. Mortise and Tenon Joint. Cross Lap Joint.
	<b>II Welding: To</b> Make the following Jobs using Electric Arc Welding Process / Gas Welding.	
	<ul> <li>a. Lap Joint.</li> <li>b. Tee Joint.</li> <li>c. Edge Joint.</li> <li>d. Butt Joint.</li> <li>e. Corner Joint.</li> </ul>	
	III Ti	<b>n Smithy:</b> To do Sheet Metal Operations with Hand Tools:
	a. b. c. d. e.	Saw Edge. Wired Edge. Lap Seam. Grooved Seam. Funnel.
	IV House Wiring:	
	a. b.	To connect one lamp with one switch. To connect two lamps with one switch.

	<ul><li>c. To connect a fluorescent Tube.</li><li>d. Stair case wiring.</li></ul>
Text books and Reference books	<b>Text Books:</b> 1. Kannaiah P. & Narayana K. C., "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.

# 14MA1201 CALCULUS

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:	Fundamentals of calculus,	<b>Continuous Evaluation:</b>	30
	vectors and geometry.	Semester end Evaluation:	70
		Total Marks:	100

<b>Course outcomes</b>	On successful completion of the course, the student will be able to:	
CO1Understand the concept of mean value theor them to expand functions as Taylors series curvaturesCO2Able to test the convergence of infinite series , curves.		Understand the concept of mean value theorems and apply them to expand functions as Taylors series and determine curvatures
		Able to test the convergence of infinite series , tracing of the curves.
	CO3	Understand the concept of multiple integrals and apply them to evaluate areas and volumes.
	CO4	Apply the concepts of calculus to scalar and vector fields and establish the relation between the line , surface and volume integrals.
Course Content	<ul> <li>UNIT I</li> <li>Differential Calculus: Rolle'sTheorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylors Theorem, Maclaurin's Series, Taylor's Theorem for Function of Two Variables, Curvature, Radius of Curvature.</li> <li>UNIT II Asymptotes, Curve Tracing, Maxima and Minima of Function of Two Variables, Lagrange's Method of undetermined Multipliers.</li> <li>Sequence and Series: Convergence of series – Comparison test – D'Alembert's Ratio test – Cauchy's Root Test – Alternating series – Absolute convergence – Leibnitz's Rule.</li> <li>UNIT III</li> </ul>	
	<b>Integral Calculus</b> : Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Area Enclosed by Plane Curves, Triple Integrals, Volumes of Solids, Change of Variables.	
	<b>Special Fu</b> Beta and G	<b>inctions</b> : Beta Function, Gamma Function, Relation between amma Function, Error Function or Probability Integral.
	UNIT – IV Vector Ca Scalar poin Physical In Functions,	<b>Iculus</b> : Scalar and Vector Point Functions, Del Applied to t Functions, Gradient, Del Applied to Vector point Functions, nterpretation of Divergence, Del Applied Twice to Point Del Applied to Products of Point Functions, Integration of

	Vectors, Line Integral, Surface Integrals, Green's Theorem in The Plane (without Proof), Stokes's Theorem (without proof), Volume Integral, Gauss Divergence Theorem (without proof), Irrotational Fields.		
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. B.S.Grewal, "Higher Engineering Mathematics", 42<sup>nd</sup> Edition Khanna Publishers, 2012.</li> </ul>		
	<ul> <li>Reference Books:</li> <li>1. Kreyszig, "Advanced Engineering Mathematics ", 8<sup>th</sup> Edition, John Wiley &amp; Sons.</li> <li>2. Peter V.O.Neil, "Advanced Engineering Mathematics ", Thomson, Canada.</li> <li>3. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics ", 3<sup>rd</sup> Edition Narosa Publishers.</li> <li>4. N.P.Bali, Manish Goyal, "A Text Book of Engineering Mathematics ", LaxmiPublications(P) Limited.</li> <li>5. B.V.Ramana, "A text book of mathematics ", Tata MC Graw Hill.</li> </ul>		
E-resources and other digital material	<ul><li>[1] mathworld.wolfram.com</li><li>[2] http://www.nptel.iitm.ac.in</li></ul>		

# 14PH1102/14PH1202 – Engineering Physics

<b>Course Category:</b>	Institutional Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1- 0
Prerequisites:	-	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	On successful completion of the course, the student will be able to:		
outcomes	CO1	Understand the differences between classical and quantum mechanics and learn about statistical mechanics	
	CO2	Understand various properties and applications of magnetic & dielectric materials and the theory of super conductivity	
	CO3	Analyze and understand semiconductor technology and various types of lasers & optical fibers.	
	CO4	Understand the fabrication of nanomaterials, carbon nanotubes and their applications in various fields	
Course	UNIT -		
	<ul> <li>hypothesis, G.P.Thomson experiment, Heisenberg's uncertainty principle and applications (Non existence of electron in nucleus, Finite width of spectral lines), Classical and quantum aspects of particle, One dimensional tir independent Schrödinger's wave equation, physical significance of wa function, Particle in a box (One dimension).</li> <li>Statistical Mechanics: Phase space, Differences between Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (qualitative), Fermi-Dirac probabilit function, Fermi energy level.</li> </ul>		
	UNIT - Magnet magneti magneti Dielect polariza suscept charge p equation applicat Superc Meissne equation superco	<b>H</b> <b>tic properties:</b> Magnetic permeability, Magnetization, Origin of ic moment, Classification of magnetic materials -dia, para, ferro ic materials, Hysteresis curve. <b>ric properties:</b> Fundamental definitions: Dielectric constant, Electric ation, Polarizability, Polarization vector, Electric displacement, Electric ibility, Types of Polarization: Electronic, Ionic, Orientation, Space polarization, Internal fields in solids (Lorentz method), Clausius-Mossotti ns, Frequency dependence of polarization, Ferroelectrics and their tions. <b>onductivity:</b> Introduction, Critical parameters, Flux quantization, er effect, Types of Superconductors, BCS theory, Cooper pairs, London's n penetration depth, high temperature super conductors, Applications of inductors.	

	<ul> <li>Semiconductor Physics: Classification of materials based on energy diagram, Fermi level in Intrinsic and extrinsic semiconductors ,Carrier drift and Carrier diffusion, Generation and recombination process (qualitative), Hall Effect.</li> <li>Lasers: Spontaneous emission, Stimulated emission, Population inversion, Solid state (Ruby) laser, Gas (He-Ne) laser, Semiconductor (Ga-As) laser, Applications of lasers.</li> <li>Fiber optics: Propagation of light through optical fiber, Types of optical fibers, Numerical aperture, Fiber optics in communication and its advantages.</li> </ul>
	Nanotechnology: Basic concepts of Nanotechnology, Nano scale, Introduction to nano materials, Surface to volume ratio, General properties of Nano materials, Fabrication of nano materials: Plasma Arcing, Sol-gel, Chemical vapour deposition, Characterization of nano materials: AFM, SEM, TEM, STM, MRFM, Carbon nano tubes: SWNT, MWNT, Formation of carbon nanotubes: Arc discharge, Laser ablation, Properties of carbon nano tubes, Applications of CNT's & Nanotechnology.
Text books and Reference books	<ul> <li>Textbooks</li> <li>[1] M.N. Avadhanulu &amp; P.G. Kshirsagar, "A text of Engineering Physics", S.Chand publications.</li> <li>[2] P.K. Palanisamy, "Applied Physics", Scitech Publishers.</li> <li>[2] P.K. Gaur and S.L.Gupta, "Engineering Physics", Dhanpatrai publishers.</li> <li>[2] S.O. Pillai, "Solid State Physics", New age international publishers.</li> <li>[3] M.R. Srinivasan, "Engineering Physics" New age international publishers.</li> <li>[4] M.Armugam, "Engineering Physics", Anuradha publishers.</li> </ul>
E-resources and other digital material	<ul> <li>[1] http://www.light and matter.com/bk4.pdf</li> <li>[2] http://www.ifw-resden.de/institutes/itf/members/helmut/sc1.pdf</li> <li>[3] http://www.microscopy.ethz.ch/history.htm</li> <li>[4] http://nptel.ac.in/courses.php?disciplineId=115</li> <li>[5] http://aph.huji.ac.il/courses/2008 9/83887/index.html</li> <li>[6] http://freevideolectures.com/Course/3048/Physics-of-Materials/36</li> </ul>

# 14CS1203 PROGRAMMING IN C

<b>Course Category:</b>	Institutional Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	Understanding the basic	<b>Continuous Evaluation:</b>	30
	types of	Semester End Evaluation:	70
	programming languages,	Total Marks:	100
	Logical		
	thinking, Basic computer		
	knowledge		

Course	On successful completion of the course, the student will be able to:			
outcomes	CO1	Understand the programming terminology and implement various c- tokens & input-output statements to solve simple problems		
	CO2	Compare various looping & branching constructs and apply the best looping structure for a given problem		
	CO3	Implement arrays and structure/union for storing homogeneous and heterogeneous groups of data		
	CO4	Implement programs using pointers to directly accessing memory locations & file operations		
	CO5	Identify the necessity of modularity in programming and design various function types		
Course Content	UNIT I Structure of a C Program: Expressions, Precedence and Associative Evaluating Expressions, Type Conversion, Statements, Sample Program Selection: Logical Data and Operators, Two -Way Selection, Multi v Selection, More Standard Functions.			
	UNIT Repetit Calcula Arrays Applic Functio Standa Strings Strings UNIT Pointer	<ul> <li>II</li> <li>tion: Concept of a Loop, Loops In C, Loop Examples, Recursion, The ator Program.</li> <li>: Concepts, Using Array in C, Inter-Function Communication, Array ations, Two Dimensional Arrays, Multidimensional Arrays. Functions: ons in C, User Defined Functions, Inter Function Communication, rd Functions, Scope.</li> <li>s: String Concepts, C Strings, String Input/Output Functions, Arrays of s, String Manipulation Functions, String- Data Conversion.</li> <li>III</li> <li>rs: Introduction, Pointers For Inter Function Communications, Pointers to</li> </ul>		

	Pointers, Compatibility, L value and R value. Pointer Applications: Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocations Functions, Array Of Pointers. Text Input/Output: Files, Streams, Standard Library Input/Output Functions, Formatting Input/Output Functions and Character Input/Output Functions. <b>UNIT – IV</b> Enumerations: The Type Definition (Type def), Enumerated Types: Declaring an Enumerated Type, Operations on Enumerated Types, Enumeration Type Conversion, Initializing Enumerated Constants, Anonymous Enumeration:
	Constants, Input/Output Operators. Structures: Structure Type Declaration, Initialization, Accessing Structures, Operations on Structures, Complex Structures, Structures and Functions, Sending the Whole Structure, Passing Structures Through Pointers. Unions: Referencing Unions, Initializes, Unions and Structures, Internet Address, Programming Applications
Textbooks and Reference books	<ul> <li>Text Book:</li> <li>(a)Behrouz A. Forouzan &amp; Richard F. Gilberg, Computer Science A Structured Programming Approach using C, Third Edition, CEN- GAGE Learning.</li> <li>Reference Books: <ul> <li>(a)Balagurusamy, Programming in ANSI C4ed.: TMH, 2009</li> <li>(b)B. Gottfried, Programming with C (Schaum's Outlines) Tata Mcgraw- Hill.</li> <li>(c) Kernighan and Ritchie, The C programming language: Prentice Hall.</li> <li>(d) Venugopal, et al., Programming with C: TMH.</li> <li>(e) A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, DataStructures Using C, PHI/Pearson education.</li> </ul> </li> </ul>

## 14HS1204TECHNICAL ENGLISH & COMMUNICATION SKILLS

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture- Tutorial- Practice:	2-0-2
Prerequisites:	Basic understanding of the language skills, viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	Continuous Evaluation:	30
		Semester end	70
		Total Marks:	100

Course	on suce	cessful completion of the course, the student will be able to:		
Outcomes	CO1	Be proficient in administrative and professional compilation skills		
		including web related communication		
	CO2	Attain practice in Interpersonal Communication, in addition to		
		standard patterns of Pronunciation		
	CO3	Be aware of the elements of functional English for authentic use of		
		language in any given academic and/or professional environment		
	CO4	Enhance Reading skills, along with a wide range of Vocabulary		
	CO5	Acquire competence in Technical communication sills		
Course	UNIT	I Professional Writing Skills		
Content	1. Pro	fessional Letter- Business, Complaint, Explanation and Transmittal		
	2. Ess	ay Writing Descriptive, Reflective and Analytical-		
	3. Ad	ministrative drafting and correspondence -Memos, Minutes and We		
	not	es		
	UNIT	II _Interpersonal Communication Skills		
	A. Communicative Facet- Speech acts- Extending Invitation, Reciprocation			
		Acceptance, Concurrence, Disagreeing without being disagreeabl		
		Articulation-oriented Facet- Phonetic Transcription using IPA symbol		
	with Vowel and Consonant charts			
	UNIT	III Vocabulary and Functional English		
	1. A b	basic List of 500 words – Over view		
	1. Vei	bal analogies, Confusibles, Idiomatic expressions and Phrasal		
	Col	llocations		
	2. Exp	posure through Reading Comprehension- Skimming, Scanning,		
	Une	derstanding the textual patterns for tackling different kinds of questions		
	3 Fur	actional Grammar with special reference to Concord Prepositions and		
	Pro	noun-referent analysis.		
	UNIT	IV Technical Communication skills		
	1. Tec	chnical Proposal writing		
	2. Tec	chnical Vocabulary- a representative collection will be handled		
	3. Dev	veloping Abstract		

	4. Introduction to Executive summary
	5. Technical Report writing(Informational Reports and Feasibility Reports)
Text books and	Text Book(s):
Reference	1. TM Farhathullah, Communication skills for Technical Students, Orient
books	Longman, 2002
	2. 'Krishna', English Language Communication Skills, I Edition, Duvvuri
	Publications, 2008
	3. B.S. Sarma, Structural Patterns & Usage in English, 4 <sup>th</sup> edition, Poosha
	Series, , 2008
	4. Eclectic Learning materials offered by the Department
	Reference Books:
	1 Randolph Quirk, Use of English, Longman, 2004.
	2 Thomson A.J & A.V, Martinet, Practical English Grammar, Oxford
	University Press,2001
	3 Thomas Eliot Berry, The most Common Mistakes in English, TMH,
	First Paper Back 1971, (reprinted) 2010.
	4 John Langan, College Writing Skills, McGraw Hill, 9 <sup>th</sup> Edition 2014.
	5 Selinkar, Larry et al, English for Academic and Technical Purposes, I edition, Newbury House Publishers, 1981
	6 Martin Cutts, Oxford guide to Plain English, 7 <sup>th</sup> Impression Oxford
	University Press, 2011
	7 V.Sethi and P.V. Dhamija, A Course in Phonetics and Spoken English,
	II edition, PHI, 2006
E-resources	1 www.britishcouncil.org/learning-english-gateway.htm up dated 2014
and other	2 pdfstuff.blogspot.com/2013//the- <b>oxford</b> -guide-to- <b>english</b> -usage-pdf.ht.
digital material	3 www.cambridgeapps.org/ up dated 2014

## 14ME1205 ADVANCED MECHANICS FOR ENGINEERS

<b>Course Category:</b>	Institutional Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4-0-0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	On successful completion of the course, the student will be able to:			
outcomes	CO1	Determine the axial forces in the members of determinate truss.		
	CO2	Develop the equilibrium conditions in terms of virtual work.		
	CO3	Determine moment of inertia of areas.		
	CO4	Determine the resultant and equilibrium conditions for force system in space.		
	CO5	Determine the kinematic relations of particles & rigid bodies		
	CO6	Determine the mass moment of inertia of rigid bodies.		
	CO7	Apply equations of motions to particle and rigid body motion.		
	CO8	Analyze motion of particles & rigid bodies using the principle of energy and momentum methods.		
Course Content	<ul> <li>UNIT - I Trusses: Plane Trusses:</li> <li>Method of joints, Method of sections. Principle Of Virtual Work: Equilibrium of ideal systems. Area Moment of Inertia of Plane Figures: Moment of Inertia of a plane figure with respect to an axis in its plane - Moment of inertia with respect to an axis perpendicular to the plane of the figure - Parallel axis theorem.</li> <li>UNIT - II Force System In Space : Components of a force, defining a force by its magnitude and two points on its line of action, components of a vector, work done by a force, Resultant of system of concurrent and parallel forces in space</li> </ul>			
	Moment of a force, Component of a vector and moment about an axis, Equilibrium of concurrent and parallel forces in space.			
	UNIT Momen	- III nt of Inertia of Material Bodies: Moment of inertia of a rigid body - nt of inertia of laminas- slender bar, rectangular plate, Circular plate,		

	<ul> <li>circular ring, Moment of inertia of 3D bodies- cone, solid cylinder, sphere &amp; parallelepiped</li> <li>Rotation of a Rigid Body about a Fixed Axis: Kinematics of rotation, Equation of motion for a rigid body rotating about a fixed axis - Rotation under the action of a constant moment.</li> <li>UNIT - IV</li> <li>Kinematics of plane motion: Concepts of relative velocity and instantaneous center.</li> <li>Kinetics of plane motion: Equations of motion, Dynamic equilibrium of symmetrical rolling bodies.</li> </ul>
Text books and	Textbooks
<b>Reference books</b>	(a) Engineering Mechanics Statics and dynamics by A K Tayal 13th Edition
	2006, Umesh Publication, Delhi, (For numerical Problems using
	S.I.System of Units).
	(b) Engineering Mechanics by S.Timoshenko, D.H.Young, J.V.Rao & Sukumar Pati Fifth Edition 2013 Mc Graw Hill Education (India) Put
	Ltd. (For Concepts and symbolic Problems using S.I.System of Units).
	<b>Reference Books:</b>
	(a) Engineering Mechanics by SS Bhavikatti and KG Rajasekharappa. 4th Edition, 2012, New Age International Private Limited.
	(b) Singer's Engineering Mechanics Statics and Dynamics by K.Vijaya
	Kumar Reddy and J Suresh Kumar, 3rd Edition 2010, SI Units-BS
	(c) Engineering Mechanics: Statics and Dynamics by Andrew pytel & Jaan
	Kiwsalaas, Third Edition, 2013, Cengage Learning
E-resources and	Web Resources:
other digital	(a) http://oponlibromy.org/books/OI 22126500M/Desigongingeringereshaning
materiai	(a)http://en.wikibooks.org/wiki/EngineeringMechanics
	(c) <u>http://nptel.iitm.ac.in/video.php?courseId=1048</u>
	(d)http://imechanica.org/node/1551 (e)http://emweb.upl.edu/
	(f)http://ebooks-freedownload.com/2009/11/engineering-
	mechanicsstatics12.html
	(g) http://www.ebookee.com/Engineering-Mechanics-Statics 37859.html

# 14ME1151/14ME1251 ENGINEERING GRAPHICS

<b>Course Category:</b>	Institutional Core	Credits:	5
Course Type:	Theory & Laboratory	Lecture - Tutorial - Practice:	2-0-6
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On suc to:	ccessful completion of the course, the student will be able
	CO1	Represent various Conics and Curves.
	CO2	Construct Plain and Diagonal Scales.
	CO3	Draw Orthographic projections of Lines, Planes, and Solids.
	CO4	Construct Isometric Scale, Isometric Projections and Views and also convert Pictorial views to Orthographic Projections.
	CO5	Draw Sectional views of the Solids.
	CO6	Understand Development of surfaces and their representation.
Course Content	CO6Understand representation.UNIT - I General: Use of Drawing instruments, Lettering - Single stroke letters, Dimensioning, Representation of various type lines - Geometrical Constructions. Scales: Construction and use of plain and diagonal scales. Conic Sections: conic sections - general construction method for ellipse, parabola and hyperbola. Special methods for conic sections. Curves: Curves used in Engineering practice - Cycloid, Involute of circle.UNIT - II Method of Projections: Principles of projection - First angle 	
	reference plane. Sections of Solids: Sections of solids such as Cubes, Prisms, Pyramids, Cylinders and Cones. True shapes of sections. (Limited to the Section Planes perpendicular to one of the Principal Plane). * 3 D Objects : Prisms, Pyramids, Cylinder and a Cone. * Sectional view of a Prism, Pyramid, Cylinder and a Cone in simple positions <b>UNIT - IV</b> Development of Surfaces: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones. Isometric Projections: Isometric Projection and conversion of Orthographic Projections into isometric views. (Treatment is limited to simple objects only). Introduction to Isometric Projections to Orthographic Projections. * Isometric View of Prism, Pyramid, Cylinder and a Cone and also simple 3 Dimensional Objects. * These topics are only for internal assessment.	
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Text books and Reference books	<ul> <li>Textbooks <ol> <li>Elementary Engineering Drawing by N.D. Bhatt &amp; V.M.</li> <li>Panchal. Charotar Publishing House, Anand. 49th Edition - 2006.</li> <li>Engineering Graphics with Auto CAD by DM Kulkarni, AP</li> <li>Rastogi, AK Sarkar, PHI Learning Private Limited, Delhi. Edition - 2013</li> </ol> </li> <li>Reference Books <ol> <li>Text Book on Engineering Drawing by Prof. K. L. Narayana &amp; Prof. P. Kannaiah, Scitech publications(India) Pvt. Ltd., Chennai 2nd Edition - fifth reprint 2006.</li> <li>Engineering Drawing and Graphics + Auto CAD by K. Venugopal, New Age International, New Delhi.</li> </ol></li></ul>	
E-resources and other digital material	Web Resources 1.http://www.youtube.com/watch?v=XCWJXrkWco 2.http://www.me.umn.edu/courses/me2011/handouts/drawing/blanc o-tutorial.html#isodrawing 3.http://www.slideshare.net8.http://edpstuff.blogspot.in	

# 14CS1252 C PROGRAMMING LAB

<b>Course Category:</b>	<b>Institutional Core</b>	Credits:	2
<b>Course Type:</b>	Laboratory	Lecture - Tutorial - Practice:	0 - 0 - 3
Prerequisites:	Algorithm, Flow	<b>Continuous Evaluation:</b>	30
	chart, Logical	Semester End Evaluation:	70
	thinking	Total Marks:	100

Course	On successful	completion of the course, the student will be able to:	
	CO1	Understand the programming terminology and implement various c- tokens & input-output statements to solve simple problems	
	CO2	Compare various looping & branching constructs and apply the best looping structure for a given problem	
	CO3	Implement arrays and structure/union for storing homogeneous and heterogeneous groups of data	
	CO4	Implement programs using pointers to directly accessing memory locations & file operations	
	CO5	Identify the necessity of modularity in programming and design various function types	
Course	CYCLE - I:Programming constructs and control structures 1.Introduction to C programming : (a)Use of		
Content			
	Turbo C IDE		
	(b)The Structure of a C Program		
	(c)Writing C Programs		
	(d)Building an Executable Version of a C Program		
	2.Data Types and Variables: (a)Data		
	Types (b)Operands, Operators (c)Arithmetic Expressions 3.Branching and Selection: (a)Simple-if (b)Nested-if 4.Control statements: (a)Break		
	(b)C	Continue	
	(c)Go to		

5.Looping constructs-I (a)While
(b)Do-while
(c)Case control structure: Switch
6.Looping constructs-II (a)Simple
for (b)Nested for
7.Arrays
(a)Single dimensional arrays
(b)Multi dimensional arrays
8.Strings
(a)Declaration and initialization of string variables
(b)Reading & Writing strings
(c)String handling functions
(d)Operations performed on strings without using string handling functions
CYCLE - II: Advanced programming constructs
1.Concept of user defined functions (a)With
arguments and no return value (b)Without
arguments and no return value (c)Without
arguments and return value (d)With arguments and
return value
2.File handling operations
(a)FILE structure
(b)Opening and closing a file, file open modes (c)Reading
and writing operations performed on a file (d)File Pointers:
stdin, stdout and stderr
(e)FILE handling functions: fgetc(), fputc(), fgets() and fputs() functions
3.Pointers
(a)Uses of Pointers
(b)Passing Arrays and Pointers as a function arguments

(c)Pointers to Character Strings

	4.User defined data types (a)Type-def (b)Enumeration
E- resources and other digital material	<ul> <li>1.Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-N1D4&amp; list=PLC5DC6AD60D798FB7</li> <li>2.Introduction to Coding Concepts Instructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11</li> </ul>

## 14PH1153/14PH1253 ENGINEERING PHYSICS LAB

<b>Course Category:</b>	Institutional Core	Credits:	2
<b>Course Type:</b>	Laboratory	Lecture - Tutorial - Practice:	0-0-3
Prerequisites:	-	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	On successful completion of the course, the student will be able to:		
outcomes	CO1	Elucidate the concepts of physics through involvement in the experiment by applying theoretical knowledge	
	CO2	Illustrate the basics of electro magnetism, optics, mechanics, and semi-conductors & quantum theory	
	CO3	Develop an ability to apply the knowledge of physics experiments in the later studies	
Course Content	<ol> <li>AC Sonometer -Verification of vibrating laws.</li> <li>Measurement of thickness of a foil using wedge method.</li> <li>Photo tube-Study of V-I Characteristics, determination of work function.</li> <li>Torsional Pendulum-Rigidity modulus calculation.</li> <li>Variation of magnetic field along the axis of a current carrying circular coil.</li> <li>Compound pendulum-Measurement of 'g'.</li> <li>LCR circuit-Resonance.</li> <li>Solar cell -Determination of Fill Factor.</li> <li>Hall effect -Study of B &amp; I Variation.</li> <li>Fibre Optics-Numerical aperture calculation.</li> <li>Newton's Rings-Radius of curvature of plano convex lens.</li> <li>Diffraction grating-Measurement of wavelength.</li> <li>Lissajous figures- calibration of an audio oscillator.</li> <li>B-H curves- determination of hysteresis loss.</li> <li>Figure of merit of a galvanometer.</li> </ol>		
Text books and Reference books	Textbo[1] IndKitab N[2] J.CPublish[3] Deducati[4] DiDr.K.VVGS P	boks u Prakash&Rama Krishna, "A text book of practical physics", 25 <sup>th</sup> ed., Mahal Publishers, Allahabad, 2003. .Mohanty&D.K.Mishra, "University Practical Physics", I <sup>st</sup> ed., Kalyani hers, 1990. .P.Khandelwal, "A laboratory manual of Physics" Ist ed.,Vani tonal books , 1991. r.Y.Aparna & Venkateswara Rao, "Laboratory manual of engineering physics",I <sup>st</sup> ed., bublications,2010.	
E-resources and other digital material	[1] <u>http</u> [2] http [3] http	<u>p://plato.stanford.edu/entries/physics-experiment/[2]</u> p://www.physicsclassroom.com/The-Laboratory[3] p://facstaff.cbu.edu/~jvarrian/physlabs.html	

## 14MA1301 COMPLEX ANALYSIS & NUMERICAL METHODS

<b>Course Category:</b>	Programme Core	Credits:	4
Course Type:	Theory	Lectures- Tutorial :	4 -1
		Continuous Evaluation: Semester end Evaluation:	30 70
		Total Marks:	100

Course outcomes	On successful completion of the course, the student will be able to:		
	CO1 Determine analytic and non analytic functions and understand the concept of complex integration.		
	CO2	Analyze Taylor and Laurent series and evaluation of real definite integrals using residue theorem and understand the concept of transformations.	
	CO3	Solve Algebraic and transcendental, system of equations and understand the concept of polynomial interpolation.	
	CO4	Understand the concept of Numerical differentiation and integration. Solve initial and boundary value problems numerically.	
Course Content	UNIT- I		
	<b>Complex Analysis:</b> Introduction, continuity, Cauchy-Riemann equations. Analytic functions, Harmonic functions, Orthogonal systems, Complex integration, Cauchy's integral theorem, Cauchy's integral formula.		
	Taylor's series, Laurent's series, Zeros and singularities. Residue theorem, calculation of residues, evaluation of real definite integrals (by applying the residue theorem). Standard transformations: Translation - Magnification and Rotation – Inversion and reflection - Bilinear transformation.		
	UNIT –III		
	<ul> <li>Numerical Methods: Solution of Algebraic and Transcendental Equations: Introduction, Newton - Raphson method, Solution of simultaneous linear equations – Gauss Elimination Method - Gauss - Seidel iterative method.</li> <li>Interpolation: Introduction, Finite Differences – Forward, Backward, Central Differences, Symbolic Relations, Differences of a polynomial, Newton's formulae for interpolation, Central difference interpolation formulae –Gauss's, Sterling's, Bessel's formulae Interpolation with unequal intervals – Lagrange's and Newton's Interpolation formulae.</li> </ul>		
	UNIT – IV		
	Numerical Different using Newton's form Numerical Solution Euler's method, Run	ntiation And Integration: Finding first and second order differentials nulae. Trapezoidal rule and Simpsons 1/3 Rule ns of Differential Equations: Taylor's series method Picard's method. nge - Kutta method of 4th order, Boundary value problems, Solution of	

Laplace's and Poisson's equations by iteration.

Text books and Reference books	<ul> <li>Text Book: 'Higher Engineering Mathematics' by B.S.Grewal, Khanna Publishers; 42ndEdition, 2012</li> <li>Reference Books:</li> <li>(1) Advanced Engineering Mathematics by Krezig, 8th Edition, 2007, JohnWiley&amp; sons</li> <li>(2) Advanced Engineering Mathematics by R.K.Jain and S.R.K.Iyengar, 3rd Edition, Narosa Publishers.</li> <li>(3) A Text book of Engineering Mathematics by N.P.Bali, Manish Goyal, 1st Edition 2011, Lakshmi Publications (P) Limited</li> <li>(4) Higher Engineering Mathematics by H.K.Das, Er. RajnishVerma, 1st Edition, S.Chand2011.</li> <li>(5) Introductory Methods of Numerical Analysis, S. S. Sastry, PHI , 2005.</li> </ul>
E-resources and other digital material	<ul><li>[1]. faculty.gvsu.edu/fishbacp/complex/complex.html.</li><li>[2] nptelvideolectures/iitm.ac.in</li></ul>

## 14CE3302 MECHANICS OF MATERIALS

<b>Course Category:</b>	Programme Core	Credits:	4
Course Type:	Theory	Lectures- Tutorial:	4-1
		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	On successful completion of the course, the student will be able to:		
	CO1	Compute the stresses and strains of axially loaded members.	
	CO2	Draw shears force and bending moment diagrams for statically determinate beams and frames for various loading conditions.	
	CO3	Apply bending theory for various sections.	
	CO4	Evaluate shearing stress for various sections.	
	C05	Apply torsional theory for circular members.	
	CO6	Evaluate stresses and deflections for helical springs	
Content	STRESS – AX Introduction; I Stress; Probler STRAIN – HO Introduction; S bars and comp mutually perper Relation betwee STATICALLI Introduction, A UNIT – II SHEAR FOR Introduction; Loading; Class of method of determinate be UNIT – III PURE BENDI Introduction; S formula; Comp SHEARING S	COG       Evaluate stresses and deflections for helical springs         UNIT -I         STRESS - AXIAL LOAD:         Introduction; Method of Sections; Stress; Axial load; Normal stress, Average shearing         Stress; Problems in Normal and shearing stress         STRAIN - HOOKE'S LAW - AXIAL LOAD PROBLEMS:         Introduction; Strain; Stress - Strain diagram; Hooke's Law; Deflection of axially loaded         bars and composite bars; Poisson's ratio; Generalized Hooke's law; Shearing stresses on         mutually perpendicular planes; Hooke's law for shearing stress and strain; Bulk modulus;         Relation between elastic constants;         STATICALLY INDETERMINATE AXIAL LOAD PROBLEMS:         Introduction, A general approach to axially loaded bars, Stresses caused by temperature.         UNIT - II         SHEAR FORCES AND BENDING MOMENTS:         Introduction; Diagrammatic conventions for supports; Diagrammatic conventions for         Loading; Classification of beams; Concept of shear force and bending moment; Application of method of Sections, Shear force and bending moment diagrams for Statically determinate beams.         UNIT - III         PURE BENDING OF BEAMS:	

Introduction; Relation between shear and bending moment; Shear flow; The shearing stress

	formula for beams; Shear stress distribution for various sections; Shear centre.				
	UNIT – IV				
	<b>TORSION:</b> Introduction; Application of method of sections; Basic assumptions; The torsion formula; Design of Circular members in torsion; Angle of twist of circular members.				
	<b>SPRINGS:</b> Stresses in closely coiled helical springs; Deflection of closely coiled helical springs.				
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Strength of Materials (Mechanics of solids) by Er. R.K.Rajput; S.Chand&amp;Company Ltd., New Delhi.</li> <li>Strength of Materials by S.Ramamrutham&amp;R.Narayan DhanpatRaiPublishingCo., (P) Ltd. New Delhi.</li> </ol> </li> <li>Reference Books:         <ol> <li>Mechanics of Materials by Gere &amp; Timoshenko</li> <li>Theory of Structures by S.P.Timoshenko&amp; DH. Young</li> <li>Mechanics of Materials by E.P.Popov; Prentice-Hall of India Pvt Ltd., New Delhi</li> </ol> </li> </ol>				
E-resources and other digital material	http://nptel.ac.in/courses/105105108/ http://nptel.ac.in/courses/105106116/13				

# 14CE 3303 ENGINEERING GEOLOGY

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lectures:	3
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On succe	ssful completion of the course, the student will be able to:
	CO1	Acquire knowledge on important rocks and minerals for construction.
	CO2	Understand the internal and external geologic processes and their affect on engineering design and construction
	CO3	Understand the geophysical investigation methods and their role in interpretation of Sub surface geological conditions.
	CO4	Acquire knowledge on geological investigations methods and techniques adopted for civil engineering projects
Course Content	UNIT I Introduct developm Mineralo Silicate an compositi Petrology Structures Textures Propertie construct UNIT II Tectonics unconforr Earthqua India Earthquak the seismi Landslida activity. UNIT III Earth Na Remote s componer Geophysic method – (UPV), C	<ul> <li>tion-Aims and evaluation of the Engineering Geology, historical ent, subdivisions, relevance of geology to civil engineering.</li> <li>gy-Definition of Mineral Physical Properties, the common rock forming and non-silicate minerals. Clay group of minerals- Structure and chemical on.</li> <li>r- Rock cycle- Igneous Rocks- Structures&amp; Textures: Sedimentary Rocks-s&amp;</li> <li>Metamorphic Rocks Structures and Textures. Engineering is of Common rocks Suitability of rocks as building and ion materials.</li> <li>and Structural geology – Rock deformation-Strike &amp;dip , folds, faults, nities, Joints. Classifications for engineering purposes.</li> <li>akes- Classification –Causes and effects of earthquakes-Seismic zones of the measuring scales- Preventive measures in construction of buildings in the areas.</li> <li>es- Classification-Effects of landslides-Preventive measures for landslide</li> <li>tural process-weathering-Engineering classification of weathered rocks sensing and GIS–Definition and components of RS – Definition and the of GIS -Civil engineering applications.</li> <li>tes-Geophysical methods of Investigations-Principles of exploration and ants of GIS -Civil engineering applications.</li> <li>tes-Geophysical methods of Investigations-Principles of exploration and the of geophysical methods. Ultrasonic pulse velocity method ore logging- Rock quality Designation(RQD)</li> <li>V</li> </ul>

	<b>Dams-</b> Types of Dams-failures of dams and their causes : Requirements of dam site, preliminary and detailed geological investigations for a dam site, <b>Tunnels-</b> Purposes of tunneling and geological problems connected with tunneling, <b>Roads</b> -geological considerations in road alignment, roads in complicated regions, <b>Reservoirs-</b> geology of reservoir sites
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. F.G. Bell, Fundamental of Engineering Geology , BS Publications PVT Ltd, Hyderabad.</li> <li>2. Parbin Singh, " Engineering and General Geology ", Katson Publication House, 1987.</li> <li>3. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications</li> <li>4. Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005</li> <li>[1] J. K. Author, "Title of the book", x<sup>th</sup>ed.,Name of Publisher, year.</li> <li>Reference Books:</li> <li>Krynine and Judd, " Engineering Geology and Geo techniques ", McGraw Hill Book Company, 1990.</li> <li>2.Legeet, " Geology and Engineering ", McGraw Hill Book Company, 1998.</li> <li>3. Blyth, " Geology for Engineers ", ELBS, 1995.</li> <li>4. GoodmanR.F-Introduction to rockmechanics, JohnWiley, Chichestor</li> <li>5. Engineering Geology by SK Duggal,HKPandey And N.Rawal –McGraw Hill Education</li> </ul>
E-resources and other digital material	NPTEL Courses : <u>www.nptel.ac.in</u> Online video lecture.com/?course_id=713 http://nptel.ac.in/courses/105105106

## 14CE3304 CONCRETE TECHNOLOGY

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lectures:	3
		Continuous Evaluation:	30
		Semester end Evaluation:	70

	Total Marks:	100

Course outcomes	On successful completion of the course, the student will be able to:			
	CO1	Understand the manufacturing process of cement, types of cements and chemical composition of cement.		
	CO2	Understand the properties of the constituent materials in concrete		
	CO3	Know the properties of fresh and hardened concrete including strength and durability.		
	CO4	Understand various concreting methods.		
	C05	Design concrete mixes using Indian Standard method and apply statistical quality control techniques to concrete quality.		
Course Content	UNIT- I			
	CEMENT Genera Functi Water cemer Field of cen AGGREG Classifi Gradir	: al; Cement and lime; Chemical composition of ordinary Portland cement; ions of cement ingredients; Hydration of cement; Structure of Hydrated cement; requirements for hydration, Manufacture of cements; Storage of cement; Uses of nt. Types of cements including blended cements, properties and their applications; tests for cement; Chemical composition test; Laboratory tests for cement; Grades nent as per IS specifications. <b>ATES:</b> fication; Fine aggregate-Natural and artificial; coarse aggregate, Source; ng of Aggregates; IS: 383 requirements for aggregates; Tests on aggregates;		
		UNIT-II		
	WATER			
	WATER: Genera	l; Quality of water; Use of sea water; IS: 456 requirements.		
	MORTAR Functio mortar mortar	: ons of sand in mortar; Classification of mortars; Properties of good mortar mix and ; Preparation of mortar; Uses of mortar; Precautions in using mortar; Selection of ; Tests for mortars.		
	<b>CONCRE</b> Definit ratio.	TE: ion; Properties of cement concrete; Proportioning of concrete; Water – cement		
	ADMIXTU Genera Accele harden FRESH C	URES IN CONCRETE: l; Air–entraining agents; Plasticizers; Mineral and chemical admixtures; rators; Retarders; Miscellaneous admixtures for damp proofing and Surface ing. ONCRETE:		

Workability of concrete; Tests for workability; Segregation; Bleeding; Yield of Concrete.

#### UNIT – III

#### MANUFACTURE OF CONCRETE:

Batching of concrete; Mixing; Transporting Concrete; Placing concrete; Compaction of concrete; Curing of concrete; Finishing.

#### HARDENED CONCRETE:

General; Water – cement ratio; Gel / space ratio; Gain of strength with age; Maturity concept of concrete; Effect of maximum size of aggregate on strength.

#### **TESTS ON HARDENED CONCRETE:**

Compression test; Moulds and compacting; Curing; Failure of compression specimen; Effect of height / diameter ratio on strength; Flexural strength of concrete; Tensile strength of concrete; Non – destructive testing methods-Rebound Hammer Test, Ultrasonic Pulse Velocity Test; Tests on composition of hardened concrete; Elastic properties of concrete; Relation between modulus of Elasticity and strength; Factors affecting modulus of elasticity; Creep; Factors affecting creep; Shrinkage; Plastic shrinkage; Mechanism of shrinkage; Factors affecting shrinkage.

#### $\mathbf{UNIT}-\mathbf{IV}$

#### **DURABILITY OF CONCRETE:**

Permeability of concrete; Sulphate attack; Methods of controlling sulphate attack; Durability of concrete in sea water; Action of foreign matter on concrete. Corrosion mechanism of reinforcement in concrete.

#### **SPECIAL CONCRETES & CONCRETING METHODS:**

Special concretes such as light weight concrete and no fines concrete; High density concrete; Polymer concrete and Fiber reinforced concrete; Cold weather concreting, Hot weather concreting, Gunite or shotcrete; Ferro cement; Vacuum concrete- Rate of extraction of water, Vacuum Dewatered Concrete, Self compacting concrete.

#### **CONCRETE MIX DESIGN:**

Concept of mix design; Variables in proportioning; List of Mix design methods; Indian standard method of mix design. Ready Mixed Concrete.

Text books and Reference books	<ol> <li>Text Book:         <ol> <li>Concrete Technology by M. S. Shetty; S. Chand &amp; Company (Pvt.) Ltd., New Delhi.</li> </ol> </li> <li>Reference Books:         <ol> <li>Properties of Concrete by A. M. Neville; Published by Dorling Kindersley(India) Pvt. Ltd. Licensees of Pearson Education in south Asia, New Delhi.</li> <li>Concrete Technology by M. L. Gambhir; Tata Mc Graw – Hill Publishing Company Ltd., New Delhi.</li> <li>Concrete Technology by A.R.Santhakumar; Oxford University press-New Delhi.</li> <li>Concrete Microstructure, Properties and Materials., by P.Kumar Mehta, Paulo J.M.Monteio, Mc.Graw Hill Publications.</li> </ol> </li> </ol>
E-resources and other digital material	http:/nptel.ac.in/courses/105102012

## 14EC1305 BASICS OF ELECTRONICS ENGINEERING

<b>Course Category:</b>	Programme Core	Credits:	2
Course Type:	Theory	Lectures	2
		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	On successful co	mpletion of the course, the student will be able to:	
	CO1	Gain knowledge about the fundamentals of electronic components, devices, transducers	
	CO2	Understand and apply principles of digital electronics	
	CO3	Get familiarity about basic communication systems	
Course Content	UNIT I ELECTRONIC COMPONENTS Passive components – resistors, capacitors & inductors (properties, common types, I-V relationship and uses). SEMICONDUCTOR DEVICES Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, photocouplers)		
	UNIT II TRANSDUCERS Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.		
	UNIT III DIGITAL ELECTRONICS Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.		
	UNIT IV COMMUNICAT Block diagram of - methods of mode AM / FM transmit	<b>TION SYSTEMS</b> a basic communication system – frequency spectrum - need for modulation ulation - principles of AM, FM, pulse analog and pulse digital modulation – tters & receivers (block diagram description only	

Text books and Reference books	<ol> <li>Text Books:</li> <li>Thyagarajan.T, Sendur Chelvi.K.P, Rangaswamy.T.R, "Engineering Basics: Electrical, Electronics and Computer Engineering", New Age International, Third Edition, 2007.</li> <li>Thomas L. Floyd, "Digital Fundamentals", Pearson Education, Tenth Edition, 2013</li> <li>G.K.Mithal, "Radio Engineering" Khanna Publishers, Twentieth Edition, 2011.</li> <li>Reference Books:</li> </ol>
	<ol> <li>Somanathan Nair.B, Deepa.S.R,"Basic Electronics", I.K.International Pvt.Ltd., 2009.</li> <li>S. Salivahanan, N.Suresh Kumar &amp; A. Vallavaraj, "Electronic Devices &amp; Circuits", Tata Mc Graw Hill, Second Edition, 2008.</li> </ol>
E-resources and other digital material	<ol> <li>http://www.nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC- ELECTRONICS/ home_page.htm</li> <li>http://nptel.ac.in/video.php?subjectId=117102059 The above course contents are available in the prescribed books and websites.</li> </ol>

### 14CE 3306 FLUID MECHANICS

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial:	4-1
		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

	On successful completion of the course, the student will be able to:		
	CO1	Measure the pressure of the flowing fluid.	
	CO2	Determine the stability of floating / submerged bodies.	
<b>Course Outcomes</b>	CO3	Measure the flow of fluid through pipes.	
	CO4	Measure the flow of fluid through Orifices/ Mouthpieces and Weirs / Notches.	
	CO5	Determine various losses in pipe flow	
	CO6	Classify the flows in the pipes	
Course Content	<b>UNIT I</b> <b>Propert</b> Fluid C Compres	<b>ies of Fluid:</b> Introduction; Properties of Fluid; Units of measurement; ontinuum; Newtonian and Non - Newtonian fluids; Vapour pressure, ssibility and Elasticity; Surface Tension and Capillarity.	
	Fluid S Pascal's by mane	tatics: Variation of static pressure; Pressure the same in all directions – Law; Atmospheric, Absolute and gauge pressure; Pressure measurement ometers; Pressure on plane surfaces and curved surfaces.	
	<b>Buoyar</b> Buoyan and me Method	<b>acy and Floatation:</b> Buoyancy; Buoyant Force and Centre of cy; Stability of submerged bodies and floating bodies; Metacentre tacentric height; Determination of Metacentric Height – Analytical .	
	UNIT I Kinema flow; St flows; T Streamli accelera stream f	<b>tics of Fluid Flow:</b> Methods of describing fluid motion; Classification of eady, unsteady, uniform and non-uniform flows; Laminar and turbulent Three, two and one dimensional flows; Irrotational and rotational flows; ne; Path line; Streak line; Equation for acceleration; Convective tion; Local acceleration; Continuity equation; Velocity potential and unction; Vortex flow – free vortex and forced vertex flow.	
	<b>Dynami</b> Energy equation	<b>cs of Fluid Flow:</b> Euler's equation of motion; Bernoulli's equation; correction factor; Momentum principle; Applications of momentum; Force exerted on a pipe bend.	
	UNIT I Measur methods through	<b>H</b> ement of Flow through Pipes: Measurement of flow through Pipes – and various devices; Discharge through Venturi meter; Discharge orifice meter; Measurement of velocity by Pitot tube.	
	Flow th of coeffi submerg cylindric	<b>rough Orifices and Mouthpieces:</b> Flow through orifices; Determination cients for an orifice; Flow through large rectangular orifice; Flow through ed orifice; Classification of mouthpieces; Flow through external cal mouthpiece.	

	<ul> <li>Flow over Notchesand Weirs: Flow through rectangular, triangular and trapezoidal notches and weirs; Cippoletti Weir; End contractions; Velocity of approach; Broad crested weir.</li> <li>UNIT – IV</li> <li>Flow through Pipes: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Concept of equivalent length; Hydraulic power transmission through a pipe; Pipes in series and parallel; Water hammer.</li> <li>Laminar Flow: Relation between shear and Pressure Gradients in Laminar Flow; Reynold's experiment; Critical velocity; Steady laminar flow through a circular</li> </ul>
	pipe – Hagen Poiseuille's Law; Laminar Flow between Parallel Plates – Both plates at rest.
Text books and Reference books	<ul> <li>Text Books:</li> <li>[1] P.N. Modi&amp; S.N. Seth, "Hydraulics &amp; Fluid Mechanics", 18<sup>th</sup> ed., Standard Book House, New Delhi, 2011.</li> <li>[2] A.K. Jain, "Fluid Mechanics", 11<sup>th</sup> ed., Khanna Publishers, New Delhi, 2012.</li> <li>Reference Books:</li> <li>[1] R. K. Bansal, "Fluid Mechanics and Hydraulic Machines",9<sup>th</sup> et.,Laxmi Publications; New Delhi, 2010.</li> <li>[2] Rajput R.K., "Fluid Mechanics and Hydraulic Machines", 3<sup>rd</sup> ed., S.Chand and Company Ltd., New Delhi, 2006.</li> <li>[3] K.Subramanya, "Theory and Applications of Fluid Mechanics", 3<sup>rd</sup> ed., Tata McGraw Hill Publishing Company, New Delhi, 1997.</li> </ul>
E-resources and other digital material	[1] Dr. T. I. Eldho, IIT / Bombay – Fluid Mechanics– "www.nptel.ac.in/courses/105101082/"
	<ul> <li>[2] Dr. SubhashivaDutta&amp; Dr. N. Sahoo, IIT/Guwahati – FluidMechanics– <u>htpp://nptel.ac.in/courses/105103095/</u>xc</li> </ul>

# 14CE 3351 ENGINEERING GEOLOGY LAB

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Practice:	3
		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

<b>Course outcomes</b>	On successful completion of the course, the student will be able to:				
	CO1	Understand rocks and minerals and their engineering properties			
	CO2	prepare topographic and geologic cross sections			
	CO3	Establish subsurface geological conditions in the field by using geophysical instruments.			
Course Content	EXP.1.1d Physical a).Quartz b)Feldsp c)Mica g d) Carbo 2. Identi b) Basalt c)Sandstd d) Limes e)Marble f)Gneiss 3. Identi a)Folds b) Faults c) Un cor d) Tunne 4 Study a)Topogr b) Geold 5 Deter (RQD 6 Deter Using 7 Deter 8 Electr 9 Seismi Interpr	lentification of the following common rock forming Minerals by properties 2 group roup nate group fication of the following common rocks by Texture a).Granite one tone tone tone tone tone tone ton			

## 14CE3352 CONCRETE LAB

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Practice:	3
		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	On successf	On successful completion of the course, the student will be able to:	
CO1 Test the properties of materials li solid/hollow etc.		Test the properties of materials like clay brick, concrete blocks-solid/hollow etc.	
	CO2	Determine the consistency, fineness, initial and final setting time, soundness, compressive strength of cement for various grades.	
	CO3	Determine the fineness modulus and particle size distribution, bulk density, specific gravity of fine and coarse aggregates.	
	CO4	Determine the properties of fresh and hardened concrete.	
	CO5	Design the concrete mix for various grades by using Indian codes.	
Course Content	<ol> <li>Testing         <ol> <li>Testing</li> <li>e. water all suggest r</li> <li>Tests on</li> <li>e. standard sample)</li> </ol> </li> <li>Determina         <ol> <li>e. finer</li> <li>Determina works.(i. absorption</li> <li>Design an various the</li> <li>Determina compression</li> <li>Mix desi concrete</li> <li>Non Dest</li> </ol> </li> </ol>	of building blocks as per IS code. psorption and compressive strength of locally available building blocks and also nost appropriate blocks for load bearing and non load bearing walls.) a cement as per IS code. d consistency, initial, final setting time and compressive strength of cement ation of the suitability of given sample of Fine aggregate for concrete works ness modulus and particle size distribution, specific gravity and bulk density). ation of the suitability of given sample of coarse aggregate for concrete e. fineness modulus and particle size distribution, specific gravity and water on of CA). my one of concrete mix by IS code Method for given workability by casting rails. (M20, M25, M30, M35, M40 by using IS 10262:2009). e the properties of hardened concrete and specifying their significance.(i.e., sive& tensile strengths, modulus of rupture) gn for rigid pavements as per IRC (IRC: 44-2008, Guidelines for cement mix design for pavements. i.e. flexural strength of concrete) ructive Test Methods (demonstration only).	

Text books and Reference books	IS 456 IS 383 IS 10262 – 2009
	Laboratory Manual – Concrete Technology by HemantSood, L.N.Mittla, P.D.Kulkarni.
	Material testing laboratory manual by CS Kukmeaa, K. Kishore, Ravi Chawla

### 14HS1353 COMMUNICATION SKILLS LAB

<b>Course Category:</b>	Programme Core	Credits:	2
Course Type:	Lab	Practice:	2
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	On successful completion of the course, the student will be able to:
	CO1 Be proficient in pronunciation of speech sounds including accentuation.
	CO2 Enhance the awareness of the elements of listening comprehension.
	CO3 Develop the abilities of rational argumentation and skills of public
	speaking.
	CO4 Be aware of the elements of professional communication
	CO5 Be exposed to the items of various competitive exams.
Course Content	UNIT I Elements of Spoken Expression and processes of Listening
	comprehension:
	Speech Mechanism
	Articulation of vowels and consonants
	Patterns of Accentuation
	Types and processes of Listening comprehension
	UNIT II Polemics and Public Speaking:
	Group Discussion
	Pyramid Discussion
	> PNI
	Seminar Talk and Power Point Presentation
	UNIT III Professional Communication:
	Self Affirmation
	Advanced Composition including Official letters and e-mail
	Resume Preparation
	Elements of Non-Verbal Communication
	UNIT IV Life Skills and Vecabulary for Competitive Eveminations:
	$\searrow$ Select Life Skills(50)
	<ul> <li>Select Logies, Isms, Phobias and Manias (25 each)</li> </ul>
	<ul> <li>Sentence Completion(50 items)</li> </ul>
	<ul> <li>Fundamentals of Syllogisms</li> </ul>
Text books and	Text Books:
Reference books	1. Martin Cutts, Oxford Guide to Plain English, 7 <sup>th</sup> Impression, OUP, 2011
	2. Exercises in Spoken English. Prepared by Department of Phonetics and Spoke
	English, CIEFL, OUP, 21 <sup>st</sup> Impression, 2003
	Reference Books:
	1. Stephen R Covey, The 7 Habits of Highly Effective people, II edition,
	(Pocket Books) Simon & Schuster UK Ltd, 2004
	2. Martin Cutts, Oxford Guide to Plain English, 7 <sup>th</sup> Impression, OUP, 2011
	3. Deborah. J. Bennett, Logic made easy: How to know when Language Deceive
	you, I edition(Reprint), 2005
	4. Eclectic Learning Materials offered by the Department
E-resources and	1. ODII Language Learner's Software, 27-6-2012 Orell Techno Systems,
other digital	2. Visionet Spears Digital Language Lab software Advance Pro , 28-01-2015
materiai	3. <u>www.natcorp.ox.ac.uk</u> , British National Corpus, XML edition 2007.

## 14CE3401 SURVEYING

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lectures:	4
		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course	On successful	completion of the course, the student will be able to:
outcomes	CO1	Understand the principles of surveying.
	CO2	Measure horizontal and vertical angles in surveying.
	CO3	Understand the concepts of leveling and location of contour.
	CO4	Compute areas and volumes of a given section.
	CO5	Setting out of a simple curve.
	CO6	Know the basic concepts of total station.
Course Content		<ul> <li>UNIT – I</li> <li>BASICS OF SURVEYING:</li> <li>Surveying: Definition; Classification; Principles of surveying; Plan and map; Scales used for Maps and plans. Accuracy; Precision; Sources of errors; Types of errors;</li> <li>CHAIN SURVEYING:</li> <li>Principles of chain surveying; Basic definitions; Different methods; Ranging out; Chaining a line on a flat ground Chaining on an uneven or a sloping ground; Chain &amp; Tape corrections; Degree of accuracy.</li> <li>UNIT-II</li> <li>COMPASS SURVEYING:</li> <li>Traverse, Bearings (WCB&amp;RB); Prismatic compass, Surveyor compass, Magnetic Dip and Declination; Local attraction; included angles from bearings; Limits of accuracy.</li> <li>THEODOLITE SURVEYING:</li> <li>Basic definitions, fundamental lines, Temporary adjustments; Measurement of a horizontal angle by repetition and reiteration. Measurement of vertical angle; Source of errors in Theodolite survey, Omitted measurement.</li> </ul>

	UNIT – III
	LEVELLING
	Basic definitions; Different methods of leveling; Classification of direct leveling methods; Auto level; Leveling staff; Level field book; Profile leveling; Cross sectioning; Height of Instrument and rise and fall method. Sources of errors in leveling; Degree of Precision.
	CONTOURING
	Contouring; contour interval; Characteristics of contours; Methods of locating contours; Interpolation and Sketching of contours; Uses of contour maps;
	UNIT-IV
	<ul> <li>AREAS&amp; VOLUMES</li> <li>Introduction; Boundaries with offsets at irregular intervals; Plani-meter – Area of Zero circle. : Area of cross sections – two level sections only; Trapezoidal rule; Prismoidal formula; Capacity of a reservoir.</li> <li>CIRCULAR CURVES:</li> <li>Basic definitions; Designation of a curve; Relationship between radius and degree of curve; Elements of a simple and compound curves; setting out of simple curve.</li> <li>INTRODUCTION TO ELECTRONIC DISTANCE MEASUREMENTS (EDM)</li> <li>AND TOTAL STATION Basic concepts, Basic principle of Electronic Distance Measurement, Total Station (Basics only).</li> </ul>
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Surveying Vol I &amp; II by K R Arora, Standard Book house.</li> <li>Plane Surveying by AM Chandra, New Age International (P) Ltd.</li> </ol> </li> <li>Reference Books: <ol> <li>Fundamentals of surveying by S.K. Roy 1999, Prentice-Hall of India, New Delhi.</li> <li>Surveying Vol.1 by B.C. Punmia, Laxmi Publications.</li> <li>Advanced Surveying, by S. Gopi, R.S. Kumar and N. Madhu, 2007, Pearson education, New Delhi.</li> </ol> </li> </ul>
E-resources and other digital material	http://nptel.ac.in/courses/webcourse-contents/IIT- ROORKEE/SURVEYING/home.htm

# 14CE3402 ADVANCED MECHANICS OF MATERIALS

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture-Tutorial:	4-1
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	On su	accessful completion of the course, the student will be able to:
outcomes	CO1	Understand the concept of stress, principal stresses, strains and stress distribution on various cross sections of members due to eccentric and lateral loads.
	CO2	Compute strain energy due to axial loads, bending, shear and torsion.
	CO3	Determine the hoop and longitudinal stresses in thin and thick walled cylinders.
	CO4	Assess the mode of failure of a structural element using failure theories and to determine factor of safety for complex stress states.
	CO5	Apply the Euler equation to calculate buckling load for long straight columns of varying end conditions.
	CO6	Analyze determinate pin jointed frames by method of sections.
	CO7	Calculate deflections and rotations for statically determinate prismatic and non-prismatic beams subjected to various loading conditions.
Course Content	<ul> <li>CO7 and non-prismatic beams subjected to various loading conditions.</li> <li>UNIT -I</li> <li>ANALYSIS OF PLANE STRESS &amp; STRAIN:         <ul> <li>Introduction; Equations for the transformation of plane stress: Principal Stresses; Principal planes; Maximum shearing stresses; Mohr's circle of stress; Construction of Mohr's circle of stress, plane strain: Principal strain, Transformation of strains, Mohr's circle of strains.</li> </ul> </li> <li>STRAIN ENERGY:         <ul> <li>Introduction, Derivation of expressions for elastic strain energy in uni-axial stress, elastic strain energy in pure bending, elastic strain energy for shearing stresses, elastic strain energy of a bar in pure torsion and strain energy for multi-axial states of stress only.</li> <li>UNIT – II                  </li> <li>COMPOUND STRESSES:                  <ul> <li>Introduction; Principle of superposition and its limitation; Stress distribution on various cross sections of members due to eccentric loads and lateral loads. Middle third rule; Core or Kernel of a section.</li> <li>THIN WALLED PRESSURE VESSELS:</li></ul></li></ul></li></ul>	

	hemispherical ends.
	THICK WALL CYLINDERS Introduction, Stresses in thick walled cylinders, variation of stresses.
	UNIT – III FAILURE THEORIES: Introduction; Maximum normal stress theory; Maximum shearing stress theory; Maximum strain energy theory; Maximum distortion energy theory; Comparison of theories.
	<ul> <li>COLUMNS: Introduction; Stability of equilibrium; The Euler's formula for columns with different end restraints, Limitations of the Euler's formulas; Generalized Euler buckling – load formulas; The Secant formula; Rankine's Empirical formula.</li> <li>TRUSSES: Analysis of determinate pin jointed frames by method of sections.</li> </ul>
	<ul> <li>UNIT – IV</li> <li>DEFLECTION OF STATICALLY DETERMINATE BEAMS:</li> <li>Introduction; Strain-curvature and Moment-Curvature relations; The governing differential equation for deflection of elastic beams; Alternative differential equations of elastic beams; Solution of beam deflection problem by direct integration;</li> <li>Introduction to the Moment Area Method; Derivation of the Moment-Area theorems; Conjugate-beam method; Slope and deflection of beams using moment – area method and conjugate – beam method.</li> </ul>
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Strength of Materials (Mechanics of solids) by Er. R.K.Rajput; S.Chand&amp;Company Ltd., New Delhi.</li> <li>Strength of Materials by S Ramamrutham&amp; R Narayan; DhanpatRai Publishing Co.(P) Ltd, New Delhi.</li> </ol> </li> </ol>
	<ol> <li>Reference Books:         <ol> <li>Structural analysis by S SBhavikatti – V K Publishers</li> <li>Theory of structures by S P Timoshenki&amp; D H Young.</li> <li>Mechanics of materials by E P Popov; Prentice-Hall of India Pvt. Ltd.,New Delhi.</li> </ol> </li> </ol>
E-resources and other digital material	http://nptel.ac.in/105105108/ http://nptel.ac.in/105102090/6

## 14CE3403 BUILDING MATERIALS & BUILDING CONSTRUCTION

<b>Course Category</b>	<b>P</b>	rogramme Core	Credits: 2	3
<b>Course Type:</b>	Т	heory	Lectures:	3
			Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100
Course outcomes	On su	accessful completion of the co	ourse, the student will be able to:	
	CO1	Understand physical prop building materials that are u	erties, uses, manufacturing processed in structural components.	es of
	CO2	Understand application members.	of protective materials for struc	ctural
	CO3	Distinguish different types components of a building.	of constructional procedures for diff	ferent
	CO4	Apply the knowledge of d and repairs.	lifferent support systems for constru	iction
Course Content	UNIT	$\Gamma - \mathbf{I}$		
	Mater Com BUII BRIC in b Comp bricks weigh calciu manu system	rials for blasting; Process non building stones of India. <b>DING BLOCKS:</b> <b>CKS:</b> General; Composition rick earth Classification of parison between clamp burn s; Tests for bricks; Classifica at of bricks; Shape of bricks; um silicate bricks. <b>CON</b> facturing; advantages; <b>FLY</b> m; use of fly ash; fly ash buil	of blasting; Precautions in blas of good brick earth; Harmful ingred of brick earth; Manufacture of br ing and kiln burning; Qualities of tion of bricks; Colours of bricks, Size Fire – clays; Fire – bricks; Sand – lin <b>ICRETE BLOCKS: R</b> aw mate <b>ASH BRICKS:</b> Fly-Ash; dry system ding bricks:	lients ricks good e and me op erials a; we
	TIMI trees; Prese Indus timbe	<b>BER:</b> Definition; Classificati Defects in timber; Qualit rvation of timber; Fire rest trial timber; Advantages of t er trees.	ion of trees; Structure of a tree; Fellin ties of good timber; Decay of time istance of timber; Seasoning of time imber construction; Use of timber. In	ng o nber nber ndiar
	UNIT	Γ – II		
	<b>STEI</b> Gener prope	EL: ral; Manufacture of steel; U erties; Defects in steel; Marke	Uses of steel; Factors affecting phy et forms of steel; Properties of mild s	ysica steel

	Properties of hard steel; Corrosion of ferrous metals.
	<b>PAINTS, VARNISHES AND DISTEMPERS:</b> General; Painting; Varnishing; Distempering; Wall paper; White washing; Colour washing.
	UNIT – III BRICK MASONRY: Technical terms; Types of bonds in brickwork- Stretcher, header, English, Flemish.
	<b>STONE MASONRY:</b> Technical terms; Classification of stone masonry.
	WALLS AND LINTELS Classification of walls, Classification of Lintels- timber, stone, brick, steel, reinforced concrete lintels.
	<ul> <li>UNIT – IV DAMPNESS AND DAMP PROOFING:</li> <li>Causes of dampness; Methods of preventing dampness; Damp proofing materials and their classification; Methods of providing DPC under different situations.</li> <li>FLOORS:</li> <li>Technical terms; Types of flooring materials.</li> <li>ROOFS:</li> <li>Technical terms; Types of roofs; pitched- single roofs, double or purlin roof, trussed roof- king post, queen post, combination of king post &amp; queen post trusses, mansard roof truss; Steel sloping roofs; Roof covering materials; Types of flat roofs; Damp proofing &amp; drainage on flat roofs.</li> <li>SCAFFOLDING, SHORING, UNDER PINNING AND FORM WORK:</li> <li>Types of scaffolding; Types of shoring; Methods of underpinning; Types of form work;</li> </ul>
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Engineering Materials by S. C. Rangwala; Charotar Publishing House.</li> <li>Building construction by B. C. Punmia -Laxmi Publications, New Delhi.</li> <li>Reference books:                 <ol></ol></li></ol></li></ol>
E-resources and other digital material	http://nptel.ac.in/courses/105102088/

# 14HS1404 ENVIRONMENTAL STUDIES

Course Category:	Institution Core	Credits:	3
<b>Course Type:</b>	Theory	Lectures:	3
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	On successful completion of the course, the student will be able to:			
outcomes	CO1	Understand the various natural resources, analyze and explore degradation management		
	CO2	Understand the Ecosystems and need of Biodiversity		
	CO3	Realize and Explore the Problems related to Environmental pollution and its management		
	CO4	Apply the Role of Information Technology and analyze social issues, Acts associated with Environment.		
Course	UNIT -	Ι		
Content	<b>The Multidisciplinary Nature of Environmental Studies</b> Definition, scope and importance Need for public awareness.			
	Natural Resources			
	Renew	vable and Non-renewable Resources:		
	Natural resources and associated problems.			
	<ul> <li>(a) Forest resources: Use and over-exploitation, deforestation. Timber extra mining, dams and their effects on forests and tribal people.</li> <li>(b) Water resources: Use and over-utilization of surface and ground water, drought, conflicts over water, dams-benefits and problems.</li> </ul>			
	neral resources: Use and exploitation, environmental effects of extracting using mineral resources.			
	(d) Foc ove logg	od resources: World food problems, changes caused by agriculture and orgrazing, effects of modern agriculture, fertilizer-pesticide problems, water ging, salinity.		
	(e) Ene	ergy resources: Growing energy needs, renewable and non-renewable rgy sources, use of alternate energy sources.		
	(f) Lan	nd resources: Land as a resource, land degradation, man induced landslides,		

soil erosion and desertification.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

## UNIT II

## Ecosystems

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:

(a) Forest ecosystem

(b) Grassland ecosystem

(c) Desert ecosystem

(d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

## **Biodiversity and Its Conservation**

Introduction, definition: genetic, species and ecosystem diversity. Biogeographically classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

Biodiversity at global, National and local levels.

India as a mega-diversity nation.

Hot-spots of biodiversity.

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India.

Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

## UNIT III

### **Environmental Pollution**

Definition

Causes, effects and control measures of

- (a) Air pollution
- (c) Soil pollution
- (e) Noise pollution (g) Nuclear hazards
- (b) Water pollution
- (d) Marine pollution
- (f) Thermal pollution

Solid waste management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Diaster management: Floods, earthquake, cyclone and landslides.

## UNIT IV

### Social Issues and the Environment

From unsustainable to sustainable development.

Urban problems related to energy.

Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation.

Consumerism and waste products.

## **Environment Protection Act**.

Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

## Human Population and the Environment

Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

## Field Work/Case Studies {<u>NOT TO BE INCLUDED IN SEMESTER END</u> <u>EXAMS</u>}

Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain.

Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.

Study of common plants, insects, birds.

Study of simple ecosystems—pond, river, hill slopes, etc.

Text books and Reference books	<ul> <li>Text Book:</li> <li>1. Text book for ENVIRONMENTAL STUDIES for under graduate courses of all branches of higher education – ErachBharucha For University Grants Commission.</li> <li>Reference Book:</li> </ul>
	1 AnjaneyuluY.Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad
E-resources and other digital material	collegesat.du.ac.in/UG/Envinromental%20 <b>Studies_</b> ebook. <b>pdf</b>

# 14EE1405 BASICS OF ELECTRICAL ENGINEERING

<b>Course Category:</b>	<b>Institutional Core</b>	Credits:	2
<b>Course Type:</b>	Theory	Lectures	2
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks	100

Course	On successful completion of the course, the student will be able to:					
outcomes	CO1 Analyze electric circuit fundamentals					
	CO2 Understand the basic concepts of Electromagnetism.					
	CO3 Analyze the basic concepts of electric machines					
	CO4 Understand measuring instruments & utilization concepts.					
Course Content	<b>Unit I</b> DC circuits: Definitions of work, power, energy and torque; Ohms law; Kirchhoff's laws; Series-parallel resistive circuits; Star-delta transformation; AC circuits: Generation of sinusoidal signal ; RMS, Average values, Form factor, Peak factor					
	<b>UNIT –II</b> Magnetic effect of an electric current; cross and dot conventions; concept of m.m.f., flux, flux density, reluctance, permeability and field strength; Self and Mutual inductances; Fleming's left hand rule; Faradays laws of electromagnetic induction, statically and dynamically induced e.m.f.,					
	<ul> <li>UNIT – III</li> <li>D.C. Machines: classification of dc machines; Principle of motor ar generator; back emf; Torque of a dc machine; Load characteristics of shunt, serie motors</li> <li>AC Machines: Classification of ac machines; Production of rotating fiel Constructional features – principle of operation; Torque-slip characteristics;</li> </ul>					
	<b>UNIT – IV</b> Measuring Instruments: Classification of instruments; Principle of operation of moving-coil and moving-iron instruments; – Dynamometer –type watt meter Utilization: Principles of resistance and induction heating – principles of electrical traction – speed time characteristics					
Text books and Reference	<b>Text Book:</b> [1] I.J.Nagrath and Kothari , "Theory and problems of Basic Electrical					
books	Engineering", Prentice-Hall of India Pvt. Ltd					

	<ul> <li>Reference Books:</li> <li>[1] Dr. K. Uma Rao, Dr. A. Jayalakshmi, "Basic Electric Engineering", Pearson Publications.</li> <li>[2] T.K. Nagasarkar and M.S. Sukhja,: Basic Electric Engineering:, oxford University press.</li> </ul>
E- resources and other digital material	http://www.nptel.ac.in/syllabus/syllabus.php?subjectId=108105053

# 14CE3406 HYDRAULICS & HYDRAULIC MACHINES

<b>Course Category:</b>	<b>Programme Core</b>	Credits:	4
<b>Course Type:</b>	Theory	Lectures	4
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	On successful completion of the course, the student will be able to		
	CO1	Determine the most economical dimensions of different channel sections.	
	CO2	Apply momentum principles to Open channel flows.	
	CO3	Classify different types of surface profiles in open channel flow.	
	CO4	Analyze various characteristics of Hydraulic Jump.	
	CO5	Analyze and select suitable type of turbine.	
	CO6	Analyze and select a suitable type of Pump.	
	CO7	Formulate an equation for a phenomenon using dimensional analysis.	
Content	<ul> <li>UNIT I:</li> <li>Open Channel Flow: Uniform Flow: Introduction, Classification of flows and channels; Chezy, Manning's, Bazin, Kutter's Equations; Hydraulically efficient channel sections - Rectangular, Trapezoidal and Circular channels; Velocity distribution; Pressure distribution.</li> <li>Non – Uniform Flow: Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; Different slope conditions; Channel transitions; Momentum principle applied to open channel flow; Specific force; Specific force curve.</li> <li>UNIT II:</li> <li>Gradually Varied Flow: Dynamic equation; Surface Profiles; Computation of surface profiles by single step &amp; multi step methods; Back water Curves and Draw down curves; Examples of various types of water surface profiles; Control section.</li> <li>Rapidly Varied Flow: Hydraulic jump; Elements and characteristics of hydraulic jump; Types of hydraulic jump; Location and applications of hydraulic jump; Energy loss in a hydraulic jump.</li> <li>UNIT III:</li> <li>Impact of Jets: Force exerted by fluid jet on stationary and moving flat plates</li> </ul>		

momentum principle; Torque exerted on a wheel with radial curved vanes.

	<ul> <li>Hydraulic Turbines: Classification; Impulse; Reaction; Radial, Axial, mixed and tangential flow turbines; Pelton, Francis and Kaplan turbines; Runner profiles; Velocity triangles; Head and efficiency; Draft tube theory; Similarity laws; Concept of specific speed and unit quantities; Selection of Turbines; Governing of turbines.</li> <li>UNIT – IV</li> <li>Centrifugal Pumps: Types of pumps, Manometric head; Losses and efficiencies; Work done; Working Principle; Priming; Velocity triangles; Performance and characteristic curves; Multistage and double suction pumps; Cavitation effects; Similarity Considerations.</li> <li>Dimensional Analysis and Similitude: Dimensional homogeneity; Rayleigh's method; Buckingham – Pi theorem; Geometric, Kinematic and dynamic similarities; Reynold's, Froude, Euler, Mach and Weber numbers; Model laws; Scale effect; Distorted models.</li> </ul>		
Text books and Reference books	<ul> <li>Text Books:</li> <li>[1] P.N. Modi&amp; S.N. Seth, "Hydraulics &amp; Fluid Mechanics", 18<sup>th</sup> ed., Standard Book House, New Delhi, 2011.</li> <li>[2] A.K. Jain, "Fluid Mechanics", 11<sup>th</sup> ed., Khanna Publishers, New Delhi, 2012.</li> </ul>		
	<ul> <li>Reference Books:</li> <li>[1] Jagadhishlal, "Hydraulic Machines",9<sup>th</sup>ed.,Metropoliton Company, New Delhi, 1995.</li> <li>[2] R. K. Bansal, "Fluid Mechanics and Hydraulic Machines",9<sup>th</sup> ed., Laxmi Publications; New Delhi, 2010.</li> <li>[3] Rajput R.K., "Fluid Mechanics and Hydraulic Machines", 3<sup>rd</sup> ed., S.Chand and Company Ltd., New Delhi, 2006.</li> <li>[4] K.Subramanya, "Flow in Open Channels" –3<sup>rd</sup> ed., Tata McGraw Hill Publishing Company, New Delhi, 2009.</li> </ul>		
E-resources and other digital material	<ul> <li>[1] Prof. Arup Kumar Sharma, IIT/ Guwahati – Hydraulics– "www.nptel.ac.in/courses/105103096/"</li> <li>[2] Prof. B.S. Murthy and Dr. B.S. Thandaveswara, IIT/Madras – Hydraulics- "www.nptel.ac.in/courses/105106114/"</li> </ul>		
# 14CE3451 FLUID MECHANICS AND HYDRAULIC MACHINES LAB

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Practice:	3
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On suc	ccessful completion of the course, the student will be able to:								
	CO1	Determine the total energy at various sections of pipe flow.								
	CO2	Determine the discharge through tanks.								
	CO3	Determine the discharge through pipes.								
	CO4	Determine the discharge through Open channel.								
	CO5	Classify different types of flows.								
	CO6	Determine the performance of various Hydraulic machines								
<b>Course Content</b>	1.	Verification of Bernoulli's theorem.								
	2.	<ol> <li>Determination of Coefficient of discharge of a Venturimeter.</li> <li>Determination of Coefficient of discharge of an Orificemeter.</li> </ol>								
	3.									
	4.	Orifice: Determination of Coefficient of discharge by steady and unsteady flow methods								
	5.	Mouthpiece: Determination of Coefficient of discharge by steady and unsteady flow methods.								
	6.	Determination of friction factor of Pipes.								
	7.	Determination of loss of head in pipes due to bends, sudden contractions and sudden expansion.								
	8.	Determination of Coefficient of discharge for a Rectangular Notch / Triangular / Trapezoidal Notch.								
	9.	Characterization of laminar and turbulent flows by Reynolds's apparatus.								
	10.	Measurement of force due to impact of jets on vanes of different types.								
	11.	Performance studies on single stage centrifugal pump.								
	12.	Performance studies on Pelton turbine/Francis turbine.								
	Demoi	nstration Experiments:								

	<ol> <li>Determination of Manning's and Chezy's coefficients in open channel.</li> <li>Performance studies on Reciprocating pump.</li> <li>Demo on Francis/Kaplan Turbine.</li> <li>Performance studies on Gear Pump.</li> </ol>
Text books and Reference books	<ol> <li>Fluid Mechanics and Hydraulic machinery laboratory manual by Dr. N.Kumara Swamy, Charrotar Publishing House Pvt. Ltd.</li> <li>Experiments in fluid mechanics by Dr. BaljeetKapoor, Khanna Publications.</li> <li>Hydraulics and fluid mechanics including hydraulic machines by Dr. P.N.Modi and Dr. SM Seth, Standard book house, New Delhi</li> </ol>
E-resources and other digital material	<ul> <li>[1] Prof. Arup Kumar Sharma, IIT/ Guwahati – Hydraulics – "www.nptel.ac.in/courses/105103096/"</li> <li>[2] Prof. B.S. Murthy and Dr. B.S. Thandaveswara, IIT/Madras– Hydraulics -"www.nptel.ac.in/courses/105106114/"</li> </ul>

# 14CE3452 SURVEY LAB

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Practice:	3
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:									
outcomes	CO1	Determine the areas by using linear measurement methods.								
	CO2	Plot the traverse and determine the bearings by using Compass.								
	CO3	Project the traverse from ground, on to the sheet by using plane table								
	CO4	etermine the horizontal & vertical angles by using Theodolite.								
	CO5	Determine the elevations by using different leveling instruments.								
Course	CHAIN	& COMPASS SURVEY:								
	1. C c 2. N 3. T	Chaining of a line using Chain/Tape and Recording of details along the hain line. Measurement of area – Cross staff survey. Traversing by compass and graphical adjustment.								
	PLANE TABLE SURVEY:									
	4. D 5. P 6. Re	Determination of the distance between two inaccessible points. lotting of a building by plane table Traversing. section by Trial and Error method.								
	THE	ODOLITE:								
	7. M 8. D	leasurement of horizontal and vertical angles. etermination of distance between two inaccessible points.								
	LEVEL	LING:								
	9. N 10. F 11. F 12. C	Measurement of elevation difference between two points using any eveling Instrument. Elevation difference between two points by Reciprocal levelling method. Profile Levelling – Plotting of Profile. Contouring of a small area by method of Blocks.								

Text books and Reference books	
E-resources and other digital material	http:/gauravtandon.wikspacaes.com

# 14CE3453 STRENGTH OF MATERIALS LAB

<b>Course Category:</b>	<b>Programme Core</b>	Credits:	2
<b>Course Type:</b>	Practical	Practice:	3
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

<b>Course outcomes</b>	On suc	cessful completion of the course, the student will be able to:					
	CO1	Do tests on steel and find its properties to ascertain suitability as per IS codes of practice.					
	CO2	Conduct tests on wood as per IS Codes of practice and its use in works.					
	CO3	Evaluate the strains and stresses experimentally using electrical resistance strain gauges.					
<b>Course Content</b>	Experiments List						
	1. To Un	study the stress-strain characteristics of mild steel/tor steel by iversal testing machine.					
	2. To sin	determine the ultimate shear strength of mild steel rod in gle and double shear.					
	3. To nu	find the Brinnel's hardness number and Rockwell's hardness mber of the given material.					
	4. To (W sir	find the Young's modulus of the given material /ood/Steel/Aluminum) by conducting bending test on nply supported beam.					
	5. To cor car	o find the Young's modulus of the given material by nducting bending test on cantilever beam and propped ntilever.					
	6. To cor ma	o find the impact resistance of the given material by nducting Charpy test and IZOD test on Impact testing achine.					
	7. To cire	find the modulus of rigidity by conducting torsion test on solid cular shaft.					
	8. To	determine the modulus of rigidity of the material of the spring.					
	9. To	determine the ductility of steel wire					
	10. Te	sts on wood					
	11. S	train gauge application and evaluation of stress.					

## 14CE3501 STRUCTURAL ANALYSIS-I

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3402 Advanced mechanics of	Continuous Evaluation:	30
	materials	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will have:												
		CO1	evalu	evaluate displacements for determinate structures using energy methods									
	CO2	analy	analyze and draw the influence line diagram for determinate structures										
		CO3	analy defor	analyze statically indeterminate structures using method of consistent deformations									
		CO4	analy energ	ze inde gy meth	etermin od.	nate rig	id join	ted and	pin joi	nted pla	ane fram	es using	strain
Contribution of Course		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes towards	CO1	Н				H							
achievement of Program	CO2	Н				H							
Outcomes	CO3	Н				H							
(L – Low, M - Medium, H – High)	CO4	H	H H H										
Course Content		<b>UNIT</b> 1.	<ul> <li>JNIT – I</li> <li>1. DISPLACEMENTS OF DETERMINATE STRUCTURES USING ENERGY METHODS: Maxwell's reciprocal theorem; Maxwell – Betti's generalized reciprocal theorem; Castigliano's theorems; Application of Castigliano's theorem for calculating deflection of beams, frames and trusses; Virtual work method for deflections.</li> </ul>										
		UNIT 2.	<ul> <li>NIT – II</li> <li>2. INFLUENCE LINES FOR STATICALLY DETERMINATE STRUCTURES: Moving loads and influence lines; Influence lines for beam reactions Influence lines for shearing force; Influence lines for bending moment Calculation of maximum shear force and bending moment at a section for rolling loads; Calculation of absolute maximum bending moment Influence lines for simple trusses.</li> </ul>						ctions; oment; ion for oment;				

	<ul> <li>UNIT - III</li> <li>3. PROPPED CANTILEVERS: Analysis of propped cantilever by method of consistent deformations.</li> <li>4. FIXED BEAMS: Fixed moments for a fixed beam of uniform section for different types of loading; Effect of sinking of support; Effect of rotation of a support; Bending moment diagram for fixed beams.</li> <li>5. CLAPEYRON'S THEOREM OF THREE MOMENTS: Analysis of continuous beam by Clapeyron's theorem of three moments.</li> </ul>
	<ul> <li>UNIT – IV</li> <li>6. STRAIN ENERGY METHOD: Strain energy method for analysis of continuous beams and rigid jointed plane frames up to second degree redundancy.</li> <li>7. REDUNDANT PIN JOINTED FRAMES: Analysis of pin jointed frames up to second degree redundancy; Forces in indeterminate pin jointed frames due to temperature variation and lack of fit; Composite structure.</li> </ul>
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Analysis of Structures volume I- 17<sup>th</sup> Edition by Vazirani&amp;Ratwani &amp; Volume –II 16<sup>th</sup> Edition by Vazirani&amp;Ratwani,Khanna Publishers; Delhi.</li> </ol> </li> <li>Reference Books: <ol> <li>Structural Analysis by S.S.BhaviKatti 4<sup>th</sup> Edition 2013</li> <li>Theory of Structures by S. Ramamrutham, 9<sup>th</sup> Edition, dhanapatirai publications.</li> </ol> </li> </ul>
E-resources and other digital material	http://onlinecourses.nptel.ac.in/105101085

## 14 CE 3502 WATER RESOURCES ENGINEERING – I

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3406 Hydraulics and Hydraulic	<b>Continuous Evaluation:</b>	30
	Machines	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Unde	rstand v	various i	rrigatio	n metho	ds and l	Irrigatio	n manaş	gement j	practice	s in the	field.
	CO2	Estin	ate the	Run-off	and eva	aluate tł	ne grour	nd water	yield.				
	CO3	Desig	Design of various Cannel sections.										
	CO4	Desig	Design of various Head works.										
<b>Contribution of</b> <b>Course Outcomes</b>		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
towards achievement of	CO1	М		Н		М							
Program Outcomes	CO2	Н				М							
(L – Low, M - Modium H High)	CO3	Н		Н		М							
Wiedrum, 11 – Ingh)	CO4	Н		Н		М							
Course Content	UNIT – I												
	INTRODUCTION TO IRRIGATION:												
		Defini	tion; No	ecessity	; Scope	of irrig	gation s	cience;	Benefit	s of irri	gation;	Ill-effe	cts of
		irrigati	ion; Typ	bes of ir	rigation								
	WATER APPLICATION METHODS:												
	Methods of applying water to crops; Uncontrolled or wild flooding; Free flooding; Contour laterals: Border strip method: Check flooding: Bosin flooding; Zigrag method:												
		Furrov Drin ir	v methor	od; C	Contour	Farmin	g; Sub-	surface	irrigatio	n; Sprin	ikler	Irrig	ation;
	W	ATER	REQU	J <b>IREM</b>	ENT (	OF CR	OPS:						
		Functi soils capaci moistu Factor Cultur depth measu	ions of and the ity; Fie ure; I cs affect cable c and Ko urement	irrigati eir recl ld capa Duty ar cting c ommar or perio t of con	on wat amation city; W nd Delf luty; M nd area d; Con sumpti	er;Suita n; Clas /ilting j ta; Bas /ethods u; Cultu sumptiv ve use;	ability of ses and point; A e perio of in urable ve use of Irrigat	of soil f d avail Availab od; Rel nprovin cultiva of wate ion effi	for irrig ability le mois ation b ng duty ted and r (Evap ciencie	gation; soil of soil sture an oetween y; Gros d uncu s ; Stan	Saline a water; d readi Duty s com ltivated unspirat dards c	und alk Satur ly avai and I mand area; ion); I of irrig	aline ation lable Delta; area; Kor Direct ation

water; Assessment of irrigation water.

### UNIT – II

### HYDROLOGY:

Introduction to Engineering Hydrology and its applications; Hydrologic cycle; Precipitation types; Rain gauges; Computation of average rain fall over a basin; Run off; Factors affecting run off; Computation of run-off. Hydrograph; definition of Unit hydrograph; Limitations and applications of unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; Application of unit hydrograph to construction of a flood hydrograph resulting from two or more periods of rainfall; Construction of unit hydrograph of different unit duration from a unit hydrograph of some given unit duration. S-hydrograph

#### WELL IRRIGATION:

Introduction; Aquifer; Aquicludes; Aquifuge; Specific yield; Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; Dupit's theory for confined and unconfined aquifers; Tube wells; Open wells; Constant level pumping test, Recuperation test.

#### UNIT-III

### **IRRIGATION CHANNELS – SILT THEORIES & DESIGN PROCEDURE:**

Classification; Canal alignment; Silt theories–Kennedy's theory, Lacey's regime theory; Kennedy's method of channel design; Silt supporting capacity according to Kennedy's theory; Use of Garret's diagram in channel design; Lacey's theory applied to channel design; Use of Lacey's regime diagrams; Drawbacks in Kennedy's theory; Defects in Lacey's theory; Comparison of Kennedy's theory and Lacey's theory.

### WATER LOGGING AND CANAL LINING:

Water logging; Effects of water logging; Causes of water logging; Remedial measures; Lining of irrigation channels – necessity, advantages and disadvantages; Types of lining; Design of lined canal; ; Drainage and pressure release arrangements behind canal lining

### UNIT-IV

### **DIVERSION HEAD WORKS:**

Component parts of a Diversion Head works. Types of weirs, causes of failures of weirs and their remedies. – Bligh's Creep Theory, &Khosla's Theory. Outlets, Types:-Non modular Outlets, Semi modular Outlets, Rigid Module, Canal falls; Necessity and locations of falls, Development of falls and classification of falls. Silt control at head works.

### CANAL REGULATION WORKS:

Canal regulators; Off-take alignment; Head regulators and cross-regulators; Canal escape.

Text books and Reference books	Learning Resources:
	<ul> <li>Text Books:</li> <li>1. Irrigation and water power Engineering by Dr. B.C. Punmia&amp; Dr. PandeB.B.Lal; Laxmi Publications Pvt. Ltd., New Delhi., 2006.</li> </ul>

	<ol> <li>Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna publishers New Delhi, 2006.</li> </ol>
	Reference Books:
	<ol> <li>Irrigation, Water Resources &amp; Water Power Engineering by Dr. P.N. Modi; standard Book House, New Delhi.,2006</li> <li>Irrigation water power and water resources engineering by K R ARORA, Standard published distributors, New Delhi.,2006.</li> <li>A text book of hydrology by Dr.P.Jayarami Reddy, published by Laxmi Publications.</li> <li>Journals in Water resources</li> </ol>
E-resources and other digital material	www.nptel.ac.in/couses/105104103

## 14CE3503- DESIGN OF CONCRETE STRUCTURES – I

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3304 Concrete Technology	<b>Continuous Evaluation:</b>	30
	14CE3403 Building Materials and	Semester end Evaluation:	70
	Building Construction	Total Marks:	100

<b>Course outcomes</b>	Upon successful completion of the course, the student will be able to:													
	CO1	unde provi	rstand t isions c	the fund of IS 45	dament 6-2000	al beha	vior of	R.C.C	structu	ral syste	ems and	1 code		
	CO2	analy	vse, and	l desigr	beams	s for fle	xure							
	CO3	desig	design of beams for shear and understandserviceability requirements.											
	CO4	analy Stair	analyse, design and draw the reinforcement details of beams, slabs and Staircases.											
Contribution of Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
towards achievement of	CO1	L		Н		Н								
Program Outcomes	CO2	L		Н		Н								
(L – Low, M - Medium H – High)	CO3	L		Н		Н								
incurum, ir ingli)	CO4	L		Н		Н								
Course Content	UNIT	– I										_		
	<ol> <li>INT Structu Loads design;</li> <li>DES Fundar design; and do</li> <li>UNIT</li> <li>DES Assum flexure reinfor with w</li> </ol>	RODU rral des on stru ; Codes SIGN I mentals ; Trans ubly re – II SIGN I ptions; ; Maxi ced, do orking –III	JCTIO sign-Ro cture; I s of pra FOR F s; Assu formed inforce FOR F ; Limit mum d oubly re stress	PN: Ductilit actice. LEXUI mption area m d section LEXUI states- lepth of einforce method	ructura y versu RE (W s; Perm nethod; ons. RE (LI Types; 1 neutra ed and f	l engine is brittle <b>ORKI</b> hissible Analys <b>MIT S</b> Partial 1 axis; A flanged	eer; Re eness; S NG ST stresse sis and a TATE safety f Analysi section	inforce Strength <b>RESS</b> s in cor design design Sactors; s and d ns; Con	d concr a and se <b>METH</b> acrete a for flex <b>IOD):</b> Failure lesign f aparison	e of R.C. or flexu	uctural bility; M l; Balan singly r C.C bea ure of s it state	elemen /lethod nced reinford m in ingly metho	nts; s of ced	

4. SHEAR AND DEVELOPMENT LENGTH:
Shear in structural members; Flexure and Shear in homogeneous beam; Shear in R. C. beams; Diagonal tension and diagonal compression; Design for shear by limit state method; Development length; Pull out test; Anchorage bond; Flexural bond; Check for development length.
5.DEFLECTION AND CRACKING:
Span/effective depth ratio; Calculation of short-term deflection and long term deflection; Cracking; Bar spacing controls; Calculation of crack width.
UNIT-IV
6. DESIGN BY LIMIT STATE METHOD
• Design of continuous one-way slab.
<ul> <li>Design of continuous beam.</li> <li>Design a section subjected to handing memory shear force and targingal</li> </ul>
• Design a section subjected to bending moment, shear force and torsional moment.
Design of dog legged staircase

Text books and	Text Books:							
Reference books	<ol> <li>Reinforced Concrete Vol-1,8<sup>th</sup> Edition by H.J.Shah, by Charotar Publication House.</li> <li>Reinforced Concrete (Limit State Design), 7<sup>th</sup> Edition by Ashok K.Jain, Nem Chand &amp; Bros., Roorkee</li> </ol>							
	Reference Books:							
	1. Reinforced concrete structures by B.C.Punmia, Ashok Kumar Jain andArunKumarJain, Laxmi, publications Pvt.Ltd., New Delhi							
	2. Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of Indi Private Ltd., New Delhi.							
	3. Reinforced concrete design by S.UnnikrishnaPillai&DevdasMenon, Tata McGraw Hill, New Delhi							
	4. Limit state designed of reinforced concrete – P.C. Varghese, Printice Hall of India, New Delhi							
	5. Design of concrete structures by ArtherH.Nilson, Tata McGraw-Hill Publishing Co. Ltd, New Delhi.							
	6. Code of practice for plain and reinforced concrete IS 456-2000.							
E-resources and other digital material	http://nptel.ac.in/courses/105105105/ http://nptel.ac.in/courses/105105104							

# 14CE3504 ENVIRONMENTAL ENGINEERING – I

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	Engineering Chemistry	<b>Continuous Evaluation:</b>	30
	Environmental studies	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On successful completion of the course, the student develops												
	CO1	an a refer	bility ence to	to co o quan	nsider tity an	sourc d qual	e of w ity of v	water 1 water	for wa	ter suj	oply s	cheme	with
	CO2	CO2 an ability to understand various types of impurities and their effects.											
	CO3	an ability to treat the water by various types of treatment units.											
	CO 4	an al builc	oility te lings.	o distri	ibute tl	ne trea	ted wa	ater to	public	and di	stribut	ion wi	thin
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	Н		Н					L				
(L – Low, M - Medium,	CO2			Н					L		L		
H – High)	CO3	Н				Н						L	
	CO4	H				Н			L				
	UNIT – I												<u> </u>
Course Content	<ul> <li>1.INTRODUCTION TO WATER SUPPLY ENGINEERING</li> <li>Need for protected water supplies; Objectives of water supply systems; Role of Environmental Engineers.</li> <li>2.QUANTITY OF WATER</li> <li>Estimating requirements; Design period; Per capita consumption; Factors affecting per capita consumption; Fire demand; Fluctuations in demand; Prediction of population.</li> <li>3.SOURCES &amp; INTAKE WORKS</li> <li>Classification of sources of water supply; Choice of source; Suitability with regard to quality and quantity; Lake, river, reservoir and canal intakes.</li> </ul>										le of g per ard to		
	UNIT – I	[											
	<ul> <li>4.TRANSPORTATION AND PUMPING OF WATER: Types of conduits; Capacity and design; Materials for pipes; Leakages; Types of pur Efficiency and choice of pumps.</li> <li>5. QUALITY OF WATER: Impurities in water; Routine water analysis - physical, chemical and bacteriological to Standards for drinking water; Water borne diseases</li> </ul>								umps; tests;				

	<ul> <li>6. PURIFICATION OF WATER: Methods of purification of water; Sequence of treatment for ground water and surface water sources.</li> <li>7. PLAIN SEDIMENTATION AND COAGULATION: Theory of sedimentation; Stoke's law; Sedimentation tanks; Design aspects; Principle of coagulation; Chemicals used for coagulation; Units of coagulation plant; Optimum dose of coagulant.</li> <li>UNIT – III</li> <li>8. FILTRATION OF WATER: Theory of filtration; Filter materials; Slow sand and rapid sand filters; Construction and operation; Troubles in rapid sand filters; Pressure filters.</li> <li>9. DISINFECTION OF WATER: Different methods of disinfection; Chlorination; Types of chlorination; Testing of chlorine.</li> <li>10.MISCELLANEOUS TREATEMENT METHODS: Water softening; Methods of removing temporary hardness; Methods of removing permanent hardness; Removal of color, odor and taste from water; De-fluoridation.</li> <li>UNIT – IV</li> <li>11. DISTRIBUTION SYSTEM: General requirements; Classification; Methods of supply; Available pressure in the distribution system; Layouts of distribution networks; Distribution reservoirs; Functions; Types; Capacity of balancing tank; Analysis of distribution system; Methods of analysis; Appurtenances in the distribution system; Sluice valves; Check valve; Air valve; Drain valve; Hydrants; Meters.</li> <li>12.PLUMBING: Water supply – pipes and fittings; House drainage - Sanitary fittings, Traps; Plumbing system of drainage – Single stack, One pipe and Two pipe systems; Principles governing design of building drainage.</li> </ul>
Text books and Reference books	<ol> <li>Text Books         <ol> <li>Elements of public health engineering by K. N. Duggal; S. Chand &amp;CompanyLtd.,New Delhi.</li> <li>Environmental Engineering Vol. I - Water supply engineering by S. K. Garg; Khanna Publishers, Delhi.</li> </ol> </li> <li>Reference books         <ol> <li>Water Supply and Sanitary Engineering Vol. 1 by Gurucharan Singh; Standard Publishers Distributors, Delhi</li> </ol> </li> <li>Water Supply and Sanitary Engineering by G.S. Birde; Dhanpatrai and sons, Delhi.</li> <li>Manual on Water Supply &amp; Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.</li> </ol>
E-resources and other digital material	NPTEL:http://nptel.ac.in/courses/105104102/ http://nptel.ac.in/courses/105106119/

# 14CE2505/1 AIR POLLUTION AND CONTROL

<b>Course Category:</b>	Institutional elective	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	30
_		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	on successful completion of the course, the student will develops												
	CO1	CO1An ability to understand various types of air pollutants and their effectsCO2An ability to understand the dispersion phenomenon of air pollutants with regard to meteorological parameters											
	CO2												
	CO3	An a ambi	An ability to know the sampling of pollutants from chimney stacks ambient atmosphere An ability to know the various types of air pollution controlling equipment										
	CO 4	An a equip											
Contribution of Course Outcomes towards		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	H											
(L – Low, M - Medium, H – High)	CO2	Η											
	CO3	Η	Η	L									
	CO4	H		H	L							L	
Course Content	<ul> <li>UNIT-I</li> <li><b>1.INTRODUCTION TO AIR POLLUTION</b> <ul> <li>Composition of air, Air pollution-definition, Prominent air pollution disasters / episodes, Sources of air pollution - Stationary and mobile sources;</li> </ul> </li> <li><b>2.CLASSIFICATION OF AIR POLLUTANTS</b> <ul> <li>Classification- Natural Contaminants; Particulate Matter Aerosols and Gaseous pollutants; Primary and secondary pollutants.</li> </ul> </li> </ul>												
	<ul><li>2. EFFECTS OF AIR POLLUTION: Effects of air pollutants on human health; Effects on plants and economic effects.</li><li>UNIT-II</li></ul>												
	<b>3.METE</b> Meteorold wind spe precipitat	OROL ogical f eed, A ion and	OGY factors Atmos 1 humi	AND s influe pheric idity	AIR I encing stabi	POLLU disper ility,	UTIO	N: f air j rature	oolluta inver	nts- V sions,	Vind di Mixi	irectio ng h	n and eight,

	<ul> <li>4.MEASUREMENT OF METEOROLOGICAL PARAMETERS Wind direction recorder, Wind speed recorder, Humidity Measurement, Temperature measurement; Wind Rose; Plume behavior.</li> <li>UNIT-III</li> <li>4.STACK SAMPLING Stack sampler; Sampling Procedure-Sampling point – size - Isokinetic Conditions- sampling of Particulate matter and Gases.</li> <li>5. AMBIENT AIR SAMPLING Sampling methods- Sedimentation, filtration, impingement methods, electrostatic precipitation and thermal precipitation. Sampling suspended particulates by high volume sampler. Sampling SO<sub>2</sub> and NO<sub>x</sub> and Carbon Monoxidegases. –Indian standard methods of analysis of SO<sub>2</sub> and NO<sub>x</sub> gases Air Quality and Emission standards</li> <li>UNIT-IV</li> <li>6. METHODS OF CONTROLLING AIR POLLUTION Different means of control of effluent discharges into the atmosphere. Control of Particulate matter by equipment -Settling chamber, inertial separators-fabric filters- wet scrubbers-Electrostatic Precipitators</li> <li>7. CONTROL OF GASEOUS POLLUTANTS Controlling methods of Gaseous Emissions- combustion, adsorption, absorption, closed collections and recovery systems- Control of SO<sub>2</sub> andNO<sub>x</sub> gases</li> </ul>
Text books and Reference books	<ul> <li>Text Books <ol> <li>Air Pollution and Control by Rao, M.N and Rao, H.N., Tata McGraw Hill, New Delhi, 2007</li> <li>Environmental Engineering and Management, (2nd Edition) by Suresh, I. S.K.Kartarai&amp; Sons, 2005.</li> </ol> </li> <li>Reference books <ol> <li>An Introduction to Air pollution by Trivedy, R.K., B.S.Publications, 2005.</li> <li>Air pollution by Wark and Warner, Addison-Wesley Publications, 1998.</li> </ol> </li> </ul>
E-resources and other digital material	NPTEL:http://nptel.ac.in/courses/webcourse-contents/IIT- delhi/Environmental%20Air%20Pollution/

# 14CE2505/2 NATURAL RESOURCE MANAGEMENT (NRM)

<b>Course Category:</b>	Institutional Elective	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4 - 0 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On succe	On successful completion of the course, the student will be able to												
	CO1 Demonstrate knowledge and understanding of methods of ass managing natural Resources										of ass	sessing and		
	CO2	Evaluate the various approaches in the study of Natural Resources Management												
	CO3	Value and express human and environmental benefits of managing natural resources												
	CO 4	unde resou	erstand urces	legal	aspect	ts for n	nanagi	ng and	l prote	cting t	he nat	ural		
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	
achievement of Program Outcomes	CO1	H							H					
(L – Low, M - Medium.	CO2	H							H					
H – High)	CO3	Н		L					H					
	CO4	н		Н	L							L	H	
Course Content	UNIT-I 1.Introdu natural re Interrelat: Productive managem 2.Resour history of access an 3.Approach managem 4.Sustain and its im systems, developm	action source ionship rity issu- ent. <b>ce Ma</b> resound contra ches i cethno nent stra able n npacts, globali nents: c	to Nat s. Fact os amo ues. Ec nagen rce ma rol syst n Reso logical ategies atural growtl zation lams a	tural I tors inf ng difi cologic nent P nagem tem. Durce l appro s l resou h vs. in , urbar nd disj	Resour fluenci ferent f cal, soc aradig nent pa ment pa bach; in nclusiv nization placem	rce Bas ng rese types o cial and gms: R radign gemen mplica nanag ve grov n and p nent, m	ses: Co ource a of natu d econ tesource ns. Res t: Eco tions c ement wth, so privatizi	oncept availab ral reso omic d ce man source ologica of the a cietal i zation, high i	of reso pility, co ources limens ageme confli l approa pproa <b>levelo</b> impact sustai mpact	ource, distribu . Conc ion of ent the cts: Re bach; e ches; i <b>pment</b> s, type nabilit agricu	classif ution a ern on resour evolut source conom ntegrat s of fa y of m lture	icatior nd use ce ion an extrac ic ted res strializ rming odern	1 of s. d ction, ource cation	

#### UNIT-II

**1. Forest resources:** forest vegetation, status and distribution, major forest types and their characteristics. Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people, forest management. Developing and developed world strategies for forestry.

2.**Land resources:** Land as a resource. Dry land, land use classification, land degradation, man induced landslides, soil erosion and desertification. Landscape impact analysis, wetland ecology & management.

**3.Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water ecology and management.

**4.Energy resources**: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies

**5.Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case-studies. Fish and other

**6.Marine resources**: Production, status, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply, new prospects.

**7.Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies

#### UNIT-III

**1.Role of Information technology in Natural Resource management 2.Remote sensing:** Definition, remote sensing process

**3.Introduction to Geographic Information System (GIS):** Basic concepts and components of GIS, geographic information and spatial data types

**4.Introduction to Global Positioning Systems (GPS):** Basics of GPS mappings and software, Types of Survey of India (SOI) topographical maps, Numbering systems of SOI maps, Interpretation of SOI topographical maps,

5.Applications of RS &GIS in NRM: Coastal zone management, disaster management, forestry and wildlife management, landform studies, land use/cover mapping, tracking water resources (surface and underground water mapping), weather monitoring, snow and glacier studies, mineral resources, mine impact studies, agriculture. The future trends in applications

#### UNIT-IV

1.Overview of legal policy instruments in Natural Resource Management:a.National Forest Policy of 1988
b. National Environment Policy of 2004,
c.National Conservation Policy,
d.National Action Plan on Climate Change of 2008,
e.Coastal Protection Act. Wildlife Protection Act of 1972,
f. Forest Protection Act of 1980, Environment Protection Act of 1986,
g.ICZM-Indian Coastal zone management,
h.Water Act, 1981.
i. Biological Diversity Act of 2002 and Rule 2004,
j. Forest Rights Act of 2006. Green Tribunal Act, 2009

	kEnvironmental pollution act
Text books and Reference books	<ul> <li>Text Books</li> <li>1. Francois Ramade1984. Ecology of Natural Resources. John Wiley &amp; Sons Ltd.</li> <li>2. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p.</li> <li>3. Lillisand, Thomas, Ralph W. Kiefer and Jonathan Chipman. 2007. Remote Sensing and Image Interpretation. Wiley India.</li> <li>4.Burrough, P.A. 2007.8.Principles of Geographic Information System.Oxford University Press.</li> </ul>
	<ul> <li>Reference books</li> <li>1. Coastal Ecology &amp; Management, Mann, K.H. 2000. Ecology of Coastal Waters with Implications for Management (2nd Edition).Chap. 2-5, pp.18-78 &amp; Chap. 16, pp.280-303.</li> <li>2. Global Change and Natural Resource Management, Vitousek, P.M. 1994.</li> <li>Beyond global warming: Ecology and global change. Ecology 75, 1861-1876</li> <li>3. Agarwal, K.C., 2001. Environmental Biology, Nidhi Publication Ltd. Bikaner.</li> <li>4 Cunningham, W.P. Cooper, T.H. Gorhani, E &amp; Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publishing House.</li> <li>5. Heywood, V.H. &amp; Watson, R.T. 1995. Global Biodiversity</li> <li>Assessment.Cambridge Univ. Press.</li> <li>6. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)</li> <li>7. Townsend C., Harper J, and Michael Begon. Essentials of Ecology, Blackwell Science.</li> <li>8. de Rolf, A. 2001 Principles of Geographic Information System.ITC Educational Text Book series</li> <li>9.International Institute of Geoinformation Science and Earth Observation (ITC).Enschede.</li> <li>10. Fazal, Shahab. 2008. GIS Basics. New Age International Publishers</li> </ul>
E-resources and other digital material	NPTEL:http://nptel.ac.in/courses/Webcourse-contents/IIT-

# 14CE2505/3 BUILDING SERVICES ENGINEERING

<b>Course Category:</b>	Institutional Elective	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4 - 0 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will have:CO1An understanding of the types, basic planning and specifications of buildings.												
										ficatio	cations of		
	CO2	An u	An understanding of ventilation and thermal insulation in structures										
	CO3	An struc	An understanding regarding the plumbing and electrical fixtures in structures										
	CO4	An u and t	An understanding of the considerations for fire prevention and fighting and termite prevention in buildings.										
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
<b>Contribution of Course</b> <b>Outcomes towards</b>	CO1	H		H									
achievement of Program Outcomes	CO2	L		H							Μ		
(I Low M Modium	CO3	L		Н							Μ		
(L - Low, M - Medium, H - High)	CO4	L		Μ							Μ		
Course Content	UNIT – I 1. B Types of types of types of types of the contract of the contra	ASICS structu ouildin egulations; Cal ASIC ning; S on, Ori consid	<b>S OF E</b> tres: La gs: Re: cons; R culation <b>BUIL</b> pace re entation	BUILI oad be sidenti egulat on of p DING equire on, Asp as – Ba	DINGS aring v al, Pul ions re linth, f PLAN ment– pect an asic bu	walled blic, A egardir loor at <b>NNIN(</b> Establi d pros ilding	structu ssemb ng layc nd carp <b>G ANI</b> shing pect, F elemen	ures & ly, Hosouts or pet are <b>D ELE</b> areas f Privacy nts: Sta	Framo spitals. sub-di a; Floc <b>MEN</b> for diff r, Elegair case	ed stru , Institt vision or spac <b>FS</b> erent u ance a es, doo	ctures utional s; Buil e inde units - nd eco ors and	– Diff l etc - lding h x. Group nomy; l windo	erent eight ing, ows -

Terms used in the construction of stair case, doors and windows

### UNIT – II

### 3. VENTILATION AND AIRCONDITIONING,

Ventilation – Necessity of Ventilation – Functional Requirements – Types: Natural Ventilation – Artificial Ventilation – Air Conditioning – Systems of Air

	Conditioning – Essentials of Air Conditioning systems – Protection against fire to be caused by Air Conditioning systems
	<b>4. THERMAL INSULATION:</b> Heat transfer – Thermal Insulating Materials – Thermal Insulation Methods – Economics of Thermal Insulation – Insulation of Walls – Roofs – Doors & Windows.
	UNIT – III
	<b>5. PLUMBING SERVICES</b> Types of plumbing – Fixing pipes in buildings – Plumbing fittings and accessories – Water Supply System: guidelines for mains, communication and consumer pipes – Water Meters; Drainage – Sanitary Fittings: Bathtubs, wash basins, sinks, flushing cisterns, water closets – Principles governing design of building drainage – Guidelines for laying of Gas supply systems.
	6. ELECTRICAL INSTALLATION IN BUILDINGS Considerations for Office Buildings, School Buildings & Residential Buildings; Lighting– Fannage – Electrical Installation for Air Conditioning/Heating – Reception and distribution of main supply – Electrical Fittings and accessories- Method of internal wiring – Earthing – Planning of electrical Installations – Lightening arrestors
	UNIT – IV
	<b>7. FIRE SAFETY:</b> Causes of fire in buildings – Planning considerations for fire resistance - Non- combustible materials in construction, staircases and lift lobbies, fire escapes - Special features required for physically handicapped and elderly people – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire fighting pump and water storage – Dry and wet risers – Automatic sprinklers
	<b>8. ANTI- TERMITE TREATMENT</b> Pre construction treatment – Post construction treatment – Construction of anti termite groove in buildings for termite prevention.
Text books and Reference books	<b>Text Books:</b> 1.Building Construction by B.C. Punmia; Ashok Kumar Jain; Arun Kumar Jain, 2005; Laxmi Publications, New Delhi 2. Building Construction by JanardhanJha; S.K. Sinha; 2007; Jain Book Agency, New Delhi
	<ul> <li>Reference Books</li> <li>1. National Building Code, 2005</li> <li>2. Building Construction by P.C.Varghese, 2005, PHI Publications, New Delhi</li> <li>3. Building Services Engineering by David V. Chatterton, Sixth Edition, 2013, Routledge Publications</li> </ul>
E-resources and other digital material	Open Web

# 14CE2505/4BUILDING MATERIALS & BUILDING CONSTRUCTION

<b>Course Category:</b>	Institutional Elective	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4 - 0 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon s	Upon successful completion of the course, the student will be able to:						
	CO1	To impact the knowledge of understanding the classification and usage of materials like plastics, Tar and sand absorbent materials						
	CO2	To understand the importance of concrete and glass materials used in Building Construction						
	CO3	To distinguish different types of partitions in a building according to the requirements of Occupants						
	CO4	Apply the knowledge of different support systems and methods of construction						

		РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
Contribution of Course Outcomes towards achievement of Program Outcomes	CO1	H										L	
	CO2											L	
(L – Low, M - Medium, H – High)	CO3											L	
	<b>CO4</b>			L								Н	

Course Content	<ul> <li>UNIT – I         <ol> <li>PLASTICS:</li></ol></li></ul>
	UNIT-II
	4.SPECIAL CONCRETES:

	Light Weight concrete, High density concrete, Fiber reinforced concrete, polymer concrete.
	<b>5.GLASS</b> Composition, classification, properties, types, manufacture of glass.
	UNIT-III
	<b>6.PARTITION WALLS:</b> Brick partitions, concrete partitions, Glass partitions, Metal lath partitions, Plaster slab partitions, Timber partitions.
	<b>7.MODERN MATERIALS:</b> Ceramics, Sealants for joints, fibre glass reinforced plastic, refractories-composite materials, geomembranes, geotextiles.
	UNIT-IV 8.POINTING AND PLASTERING Platering with cement mortar, Defects in plastering; pointing
	<b>9.SCAFFOLDING, SHORING, UNDER PINNING AND FORM WORK:</b> Types of scaffolding; Types of shoring; Methods of underpinning; Types of formwork
Text books and Reference books	<ul> <li>Text Books:         <ol> <li>Engineering Materials by S. C. Rangwala; Charotar Publishing House.</li> <li>Building construction by B. C. Punmia - Laxmi Publications, New Delhi.</li> </ol> </li> <li>Reference books:         <ol> <li>Building construction and construction materials by G.S.Birdie and T.D.Ahuja, Dhanpathrai publishing company, newdelhi</li> </ol> </li> </ul>
E-resources and other digital material	www:http://nptel.ac.in/courses/105102088/

# 14CE5506/1 ADVANCED GEOMATICS

<b>Course Category:</b>	Independent learning	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	0 - 0 - 0
Prerequisites:	14MA1301 Complex Analysis and	<b>Continuous Evaluation:</b>	30
	Numerical Methods,	Semester end Evaluation:	70
	14CE3401 Surveying,	Total Marks:	100
	14CE3303 Engineering Geology.		

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	CO1 apply the recent advances satellite based remote sensing technology in various fields of Civil engineering.											
	CO2	understand the Geographical Information Techniques.											
	CO3 Apply the GPS instrument in field for various civil Engi applications.									Engine	ering		
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	H							Μ	Μ		H	
(L – Low, M - Medium,	CO2	H							М	М		Н	
H – High)	CO3	H							М	М		Н	
Course Content	1. INTE Introduct sensing, Electrom energy i propertie bodies, C UNIT-II	RODUC ion to Passive agnetic nteract s of veg Concept	CTION remote and spect ions getatio of res	TOR active rum, re with e on, soil olution	EMOT ing; N remote earth and w n in Re	TE SEN Jecessi e sensin sensin surface rater emote S	NSING ity and ing, E g term e feat Sensin	:: d impo lemen iinolog ures a g.	ortance ts invo gy and and at	e; Pri blved i units, tmosph	nciple: n rem Energ here a	s of re ote ser y reso nd sp	emote nsing, urces, ectral
	<ul> <li>2. REM Introduct platforms sensing s limitation data into analysis.</li> <li>UNIT – I</li> <li>3. APPI</li> </ul>	<ul> <li>2. REMOTE SENSING PLATFORMS &amp; SENSORS:</li> <li>Introduction; Classification of sensors; Spectral bands for sensors ; types of platforms; Rockets; Satellites - Indian remote sensing satellite series, other remote sensing satellites; Multi concept in acquiring remote sensing data; Advantages and limitations of landsat imagery; geosynchronous orbits, Ground truth; Conversion of data into information. Elements of Visual Interpretation and techniques, digital data analysis. Advantages and disadvantages of remote sensing.</li> <li>UNIT – III</li> </ul>								es of emote s and ion of 1 data Water			
	Resor	urces A mappi	pplicat ng, dro	ion(wat ought a	tershed ssessm	managent ) V	gement Veather	, rainfa r & Cl	ll run o imate	off; irrig Applica	gation ation(E	manage nvironi	ement, nental

	monitoring),Urban and Regional planning, Identification of geo thermal energy sources, snow cover, groundwater studies. Earthquakes and Tsunamis.
	4. GEOGRAPHIC INFORMATION SYSTEM:
	Introduction, GIS definition and terminology, GIS categories, components of GIS,
	fundamental operations of GIS, A theoretical framework for GIS; Advantages and disadvantages of GIS.
	UNIT-IV
	5. GLOBAL POSITIONING SYSTEM (GPS):
	Introduction, GPS principles, Satellite navigation System, Space segment, Control segment, User segment, GPS satellite signals, Receivers, Static, Kinematic and Differential GPS, Application of GPS in Civil Engineering.
Toyt books and	Toyt Books
Reference books	1. Remote Sensing & Geographical Information Systems by M.Anji Reddy, BPS
	Publications-Hyderabad.
	2. Remote Sensing & GIS by BasudebBhatta, Oxford University Press.
	Reference Books
	<ol> <li>Remote sensing and Image interpretation by TM Lillesand and RW Kiefer; John willey and sons.</li> </ol>
E-resources and other	NPTEL : http://nptel.ac.in/courses/105108077/
E-resources and other digital material	NPTEL : <u>http://nptel.ac.in/courses/105108077/</u> http://nptel.ac.in/courses/105108073/module1/lecture1.pdf

### 14CE5506/2 MODERN CONSTRUCTION MATERIALS

<b>Course Category:</b>	Independent learning	Credits:	3
<b>Course Type:</b>	Theory	Lectures	0-0-0
Prerequisites	14CE3304 Concrete	<b>Continuous Evaluation:</b>	30
	technology,	Semester end Evaluation:	70
	14CE3403 Building materials	<b>Total Marks:</b>	100
	and Building construction		

Course outcomes	On successful completion of the course, the student will be able to:
	CO1 Understand the special types of concrete and their properties
	CO2 Understand the various modern materials used in roofing, floors and in walls construction
	CO3 Understand the Fundamental Concepts of various composite materials and handling of pre-fabricated elements in construction.
	CO4 Understand properties of various miscellaneous materials used in construction.

Contributio n of Course		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1
Outcomes towards achievement	CO 1	М		М								
of Program Outcomes	CO 2	М	М	М								
(L – Low, M - Medium, H – High)	CO 3	М		М								
	CO 4	Н		М	Н	М	М		М			М

### **Course Content**

### UNIT-I

### **Special concrete**

Properties and requirement for special materials, Special concrete types; manufacture and properties of high volume fly ash concrete, silica fume concrete, GGBS, light weight concrete, self compacting concrete, colored concrete, fiber-reinforced concrete, pervious concrete, and temperature controlled concrete. Shotcrete, pre-stressed concrete and pre-cast concrete, grout materials in precast connections.

### UNIT-II

#### **Roofing, walls and flooring**

	Structural Steel and Aluminum – Roofing Material – Physical descriptions of asbestos sheets, GI sheets, tubes and light weight roofing materials - Timber - Types, Seasoning and various products, Aluminum formwork. Principles of construction – Bonding – Reinforced brick work — Stone masonry – Hollow block masonry - Pointing - Plastering – DPC Floor and Roof Construction: Floors, General Principles – Types of floors – Floor coverings – Types of roofs.
	UNIT-III
	Composite materials
	Properties. Expanded Polystyrene (EPS) - properties, fire resistance, strength, economics aspects. Fibre Reinforced Laminates (FRP) - Mechanical, structural properties, applications. Glass Fibre Reinforced plastic (GFRP) and Carbon Fibre Reinforced plastic (CFRP) - Properties, applications in construction and retrofitting.
	Prefabricated buildings
	Sound insulations – Ventilations – Fire resisting construction – Prefabricated panels and structures – Production, transportation and erection of structures.
	UNIT- IV
	<b>Other miscellaneous materials:</b> Plastic and its properties as a building material. Glass- manufacture, physical and structural properties and types. Geo-polymers and synthetics, natural stone- physical and structural properties and various types. Glass, Ceramics, Sealants for joints – Fibre glass reinforced plastic, Clay products – Refractories, Neoprene, thermocol, decorative panels and laminates, architectural glass and ceramics, ferrocement, PVC, polymer base materials, fibre reinforced plastics.
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.</li> <li>2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.</li> <li>3. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd., 2008.</li> <li>4. Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004</li> <li>5. Duggal.S.K., "Building Materials", 4th Edition, New Age International, 2008.</li> <li>References:</li> <li>1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.</li> <li>2. Gambhir. M.L., &amp;NehaJamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.</li> </ul>

# 14CE3507 GEOTECHNICAL ENGINEERING

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able:					
	CO1	To understand the origins of soil and basic inter-relationships of soil components				
	CO2	To determine the index properties of soil and classify the soil based on the index properties				
	CO3	To understand the Soil-Water Interaction				
	CO4	To understand compressibility and shear characteristics of soil				

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Contribution of Course Outcomes towards	CO1	Н											
achievement of Program Outcomes (L – Low, M - Medium, H – High)	CO2	Η	Η										
	CO3	Н				Н							
	CO4	Н	Н			Н							
<b>Course Content</b>	UNIT – I	UNIT – I											
	INTROD	INTRODUCTION											
	Scope of Geotechnical Engineering; Origin of Soils; Formation of soils; Types o soils; Transportation of soils; Major soil deposits of India.									bes of			
	BASIC D	BASIC DEFINITIONS AND RELATIONS											

Phase diagrams; Volumetric relationships; Weight relationship; Volume-weight relationships; Specific gravity of soils; Three phase diagram in terms of void ratio; Inter-relationships;

### **INDEX PROPERTIES**

Determination of Water content, Specific gravity; Index Properties of soils; Mechanical sieve analysis; Sedimentation analysis- Stokes law\*; Pipette analysis and hydrometer analysis; Limitation of sedimentation analysis; Combined sieve and sedimentation analysis; Particle size distribution curve and its uses; Determination of field density ( core cutter and sand replacement method ), Relative density. Soil Structure and Clay Mineralogy (In brief)

Plasticity of soils; Consistency limits; Determination of liquid limit by Casagrande method\*, Plastic limit\* and shrinkage limit\*; Uses of consistency limits, Plasticity index, shrinkage limit, consistency and liquidity indices; Flow index & toughness index; Sensitivity; Thixotropy; Activity of soils;

### UNIT – II

### SOIL CLASSIFICATION

Introduction; Particle size classification; Unified soil classification system; Indian standard soil classification system;

### SOIL MOISTURE AND PERMEABILITY

Flow of water in soils; Darcy's law; Validity of Darcy's law by Reynolds number; Determination of coefficient of permeability\* by constant head and variable head methods & Indirect methods; Seepage velocity; General expression for laminar flow; Laminar flow through porous media; Factors affecting permeability; Permeability of stratified soil deposits.

### **EFFECTIVE STRESS PRINCIPLE**

Effective stress principle; Effective stress in a soil mass under different loading conditions – effect of depth of water table, surcharge loading, capillary water

### UNIT – III

### SEEPAGE THROUGH SOILS

Seepage pressure; Quick sand conditions; Laplace equations\*; Stream and potential functions\*; Characteristics of flow net; Uses of flow nets; Seepage through earth dams with horizontal filter\*; Uplift pressure; Flow net for anisotropic soils.

### **COMPACTION OF SOILS**

Introduction; Standard proctor test and modified proctor test; Compaction of clayey soil and sand; Factors affecting compaction; Effect of compaction on properties of soils; Field compaction of soils and field compaction control.

### UNIT – IV

	<ul> <li>CONSOLIDATION OF SOILS</li> <li>Introduction; Initial and secondary consolidation; Spring analogy for primary consolidation; Terazaghi's theory of consolidation; Solution of basic differential equation; Consolidation tests; Determination of void ratio at various load increments-height of solids and change in voids ratio methods; Consolidation test results; Determination of coefficient of consolidation-square root of time and logarithmic time fitting methods;</li> <li>SHEAR STRENGTH OF SOILS</li> <li>Introduction; Mohr – coulomb theory; Different types laboratory of shear strength tests*(Triaxial test Direct shear test; Unconfined compressive strength test; Vane shear test*); Different drainage conditions and their field applicability; Mohr - coulomb failure criterion; Shear characteristic of cohesive and cohesion less soils; Note:</li> <li>1. In Laboratory tests only test procedures need be studied - no need of derivations of the formulae used in the tests</li> <li>2. Only test procedures according to relevant IS codes need be studied.</li> <li>3.*methods and / or formulae only - no derivation of formulae needed.</li> </ul>
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Soil Mechanics and Foundation Engineering by K.R. Arora; Standard Publishers &amp; Distributors, Naisarak, New Delhi.</li> <li>Basic and Applied Soil Mechanics by GopalRanjan and A.S.R.Rao. published by New Age International Ltd.,</li> </ol> </li> <li>Reference Books:         <ol> <li>Geotechnical Engineering by B. J. Kasmalkar; Pune VidyarthiGrihaPrakashan, Pune.</li> <li>Modern Geotechnical Engineering by Alam Singh; CBS Publishers &amp; distributors Pvt. Ltd., Delhi.</li> <li>Soil Mechanics and Foundation Engineering Vol. 1 by V. N. S. Murthy;Saikripa Technical Consultants, Bangalore.</li> <li>Soil Mechanics and Foundation Engineering by B. C. Punmia;Laxmi Publications, Delhi.</li> </ol> </li> </ol>
E-resources and other digital material	Introduction to Soil Mechanics - http://nptel.ac.in/courses/105103097/ Soil Mechanics - http://nptel.ac.in/courses/105101084/

### 14CE3551-BUILDING PLANNING AND DESIGN LAB

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Lecture - Tutorial - Practice:	1 - 0 - 3
Prerequisites:	14CE3403 Building materials and	<b>Continuous Evaluation:</b>	30
_	construction,	Semester end Evaluation:	70
	14CE3401 Surveying	Total Marks:	100

Course outcomes	Upon successful completion of the course, the studentwill have:														
	CO1	CO1 An ability to understand and apply the basic requirements of the national building code of practice for general construction in load bearing wall, RCC framed buildings.													
	CO2 An ability to understand principles of planning, principles of architecture and building bye-laws.														
	CO3 An ability to draw the line diagrams as per NBC.														
	CO 4	An a	bility	to drav	v the p	lan, el	evatio	n, sect	ional v	view of	the bu	e building.			
Contribution of Course Outcomes towards		<b>PO</b> 1	<b>PO</b> 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	PO 9	PO 10	PO 11	PO 12		
achievement of Program Outcomes	CO1	L		Μ											
(L – Low, M - Medium, H – High)	CO2	L		Μ											
	CO3	L		Μ							Μ				
	CO4	L		Μ											
Course Content	All the bucconsiderate Principle Layout pl with funce <b>Resident</b> buildings various ty a) Resident b) Sc	iilding tions the s of pl anning tional the ial Bui – reque resident alti-sto hools,	s ment he foll anning , prep require ildings iremet reside ial bu reyed Hospi	ioned owing g, archi aration ements s: Mini nts of c ential b ildings buildin tals, ar	in part tecture of lin differe uilding d – Fl ngs. nd Hos	PART A sha e, Buil- e diagn measur nt roor gs at-roof tels.	<b>F A</b> ll be d ding b rams a remen ms and <b>F</b> and	iscusso ye-law nd wo t stand l theirg pitche	ed for vs and rking c ards fo groupir d root	plannin Nation Irawin or varion g - ch	ng by t aal Bui gs in a bus par aractes partme	aking lding ( ccorda rts of ristics	into Code. unce of ats in		
	c) In	dustria	l build	ings –	works	hop w	ith tru	ssed ro	oof						

	d) RCC framed building, staircase.
	PART B
	The below mentioned Detailed Drawings (Plan, Elevation and sectional views) shall be drawn manually/Auto CAD with the knowledge imparted from part-A
	1. Detailed drawings for doors, windows, rolling shutters and collapsible gates.
	2. Detailed drawing of different rooms (living room, open verandah/lobby, bed room, Kitchen, Dinning room, Toilets, corridors/passages, store room, wash room with furniture as per NBC.
	3. Dog legged stair case
	4. Simple residential buildings with flat and pitched roof.
	5. Five floors apartment building.
	6. Workshop – Trussed roof-North light roof truss.
	7. Elevations of different buildings.
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Building planning, designing and scheduling by Gurucharan Singh and Jagdish Singh. –Standard Publishers-Delhi.</li> <li>Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki; Tata McGrawHill Publishing Co. Ltd., New Delhi.</li> </ol> </li> <li>Reference Books: <ol> <li>National Building Code, Bureau of Indian Standards, New Delhi, 2005.</li> <li>Planning &amp; Designing Buildings by Yashwant S. Sane; Allies Book Stall, Pune</li> </ol> </li> </ul>
E-resources and other digital material	<b>NPTEL :</b> NPTEL, www.floorplanner.com

# 14CE3552 GEOTECHNICAL ENGINEERING LABORATORY

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Lecture - Tutorial - Practice:	0-0-3
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able:												
	CO1	Deve refer	elops t	he abil o India	lity to In Stan	unders dard C	tand the code of t	he eng f Pract	ineerir ice	ng prop	oerties	of soil	with
	CO2	Develops the ability to determine the basic properties of soil in the laboratory.											
	CO3	Develops the ability to understand, determine, analyze the index properties in the laboratory											
	CO4	Develops the ability to understand, determine, analyze the engineering properties of soil such as shear strength, permeability and consolidation											
	CO5	Develops the ability to understand, determine and analyze the compaction characteristics of soil in the laboratory											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	Н	Н	Н									
	CO2	H	Η	Н									
	CO3	H	H	Н									
	CO4	H	H	Н									
	CO5	H	H	H									
Course Content	<ul> <li>List of Experiments:</li> <li>1. Determination of water content by oven drying method.</li> <li>2. Determination of specific gravity by Density bottle method &amp;Pycnometer method</li> <li>3. Sieve analysis – Mechanical analysis – dry soil.</li> <li>4. Hydrometer analysis.</li> <li>5. Determination of liquid limit and plastic limit.</li> <li>6. Determination of field unit weight by Core cutter method.</li> <li>7. Determination of field unit weight by sand replacement method.</li> <li>8. Determination of permeability by Constant head permeameter.</li> <li>9. Determination of permeability by Variable head permeameter.</li> <li>10. Determination of C and φ by direct shear test.</li> <li>11. Determination of Shear strength by Vane shear test.</li> </ul>												

	<ol> <li>Unconfined compression test- Determination of C and φ.</li> <li>Standard proctor compaction test- Determination of OMC, MOD.</li> <li>Modified proctor compaction test – Determination of OMC, MDD.</li> <li>Triaxial shear test. 16. Consolidation test.</li> </ol>
Text books and Reference books	IS 2720-code
E-resources and other digital material	-

## 14CE3601 STRUCTURAL ANALYSIS-II

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:	Structural analysis I	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcome	Upon successful completion of the course, the student will have:														
	CO1	An ability to analyze statically indeterminate beams and frames using Slope deflection method.													
	CO2	An ability to analyze statically indeterminate beams and frames using Moment distribution method.													
		CO3	An ability to analyze and construct influence lines for indeterminate beams.												
		CO4	An al	An ability to analyze multi-storey frames using approximate methods.											
		CO5	An ability to analyze statically indeterminate beams and frames using Kani's method.												
		CO6	An ability to analyze arches cables and curved beams.												
Contribution		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
Outcomes	CO1	Н	L	-	-	L	-	-	-	L	-	L	-		
towards achievement	CO2	Н	-	-	-	L	-	-	-	L	-	L	-		
of Program Outcomes	CO3	L	L	L	-	L	-	-	-	L	-	L	-		
$(\mathbf{I} - \mathbf{I})$ ow $\mathbf{M}$ -	CO4	Н	-	-	-	L	-	-	-	L	-	L	-		
$\frac{(L - Low, M - M)}{Medium, H - M}$	CO5	Н	-	-	-	М	-	-	-	L	-	L	-		
Hign)	CO6	Н	-	L	-	М	-	-	-	L	-	L	-		
Course Content U			– I SLOP Slope metho single	E DEF - defle d to th storey	<b>ELECT</b> ection of e analy with vo	<b>ION M</b> equation ysis of ertical	<b>IETH(</b> ons; Pr contin legs on	<b>DD:</b> inciple uous b lly) wit	s of the beams a bout ar	e meth and por ad with	od; App rtal fram sideswa	lications nes (Sing y.	of the gle bay,		
	<ul> <li>UNIT – II</li> <li>2. MOMENT DISTRIBUTION METHOD: Principles of the method; Application of the method to analysis of continuous beams and portal frames (Single bay, single storey with vertical legs only) without and with sidesway.</li> <li>3. INFLUENCE LINES FOR INDETERMINATE STRUCTURES: Muller - Breslau Principle with applications to continuous beams and framed structures to obtain the general shape of the influence lines; Influence lines for reactions, shear force at a point and bending moment at a section of (a) Beam with fixed ends. (b) 2 Span continuous Beam.</li> </ul>														
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	<ul> <li>UNIT – III</li> <li>4. MULTI STOREY FRAMES (APPROXIMATE METHODS): Substitute frame method for gravity loads; Portal method and cantilever method for lateral loads.</li> <li>5. KANI'S METHOD: Principles of the method; Application to continuous beams and portal frames (single bay, single storey with vertical legs only) without and with side-sway</li> </ul>														
	<ul> <li>UNIT – IV</li> <li>6. ARCHES Eddy's Theorem; Analysis of three hinged and two hinged Parabolic and Circular arches for Static and moving loads.</li> <li>7. CABLES: Analysis of cables under uniformly distributed and concentrated loads; Shape of the cable under self weight; Effect of temperature changes in suspension cables; Anchor cables.</li> <li>8. CURVED BEAMS: Analysis for internal forces in simply supported and continuous curved beams (including ring beams) on symmetrically placed columns for uniformly distributed loads.</li> </ul>														
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Basic Structural Engineering by C.S.Reddy, Tata McGraw Hill, Third Edition.</li> <li>Theory of Structures Vol-I by G.S.Pandit and S.P.Gupta and R .Gupta by Tata McGraw Hill Ltd.,New Delhi.</li> <li>Theory of StructuresVol-II by G.S.Pandit and S.P.Gupta and R .Gupta by Tata McGraw Hill Ltd.,New Delhi.</li> </ol> </li> <li>Reference Books: <ol> <li>Analysis of structures vols.2 by Prof V.N.Vazirani, Dr.M.M.Ratwani, Dr.Sk.Duggal, 16<sup>th</sup> Edition, Khanna Publishers, Delhi.</li> <li>Indeterminate Structural Analysis by C.K.Wang, McGraw Hill.</li> </ol> </li> </ul>														
E-resources and other digital material	http://onlinecourses.nptel.ac.in														

# 14 CE-3602 WATER RESOURCES ENGINEERING-II

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	Water Resources Engineering - I	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:															
	CO1 understand various discharge measurement methods in streams and rivers											rivers.				
	CO2 apply the design principles of various cross drainage works.															
	CO3	O3 estimate the life of reservoir and storage capacity.														
	CO4	desig	design various types of dams.													
	CO 5	unde	rstand	various	compo	onents	of hydr	o-elect	ric pow	ver plan	ıts.					
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12			
achievement of Program Outcomes	CO1	L				L										
(L – Low, M - Medium,	CO2	Н	Μ			Μ										
H – High)	CO3	Н				Μ										
	CO4	Н	Μ	Н		Μ										
	CO 5	Н		L		Μ										
Course Content	UNIT - 1 RT No Vo flo mi M CH In dr su UNIT - 1 RH In Zo de in of DA In Ti	CO.5       H       L       M       Image: Construction of the second							Area- urface urrent ethod; cross - n of a ervoir; /e and e mass ; Life dams, ection							

	of type of dam and selection of site for a dam. UNIT – III
	<ul> <li>GRAVITY DAMS: Introduction; Forces acting on a gravity dam; modes of failure and stability analysis of gravity dams; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam; High and low gravity dams; Design of gravity dams–single step method; Galleries; Joints; Keys and water seals.</li> <li>UNIT – IV</li> <li>EARTH DAMS: Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams; Section of an earth dam; Seepage control measures; Slope protection.</li> </ul>
	<b>SPILLWAYS:</b> Introduction; Types of spillways; Profile of ogee spillway; Energy dissipation below spillways for relative positions of jump height curve and tail water curve; Stilling basins; Types and description only.
	WATER POWER ENGINEERING: Introduction; Component parts of Hydro-Electric Scheme; Hydropower - Advantages & disadvantages; Estimation of hydro-power; Flow duration curve; Power duration curve; Load curve; Load factor; Capacity factor; Utilization factor; Diversity factor; Load duration curve; Firm Power; Secondary power; Types of hydel schemes; Forebay; Intake structures; Penstocks; Surge tank; Tail race.
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Irrigation and Water Power Engineering by Dr. B.C.Punmia&amp; Dr. Pande B.B. Lal; Laxmi Publications pvt. Ltd., New Delhi. 2006.</li> </ul>
	<ol> <li>Water Power Engineering by M.M. Dandekar and K. K. Sharma; Vikas Publishing House Pvt. Ltd., New Delhi.,2006.</li> <li>Irrigation Engineering and Hydraulic Structures by S.R. SahasraBudhe; Katson Publishing House, Ludhiana. 2000.</li> </ol>
	<ul> <li>Reference Books:</li> <li>1. Irrigation Engineering and Hydraulic Structure by S. K. Garg; Khanna Publishers, Delhi.,2006</li> <li>2. Irrigation, Water Resources and Waterpower Engineering by Dr. P.N. Modi; Standard Book House, New Delhi. 2006.</li> <li>3. Journals in Water Resources</li> </ul>
E-resources and other digital material	www.nptel.ac.in/courses/105105110

# 14CE3603- DESIGN OF CONCRETE STRUCTURES – II

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	Design of Concrete Structures -I	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1 analyse, design and draw the reinforcement details of two way slabs and slabs										and fl	at	
	CO2	analy	se, desi	ign and	draw t	the rein	forcem	ent det	ails of I	R.C.C a	columns	8	
	CO3	analy retain	analyse, design and draw the reinforcement details of cantilever and counter fort retaining walls.								r fort		
	CO4	analy footir	analyse, design and draw the reinforcement details of Isolated & combined footings & pile caps.										
Contribution of Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
towards achievement of	CO1	L		Н		Η							
Program Outcomes	CO2	L		Н		Н							
(L – Low, M - Medium, H – High)	CO3	L		Н		Н							
	CO4	L		Н		Н							
Course Content	UNIT 1. TWO D slabs). 3. Des UNIT 3. COI General loaded Interac section	<b>- I</b> O WAY esign a FLAT sign and <b>- II</b> LUMN al Requ column tion dia in the	Y SLAE nd deta SLABS d detail iremen ns; Des agrams; followi a. A b. A	3S: iling of : ing of ign of ; Desig ng case xial co xial co	f two w Flat sla ort Colu axially n of sha es ompress	vay slab ibs by d umns, L v loaded ort colu sion and	os (Simj lirect de Long Co l circula umns ar l Uni-a l bi-axi	ply sup esign m blumns, ar colun ad slenc xial ben al bend	ported nethod. , Assun nns wit ler colu nding. ling (Pr	and res	trained; Designal reinf f rectang e only).	two-w n of ax forceme gular	ay ially ent;

UNIT – III
<b>4. RETAINING WALLS:</b> Types of retaining walls; Forces on retaining walls; Stability requirements; Design and detailing of cantilever type retaining wall and counter fort type retaining wall
UNIT-IV
<b>5. FOUNDATIONS:</b> Design and detailing of Isolated Column footings, combined footings, Design of Pile cap for two, three & four pile groups.

Text books and Reference books	<ul> <li>Text Books: <ol> <li>Reinforced Concrete (Limit State Method) by Ashok K. Jain, Nemchand&amp; Bros., Roorkee.</li> </ol> </li> <li>Reinforced Concrete Vol-1 ,8<sup>th</sup> Edition by H.J.Shah, by Charotar Publication House.</li> <li>Reference Books: <ol> <li>Reference Gooks:</li> <li>Reinforced concrete structures by B.C.Punmia, Ashok Kumar Jain andArunKumarJain, Laxmi, publications Pvt.Ltd., New Delhi</li> <li>Reinforced concrete design by S.UnnikrishnaPillai&amp;DevdasMenon, Tata McGraw Hill, New Delhi</li> </ol> </li> <li>Reinforced Concrete Design by N. Krishna Raju&amp; RN Pranesh, New Age International.</li> <li>Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, New Delhi</li> <li>Reinforced concrete design by M.L.Gambhir, Printice Hall of India Private Ltd. New Delhi.</li> <li>Advanced RCC design – S. Bhavikatti (RCC Volume – II, 2<sup>nd</sup> Edition, New Age International publishers Ltd. New Delhi</li> <li>Reinforced concrete Design, Second Revised Edition by S.N.Sinha, Tata Mc-Graw Hill Education Code of practice for plain and reinforced concrete IS 456-2000.</li> </ul>
E-resources and other digital material	http://nptel.ac.in/courses/105105105 http://nptel.ac.in/courses/105105104

# 14HS1604 ENGINEERING ECONOMICS AND FINANCE

Course Category:	Institutional core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon s	success	ful com	pletion	n of the	course	, the stu	udent w	vill be a	ble to:			
	CO1	under	understand various forms of organisations and principles of management.(a,l)										
	CO2	under	understand the various aspects of business economics.(a,e,l)										
	CO3	acqui	equire knowledge on Human resources and Marketing functions.(a,l)										
	CO4	under depre	understand best alternatives for various investment decisions and different depreciation methods .(a,e,l)										
Contribution of Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
towards achievement of	CO1	Μ											Μ
Program Outcomes	CO2	Μ				Η							Μ
(L – Low, M - Medium H – High)	CO3	Μ											Μ
Medium, H – Hign)	CO4	М				Н							Μ

#### **Course Content**

### UNIT I

**Forms of Business Organization:** Salient Features of Sole Proprietorship, Partnership, JointStock Company: Private Limited and Public Limited Companies, Co-operative Society and Public Sector.

**Management:** Introduction to Management, Management an Art or Science, Functions of Management, Principles of Scientific Management, Henri Fayol's Principles of Management.

### UNIT II

**Introduction to Economics:** Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility and Total Utility, Lawof Diminishing Marginal Utility, Law of Equi Marginal Utility, Demand Analysis: Theory of Demand: Demand Function, Factors Influencing Demand, Demand Schedule and Demand Curve, Shift in Demand, Elasticity of Demand: Elastic and Inelastic Demand, Types of Elasticity, Factors of Production,Production Function, Production with one variable input, Isoquants, Returns to Scale, Cost Function: Cost - Output Relationship in short run and long run, Relationship between AC and MC. Supply Analysis: Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function, Theory of firm: Price determination under equilibrium of firm, Perfect competition.

### UNIT III

**Human Resource Management:** Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management, Recruitment and Selection Process.

**Marketing Management:** Concept of Selling And Marketing – Differences, Functions of Marketing, Product Life Cycle, Concept of Advertising, Sales Promotion, Types of Distribution Channels, Marketing Research, Break-Even Analysis - Problems.

### UNIT IV

**Financial Management:** Functions of Financial Management, Time value of money with cash flow diagrams, Calculation of Simple and CompoundInterest -Present worth, Future worth, Annual Equivalent, Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method for choice of decision making among alternative projects.

**Production Management:** An Overview and significance of Production Management, Objectives, Scope of production management, Production cycle.Depreciation, Causes of depreciation, Factors influencing depreciation, common methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of Year's Digits Method – Problems

Text books and Reference books	<ol> <li>Text Books:         <ol> <li>P.PremchandBabu and M.MadanMohanManagerial Economics and Financial AnalysisHimalaya publishing house 2011 edition</li> <li>M. MahajanIndustrial Engineering and Production Management 2<sup>nd</sup> Edition DhanpatRai Publications.</li> </ol> </li> <li>Reference Books:</li> </ol>
	<ol> <li>Theusen&amp;Theusen, "Engineering economy".</li> <li>Philip Kotler &amp;Gary Armstrong "Principles of Marketing", pearson prentice Hall,New Delhi,2012 Edition.</li> <li>B.B Mahapatro, "Human Resource Management".,New Age International ,2011</li> <li>IM Pandey, "Financial Management" Vikas Publications 11<sup>th</sup> Edition</li> <li>R.Panneerselvam, "Production and operations management", PHI Learning pvt Ltd, New Delhi, 2012</li> </ol>
E-resources and other digital material	www.tectime.com www.exinfm.com www.slideshare.net www.economywatch.com

# 14CE3605 ENVIRONMENTAL ENGINEERING – II

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	Environmental Engineering-I	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On suce	On successful completion of the course, the student											
	CO1	Deve	Develops an ability to estimate quantity of sewage										
	CO2	Deve	evelops an ability to design sewer along with sewer appurtenances										
	CO3	Deve	evelops an ability to understand the quality of sewage										
	CO4	Deve	lops an	ability	to trea	at and	dispos	e the s	ewage				
	CO5	Deve	lops an	ability	to ma	nage N	Aunici	pal So	lid Wa	ste.			
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	Н							L				
(L – Low, M - Medium,	CO2	Н		H									
H – High)	CO3		H										
	CO4			H		H			L		L		
	CO5		Н										
	UNIT -	- I			<u> </u>		1					1	1
Course Content	<b>1. INTRODUCTION TO SANITARY ENGINEERING</b> Sanitation; Conservancy and water carriage system; Sewerage systems; Relative merits.												
	2. SAN	ITARY	Y SEW	AGE A	AND S	TOR	M SEV	WAGE	C				
	Quantit	y of sa	nitary s	ewage;	Factor	rs affe	cting s	anitary	y sewa	ge; De	termin	ation of minati	of
	of quan	tity of	storm w	vater se	wage.	s allet	ang si	UTII W	atel st	wage,	Detel	iiiiiau	011
	3.SEW	ERS, S	SEWEI	R APPI	URTE	NANC	CES, S	SEWA	GE PI	U <b>MPI</b> I	NG		

Types of sewers; Design of sewers; Construction; Testing; Maintenance of sewers; Sewer appurtenances – Man holes, Drop man holes, Lamp holes, Flushing tanks, Grease and Oil traps; Inverted syphons; Street inlets; Catch basins; Storm water regulators; Sewage pumping; Types of pumps.

# UNIT – II

## 4. QUALITY AND CHARACTERISTICS OF SEWAGE

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

### 5. PRIMARY TREATEMNT OF SEWAGE

Screens; Grit chamber; Grease traps; Skimming tanks; Sedimentation tanks.

# 6. SEPTIC TANKS

Septic tank; Design criteria of septic tank; Septic tank effluent disposal; soak pit Leaching Cess pool; Dispersion trenches

# UNIT – III

### 7. SECONDARY TREATEMNT OF SEWAGE:

Trickling filters; Principles of action; Filter types; Recirculation; Final settling tanks; Operational problems and remedies; Activated sludge process; Principle of action; Activated sludge process vs Trickling filter process; Features of operation; Organic loading parameters; Methods of aeration; Diffused air system; Mechanical aeration; Combined system; Sludge bulking; Sludge volume index.

### 8. SEWAGE DISPOSAL:

Objects; Methods; Disposal by dilution; Self purification process; Oxygen sag; Zones of pollution of river; Disposal by irrigation; Sewage sickness; Reuse of treated sewage.

### UNIT – IV

	9. SLUDGE TREATEMENT AND DISPOSAL
	Characteristics of sewage sludge; Anaerobic sludge digestion process; Stages of
	sludge digestion; Factors affecting sludge digestion; Sludge digestion tank; High
	rate digestion; Sludge thickening; Sludge conditioning; Methods of dewatering the
	sludge; Methods of sludge disposal.
	10. URBAN SOLID WASTE MANAGEMENT:
	Sources; Quantities and characteristics; Classification; Collection and
	transportation; Recovery and reuse; Treatment methods such as compositing,
	incineration, sanitary landfill and pyrolysis.
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Elements of public health engineering by K. N. Duggal; S. Chand &amp; Company Ltd., New Delhi.</li> <li>Environmental Engineering vol. II – Sewage disposal and air pollution engineering by S. K. Garg; Khanna Publishers, Delhi.</li> <li>Environmental pollution control engineering by C. S. Rao; Wiley Eastern Limited, New Delhi.</li> </ol> </li> <li>Reference Books: <ol> <li>Wastewater Engineering Treatment, Disposal &amp; Reuse by Met Calf &amp; Eddy; Tata Mc. Graw – Hill publishing Co. Ltd., New Delhi.</li> <li>Water &amp; Wastewater Technology by Mark J. Hammer; John Wiley &amp; Sons.</li> <li>Sewerage and sewage treatment by S. R. Kshirasagar; Roorkee Publishing House, Roorkee.</li> <li>Manual on Sewerage &amp; Sewage treatment; CPH and EEO, Ministry of Works and Housing; Govt. of India; New Delhi.</li> </ol> </li> </ul>
E-resources and other digital material	NPTEL: http://nptel.ac.in/courses/105104102/ http://nptel.ac.in/courses/105106119/

# 14CE 3651 – COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB-I

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Lecture - Tutorial - Practice:	0-0-3
Prerequisites	Design of concrete structures	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On suc	On successful completion of the course, the student will be able to:						
	CO1	design and prepare structural drawings themselves for various structural elements by using AUTOCAD						
	CO2	write and execute the program using Microsoft Excel/ C language/ Mat Lab						
<b>Course Content</b>	PART	<b>Y-A: AUTOCAD</b>						
	Design	and Drawing the reinforcement details of the following RCC Structural						
	elemen	ts / steel structural elements						
	1. Roo	f/Floor System (Continuous) with flanged beams						
	2. Dog	legged staircase						
	3. Two	way slabs (Simply supported slabs corners held down / corners not held down)						
	4. Col	umn & Beam column joint						
	5. Isola	ated and Combined footing						
	6. Stee	l Roof Truss						
	7. Plate	e Girder with connections						
	PART	- B: PROGRAMMING						
	Studen	ts are required to write & execute the programs using Microsoft Excel/ C						
	langua	ge						
	1. Desi	gn of singly reinforced beam for flexure by LSM.						
	2. Desi	gn of doubly reinforced beam for flexure by LSM.						
	3. Desi	gn of R.C.C column of rectangular section for axial load by LSM.						
E-resources and other digital material	TEXT 2. Eng Pvt. Lt	BOOKS: 1. Structural Design and Drawing - Dr. N. Krishnaraju ineering Graphics using AUTOCAD, T.Jeyapoovan, Vikas Publishing House d., 2000.						
	Interna	tional Publishers, 2001.						
	4. Con 1979.	nputer Applications in Civil Engineering, New Chand & Bros., Roorkee, India,						

### 14CE3652 ENVIRONMENTAL ENGINEERING LAB

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Lab	Lecture - Tutorial - Practice:	0-0-3
<b>Prerequisites:</b>	Environmental engineering	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On succe	On successful completion of the course, the student will develops				
	CO1	an ability to test the various parameters and understand their significance and application.				
	CO2	an ability to recommend the suitability of water for various applications by knowing water quality standards.				
	1. Deterr sewag	nination of total suspended and dissolved solids in water / ge sample.				
	2. Determination of fixed and volatile solids in water / sewage sample.					
<b>Course Content</b>	3. Determination of turbidity of water / sewage sample.					
	4. Determination of alkalinity of water sample.					
	5. Determination of acidity of water sample.					
	6. Determination of temporary and permanent hardness of water sample.					
	7. Determination of chloride concentration of water / sewage sample.					
	8. Determination of PH value of water / sewage sample.					
	9. Deterr	nination of optimum dose of coagulant.				
	10. Deter	rmination of dissolved oxygen of water / sewage sample.				
	11. Deter	rmination of fluorides in water sample.				
	12. Deter	rmination of biochemical oxygen demand (BOD) of waste water.				
	13. Deter	rmination of Chemical oxygen demand (COD) of waste water.				
	14. Deter	rmination of chlorine demand and residual chlorine.				
	15. Deter	rmination of nitrogen in water sample.				

#### **TERM PAPER**

Lecture	:	-	Internal Assessment:		30 Marks
Tutorial	:	1 hr/Week	Final Examination:		70 Marks
Practical	:	-	Credits:	2	

#### Description

The Term paper is a precursor to the project work to be done in the 2<sup>nd</sup> semester of the final year B.TechProgramme. The paper may be of 8-10 (A4 size) in length and follows the standard IEEE/Technical Journal Format

#### PURPOSE

The Term Paper helps to supplement the final year Project Work of the B.Tech Students. It helps to identify their Research area/topic and complete the ground work and preliminary research required for it comfortably. It trains the students to make use of Research Tools and Material available both in print and digital formats.

#### PROCEDURE

The topic of Term Paper is chosen from the B.Tech curriculum. Based on the topic a hypothesis is to be made by the student. The hypothesis may be a null hypothesis also. The students are then required to collect literature and support information for their term paper from Standard Reference Books, Journals, and Magazines – both printed and online. Each student should refer to a minimum of 5 reference sources outside their prescribed text books. The students also present their papers with the help of Power Point slides/OHP.

The Term Paper contains:

- The Aim and Objectives of the study
- The need for Rationale behind the study
- Identify the work already done in the field
- Hypothesis and Discussion
- Conclusion
- Appendix with support data (Illustrations, Tables, Graphs, etc.,)

Page Limit : 8 - 10 (A4 Size)

#### Time Limit : 8 - 10 weeks

Last date of submission of the Draft : One week after the 1<sup>st</sup> Mid Term Exams

Last date of submitting the Term Paper : One week before commencement of 2<sup>nd</sup> Mid

#### Term Exams

Date of Seminar : During the Lab Internal Exam.

Method of Evaluation:

Total	: 100 marks
Report Submission	:70
Seminar-2	: 10
Seminar-1	: 10
Day-to Day work	: 10

# 14CE3701 TRANSPORTATION ENGINEERING – I

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 – 1 - 0
Prerequisites:	14CE3304 Concrete Technology	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Plan	and se	elect th	e best	route	for hig	hways					
CO2 identify suitable Pavement materials in Highway Constru								ructior	iction				
	CO3	desig	design geometrics, traffic control devices and pavement crust										
	CO4 Implement the principle of Construction and Maintenance of High								Highw	ays			
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	H		H								H	
(L – Low, M - Medium,	CO2			Н									
H – High)	CO3	H		H								H	
	CO4					н							
Course Content	CO4       H         UNIT-I         1. HIGHWAY NETWORK PLANNING AND ALIGNMENT         Different Modes of Transportation, Road Classification, Road Patterns, 20 Year Road Development plans. Highway Alignment: Requirements , factors controlling , Engineering Surveys         2. HIGHWAY GEOMETRIC DESIGN         Geometric Design: Highway Cross Section Elements- Friction, Unevenness, Camber, Carriageway Width, Kerbs, road margins, formation width, right of way, Sight Distance-Stopping Sight Distance, Overtaking Sight Distance, Intermediate Sight Distance, Design of Horizontal Alignment- Super elevation, transition curves, extra widening, set back distance, Design of Vertical Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment-Grades and Grade Compensation, Types of Vertical curves and Alignment Curves and Alignment Curves and Curves and Curves and Curves and Curv												

## 3. TRAFFIC STUDIES

Introduction, Road User Characteristics, Vehicle Characteristics, Traffic Volume Studies, Speed Studies, Origin and Destination Studies, Traffic Flow Characteristics, Traffic Capacity and Level of Service.

### 4. DESIGN OF TRAFFIC CONTROL DEVICES

Traffic Operations-Traffic Regulation, Traffic Control Devices- Signs, Signals, Rotary Intersection

### UNIT-III

### **5. PAVEMENT MATERIALS**

Sub grade Soil Properties, CBR Test, Plate Bearing Test, Stone Aggregates-Desirable Properties, tests- Aggregate Crushing Value Test, Aggregate Impact Value Test, Aggregate Abrasion Value Test, Shape Tests, Soundness Test, Bitumen-Desirable Properties, Tests, Marshal Method of Bituminous Mix Design

### 6.DESIGN OF PAVEMENTS

Types of Pavement Structures, Design Factors, Design of Flexible Pavements- IRC Method, Design of Rigid Pavement- Wheel Load stresses, Temperature Stresses, Frictional Stresses, Design of Joints, IRC method of rigid pavement design.

### **UNIT-IV**

### 7. HIGHWAY CONSTRUCTION AND MAINTENANCE

Construction Steps of Embankment, Sub Grade, Granular Sub Base (GSB), Wet Mix Macadam (WMM), Dense Bituminous Macadam (DBM), Bituminous Concrete (BC), Pavement Quality Concrete (PQC), Roller Compacted Concrete pavement (RCCP), Pavement failures, causes, failures in flexible pavement, failures in rigid pavements, maintenance of Bituminous pavements and concrete pavements,

### 8. HIGHWAY DRAINAGE

Importance of Highway Drainage, Requirements, Surface Drainage and Sub Surface Drainage

Text books and Reference books	Text Books
	<ol> <li>Khanna, S. K., C. E. G. Justo, A.Veeraragavan"Text book on Highway Engineering." Nem Chand Bros, Roorkee (UA) (2011).9<sup>th</sup> edition</li> <li>Kadiyali, L. R., and N. B. Lal. Principles and Practices of Highway Engineering:(Including Expressways and Airport Engineering). Khanna Publishers, 2005.</li> </ol>
	Reference Books
	1.Principles of Transportation Engineering by Partha Chakroborthy&Animesh Das; Prentice Hall of India, New Delhi
	2.Ministry of Road Transport and Highways- Specifications for Roads and Bridge Works, Fifth Revision, IRC, New Delhi, India-2013
	3.IRC 37:2012- GUIDELINES FOR THE DESIGN OF FLEXIBLE PAVEMENTS (Third Revision)
	4. IRC58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways
E-resources and other digital material	NPTEL : http://nptel.ac.in/courses/105101087/ http://nptel.ac.in/courses/105105107/

## **CE14CE3702 FOUNDATION ENGINEERING**

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	14CE3507—Geotechnical	<b>Continuous Evaluation:</b>	30
	Engineering	Semester end Evaluation:	70
		Total Marks:	100

	Upon successful completion of the course, the student will be able to														
Course Outcomes	CO1	under structu	understand the principle of earth pressure, analyze and design of earth retaining structures.												
	CO2	unders	inderstand, analyze and design of soil slopes.												
	CO3	study profile	study the various parameters in soil investigation program and analyze the soil profile and its properties.												
	CO4	determ distrib	determine and analyze various types of loads applied to the soil and its distribution in soil.												
	CO5	know, settlen	know, analyze and design of various types of shallow foundation including settlements.												
	CO6	familia	arize, a	nalyze a	and des	ign of	various	types of	of deep	founda	tions.				
<b>Contribution of</b> <b>Course Outcomes</b>		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		
towards achievement of	CO1	Н		Н		Н						Н			
Program Outcomes	CO2	Н		Н		Н						Н			
(L – Low, M - Medium H – High)	CO3	Н	Н	Н											
inconum, 11 – 11gn)	CO4	Н		Н		Н									
	CO5	Н		Н		Н						Н			
	CO6	Н		Н		Н						Н			

	UNIT – I
	1. LATERAL EARTH PRESSURE & RETAINING WALLS
Course Content	Different types of lateral earth pressure; Rankine's and Coulomb's earth pressure theories; Graphical methods; Types of retaining walls; Proportioning of retaining walls.
	2. STABILITY OF SLOPES
	Definition of slope; Types of slopes; Types of slope failures; Different factors of safety; Factors affecting the stability of slopes;

Assumptions in the stability analysis; Analysis of finite slopes by Culman's method; Method of slices; Friction Circle method and Taylor's stability charts; Methods of improving stability of slopes.

### UNIT – II

## 3. SUB-SOIL INVESTIGATION AND SAMPLING

Introduction; Planning of sub-surface exploration Program; Stages in sub-surface exploration; Methods of exploration; Soil sampling and samplers; Water table location; Depth and number of borings; Bore hole logging; In-situ tests – Standard penetration test, Static cone penetration test, Dynamic cone penetration test and Vane shear tests.

### 4. STRESSES DUE TO APPLIED LOADS

Stress-strain parameters; Vertical and horizontal stresses due to concentrated loads; Boussinesq and Westergarrd solutions; Isobars; Influence diagram; Newmark's influence charts; Contact pressure distribution.

### UNIT – III 5. BEARING CAPACITY OF SHALLOW FOUNDATION

Different bearing capacity equations; Types of shear failures; Effect of inclined load, eccentric load and water table on bearing capacity; Bearing capacity from in-situ tests; Methods of improving bearing capacity; Plate load test.

### 6. SETTLEMENT ANALYSIS

Settlement of foundations; Immediate and consolidation settlements; Allowable settlement; Proportioning of a foundation for a given settlement.

# UNIT – IV

# 7. PILE FOUNDATIONS

Necessity of pile foundation; Classification of piles; Construction of piles; Load carrying capacity of single pile from static, dynamic and in-situ test methods; Pile load tests; Pile group and its efficiency; Settlement of pile foundation; Negative skin friction; Under-reamed pile foundation in swelling soils.

### 8. WELL FOUNDATION

Forces acting on well foundation; Types, different shapes of wells; Analysis of well foundation; Individual components of well; Sinking of wells; Measures for rectification of tilts and shifts.

Text books and Reference books	<ul> <li>Text Books</li> <li>1. Basic and Applied Soil Mechanics, Gopal Ranjan and A.S.R.Rao, New Age International (P) Limited Publishers, 2<sup>nd</sup> Edition, 2006</li> <li>2. Soil Mechanics and Foundation Engineering K.R.Arora; Standard Publishers and Distributors, 2009</li> </ul>
	<ul> <li>Reference Books</li> <li>1. Advanced Foundation Engineering, V.N.S.Murthy, CBS Publishers and Distributors, New Delhi, 2007.</li> <li>2. Foundation Analysis and Design, Joseph E. Bowles, Mc Graw – Hill International Editions, 4<sup>th</sup> Edition, 1988</li> <li>3. Relevant Indian Standard Code Books.</li> </ul>
E-resources and other digital material	nptel.ac.in/courses/105107120 nptel.ac.in/courses/105101083

### 14CE3703 ESTIMATION, COSTING & VALUATION

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3403 Building materials and	<b>Continuous Evaluation:</b>	30
	building construction	Semester end Evaluation:	70
	14CE3551 Building Planning &	Total Marks:	100
	Design Lab, 14CE3401Surveing		

Course outcomes	Upon successful completion of the course, the student will be able to													
	CO1	acqui estim	ire the nating	know metho	ledge o ds of b	of the ouilding	drawin gs.	gs, pro	ocedur	es and	differe	ent		
	CO2	estin	nate H	R.C.C,	Canal	and R	oad w	orks.						
	CO3	CO3 recognize the importance of specifications and estimate the rates for different civil engineering works.												
	CO 4	know and f	v PWI Tixatio	D accound account of real of r	ints, p nt of p	rocedu roperti	ire of v ies.	vorks,	valuat	ion of	proper	ties		
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO 1	PO 2	PO 3	<b>PO</b> 4	<b>PO</b> 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	
	CO1	Μ		H			Μ							
	CO2	Μ		H			Μ							
	CO3	Μ		H			Μ							
	CO4	Μ		H			Μ				M			
Course Content	UNIT - I 1. Pi M of 2. M In E fo 3. E E UNIT - I 4. E St 5. R	ROCE lethods f accura <b>IETHC</b> dividu stimatic ootings <b>STIM</b> stimatic <b>I</b> <b>STIM</b> tandard <b>OAD H</b>	DURI of Es acy; U DDS O al wall on of (or) pi ATION on of H ion of hooks	E OF F timatic nits of F BUI l metho Single ile four N OF I RCC fr a stairc N OF I s and c	ESTIN on; Ma measu ILDIN od; Ce Room ndation BUILI amed case. RCC V ranks;	IATIC in iten iremen (G ES) ntre lin build n. DINGS buildir WORK RCC	DN ns of w nt. TIMA ne met ling with S ng with S beam;	rork; E TION hod th (a).	Deduction Load	ion for	openin g walls	ngs; D s (b). w	egree	
1	5. K	UAD	19111	IATIC	JIN									

	Estimation of earthwork; Estimation of pitching of slopes; Estimation of earth work of road from longitudinal sections;
	6. CANAL ESTIMATION Earthwork in canals-different cases; Estimation of earthwork in irrigation channels
	<ul> <li>UNIT – III</li> <li>7. SPECIFICATIONS         Purpose and method of writing specifications; General specifications.         Detailed Specifications for Brick work; R.C.C work; Plastering; C C flooring; painting;     </li> </ul>
	<ul> <li>8. ANALYSIS OF RATES         <ul> <li>Task or out - turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work: i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) CC flooring vi) painting.</li> <li>UNIT - IV</li> </ul> </li> </ul>
	<b>9. PWD ACCOUNTS AND PROCEDURE OF WORKS</b> Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.
	10. VALUATION Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for Estimation cost depreciation; Valuation of building.
	11 MISCELLANEOUS TODICS
	Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.
Toyt books and	Taxt Pooles
Reference books	<ol> <li>Estimation &amp; Costing in Civil Engineering by B.N. Dutta; U. B. S. Publishers &amp; Distributors, New Delhi. 27<sup>th</sup> Revised Edition</li> <li>Valuation of Real properties by S. C. Rangwala; Charotar Publishing House, Anand, 7<sup>th</sup> Edition, 2008</li> </ol>
	Reference Books: <ol> <li>Estimation &amp; costing &amp; valuation by M. Chakraborthi, 24<sup>th</sup> Edition, 2010 published by M. Chakraborthi</li> </ol>
E-resources and other digital material	http://nptel.ac.in/courses/105103093/15 https://www.youtube.com/watch?v=RvDO4KCmHRQ

### 14CE3704-DESIGN OF STEEL STRUCTURES

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4-1-0
Prerequisites:	14CE 3402 Advanced mechanics of	<b>Continuous Evaluation:</b>	30
	materials	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to													
	CO	1	desig	n steel	memt	pers in	tension	n and c	ompre	ssion v	with con	nnection	18	
	CO	2	desig	design of columns and column bases										
	CO.	3	design laterally supported and unsupported beams and Plate Girders											
	CO	4	analy	ze & c	lesign	Roof t	russes							
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)			PO 1	PO 2	PO 3	<b>PO</b> 4	<b>PO</b> 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO	1	Μ		Μ		H							
	CO	2	Μ		M		H							
	CO	3	Μ		M		H							
	CO4		М		M		H							
<b>Course Content</b>		U	NIT I											
		1.	INT	RODU	UCTIO	DN								
			Adv steel	antage sectio	s and ons and	disadv desigi	antage 1 philo	s of st sophy.	eel as	structu	ural me	ember;	Гуреs с	of rolled
		2.	SIM	IPLE (	CONN	ECTI	ONS							
			Desi	gn of l	bolted	and we	elded c	onnect	ions.					
		3.	TEN	ISION	I MEN	1BERS	5							
			Type Lug	es of T angles	Censior ; tensio	n meml on spli	bers; E ces.	Design	of tens	sion m	embers	with er	nd conn	ections;
		U	NIT I	I										
		4.	CO	MPRE	SSIO	N MEI	MBER	S						
			Des lacir	ign of 1g and	axiall batteni	y loade ing; Sp	ed con olicing	pressi of colu	on mei imns.	mbers;	Built 1	up colu	mns; D	esign of

	5. COLUMN BASES
	Types of column bases; Design of slab base for axially loaded and eccentrically loaded columns; Design of Gusset base
	UNIT III
	6. BEAMS
	Introduction; classification of sections; Lateral stability of beams; web buckling; Web crippling; Design of laterally supported beams; Design of laterally unsupported beams
	7. PLATE GIRDER
	Elements of plate girder, self weight and economical depth of plate girder. Design of web, design of flanges, Design of bearing stiffeners, End stiffeners, Intermediate. Proportioning of section, Design of plate girder
	UNIT – IV
	<b>8. ROOF TRUSS</b> Types of trusses; components of roof truss loads and load combinations, Design of purlins; design of members
Text books and Reference books	Text Book:1.Design of steel structures by S. S. Bhavikatti, fourth edition2015,I.K.International Publishing House Pvt.Ltd2. Limit State Design of steel structures by S.K.Duggal, 2 <sup>nd</sup> Edition 2014, TataMcGraw Hill Education Private Limited.Reference Books:1. Steel Structures Design and Practice by N.Subramanian, 2011,Oxford UniversityPress2.IS: 800 – 2007 Indian Standard GENERAL CONSTRUCTION IN STEEL —CODE OF PRACTICE (Third Revision)
E-resources and other digital material	http://nptel.ac.in/courses/105103094/ http://nptel.ac.in/courses/105106112/ http://nptel.ac.in/courses/105106113/

# 14CE4705/1– FINITE ELEMENT ANALYSIS

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14MA1201 Calculus	<b>Continuous Evaluation:</b>	30
_	14CE 3402Advanced Mechanics Of	Semester end Evaluation:	70
	Materials	Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to
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		CO1	employ the principles and concepts of structural mechanics to finite element method												
		CO2	formulate stiffness matrices for 1D and 2D elements using local co-ordinate system and iso-parametric concepts												
		CO3	analy	analyze plane trusses and beams using direct stiffness method											
		CO4	solve	solve plane stress and plane strain problems using finite element method.											
Contribution		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
of Course Outcomes	CO1	Н		Н		Н						М			
towards achievement	CO2	Н		Н		М						М			
of Program Outcomes	CO3	Н		М		М						М			
(L – Low, M - Medium, H – High)	CO4	Н		М		М						М			

Course Content	UNIT – I
course content	
	1. BASIC PRINCIPLES OF STRUCTURAL MECHANICS
	Equilibrium conditions; Strain – displacement relations; Linear constitutive relations; Principle of virtual work, Energy principles; Application to finite element method.
	2. ELEMENT PROPERTIES
	Displacement models; Relation between nodal degrees of freedom and generalized co – ordinates; Convergence requirements; Natural coordinate systems; Shape functions; Element strains and stresses; Element stiffness matrix; Static condensation.
	UNIT – II
	3. ISOPARAMETRIC FORMULATION
	Isoparametric formulation of the bar element stiffness matrix, rectangular plane stress element, isoparametric formulation of the plane element stiffness matrix, Gaussian numerical integration, evaluation of the stiffness matrix and stress matrix by Gaussian quadrature.
	UNIT – III
	4. DIRECT STIFFNESS METHOD OF ANALYSIS AND SOLUTION TECHNIQUE
	Assemblage of elements – Direct stiffness method - Development of truss equations, Development of beam equations; Gauss elimination and matrix decomposition.
	UNIT – IV
	5. PLANE STRESS AND PLANE STRAIN ANALYSIS
	Triangular elements; Rectangular elements; Isoparametric elements; Incompatible displacement models; The patch test; Reinforced concrete element; Application to plane stress analysis of a gravity dam.
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Finite Element Analysis – Theory and Programming by C. S. Krishnamoorthy; Tata Mc Graw – Hill Publishing Co.Ltd., New Delhi.</li> <li>Concepts and Applications of Finite Element Analysis by Robert D. Cook David S. Malkus, Michael E. Plesha, Robert J. Witt – Fourth edition.</li> </ol> </li> </ol>
	<ul> <li>Reference Books:</li> <li>1. An introduction to Finite Element Method by JN Reddy - Mc Graw Hill publications.</li> <li>2. A first course in the finite element method fourth edition Daryl L.Logan-Thomson publications.</li> </ul>

E-resources and other digital material	nptel.ac.in/courses/105105041 nptel.ac.in/courses/112104116

# 14CE4705/2 PRESTRESSED CONCRETE

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	14CE3603 -Design of concrete	<b>Continuous Evaluation:</b>	30
	structures-II	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to														
	CO1 understand the concept of prestressing and systems of									ns of p	of prestressing				
	CO2	comj	pute th	ne losse	es of p	restres	sing								
	CO3	analy	yze an	d desig	gn pres	tressin	ıg beaı	n							
	CO4	desig	design end anchorages for prestressing beams.												
		PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12		
Contribution of Course Outcomes towards	CO1	L		L											
achievement of Program Outcomes	CO2			Н		H									
(L – Low, M - Medium,	CO3	L		H		H									
H – High)	CO4	L		H		H									
Course Content	CO4LHHUNIT - I1.INTRODUCTIONBasic concepts of prestresseing; Historical development; Need for High strength steel and High strength concrete; Advantages of prestressed concrete.2.PRESTRESSING SYSTEMSTensioning devices; Hoyer's long line system of pretensioning; Post tensioning systems; Detailed study of Freyssinet system and Gifford – Udall system; Thermo – electric prestressing; Chemical prestressing.3.LOSSES OF PRESTRESS Nature of losses of prestress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.UNIT – II4.ANALYSIS OF PRESTRESS AND BENDING STRESSES Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.5.DEFLECTIONS OF PRESTRESSED CONCRETE MEMBERS ImprovementImage of control of definitionsBasic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.5.DEFLECTIONS OF PRESTRESSED CONCRETE MEMBERS								ength oning iermo n and essure ses in m and						

	<ul> <li>UNIT – III</li> <li>6.ELASTIC DESIGN OF PRESTRESSED CONCRETE SECTIONS FOR FLEXURE</li> <li>Permissible compressive stresses in concrete as per IS 1343; Elastic design of rectangular and I – sections of TYPE 1, TYPE 2 members magnals approach, LINs approach.</li> <li>UNIT – IV</li> <li>7. SHEAR RESISTANCE</li> <li>Shear and Principal stresses; Ultimate shear resistance of prestressed concrete members; Design of shear reinforcement</li> <li>8. TRANSFER OF PRESTRESS IN PRE–TENSIONED MEMBERS</li> <li>&amp;ANCHORAGE ZONE STRESSES IN POST-TENSIONED MEMBERS</li> <li>Transmission of prestressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement;Stress distribution in end block; Investigations on anchorage zone stresses by IS code method; Anchorage zone reinforcements; Design of anchorage and end block.</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Prestressed Concrete by N. Krishna Raju; Tata Mc Graw - Hill Publishing Company Limited, New Delhi. – 5<sup>th</sup> Edition, 2012</li> <li>2. Design of Prestressed Concrete Structures by T.Y. Lin &amp; Ned H. Burns; John Wiley &amp; Sons., 3<sup>rd</sup> Edition, 2010</li> <li>Reference Books:</li> <li>1.Prestressed Concrete by N.Raja Gopalan, 2<sup>nd</sup> Edition, 2008</li> <li>2.Prestressed Concrete Structures by S.Ramamrutham, 6<sup>th</sup> Edition, 2009</li> <li>3. Prestressed code book of IS1343-2012</li> </ul>
E-resources and other digital material	www.nptel.ac.in/courses/105106117 nptel.ac.in/courses/105106118 www.nptelvidoes.in/2012/11prestressedconcrete-structures/html

## 14CE4705/3 ADVANCED ENVIRONMENTAL ENGINEERING

<b>Course</b> Pro	ogramme Elective	Credits:	3

Category:			
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	14CE3605:Environmental	Continuous Evaluation:	30
_	Engineering -II.	Semester end Evaluation:	70
		Total Marks:	100

# Aquient

Course		On suc	accessful completion of the course, the students											
Outcomes		CO1 acquaint the knowledge of protection of water bodies again contamination on disposal of waste water.							s agair	ist				
		CO2	acqu treat	equaint new concepts of waste water treatment & design of low cost eatment units.								ost		
		CO3	plan	suital	ole tre	atment	proce	ss for	selecte	ed ind	ustrial	effluei	nts.	
		CO4	acqu	aint t	ypes o	f air p	ollutar	ts, the	ir effe	cts and	d contr	olling	device	es to
			contr	ol par	ticulat	te matt	er.							
		CO5	develops an ability to understand basics of noise, sources, effects						fects a	nd				
			contr	colling	meas	ures	1			1	1		1	
Contribution o	of		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO
COs towards			1	2	3	4	5	6	7	8	9	10	11	12
achievement o	f	CO1	Н		L		L							
FUS.		CO2	Н		Η		Н							
Medium H-		CO3	Н											
High		CO4	L											
8		CO5	Н											
Course Content:	UN	IT – I												
		1. ST	REAN	A SAN	NITA	ΓΙΟΝ								
		Intr pol stre refe	roduct lution eams; l erence	ion; ( and Impac to flo	Charac self p t of po ra and	cteristi ourifica ollutan fauna	cs of ation i ts on s	the t n a s tream	treatme stream: waters	ent pl ; Diss ; and u	lant ei solved isage o	ffluent oxyge f strea	s; Pat en bal m wat	ttern of ance in ers with
	2	. DE	SIGN	OF I	LOW	COST	WAS	TE W	ATE	R TRI	EATM	ENT	SYST	EMS
		Inti log	roduct oons;	ion; B Oxida	iologi tion d	cal kii itch; E	netics xtende	of was ed aera	ste wa tion p	ter; St rocess	abiliza	tion p	onds;	Aerated
	UN	IT – II												
		3. IN	DUST	RIAL	WAS	STE V	ATE	R TRI	EATM	IENT				
		Int	roduct	ion, C	haract	teristic	s and t	reatmo	ent of	indus	trial ef	fluents	5,	
		4. SU	GAR	PLAN	T									
		Qu	antity	of li	quid	waste;	Chara	acterist	tics of	f liqu	id was	ste; M	[ethod	s of its

# 5. DAIRY INDUSTRY

Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

## 6. PULP AND PAPER INDUSTRY

Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

# UNIT – III

### 7. NEW CONCEPTS IN BIOLOGICAL WASTE TREATMENT

Introduction; Nitrogen removal by biological nitrification and de-nitrification; Phospate removal from the activated sludge process; Rotating disc biological contactor; An–aerobic filters; U-tube aeration systems.

# 8. AIR POLLUTION

Stationary and mobile sources; Primary and secondary pollutants; Natural contaminants; Particulate matter; Aerosols; Gases.

### 9. EFFECTS OF AIR POLLUTION

Effects of air pollutants on human health; Effects on plants and economic effects.

### UNIT – IV

### **10. METEOROLOGY AND AIR POLLUTION**

Atmospheric stability and temperature inversions; Mixing height; Wind direction and speed; Wind direction recorder; Wind speed recorder; Humidity measurement; Temperature measurement; Plume behavior.

### 11. CONTROL OF AIR POLLUTION BY EQUIPMENT

Objectives; Types of collection equipment; Settling chambers; Inertial separators; Cyclones; Filters; Electrostatic precipitators; Scrubbers.

# **12. NOISE POLLUTION**

Introduction; Levels of noise; Noise rating systems; Measures of noise; Sources of noise and their noise levels; Acceptance of noise levels; Effects of noise; Control of noise.

	<ol> <li>Waste water treatment by M. N. Rao and A. K. Datta; Oxford &amp; IBH publishing Co. Pvt. Ltd., New Delhi.</li> <li>Air pollution by M. N. Rao and H. V. N. Rao; Tata Mc Graw – Hill Publishing Co.</li> <li>Waste Water Engineering, Treatment, Disposal and Reuse by Metcalf &amp; Eddy; Tata Mc Graw – Hill publishing Co. Ltd., New Delhi.</li> </ol>
	Reference Books:
	<ol> <li>Environmental pollution control Engineering by C. S. Rao; Wiley Eastern Ltd., New Delhi.</li> <li>Water Supply and waste water disposal by G. M. Fair et all; John Wiley &amp; Sons.</li> <li>Sewage and Sewage treatment by S. K. Kshirasagar: Boorkee</li> </ol>
	<ul><li>9. Sewage and Sewage deathent by S. K. Ksinasagar, Koorkee</li><li>Publishing House, Roorkee.</li><li>4. Sewage Disposal and Air pollution Engineering by S. K. Garg;</li></ul>
	Khanna Publications; Delhi.
<b>E-resource</b>	nptel.ac.in/courses/105104099

# 14CE4705/4 ADVANCED GEOTECHNICAL ENGINEERING

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	14CE3507 Geotechnical Engineering	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

	Upon suc	cessfu	l comp	oletion	of the	the course, the student will be able to								
	CO1	und	lerstan	d clay	Miner	alogy a	and So	il Stru	cture a	ind wa	ter			
	CO2	D2 understand, analyze and determine the shear strength parameters of the soil												
	CO3	analyze 3-dimentional Consolidation and its application												
	CO4	analyze and design of Mat/Raft Foundation, Braced Cuts, Coffer Dams, Shafts, Tunnels and Underground Conduits												
	CO5	understand, analyze and design of foundations to various machines												
	CO6	know, analyze and design of foundations in Expansive and Collapsing soils												
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	
Contribution of Course Outcomes towards	CO1	H	Н	Н										
achievement of Program Outcomes	CO2	L	H	H		H								
(I Low M Modium	CO3	Н		Н		Н						Η		
(L - High)	CO4	Н		H		Н						H		
	CO5	Н		Н		Н						Н		
	CO6	Н		Н		н						Н		
Course Content	UNIT-I	1	1	1	1		1	1	1					
	1. CLAY	MIN	ERAL	OGY	AND	SOIL	STRU	CTU	RE					
	Soil type; minerals;	Soil type; Gravitational and surface forces; Bonds; Basic structural units of clay minerals; Soil structure; Capillary water.												
	2. SHEAT	R STF	RENG	TH										
	Mohr's st Hvorslev Coulomb	ress ci shear , Tresc	rcle; N strengt a, Vor	/Iohr – th para nmises	Coulo meters failure	mb fai ; Stres e envel	lure the spath lopes).	neory; metho	Effecti od; Fai	ve stre lure en	ess prin velope	nciple; es (Mo	hr –	

### **3.THREE DIMENSIONAL CONSOLIDATION**

3 D Consolidation equation; Solution; Vertical sand drain.

### UNIT – II

### 4. MAT FOUNDATION ANALYSIS AND DESIGN

Types of foundation; Mat and floating foundation; Analysis and design of mat foundation.

### **5. BRACED CUTS AND COFFER DAMS**

Lateral earth pressure on sheetings; Types of sheeting and bracing systems; Types of coffer dams.

### 6. SHAFTS, TUNNELS AND UNDERGROUND CONDUITS

Stresses in soil in the vicinity of vertical shaft; Stresses in soil around tunnels; Arching in soils; Types of underground conduits.

### UNIT – III

### 7. MACHINE FOUNDATION ANALYSIS AND DESIGN

Theory of vibration; Forced and Free vibration.; Experiments to determine dynamic soil properties; Types of machine foundation; Principles of design for different machines; IS Code specifications for foundation for impact, rotary and reciprocating machines; Vibration isolation.

### UNIT – IV

### 8. FOUNDATIONS ON PROBLEMATIC SOILS

Collapsing and swelling soils; Foundations on collapsing and swelling soils; Foundations on non-uniform soils; Foundations on rock.

### Note:

1. In Laboratory tests only test procedures need be studied - no need of derivations of the formulae used in the tests

2. Only test procedures according to relevant IS codes need be studied.

3.\*methods and / or formulae only - no derivation of formulae needed.

Text books and Reference books	<ul> <li>1.Basic and Applied Soil Mechanics, Gopal Ranjan and A.S.R.Rao, New Age International (P) Limited Publishers, 2<sup>nd</sup> Edition, 2006</li> <li>2. Soil Mechanics and Foundations, B.C Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P). Ltd., New Delhi, 16<sup>th</sup> Edition, 2005</li> </ul>						
	<ol> <li>Reference Books         <ol> <li>Soil Mechanics and Foundation Engineering, K.R. Arora; Standard Publishers Distributors, 2009</li> <li>Hand book of Machine Foundations, P. Srinivasul, C.V. Vaidyanathan, Tata Mc Graw – Hill Publishing Company Ltd., New Delhi, 1993</li> <li>Advanced Foundation Engineering, V.N.S.Murthy, CBS Publishers and Distributors, New Delhi, 2007.</li> </ol> </li> </ol>						
	4. Relevant Indian Standard Codes.						
E-resources and other digital material	nptel.ac.in/courses/105101001						

## 14CE4705/5 BUILDING SERVICES

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon succ	Upon successful completion of the course, the student will be:					
	CO1	Perceptive of the concept of ventilation and thermal insulation in structures and be able to suggest practical solutions in regard to them					
	CO2	Perceptive of the concept, types and needs of plumbing services structures and be able to suggest practical solutions in regard to them					

	CO3	Perceptive of the concept, types and needs of electrical fixtures in structures and be able to suggest practical solutions in regard to them											
	CO4	Perceptive of the concept of fire prevention and fighting in buildings and also termite prevention in structures											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
Contribution of Course Outcomes towards	CO1	Н									М		
achievement of Program Outcomes	CO2	H									M		
(L – Low, M - Medium,	CO3	H									M		
H – High)	CO4	H									Μ		
	<ul> <li>UNIT - 1         <ul> <li>I.VENTILATION</li> </ul> </li> <li>Ventilation – Necessity of Ventilation – Functional Requirements – Types: Natural Ventilation – Arificial Ventilation – Air Conditioning – Systems of Air Conditioning – Essentials of Air Conditioning systems         <ul> <li>2.THERMAL INSULATION</li> <li>Heat transfer – Thermal Insulating Materials – Thermal Insulation Methods – Economics of Thermal Insulation – Insulation of Walls – Roofs – Doors &amp; Windows.</li> <li>UNIT – II</li> <li>3. PLUMBING SERVICES</li> </ul> </li> <li>Types of plumbing – Fixing pipes in buildings – Plumbing fittings and accessories – Water Supply System: guidelines for mains, communication and consumer pipes – Water Meters; Drainage – Sanitary Fittings: Bathtubs, wash basins, sinks, flushing cisterns, water closets – Principles governing design of building drainage – Guidelines for laying of Gas supply systems.</li> <li>UNIT – III                 <ul> <li>ELECTRICAL INSTALLATION</li> <li>Considerations for Office Buildings, School Buildings &amp; Residential Buildings; Lighting – Fannage – Electrical Installation for Air Conditioning/Heating – Reception and distribution of main supply – Electrical Fittings and accessories-Method of internal wiring – Earthing – Planning of electrical Installations – Lightening arrestors</li> </ul> </li> <li>S. VIDEO SURVEILLANCE SYSTEMS:         <ul> <li>Overview, Major Functions Analytics, IP-Based Video Surveillance Systems.</li></ul></li></ul>												
	termite groove in buildings for termite prevention.												
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Text books and	Text Books:												
<b>Reference books</b>	1.Building Construction By B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, 11 <sup>th</sup> Edition, 2016												
	2. Building Construction by Dr. J. Jha, S.K.Sinha, Khanna Publications, 5 <sup>th</sup> Edition, 2007												
	Reference Books												
	1. National Building Code, 2005												
	2. Building Construction by P.C.Varghese, PHI Learning Pvt Ltd, 2 <sup>nd</sup> Edition, 2009												
E-resources and other digital material													

# 14CE 4705/ 6 ADVANCED FLUID MECHANICS

<b>Course Category:</b>	Programme Elective - I	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE 3306 – Fluid Mechanics	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

	Upon successful completion of the course, the student will be able to:													
	CO1	Apply and li	y princ ft on s	iples of ubmerg	f kinen ged boo	natics a lies	and dy	namics	of fluid	d flow	and de	termin	e drag	
Course Outcomes	CO2	Analyze Ideal and Turbulent fluid flows												
	CO3	Apply Navier – Stoke's equations												
	CO4	Analy	Analyze boundary layer and separation of boundary layer											
	CO5	Illusti	ate the	e worki	ng of I	Recipro	ocating	g pump						
	CO6	Analy	ze the	worki	ng of v	arious	hydrau	ılic mac	hines					
		РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
Contribution of Course Outcomes	CO1	M		M										
towards achievement of	CO2	Н		Н										
Program Outcomes	CO3	Н		Н		Н								
(L – Low, M -	CO4	Н		H		Н								
Medium, n – nign <i>)</i>	CO5	Н		H		Н								
	CO6	М		M										
Course Content	UNIT	I Basic Introdu Contin Euler's potenti Fluid I Introdu Flat pl on a C	Concentration; uity ; s equat al function; ate, Draircular	epts of Role of Kinemion of ctions. Types rag on Cylind	<b>Kinen</b> of fluid natics of motior <b>I Subn</b> of Dr an Ain ler; Lif	natics a prope of fluid ; .Bern nerged ag – I foil; E t on ar	and Dy erties in d flow noulli's l <b>Bodie</b> Drag on Develop n Airfo	ynamic f Fluid I ; Force s equati es n a Sph oment o il.	s Motior s actir on; Str ere, D f Lift	n; Cont ng on ream fu brag on on Im	tinuum a Flui unctior Cylin mersed	; Equa d in M and v der, D l Bodie	tion of Aotion; elocity brag on es; Lift	

	3. Ideal Fluid Flow Introduction; Dynamics of Ideal fluid flow; Uniform Flow – Uniform Flow parallel to x-axis, Uniform Flow parallel to y-axis; Source Flow; Sink Flow, Free Vortex Flow; Super-Imposed Flow – Source and Sink Pair; Doublet.
	<b>4. Turbulent Flow in Pipes</b> Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro- dynamically smooth and rough boundaries, Velocity distribution, Friction factor for pipe flow, Moody's diagram.
	UNIT III
	5. Navier- Stokes Equations and Its Applications Introduction; N. S. Equations in cylindrical coordinates; Boundary conditions; Significance of viscous term; Simple applications of N. S. equation; Laminar flow between two straight parallel boundaries.
	6. Boundary Layer Flow Definition of boundary layer; Boundary layer thickness; Nominal thickness; Displacement thickness; Momentum thickness and energy thickness; Growth of boundary layer over a flat plate; Pressure distribution in the boundary layer and separation of boundary layer and control of boundary layer separation.
	UNIT – IV
	7. Reciprocating Pumps Classification of Pumps; Reciprocating pumps - Types: Working Principle; Power required by a Reciprocating Pump; Coefficient of Discharge, Slip and Negative Slip; Effect of Acceleration of Piston on velocity and pressure in suction and delivery pipes; Indicator Diagram; Air Vessels.
	8. Miscellaneous Hydraulic Machines Hydraulic Accumulator – Simple and Differential; Hydraulic Intensifier; Hydraulic Press; Hydraulic Lift; Hydraulic Ram.
Text books and Reference books	<ul> <li>Text Books</li> <li>[1] P.N. Modi &amp; S.N. Seth, "Hydraulics &amp; Fluid Mechanics", 18<sup>th</sup> ed., Standard Book House, New Delhi, 2011.</li> <li>[2] A.K. Jain, "Fluid Mechanics", 11<sup>th</sup> ed., Khanna Publishers, New Delhi, 2012.</li> </ul>
	<ul> <li>Reference Books</li> <li>[1] H. R. Vallentine , "Applied Hydrodynamics", Butterworths Company Ltd., London</li> <li>[2] V.L. Streeter &amp; S. B. Wiley, "Fluid Transients", Mc. Graw – Hill Book Co. Inc., Newyork .</li> </ul>
E-resources and other digital material	<ul> <li>[1] Dr. T. I. Eldho, IIT/Bombay – Fluid Mechanics – "<u>www.nptel.ac.in / courses/</u><u>105101082/</u>"</li> <li>[2] Dr. Subhashiva Dutta &amp; Dr. N. Sahoo, IIT/Guwahati – Fluid Mechanics – "www.nptel.ac.in/courses/105103095/"</li> </ul>

# 14CE4706/1 ADVANCED STRUCTURAL ANALYSIS

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3501 Structural Analysis -1	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcom	es	Upon	success	ful con	npletio	n of the	e course	e, the st	udent v	vill be a	able to		
	CO1	analy using	ze stati Flexib	cally i ility me	ndeterr ethod	ninate	beams,	rigid	jointed	and pin	jointed	frames	
C			analy using	ze stati Stiffne	cally i ss met	ndeterr hod	ninate	beams,	, rigid	jointed	and pin	jointed	frames
		CO3	apply	the bas	sic con	cepts o	f finite	elemer	nt metho	od to 1I	D, 2D an	d 3D ele	ments.
		CO4	analy analy	analyze determinate and indeterminate beams and portal frames using plastic analysis									
Contribution		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
of Course Outcomes	CO1	Н		М		L						Н	
towards achievement	CO2	Н		L		L						L	
of Program OutcomesCO3(L - Low, M - Medium, H - High)CO4	CO3	Н		L		L						L	
	CO4	Н		М		L							

<b>Course Content</b>	UNIT – I
	1. FLEXIBILITY AND STIFFNESS MATRICES
	Flexibility and stiffness; Flexibility matrix; Stiffness matrix; Relationship between flexibility matrix and stiffness matrix.
	2. FLEXIBILITY METHOD (MATRIX APPROACH)
	Analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) by flexibility method with matrix approach.
	UNIT II
	3. STIFFNESS METHOD (MATRIX APPROACH)
	Analysis of continuous beams, rigid jointed plane frames (Single bay single storey with vertical legs only) and pin jointed plane frames by stiffness method with matrix approach.
	UNIT III
	4. FINITE ELEMENT ANALYSIS
	Equilibrium Conditions; Strain-displacement relations; Linear Constitutive relations; Principle of Virtual work, Energy Principles Application to finite element method.Element Strains and Stresses Element Stiffness matrix.Stiffness matrix formulation for bar element beam element, plane stress/plane strain triangular element (CST) Natural Coordinate Systems, Shape functions. Concept of Isoperimetric Approach, shape functions for 1D, 2D and 3D elements
	UNIT IV
	5. PLASTIC ANALYSIS OF STRUCTURES
	Idealized stress - strain curve for mild steel; Ultimate load carrying capacity of members carrying axial forces; Moment - Curvature relationship for flexural members; Evaluation of fully plastic moment; Shape factor; Collapse load factor; Upper and lower bound theorems; Collapse load analysis of indeterminate beams and single bay, single storied portal frames.

Text books and Reference books	<ol> <li>Text Books         <ol> <li>Structural Analysis – A matrix approach by G. S. Pandit&amp; S.P. Gupta; Tata Mc. Graw – Hill Publishing Co. Ltd., New Delhi.</li> <li>Finite Element Analysis – Theory and Programming by C.S.Krishna Murthy; Tata McGraw Hill Publishing Company Ltd., New Delhi.</li> <li>Basic Structural Analysis by C.S.Reddy, McGraw Hill Education; 3 edition, 2010</li> </ol> </li> </ol>
	<ol> <li>Introduction to the Finite Element Method – A Numerical method for engineering analysis by Desai &amp;Abels CBS Publishing &amp; Distributors, Delhi.</li> <li>Introduction to Finite Element Method by <i>Chandraputla</i>, Ashok and Belegundu.</li> <li>WeaverGere-Matrix Analysis Of Framed Structures 2ndEdition <u>198</u>0</li> </ol>
E-resources and other digital material	http://onlinecourses.nptel.ac.in/courses/105106050

# 14CE4706/2 EARTHQUAKE RESISTNAT DESIGN OF STRUCTURES

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14MA1101 Linear Algebra and	<b>Continuous Evaluation:</b>	30
	Differential Equations	Semester end Evaluation:	70
	14CE3303 Engineering Geology	Total Marks:	100

Course outcom	es	Upon successful completion of the course, the student will be able to											
		CO1	Reco	gnize E	Enginee	ering se	eismolo	gy					
	CO2	Dem syster	onistrat n.	te conc	ept of	respon	se spec	ctra thr	ough si	ingle deg	gree of f	reedom	
		CO3	Reco	gnize r	nulti de	egree –	of – fr	eedom	system	S			
<b>CO4</b> Operate seismic code provisions and ductility requirements in the eart resistant design of structures.						the earth	h quake						
Contribution		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
of Course Outcomes	CO1	Н				L							
towards achievement	CO2	Н				М							
of Program Outcomes	CO3	Н		М		L							
(L – Low, M – Medium, H – High)	CO4	М											

Course Content	UNIT-I
	1. INTRODUCTION TO EARTHQUAKES: SEISMOLOGY
	Introduction, Terminology, Classification of Earthquakes, causes of earthquakes, effects of earthquakes, recording of an earthquake, distribution of earthquakes, strong ground motion, seismic hazards, liquefaction, engineering considerations, earthquake problems in india, tsunami.
	UNIT-II
	2.SINGLE DEGREE OF FREEDOM DYNAMICS AND CONCEPT OF RESPONSE SPECTRUM Equation of motion of Single degree of freedom system, free vibration of Undamped and damped systems, forced vibrations of damped system. Earthquake response of structures, Response Spectrum and Design Spectrum. UNIT-III
	<b>3.INTRODUCTION TO MULTI DEGREE OF FREEDOM SYSTEMS</b>
	Two degrees of Freedom; undamped free vibration, Forced vibration of an undamped system.
	UNIT-IV 4.EARTHQUAKE RESISTANT DESIGN
	Philosophy of earthquake resistant design, lateral load analysis, ductility, redundancy and over strength. Damping, supplemented damping, Base Isolation, Code provisions. Material properties, Seismic code provisions, detailing provisions, review of damage in past earthquakes.
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Earthquake Resistant Design of Structures by PankajAgarval and Manish Shrikhande</li> <li>Vibrations, dynamics and structural systems by Madhujit Mukhopadhyay, Oxford and IBH publishing company pvt. Ltd.</li> <li>A Text of Engineering and General Geology by Prof. Parbim Singh.</li> </ol> </li> <li>Reference Books: </li> </ul>
	<ol> <li>Vibrations, Dynamics and Structural Systems, Second Edition by Madhujit Mukhopadhyay, Oxford &amp; IBH Publishing Co. Pvt. Ltd., New Delhi, Culcutta</li> <li>Elements of Earthquake Engineering by Jai Krishna, A.R.Chandrasekharan, Brijesh Chandra-Second Edition (1994)-South Asian Publishers, New Delhi</li> <li>Geotechnical Engineering by Shashi K Gulahati, Manoj Datta</li> <li>IS:1893(Part-I):2002-Criteria for Earthquake Resistant Design of Strucutres.</li> <li>IS:13920-1993- Ductile Detailing of Reinforced Concrete Sructures subjected to Seismic forces- Code of Practice.</li> </ol>

E-resources and other digital material	http://onlinecourses.nptel.ac.in nptel.ac.in/courses/105101004; nptel.ac.in/courses/105101004/4; nptel.ac.in/courses/105108074
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# 14CE4706/3 ENVIRONMENTAL IMPACT ANALYSIS

Course	Program Elective	Credits:	3
Category:			
Course Type:	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	14CE3605- Environmental	<b>Continuous Evaluation:</b>	30
	Engineering-II	Semester end Evaluation:	70
		Total Marks:	100

Course	On su	On successful completion of the course, the students become											
Outcomes	CO1	profi	proficient in basics of EIA										
	CO2	profi	cient i	n con	npone	nts and	metho	ods for	r predi	ction a	and ass	essme	ent of
		impa	cts of	air, w	ater, e	tc.							
	CO3	profi	cient i	n docu	umenta	ation a	nd mo	nitorir	ng	1.1 1	• ,•		
	C04	gene	ration	in pr	eparin	g eia	repor	t for P	rojects	s like I	rrigatio	on and	l power
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO
of COs	-	1	2	3 1	4	5	6	7	8	9	10	11	12
achievement	CO1	п		L		L			п				
of POs.	CO2	L		H		H			H				
L-Low, M-	CO3			L U		L U			L U				
Medium, H-	04	п		п		п			п				
High	TINITT	т											
Content:	UNII -	-1											
	1. INT	RODI	JCTI	ON									
	Environ of EIA Assess Limitati cultural	nmenta – E nent ( ions o	mental Impact Assessment (EIA) – Objectives of EIA report – Contents – Environmental Impact Statement (EIS) – Environmental Risk nent (ERA) – Legal and regulatory aspects in India – Types and ons of EIA – Issues in EIA – National – Cross sectoral – social and										
	UNIT -	- II											
	2.COM	IPONI	ENTS	AND	MET	HODS							
	Compor Mitigati matrice benefit assessm Social Public p	onents – Scoping – Screening. Identifying and evaluating alternatives. ting measures dealing with uncertainty. Issuing environmental statement es – networks – checklists; Importance assessment techniques – cost t analysis – analysis of alternatives – methods for prediction and ment of impact – Air – Water – Soil – Noise – Biological – Cultural – – Economic Environments, Standards and Guidelines for evaluation. participation in Environmental decision-making.											
	UNIT -	- III											
	3.DOC	UMEN	NTAT	ION A	AND I	MONI	ΓORI	NG					

Document planning - collection and organization of relevant information - use

	of visual display materials – team writing – remainder checklists. Environmental
	monitoring – Guidelines – policies – planning of monitoring programs.
	Environmental management plan. Post project audit. Expert system in EIA.
	UNIT – IV
	4.CASE STUDIES
	Case studies of EIA of developmental projects. Dams, Sardar Sarovar Irrigation Project, Highway Projects, Power generation and their Impacts.
Text	Learning Resources:
Books&	1. Canter, L.W., "Environmental Impact Assessment", McGraw Hill, New
Reference	York, 1996.
books	2. Y. Anjaneyulu, "Environmental Impact Assessment", BS Publications,
	Hyderabad.
	Reference Books:
	3. The World Bank Group., "Environmental Assessment Sourcebook
	Vol.I,II and III", The World Bank, Washington, 1991.
	4. Petts, J., "Handbook of Environmental Impact Assessment Vol.I and II",
	Blackwell Science, London, 1999.
E magazinas	nntol ac in/courses/120108001/5
E-resource	nptel ac in/Clarify, doubts php?subjectId=120108004&lectureId=5

# 14CE4706/4 URBAN TRANSPORTATION PLANNING

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	anal	yze v	arious	stages	s in tra	insport	t Plann	ing Pr	ocess			
	CO2	CO2 apply various methods for data collection											
	CO3	finalize the route choice and network design											
	CO 4	inter	pret tl	he me	thods f	for eco	onomic	evalu	ation c	of trans	sport p	rojects	
Contribution of Course Outcomes towards		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	PO 9	PO 10	PO 11	PO 12
Achievement of Program Outcomes	CO1			H									
(L – Low, M - Medium,	CO2	H	H									Н	
H – High)	CO3	H	H	Н		Н							
	CO4	H							H				
Course Content	CO4HHUNIT-I1. TRANSPORT PLANNING PROCESSSystems Approach to Transport Planning, Stages in Transport Planning, Survey and analysis of Existing Conditions, Forecast Analysis of Future Conditions and plan synthesis, Evaluation, Program Adoption and Implementation, Continuing Study, Citizen Participation, Difficulties in the Transport Planning Process.2. TRANSPORTATION SURVEYStudy Area, Zoning, Type of Surveys, Home Interview Surveys, Commercial Vehicle Surveys, Road Side Interview Surveys, Public Transport Surveys, Inventory of Transport Facilities, Expansion of Data from Samples UNIT-II 3. TRIP GENERATIONFactors governing trip generation and attraction rates - Multiple linear regression analysis, Category analysis - Critical appraisal of techniques.							y and in y,					

	<ul> <li>Uniform factor method, average factor methods - Gravity model and its calibration – opportunity model.</li> <li>UNIT-III</li> <li><b>5.</b> TRIP ASSIGNMENT</li> <li>Traffic assignment - General principles - Assignment techniques - Multiple root assignment Capacity - Restraint assignment - Diversion curves</li> <li>6. MODAL SPLIT</li> <li>Modal split - Advantages and limitations.</li> <li>UNIT-IV</li> <li><b>7.</b> ECONOMIC EVALUATION OF TRANSPORTATION PLANS</li> <li>Economic evaluation techniques – Road user cost, Net present value method, Benefit cost ratio method, internal rate of return method, comparison of various methods.</li> </ul>
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Kadiyali, L.R., "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2006.</li> </ol> </li> <li>Rador J. Paque, Norman, J. Ashford, Paul L.H. Wright "Transportation Engineering Planning and Design" 2000</li> <li>Reference Books: <ol> <li>John W.Dicky, "Metropolitan Transportation Planning", Tata McGraw Hill Publication Co., New Delhi, 2000</li> <li>Bruton, "An Introduction to Transportation Planning", Hutchinson Publishers 2001</li> </ol> </li> </ul>
E-resources and other digital material	http://nptel.ac.in/courses/105106058/ http://nptel.ac.in/courses/105107067/ https://ocw.mit.edu/courses/urban-studies-and-planning/11-540j-urban- transportation-planning-fall-2006/ http://nptel.ac.in/courses/105104098/

# 14CE4706/5 ADVANCED SURVEYING

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3401: Surveying,	<b>Continuous Evaluation:</b>	30
	14CE3303: Engineering Geology.	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon suc	cessful	comp	oletion	of the	course	e, the s	tudent	will b	e able	to		
CO1 carry out trigonometri					rry out a detail survey using Tachometry and objects using gonometric leveling.								
	CO2	gain knowledge regarding the advanced instruments like the principles of EDM and triangulation and selection of triangulation stations.											
	CO3	study	/ large	scale	maps ı	using a	erial i	mageri	ies.				
	CO4	the p settir	orincip ng out	les and works	d work	ting of	hydro	ograph	ic surv	veying	and te	chniqu	ues of
Contribution of Course Outcomes towards		PO 1	PO 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	Μ		Μ		Μ							
(L – Low, M - Medium,	CO2	Μ		Μ		Μ							
H – High)	CO3	Μ		Μ	Μ							H	
	CO4	M		Μ		Μ						н	
	UNIT – I												
	1. TACHEOMETRIC SURVEYING												
	Advantag	es of	f tac	heome	etric	survey	ving;	Basic	syst	ems	of ta	acheor	netric
Course Content	measurements; Determination of constants K and C; Inclined sight with staff vertical: inclined sight with staff normal to the line of sight												
	2.TRIGONOMETRIC LEVELLING												
	Introduction; Determination of the level of the top of an object, When its base is												
	accessible	e and V	When	its bas	se is n	ot acc	essible	; Dete	erminat	tion of	the h	eight o	of the
	object wł	nen the	e two	instru	ment s	tations	s are r	not in	the sa	me ve	rtical	plane;	Axis
	signal co	rrectio	n; Di	fferenc	e in	elevati	ion by	sing	le obs	ervatio	on and	l recip	orocal
	observatio	ons.											
	UNIT – I	I											
	3.ELECT	[RON]	IC DI	STAN	CE M	EASU	J <b>REM</b>	ENTS	5				

Basic concepts, Classification of Electronic Radiation, Basic principle of Electronic Distance Measurement, Computing the distance from the phase differences, Total Station, Instrumental errors in EDM.

# **4.TRIANGULATION**

Principles of triangulation; Uses of triangulation survey; Classification of triangulation; Field and office work in triangulation – Selection of triangulation stations, Signals and towers, Satellite station; Base line & Extension of the base line;

# UNIT – III 5.AERIAL PHOTOGRAMMETRY

Introduction, Principle, Uses, Aerial camera, Aerial photographs, Definitions, Scale of vertical and tilted photograph, Ground Co-ordinates, Displacements and errors, Ground control, Procedure of aerial survey, Photomaps and mosaics, Stereoscopes, Parallax bar.

# UNIT-IV

# 6.HYDROGRAPHIC SURVEYING

Purpose of hydrographic surveying – Soundings, sounding equipment, methods of locating sounding, plotting of soundings by range lines, two angles from a boat.

# **7.SETTING OUT WORKS**

Control station; Horizontal control; Reference grid; Vertical control; Positioning of a structure; Setting out a foundation: Setting out with a theodolite; Graded stakes; setting out a sewer; Setting out a culvert.

#### Text books and Reference books

# **Text Books**:

- 3. Surveying Vol I & II by K R Arora, Standard Book house...( Edition :Fifteenth ,2016)
- 4. Remote Sensing & Geographical Information Systems by M.Anji Reddy, BPS Publications-Hyderabad.(Third Edison, Year 2013)
- 5. Higher Surveying by Dr.A.M.Chandra, Newage International Publishers.(Year 2006)

# **Reference Books:**

	1. Remote sensing and Image interpretation by TM Lillesand and RW Kiefer; John willey and sons.( Edition :Seventh ,2016)
	2. Surveying Vol I & II by B.C. Punmia, Laxmi Publications.( Edition :Sixteenth, 2016)
	<ol> <li>Remote Sensing &amp; GIS by BasudebBhatta, Oxford University Press. (Edition :Second, 2011)</li> </ol>
E-resources and other digital material	NPTEL : http://www.nptelvideos.in/2012/11/surveying.html

# 14CE3751 TRANSPORTATION ENGINEERING LABORATORY

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Laboratory	Lecture - Tutorial - Practice:	0 - 0 - 3
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

CO1	Evaluate the desirable properties of the payement materials
	D'unade de destructe properties of the pavement indertuis
CO2	Perform quality control tests on pavements and pavement materials
CO3	design the job mix formula for Bituminous Mixes
CO 4	conduct traffic volume study
A. TEST B. TEST C. TEST D. TRAF E. Chara quality c	<ul> <li>S ON AGGREGATES: <ol> <li>Aggregate Crushing value test.</li> <li>Aggregate impact value test.</li> <li>Los Angele's abrasion test.</li> <li>Shape tests</li> <li>Gradation of Aggregate.</li> <li>Specific gravity Test.</li> <li>Stone polishing value.</li> </ol> </li> <li>S ON BITUMINOUS MATERIALS: <ol> <li>Penetration test.</li> <li>Softening point test.</li> <li>Flash and fire point test.</li> <li>Viscosity test.</li> </ol> </li> <li>ON BITUMINOUS MIXES: <ol> <li>Marshall Stability test- Analysis, Binder content determination.</li> </ol> </li> <li>FIC VOLUME STUDIES <ol> <li>Direction, duration and classification of traffic volume at midblock section and intersections, manual method</li> </ol> </li> </ul>
	CO2 CO3 CO4 A. TEST B. TEST C. TEST D. TRAF E. Chara quality c

Text books and Reference books	<ul> <li>Text Books:</li> <li>1. S. K. Khanna and C.E.G Justo, Highway Material Testing (Laboratory Manual) Nem Chand &amp; Bros,</li> <li>2. All laboratory tests are as per IS, ASTM, AASHTO, IRC procedures / specifications and guidelines.</li> </ul>
E-resources and other digital material	http://aproadbuildqa.blogspot.in/ http://www.engineeringcivil.com/various-lab-test-on-bitumen.html http://www.engineeringcivil.com/various-lab-test-on-aggregates.html http://civilblog.org/2015/09/12/7-lab-tests-on-aggregate-to-check-quality-for-use-in- road-work/#

# 14CE3752 SURVEY FIELD WORK

<b>Course Category:</b>	Programme Core.	Credits:	2
<b>Course Type:</b>	Practical	Lecture - Tutorial - Practice:	0-0-3
Prerequisites:	14CE3401: Surveying,	<b>Continuous Evaluation:</b>	30
	14CE3452:Survey Lab	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:							
	CO1	Calculate linear and angular measurements using Total station						
	CO2	calculate area of a given building/field using Total station						
	CO3	setting out curves						
	CO 4	Transfer points from plan to field						
Course Content	PART-A 1. Int 2. Int Ins 3. Se Sta 4. Se 5. Se 6. Se 7. Se 8. Se 9. Co 10. Co PART-B Survey Ca Us	<ul> <li>roduction to Total Station - Study of Instrument</li> <li>roduction to Digital Theodolite and Digital Auto level - Study of strument</li> <li>tting of Boundaries and computation of area of a field by using Total ation.</li> <li>tting of simple curve using chain and tape.</li> <li>tting of simple curve using chain, tape and Theodolite</li> <li>tting of simple curve using Total Station.</li> <li>tting out for a Building using Chain and tape.</li> <li>tting out for a Building using Total Station.</li> <li>omputation of area of building by using Total station.</li> <li>omputation of area of building by using Total station.</li> <li>must be conducted for a minimum period of one week</li> <li>ting Total Station to train in one of the following areas:</li> <li>Preparation of a contour Plan/ Map.</li> <li>Earth work Computations for a high way / canal projects</li> <li>Marking of a Sewer line/ Water supply line.</li> <li>Any type of Execution works.</li> </ul>						

Text books and Reference books	Text books 1. Surveying Vol I & II by K R Arora, Standard Book house( Edition :Fifteenth ,2016)
	<ol> <li>Higher Surveying by Dr.A.M.Chandra, Newage International Publishers.(Year 2006)</li> </ol>
	Reference Books
	<ol> <li>Surveying Vol I &amp; II by B.C. Punmia, Laxmi Publications.( Edition :Sixteenth, 2016)</li> </ol>
E-resources and other digital material	NPTEL: http://www.nptelvideos.in/2012/11/surveying.html

# 14CE6754 INDUSTRY OFFERED COURSE

<b>Course Category:</b>	Industry Interaction	Credits:	2
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	2-0-0
Prerequisites:		<b>Continuous Evaluation:</b>	0
		Semester end Evaluation:	100
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	CO1 develop an understanding of laws relating to housing industry.											
	CO2	understand various planning schemes for urban and regional land use								e			
	CO3	understand various laws and rights for land pooling, aquisitioon and other government schemes											
	CO4	unde for o	erstano btainii	d build ng buil	ing by ding p	laws, ermiss	zoning sions	g regu	lations	, layou	its and	l proce	dures
Contribution of Course Outcomes towards		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	L			L		Μ				Н	Μ	Μ
(L – Low, M - Medium, H – High)	CO2	L			L		Μ				Н	M	M
	CO3	L			L		Μ				Н	Μ	Μ
	CO4	L			L		Μ				Н	M	M
Course Content	PLANNING LEGISLATION UNIT -I 1.EVOLUTION OF PLANNING LEGISLATION IN INDIA												
	Municipa	l Acts	- Impr	oveme	ent Tru	st Act	s - Tov	vn and	l Coun	try Pla	nning	Acts -	
	Gram Par	nchaya	ts Acts	s - Dev	elopm	ent Au	uthorit	y Acts	- And	Specia	al Purp	oose	
	legislations - Legislations for creating special purpose bodies such as Housing												
	Board, Slum Clearance Boards and Water Supply and Sewerage Boards -Land												
	Acquisition Act, 1894 - Urban Land (Ceiling and Regulation) Act of 1976 - Water												
	Pollution (Prevention and Control) Act of 1974 - Pollution (Prevention and Control)												
	Act of 19	81 and	the E	nviron	menta	Prote	ction A	Act of	1986-	Urban	Art C	ommis	ssion
	Act of 19	73											
	UNIT - I	I											
	2.URBA	N ANI	) REG	GIONA	AL LA	ND U	SE PL	ANN	ING				

Land use planning - Town Planning Schemes - Master Plans - Zonal Developmer Plans for urban local bodies - Regional Master Plans - 73rd and 74th amendmer the Constitution of India- functions of urban local bodiesUNIT - III3. LAND BANKING Land pooling Schemes - Land Acquisition Act - Transfer of Development Righ (TDR) to obtain land for road widening schemes - PPP schemes – BOOTmode projectsUNIT - IV 4.DEVELOPMENT PROMOTION REGULATIONS Model Building bye laws drafted by Town and Country Planning organization (TCPO) - Zoning Regulations - A.P. State Common Building Rules - FAR and Coverage - Layout Rules for sub-division of land into residential plots - Proced for obtaining permission for individual buildings / group housing / Apartments / housing / gated community - procedure to obtain permission for sub-division of land for the development of residential layout.Teaching faculty must be a qualified Town Planner: Holding Masters Degree i Urban and Regional Planning and Associate Membership in the Institute of Tow Planners, India with practical experience of min 20 years in any urban local bod Planning and Governance – A.K.Jain, Jain Book Depot, New Delhi 2. Urban Planning and Governance – A.K.Jain, Jain Book Depot, New Delhi Performer Pacher
Plans for urban local bodies - Regional Master Plans - 73rd and 74th amendment         the Constitution of India- functions of urban local bodies         UNIT - III         3. LAND BANKING         Land pooling Schemes - Land Acquisition Act - Transfer of Development Right         (TDR) to obtain land for road widening schemes - PPP schemes - BOOTmode         projects         UNIT - IV         4.DEVELOPMENT PROMOTION REGULATIONS         Model Building bye laws drafted by Town and Country Planning organization         (TCPO) - Zoning Regulations - A.P. State Common Building Rules - FAR and         Coverage - Layout Rules for sub-division of land into residential plots - Proced         for obtaining permission for individual buildings / group housing / Apartments /         housing / gated community - procedure to obtain permission for sub-division or         land for the development of residential layout.         Teaching faculty must be a qualified Town Planner: Holding Masters Degree i         Urban and Regional Planning and Associate Membership in the Institute of Tow         Planners, India with practical experience of min 20 years in any urban local bod         Poelhi       2. Urban Planning and Governance – A.K.Jain, Jain Book Depot, New Delhi
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Text books and Reference books       Text Books: 1.Inclusive planning and social infrastructure – A.K.Jain, Jain Book Depot, New Delhi         2. Urban Planning and Governance – A.K.Jain, Jain Book Depot, New Delhi
<ul> <li>a. Urban Land Policy – A.K.Jain , Jain Book Depot, New Delhi</li> <li>b. New Dimesnions of Urban Management in India, Nishith Rai, Awadhesh Kumar Singh, Jain Book Depot, New Delhi</li> </ul>
E-resources and other digital materialYou Tube – Urban – Design – The Pluralism of practice - Problems of town planning in india-Problems of town planning in india-Emerging futures in urban india – perspectives.

# 14CE5755 MINI PROJECT

<b>Course Category:</b>	Programme core	Credits:	2
<b>Course Type:</b>	Project	Lecture - Tutorial - Practice:	0-1-0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:							
	CO1	identify real world problems						
	CO2	develop awareness of design methodologies & its implementation						
	CO3	understand advanced programming techniques						
	CO 4	acquire skills in technical report writing						
	The topic supplement complete p The stude before the The Minit	<ul> <li>c of Mini Project is chosen from the B.Tech curriculum. It helps to nt the subjects learned during three years in order to Plan/Analyse/Design a problem.</li> <li>ent should select a topic of his choice and submit the project one week</li> <li>commencement of 2nd mid term examination.</li> <li>Project Report contains:</li> <li>Objectives of the project</li> <li>Methodology</li> <li>Plan/Analysis/Design</li> <li>Summary &amp; Conclusion</li> </ul>						
<b>Course Content</b>	Date of Se	eminar: During the Lab Internal Exam.						
	Method of	f Evaluation(Continuous):						
	Day to day	y assessment $= 10$						
	Two Semi	(10+10) = 20						
	Total							
	Method of Evaluation (Semester end):							
	Report $= 40$							
	Seminar P	Project Demonistration = 30						
		=====						
	Total	70						

### 14CE3801 TRANSPORTATION ENGINEERING – II

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	4 - 0 - 0
Prerequisites:	14CE3701 Transportation Engineering – I	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	iden	tify the	e railw	ay trac	k com	ponen	ts					
	CO2	analyze the data for runway design											
	CO3	plan and design runway geometrics and airfield pavements.											
	CO4	desc	analyze the data for runway design         plan and design runway geometrics and airfield pavements.         lescribe the harbor components         PO       PO										
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
Contribution of Course Outcomes towards	CO1	H	H			H							
achievement of Program Outcomes	CO2	H		Н								PO       PO       PO         10       11       12         IO       II       II         IO       II       II         IO       II       II         III       III       III         III       III       III         III       III       III         IIII       IIII       IIII         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	
(L – Low, M - Medium, H – High)	CO3			H									
	CO4	H		H								H	
Course Content	UNIT-I												
	<ul> <li>I.INTRODUCTION TO RAILWAYS</li> <li>Comparison of railway and highways transportation; Classification of Indian railways.</li> <li>2.COMPONENTS OF RAILWAY TRACK</li> <li>Gauges in Railway Track, Coning of Wheels, Permanent way-Rails-Types, Rail failures, Creep of Rails, Rail Joints-Types of Joints, Sleepers-Types, Comparison of sleepers, Ballast and formation-Types of Ballast materials- Specifications of Indian Railways, Ballast Profile, Blanket or Sub Ballast, Specification for Blanket Material Formation, Compaction of Formation.</li> <li>UNIT-II</li> <li>3. GEOMETRIC DESIGN OF RAILWAY TRACK</li> <li>Geometric Design Of Track-Necessity; Gradients &amp; Gradient Compensation; Elements of horizontal alignment; Super elevation; Cant deficiency and cant excess; Negative Super elevation; Length of Transition Curve, Length of vertical curve.</li> <li>4. POINTS AND CROSSINGS &amp; SIGNALLING Switches, Components and types of crossing, Turnouts and its working principle , Classification of signals</li> </ul>							l on of dian terial, cess;					
	UNIT-II	Ι											

	<ul> <li>5. AIRPORT PLANNING AND DESIGN Aero plane components; Air–craft characteristics; Selection of site for airport;  Typical airport layouts; Airport Obstructions-Zoning laws; Classification of  obstructions; Imaginary surfaces </li> <li>6. RUNWAY DESIGN Runway Design-Runway orientation; Basic runway length; Corrections for  elevation; Temperature and gradient; Runway geometric design. UNIT-IV 7. AIRFIELD PAVEMENT DESIGN Design Of Airport Pavements- Design methods for flexible airfield Pavement- CBR Method, Mcleod Method and Burmister's Method and rigid pavement Design-PCA Method; LCN Method of pavement design. 8. HARBOUR ENGINEERING Harbour layout: types of harbours, port terms, site selection, Break Waters, Piers and</li></ul>
	wharves, dry docks and slipwaves
Text books and Reference books	<ol> <li>Text Books         <ol> <li>Railway Engineering by S.C.Saxena and S.Arora Dhanpat Rai &amp; sons</li> <li>Airport Planning and Design by S. K. Khanna &amp; M. G. Arora; Nemchand &amp; Bros, Roorkee</li> <li>DOCK AND HARBOUR ENGINEERING by Hasmukh P. Oza, Gautam H. Oza, Charotar Publishing House, 8th Revised Edition : 2016</li> </ol> </li> <li>Reference Books         <ol> <li>Railway Engineering by M.M.Agarwal; Prabha &amp; Co, New Delhi</li> <li>Airport Engineering by G.V.Rao; Tata Mc Graw Hill, New Delhi.</li> </ol> </li> </ol>
E-resources and other digital material	NPTEL : <u>http://nptel.ac.in/courses/105107123/</u> http://nptel.ac.in/courses/105101008/ http://nptel.ac.in/courses/114106025/

# **14CE 4802/1: STRUCTURAL DYNAMICS**

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1- 0
Prerequisites:	14MA1101: Linear Algebra and	<b>Continuous Evaluation:</b>	30
	Differential Equations	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	unde vibra	rstand tions	the r	espons	se of	single	degre	e of f	reedo	n syst	tem in free		
	CO2	unde dyna	understand the response of SDOF systems to harmonic loading & general dynamic loading											
	CO3	understanding the response of SDOF systems under various dynamic loading using Rayleigh's method												
	CO4	develop equations of motions & solving them for stiffness buildings under free & forced vibrations												
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
Contribution of Course Outcomes towards	C01	H	L			Η								
achievement of Program Outcomes	CO2	H	L			Η								
	CO3	H	L			H								
	CO4	H	L			H								

# UNIT – I

# 1. INTRODUCTION:

Comparison between static and dynamic analysis; Degrees of freedom; un damped system; Newton's law of motion; 'D' Alembert's principle; Solution of the differential equation of motion.

# 2. FREE VIBRATION OF SINGLE DEGREE – OF – FREEDOM SYSTEM:

Equation of motion for single degree – of – freedom system; Free un damped vibration of the SDOF system; Damped single degree – of – freedom system – Viscous damping, Equation of motion, Critically damped system, Over damped system, Under damped system and Logarithmic decrement.

# UNIT – II

# 3. RESPONSE OF SDOF SYSTEM TO HARMONIC LOADING:

Un damped harmonic excitation; Damped harmonic excitation; Evaluation of damping at resonance; Response to support motion; Force transmitted to the foundation.

# 4. RESPONSE OF SDOF SYSTEM TO GENERAL DYNAMIC LOADING:

Impulsive loading and Duhamel's integral; Numerical evaluation of Duhamel's integral – un damped system; Numerical evaluation of Duhamel's integral – Damped system.

# UNIT – III

 GENERALIZED COORDINATES AND RAYLEIGH'S METHOD: Principle of virtual work; Generalized SDOF system – Rigid body; Generalized SDOF system – Distributed elasticity; Rayleigh's method; Improved Rayleigh's method.

# UNIT - IV

# 6. STRUCTURES MODELED AS SHEAR BUILDINGS:

Stiffness equations for the shear building; Flexibility equations for the shear building; Free vibration of a shear building (Single bay two Storeyed) - Natural frequencies and normal modes.

# 7. FORCED MOTION OF SHEAR BUILDINGS (Two Storeyed):

Modal superposition method; Response of a shear building to base motion; Harmonic forced excitation.

Text books and Reference books	<b>Text Books:</b> 1. Structural Dynamics by Mario Paz; CBS Publishers & Distributors, Delhi.	
	Reference Books:	

	<ol> <li>Dynamic of Structures by Ray W. Clough &amp; Joseph Penzien; McGraw- Hill, Inc.</li> <li>Dynamics of Structures by Anil K. Chopra</li> <li>Basics Of Structural Dynamics And Aseismic Design by S.Kavitha And R. Damodar Swamy</li> </ol>
E-resources and other digital material	<b>NPTEL :</b> <u>http://nptel.ac.in/course.php?disciplineId=105</u>

### 14CE4802/2 ADVANCED DESIGN OF STRUCTURES

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	14CE3603 Design of concrete	<b>Continuous Evaluation:</b>	30
	structures-II	Semester end Evaluation:	70
	14CE3704 Design of Steel Structures	Total Marks:	100

Course outcomes	Upon suc	cessfu	l comp	oletion	of the	course	e, the s	tudent	will b	e able	to:			
	CO1	desig	gn the	water	tanks									
	CO2	desig	gn R.C	C slab	culver	t for	I.R.C	loading	gs					
	CO3	desig	gn con	nection	ns in st	eel str	ucture	S						
	CO4	appl	apply the knowledge of Light gauge steel in construction											
	CO5	know basic principles of steel - concrete composite cross sections for beams and slabs												
		PO 1	PO 2	PO	PO	PO 5	PO 6	PO 7	PO 8	PO 0	PO	PO	PO 12	
Contribution of Course		1	4	3	4	3	U	/	0	9	10	11	14	
Outcomes towards	C01	L		H		H								
achievement of Program Outcomes	CO2	L		H		Н								
(L – Low, M - Medium, H – High)	CO3	L		H		Н								
	CO4	L		H		Н								
	CO5	L		H		Н							Î	
Course Content														

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#### UNIT-I 1. WATER TANKS:

Introduction to water tanks; Tanks resting on ground with flexible base and Rigid base. Design of elevated circular tank with flat base slab supported on circular beam:

### UNIT – II 2. SLAB BRIDGES

Introduction to various types of bridges; classification of bridges, components and advantages of RC slab bridge, T-beam bridge; Pigeaud's method for computation of slab moments; Courbon's method for computation of moments in girders; loads on bridges, I.R.C specifications for road bridges.

# 3. DESIGN OF R.C SLAB CULVERT

Effective width method; Design of RC slab culvert for class AA tracked loading.

### 4. SUB STRUCTURE FOR BRIDGES:

Pier and abutment caps; Materials for piers and abutments;

### **5.TYPES OF BEARINGS FOR BRIDGES:**

Importance of bearings; Bearings for slab bridges; Bearings for girder bridges;

	Note: Design of bridges have to be done as per IRC 21 UNIT-III
	6.ECCENTRIC CONNECTIONS (bolted and welded)
	1. Framed connections. 2. Seated connection (Stiffened) 3. Un Stiffened seated connection. 4. Moment resistant connection
	UNIT-IV
	7.LIGHT GAUGE STEEL STRUCTURES
	Cold form light gauge sections - Type of cross section, stiffened, multiple stiffened and un-stiffened element, flat-width ratio, effective design width, design of light gauge compression, tension and flexural members as per codal provisions.
	8. INTRODUCTION TO COMPOSITE STRUCTURES (BEAMS AND SLABS)
	Introduction to composite design – shear connectors – types of shear connectors – degrees of shear connections – partial and full shear connections – composite sections under positive bending – negative bending – propped conditions – unpropped conditions – deflection of composite beams.
Text books and Reference books	Text Books:1. RCC Designs by Dr. B. C. Punmia; Standard Publishers Distributors, Delhi.2. Essentials of Bridge Engineering by Dr. Johnson Victor; Oxford & IBHPublishing Co. Pvt. Ltd., New Delhi3. Design of Steel Structures by S. K. Duggal4. Design of Steel Structures by A. S. Arya and Azmani5. Design of Steel Structures by S. S. Bhavi Katti.
	<ul> <li>Reference Books:</li> <li>1.Bridge Engineering by N. Krishna Raju</li> <li>2.Advanced Reinforced Concrete Structures by N.Krishna Raju</li> <li>3. Design of Steel Structures by N. Subramanian</li> <li>4.IRC:6-2014;Standard Specifications and code of practice for Road bridges, Loads and Stresses</li> <li>5.IRC:21, Standard Specifications and Code of Practice for Road bridges; Cement Concrete (Plain and Reinforced).</li> <li>5.IS: 800-2007 General Construction in Steel – Code of Practice</li> <li>6.IS:801 – 1975 Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction</li> </ul>
E-resources and other digital material	nptel.ac.in/courses/105105105/ www.steel-insdag.org/TeachingMaterial/Teaching_Materials.pdf

# 14CE4802/3 SOLID WASTE MANAGEMENT

Course Category:	Programme Election	ve	Credits:	3
<b>Course Type:</b>	Theory		Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	CE3605	Environmental	<b>Continuous Evaluation:</b>	30
	Engineering-II		Semester end Evaluation:	70
			Total Marks:	100

Course	On successful completion of the course, the students													
outcomes	CO1	ident	dentify the sources and composition of Municipal Solid Waste.											
	CO2	acqui	acquiant an ability to collect, transport and dispose the Municipal Solid Waste.											
	CO3 acquaint an ability to separate and recycle the Municipal Solid Waste.													
	CO4	acqua	aint an	ability	to han	dle the	Bio-m	edical,	plastic	and e-v	waste.			
Contribution of		PO	PO	РО	PO	PO	PO	PO	РО	PO	РО	РО	РО	
COs towards		1	2	3	4	5	6	7	8	9	10	11	12	
achievement of POs.	CO1	Н		L		L			Н					
	CO2	Н		Η		Н			Η					
Medium, H-	CO3	Н		L		L			Η					
High	CO4	Н		L		L			Н					

Course Content:	UNIT-I
	1. SOURCES, TYPES AND COMPOSITION OF MUNCIPAL SOLID WASTE: Sources, Types, Composition of Solid Waste, Effects of improper disposal of solid waste, public health effects, Types of materials recovered from MSW.
	2. WASTE HANDLING, SEPARATION AND STORAGE: On - site handling and separation at solid waste, on - site storage of solid waste, options under Indian conditions.
	UNIT-II
	<b>3. COLLECTION OF MUNCIPAL SOLID WASTE:</b> Methods of collection, equipment, types of vehicles, man power requirement, collection routes.
	4. TRANSFER AND TRANSPORT OF MUNCIPAL SOLID WASTE: Need for Transfer operations, Transfer Stations, Selection of Location of Transfer Stations, Transport means and methods.
	UNIT-III
	5. OFF-SITE PROCESSING, SEPARATION, TRANSFORMATION AND RECYCLING OF WASTE MATERIALS: Size Reduction, Separation, Density separation, Magnetic Separation, Pyrolysis, Composting, Incineration, Recycling of materials of Municipal Solid Waste.

	6. DISPOSAL OF SOLID WASTE:
	Disposal of Solid Waste – Sanitary land Fills, Site selection, Planning, Design and operation of Sanitary land fills, Leachate collection & treatment, composition of land fill gases.
	UNIT-IV
	7. BIO-MEDICAL WASTE MANAGEMENT: Sources & generation of Bio-medical Waste, Biomedical Waste Management.
	8. PLASTIC AND E-WASTE MANAGEMENT:
	Dangers of Plastics, Recycling of Plastic waste, Disposal of plastic waste. Health Hazards of E- waste, E- waste Management
Text Books&	Learning Resources:
Reference	Text Books:
books	1. Integrated Solid waste management by Goerge Tchobanolous, Hilary Theisen & Samuel A. Vigil. McGraw Hill International Editions
	2. Design of Land Fills and Integrated Solid waste management by Amalendu Bagchi, John Wiley & Sons
	Reference Books:
	1. CPCB Manual on solid waste Management
	2. Solid waste management K.Sasikumar, Sanoop Gopi Krishna PHI
	Learning (P)Ltd.
	5. Sond waste management in indra by Orvasin Dhannja.
E-resource	www.nptel.ac.in/courses/120108005
	nptel.ac.in/courses/10510605
	https://www.coursera.org/learn/solid-waste-management

# 14CE4802/4 GROUND IMPROVEMENT TECHNIQUES

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:		<b>Continuous Evaluation:</b>	30
	14CE3702- Foundation Engineering	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon succ	essful o	comple	tion of	the cou	urse, th	e stude	ent will	be able	e to				
	CO1	analy cohes	ze and sive soi	design ils.	of var	ious gr	ound in	mprove	ement to	echniqu	ues in C	Granula	r and	
	CO2	famil	iarize	differe	nt Geot	textiles	and its	s functi	on, test	s on the	em			
	CO3	know	the p	rinciple	es, anal	ysis an	d desig	n of re	einforce	ed earth	n walls			
	CO4	identify, analyze the expansive soils and design of foundation using different techniques												
	CO5	CO5 analyze and design of different methods of drainage and dewatering systems												
	CO6 understand, analyze and design of different methods of stabil including grouting.										tabiliza	zation of soils		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
Contribution of Course Outcomes towards	CO1	Н		Н		Н						Н		
achievement of Program Outcomes	CO2	H	Н	H										
(L – Low, M - Medium, H	CO3	H		Η		H						H		
– High)	CO4	н	Н	Н										
	CO5	Н		Н		Н						Н		
	CO6	H	Н	H										
Course Content	UNIT-I 1. GROU SOILS In-situ de surface, I Densificat walls – Sa UNIT-II 2. GEOTI Geotextile geotextiles Reinforced of reinforce UNIT-III 3. FOUNI Expansive	ND IM nsificat mpact ion Me nd Drai EXTIL s: Intro s materi d Earth: ced earth DATIO soils: 1	IPROV ion M at the thod in ns, Sar ES AN duction als – g Princi h walls NS IN Probler	vEME ethods Grou n Cohe ndwitch <b>D RE</b> n – Ty eogrids iples – - desi <b>PRO</b> ns of e	NT MI in gra nd Su esive S n geodr INFOR pe of g s – func Compc gn prin BLEMA xpansiv	ETHO inular rface, oils – ains – 3 acced 1 geotext ctions. onents of ciples of ATIC 5 ve soils	DS IN Soils - Vibrat Introdu Stone a EART iles: Fu of reinf of reinf SOILS 5 - test	GRA - Intro ion at uction, and lim H RET unction forced forced s for id	NULA duction depth preload e colun CAININ s and t earth – earth w	<b>R SOI</b> Vibra , Impa ding or nns- the <b>NG WA</b> heir ap factors valls.	LS & o ation at act at r dewat ermal n ALLS oplicatio – gove	COHE the g depth.l tering, nethods ons, tes erning o	SIVE round in-situ Drain sts for design	

	determination of swelling – pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles – I.S.Code practice – Remedial measure. <b>4. DRAINAGE AND DEWATERING</b> Well point system - Vacuum dewatering system - Electro-osmatic method - Seepage analysis for two dimensional flow - fully penetrating slots in homogeneous deposits (simple cases only). <b>UNIT-IV</b> <b>5. STABILIZATION OF SOILS</b> Mechanical stabilization: Soil aggregate mixtures-properties and proportioning techniques – soft aggregate stabilization – compaction – field compaction control. Cement stabilization: Mechanism – factors affecting and properties – Use of additives – design of soils cement mixtures – construction techniques. Lime and Bituminous stabilization: Types of admixtures – mechanism – factors affecting – design of mixtures – construction methods. <b>6. GROUTING TECHNIQUE</b> Suspension grouts - solutions grouts - Grouting equipment and method - Grouting with soil, Bentonite - cement mixes and asphalt - Grout monitoring schemes
Text books and Reference books	Text Books
	<ol> <li>Basic and Applied Soil Mechanics, Gopal Ranjan and A.S.R.Rao, New Age International (P) Limited Publishers, 2<sup>nd</sup> Edition, 2006</li> <li>Ground Improvement Techniques, P.Purushothama Raju, Lakshmi Publications (P), Ltd, 2007</li> </ol>
	Reference Books
	<ol> <li>ROBERT M. KOERNER : Construction and Geotechnical Methods in Foundation Engineering , Mc Graw Hill.</li> <li>Geotechnical Engineering , Shashi K Gulhati, Manoj Datta,, Mc Graw Hill Education (I), Private Limited, Delhi, 18<sup>th</sup> Edition, 2014.</li> <li>Relevant Indian Standard codes</li> </ol>
E-resources and other digital material	nptel.ac.in/courses/105108075/module1/Lecture01.pdf nptel.ac.in/courses/105108075/module6/Lecture18.pdf nptel.ac.in/syllabus/105104034/ nptel.ac.in/courses/105108075/module1/Lecture02.pdf
#### 14CE4802/5 TRAFFIC ENGINEERING

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3701 Transportation Engineering – I	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Conc	luct tra	ffic stu	dies an	d analy	ze traf	fic data	l				
	CO2	Estin	Estimate traffic characteristics of traffic stream										
	CO3	Determine the capacity of highways											
	CO 4	Desi	Design traffic signal systems										
Contribution of Course Outcomes towards		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	H	Н			Н							
(L – Low, M - Medium, H – High)	CO2	H	Н			Н							
	CO3	H	H			Н							
	CO4	H		н		н							
	UNIT-I												
Course Content	<b>1. TRAFFIC CHARACTERISTICS MEASUREMENT AND ANALYSIS</b> Basic traffic Characteristics - Speed, Volume and Concentration. Relationship between Flow, Speed and Concentration. Traffic Measurement and Analysis - Volume Studies - Objectives, Methods; Speed studies – Objectives, Definition of Spot Speed, time mean speed and space mean speed; Methods of conducting speed studies; Presentation of speed study data; Head ways and Gaps; Critical Gap; Gap acceptance studies.												
	UNIT-II												
	<b>2. HIGHWAY CAPACITY AND LEVEL OF SERVICE</b> Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, Multilane highways and free ways.												
	<b>3. PARK</b> Types of studies a Questionr accumula	<b>3. PARKING ANALYSIS</b> Fypes of parking facilities – On-street parking and Off-street Parking facilities; Parking studies and analysis- Parking Inventory Study, Parking Usage Study By Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Index, Parking Volume											
	UNIT-III												

	<b>4. TRAFFIC SAFETY</b> Traffic Safety -Accident studies and analysis; Causes of accidents - The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents.
	<b>5. TRAFFIC SIGNALS</b> Traffic Signals –Types of Signals; Principles of Phasing; Timing Diagram; Design of Isolated Traffic Signal by Webster method, Warrants for signalization. Signal Coordination - Signal Coordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.
	UNIT-IV
	<b>6. TRAFFIC AND ENVIRONMENT</b> Detrimental effects of Traffic on Environment, Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic. Sustainable Transportation: Sustainable modes, Transit Oriented Development, ITS based benefits for Environment.
Text books and Reference	Text Books
Text books and Reference books	<ul> <li>Text Books</li> <li>1. Kadiyali, L.R., "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2006.</li> <li>2. Papacostas, C. S. (1987), Fundamentals of Transportation Engineering, Prentice-Hall, India</li> </ul>
Text books and Reference books	<ul> <li>Text Books</li> <li>1. Kadiyali, L.R., "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2006.</li> <li>2. Papacostas, C. S. (1987), Fundamentals of Transportation Engineering, Prentice-Hall, India</li> <li>Reference Books</li> </ul>
Text books and Reference books	<ul> <li>Text Books</li> <li>1. Kadiyali, L.R., "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2006.</li> <li>2. Papacostas, C. S. (1987), Fundamentals of Transportation Engineering, Prentice-Hall, India</li> <li>Reference Books</li> <li>1. Transportation Engineering - An Introduction - C.Jotin Khisty, Prentice Hall Publication, 2003</li> <li>2. Highway Conseity Manual (2000) Transportation Research Board, USA</li> </ul>
Text books and Reference books	<ul> <li>Text Books</li> <li>1. Kadiyali, L.R., "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2006.</li> <li>2. Papacostas, C. S. (1987), Fundamentals of Transportation Engineering, Prentice-Hall, India</li> <li>Reference Books</li> <li>1. Transportation Engineering - An Introduction - C.Jotin Khisty, Prentice Hall Publication, 2003</li> <li>2.Highway Capacity Manual (2000), Transportation Research Board, USA</li> </ul>
Text books and Reference books	Text Books         1. Kadiyali, L.R., "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2006.         2. Papacostas, C. S. (1987), Fundamentals of Transportation Engineering, Prentice-Hall, India         Reference Books         1. Transportation Engineering - An Introduction - C.Jotin Khisty, Prentice Hall Publication, 2003         2.Highway Capacity Manual (2000), Transportation Research Board, USA         NPTEL :         http://nptel.ac.in/syllabus/syllabus.php?subjectId=105101008

#### 14CE4802/6 IRRIGATION AND HYDRAULIC STRUCTURES - DESIGN

<b>Course Category:</b>	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:	14CE3602 – Water Resources Engineering – II 14CE3406Hydraulics and Hydraulic Machines	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes		Upon	Upon successful completion of the course, the student will be able to										
	CO 1	desig	n and dr	aw Sur	plus We	ir and	Vertical	drop we	eir				
	CO2	desig	esign and draw Direct Sluice and Canal drop										
	CO3	desig	sign and draw Canal Cross Regulator.										
	CO 4	desig	sign and draw Syphon Aqueduct-Type-III										
		PO 1	D         PO 2         PO 3         PO 4         PO 5         PO 6         PO 7         PO 8         PO 9         PO 10								PO 11	PO 12	
Contribution of Course Outcomes	CO1	Н		Н		Н							
towards achievement of	CO2	Н		Н		Н							
Program Outcomes	CO3	Н		Н		Н							
(L – Low, M - Medium, H – High)	CO4	Н		Н		Н							
Course Content			SECTION-A										
		DESI	GN & 1	DRAW	ING OF	THE I	FOLLO	WING					
			<ol> <li>Surplus weir.</li> <li>Canal drop – Notch type.</li> <li>Canal cross regulator.</li> </ol>										
							SECTI	ON-B					
		DES.	IGN &	DRAV	VING (	OF TH	E FOL	LOWI	NG				
			<ol> <li>Direct sluice.</li> <li>Vertical drop weir.</li> <li>Syphon Aqueduct – Type-III</li> </ol>										
		NOT	E										

	Two questions of 35 marks each will be given from each section out of which one is to be answered.
Text books and Reference books	<ul> <li>Text Book:         <ol> <li>Design of Minor Irrigation and Canal Structures by C. Satyanarayana Murthy; Wiley Eastern Ltd., New Delhi.2006</li> <li>Irrigation Engineering and Hydraulic structures by S.K.Garg ; Khanna Publishers New Delhi, 19<sup>th</sup> Edition, 2014</li> </ol> </li> <li>Reference Book:         <ol> <li>Irrigation and water power engineering by Dr.B.C.Punmia, Dr. Pandey B.B.Lal, Ashok Kumar Jain, Arun Kumar Jain, 16<sup>th</sup> Edition, 2016-Lakshmi Publications, New Delhi.</li> </ol> </li> </ul>
E-resources and other digital material	nptel.ac.in/syllabus/syllabus_pdf/105105040.pdf <u>www.nptel.ac.in/syllabus/syllabus.php?subjectId=10510504</u> nptel.ac.in/courses/105105110/pdf/m4l02.pdf

# 14CE4803/1 GREEN BUILDINGS AND SUSTAINABILITY 14CE2505/5 GREEN BUILDINGS AND SUSTAINABILITY

<b>Course Category:</b>	ProgrammeElective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	Basic civil engineering	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	On successful completion of the course, the student will be able												
	CO1	reco	gnize v	what is	a gree	en buil	ding a	nd gree	en buil	lding n	nateria	ls.	
	CO2	diffe	rentiat	e diffe	erent ra	ting ag	gencie	s and f	eature	s of gr	een bu	ildings	5.
	CO3	reco	gnize s	sources	s of ca	rbon e	missio	ns and	its im	pact or	ו clima	ite.	
	CO4	plan	plan land use confirming to zonal regulations.										
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)	CO1	L					Μ		Н				
	CO2						Μ		Н		H		
	CO3	H					M		Н				
	CO4			H		Μ	Μ		H				
Course Content	UNIT I INTROE What is C Buildings Requisite Green Bu UNIT II GREEN Indian Gr Experience Residenti Benefits: Resource Approach	UNIT I INTRODUCTION What is Green Building, Why to go for Green Building, Benefits of Green Buildings, Green Building Materials and Equipment in India, What are key Requisites for Constructing a Green Building, Important Sustainable features for Green Building UNIT II GREEN BUILDING CONCEPTS AND PRACTICES Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Bating System and Energy Efficiency							r nd ing				

	UNIT III
	SUSTAINABILITY
	Introduction, Human development index, Sustainable development and social ethics, definitions of sustainability, populations and consumptions.
	THE CARBON CYCLE AND ENERGY BALANCES
	Introduction,Climate science history, carbon sources and emissions, The carbon cycle, carbon flow pathways, and repositories, Global energy balance, Global energy balance and temperature model, Greenhouse gases and Effects, Climate change projections and impacts
	UNIT IV
	SUSTAINABILITY AND BUILT ENVIRONMENT
	Introduction, Land use and land cover change, Land use planning and its role in sustainable development-Zoning and land use planning, smart growth, Environmentally sensitive design- low impact development, green infrastructure and conservation design, Green buildings and land use planning, Energy use and buildings
Text books and Reference books	<ul> <li>Text Books <ol> <li>Standard for the Design of High-Performance Green Buildings by ASHRAE</li> <li>Engineering Applications in Sustainable Design and Development By Bradley</li> <li>A.Striebig, Adebayo A.Ogundipe and Maria Papadakis. First edition, 2016,</li> <li>CENGAGE Learning.</li> </ol></li></ul>
	<ul> <li><b>Reference Books</b></li> <li>1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.</li> <li>2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.</li> </ul>
E-resources and other digital material	IGBC and GRIHA websites.

## 14CE4803/2 REPAIR AND REHABILITATION OF STRUCTURES

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3304 Concrete technology	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon suc	Upon successful completion of the course, the student will be able to											
	CO1	CO1 identify the causes for deterioration of structures and assessment of damage											
	CO2	apply and	apply the methods of diagnosis for the damage by semi destructive and non-destructive tests										
	CO3	knov struc	know the effect of environment and natural hazards on civil structures										
	CO 4	acqu	acquire the knowledge of various retrofitting techniques and repairs										
Contribution of Course Outcomes towards		<b>PO</b> 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	PO 9	PO 10	PO 11	PO 12
Program Outcomes	CO1	Μ	Μ	Μ			Μ		H			H	
(L – Low, M - Medium,	CO2	Μ	Μ	Μ			Μ		Н			H	
H – High)	CO3	Μ	Μ	Μ			Μ		H			H	
	CO4	M	M	M			M		H			Н	
Course Content	UNIT – I 1. Intr reh syn erro mo 2. asso UNIT – I Diagnosi 3. SEMI	Age a oducti abilitat ptoms ors, coi vemen Dam Visua essmer I s and J DEST	and pe on iion; ( s, prev rrosior t, shrir age as il exam t proc Assess RUCT	erform service Causes ention h, design hage, sessme ninatio edure	ance i e life of d for A gn erro tempe ent n, Act –pre a of Dist	n stru and istress ccider ors ,ero rature ion pla nd pos	syn in st ital loa osion, chang un, con t repai	drome tructur adings, freezir es, fire nmon o r evalu	Failure year, al me , chem ng and e, weat observa- nation sts	e of St mbers lical at thawin hering ations	ructur air, m and t tack, c ng, set	res nainten mecha constru tlemen	nance, nism, action at and
	C	ore tes	st, LO	K Tes	t, CA	PO Te	st,Nor	th Am	nerican	pull-	out te	est, pu	ll off

test, Figg's Air and water -permeability test

#### 3. NON DESTRUCTIVE TESTS

Compressive strength of concrete -rebound hammer test, Windsor probe test

Cracks, voids, changes in condition of concrete tests –ultra pulse velocity test, acoustic method, pulse echo method, radiography.

Deterioration of concrete -radar technique, infrared thermography test

Chloride test-Quntab test, carbonation test,

Corrosion test –open circuit and surface potential measuring techniques, electro chemical noise analysis, resistivity of concrete test

Strain gauges -vibrating type and contact type strain gauges

## UNIT – III

#### 4. ENVIRONMENTAL PROBLEMS AND NATURAL HAZARDS

. Effect of corrosive, chemical and marine environment – pollution and carbonation problems – durability structures

#### 5. **DAMAGE DUE TO EARTHQUAKE**

Strengthening of buildings – provisions of BIS 1893 and 4326.

#### UNIT - IV

#### 6. MODERN TECHNIQUES OF SEISMIC RETROFITTING

Introduction,

Global level and local level and Local level retrofitting techniques

#### 8. REPAIR MATERIALS

Epoxy resins, epoxym ortor, quick-setting cement, gypsum cement mortar, mechanical anchors,

#### 9. REPAIR METHODS

Crack Repair techniques, stitching, blanketing, jacketing and types, shotcrete, guniting, grouting, pressure injection of epoxy.

Text books and Reference books	<ul> <li>Text Books:</li> <li>1. CPWD Hand book on Repair and Rehabilitation of RCC Buildings, January 2008</li> <li>2. Concrte technology by A.R.Santhakumar,Oxford university press, 1<sup>st</sup> Edition, 2006</li> </ul>
	Reference Books:
	<ol> <li>Repair of concrete structure S.C.Edwards and J.D.N. Shaw and R.T.Allen 2<sup>nd</sup> Edition January 1993, Springer-Science+Business Media, B.V.</li> <li>Dovkaminetzky, Design and Construction Failures, Galgotia Publications, New Delhi, 2001</li> <li>Jacob Feld and Kenneth L Carper, Structural Failures, Wiely Europe,1998</li> </ol>
E-resources and other digital material	http://nptel.ac.in/courses/114106035/38 https:freevedeos.com/courses/3489/oceanstructures and materials

# 14CE4803/3 REMOTE SENSING AND GIS 14CE2505/6 REMOTE SENSING AND GIS

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3401: Surveying,	<b>Continuous Evaluation:</b>	30
	14CE3303: Engineering Geology.	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon suc	Upon successful completion of the course, the student will be able to:											
	CO1	CO1 apply the recent advances satellite based remote sensing and GIS technology in various fields of Civil engineering						GIS					
	CO2	CO2 evaluate the opportunities and available methods for integrating rem sensing and GIS in various civil engineering applications					emote						
	CO3	study	y large	scale	maps	using s	satellit	e imag	eries.				
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	PO 4	<b>PO</b> 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	Μ		Μ	Μ							Н	
(L – Low, M - Medium,	CO2	Μ		H	Μ	Н					Μ	Н	
H – High)	CO3	Μ			M							Н	
Course Content	Intra from the Absorption radiation; and Platfo Basic ele Processin classifica <b>UNIT-II</b> Introducti Forestry: studies: ' wastelance Applicati	<ol> <li>I. If oduction sun; on, transformer, transfo</li></ol>	REMC on to The e unsmis ilar an Satelli of ima e-Proc REMC and use nd wa extent trict le Remote	DTE Si remote lectror sion a d diffe tes: Ty age int essing DTE S e and I ter m and vel pla e Sensi	ENSIN e sens nagner and re use sur ypes o erpret – ima SENS land ce apping distribunning ing in t	NG ing; N tic spe eflection f data ation - ge enh ING ge enh ING cover m g: Floo bution : Disa Civil E	Vecessi ectrum on; A Multi produ- visua ancen A <b>PPI</b> appin od pla of wa ster m Engine	ity and ; Atm tmosp i conce cts – 7 al inter nent ter <b>LICA</b> g: urba ain ma astelan anager ering;	d impo ospher heric ept of f Types o pretati chniqu <b>TION</b> an grov apping ds in nent:	ortance ric eff windo Remot of im on key es – m S wth stu : Hyd India;	e; Rad ects o ows; I e Sens age int ys - D nultispo udies: ro mo Deve	iant e n radi 3lack sing: S terpret igital l ectral i ectral i lopme	nergy ation; body ensor ation- image image image

	UNIT – III 3. GEOGRAPHICAL INFORMATION SYSTEM Introduction – Maps – Definitions – Map projections – types of map projections – Maps analysis – GIS definition and terminology – basic components of GIS – standard GIS software's – Data types – Spatial and Non Spatial (attribute) data – measurement scales – Data Base Management system (DBMS): definition - DTM ,
	UNIT-IV
	4. APPLICATIONS OF GIS
	Introduction, Problem Identification; GIS for Site Suitability in Urban Planning – Road Accident Analysis – Irrigation water management – Tourism Information System – Worldwide Earth quake Information System- Drainage problem in Tea Plantation Area- Knowledge Based System for Military Use. GIS – T; Application of GIS in Civil Engineering.
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Remote Sensing &amp; Geographical Information Systems by M.Anji Reddy, BPS Publications-Hyderabad.(Third Edison, Year 2013)</li> <li>2. Remote Sensing &amp; GIS by BasudebBhatta, Oxford University Press. (Edition :Second, 2011)</li> </ul>
	<ul> <li>Reference Books:</li> <li>1. Remote sensing and Image interpretation by TM Lillesand and RW Kiefer; John willey and sons. (Edition :Seventh ,2016)</li> <li>2. Remote sensing and Geographical information System by AM Chandra &amp; SK Ghosh; Narosa Publishing House.</li> </ul>
E-resources and other digital material	NPTEL : <a href="https://www.youtube.com/watch?v=Yy-8e3sCr0U">https://www.youtube.com/watch?v=Yy-8e3sCr0U</a> <a href="https://nptel.ac.in/courses/105108077/">https://nptel.ac.in/courses/105108077/</a> <a href="https://www.youtube.com/watch?v=cn5CWu_zt_s">https://www.youtube.com/watch?v=cn5CWu_zt_s</a>

## 14CE4803/5 ARCHITECTURE AND TOWN PLANNING

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon suc	Upon successful completion of the course, the student will be able to:											
	CO1	D1 attain knowledge of architectural history and theory.											
	CO2	appra	aise ba	sics of	Land	scape l	Design	n and H	Iousing	g scen	arios.		
	CO3	appra of to	aise th wn pla	e Cor anning	cepts	and th	eories	of urb	an des	sign ar	nd basi	c prine	ciples
	CO4	empl plant	oy sig ning fo	gnifica or diffe	nt tech rent u	nnique rban in	s used Ifrastru	l in dr	afting system	develo ns.	opmen	t plan	s and
Contribution of Course Outcomes towards		PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
achievement of Program Outcomes	CO1	Μ			Μ			Μ					Μ
(L – Low, M - Medium,	CO2	Μ		Н	Н					Μ		H	H
H – High)	CO3	Μ	Μ	Μ	Н				H			Н	
	CO4	M	M		H							M	
Course Content	UNIT-I History of Indian – I Mughal µ periods co Principles Environ Compone efficient 1 and styles	<ul> <li>UNIT-I</li> <li>History of Architecture: Indian – Indus valley, Vedic, Buddhist, Indo-Aryan, Dravidian and Mughal periods: European – Egyptian, Greek, Roman, medieval and renaissance periods construction and Architectural styles; vernacular and traditional architecture. Principles of Architecture.</li> <li>Environmental Studies in Building Science: Components of Ecosystem; ecological principles concerning environment; energy efficient building design; thermal comfort; solar architecture; principles of lighting and styles for illumination; basic principles of architectural acoustics.</li> </ul>											
	UNIT-II Landscap Principles landscape Housing: Concept	<b>pe Desi</b> s of la e eleme of ho	<b>gn:</b> indsca nts and using;	pe des d mate neigh	sign a rials. 1borho	und sit	te plan	nning;	histor planni	ry of ing pr	landsc	cape s es; ho	tyles; busing

	typology; housing infrastructure; housing policies, finance and management; housing programs in India;
	UNIT-III Urban Design Concepts and theories of urban design; Urban design interventions for sustainable development and transportation; Historical and modern examples of urban design; Public spaces, spatial qualities and Sense of Place; Elements of urban built environment – urban form, spaces, structure, pattern, etc; Urban renewal and conservation; Site planning; Landscape design;.
	<b>City planning:</b> Evolution of cities; principles of city planning; planning regulations, Development controls – FAR, densities and building byelaws; sustainable development.
	<b>UNIT-IV</b> <b>Techniques of Planning:</b> Planning survey techniques; preparation of development plans; site planning principles and design; application of G.I.S and remote sensing techniques in urban and regional planning;
	<b>Urban Infrastructure, Services and Amenities</b> : Basic understanding of sustainable Development, green infrastructure; urban rainwater harvesting; power supply and communication systems guidelines;
Text books and	Text Books:
Reference books	
	1. Percy Brown, 'Indian Architecture (Buddhist and Hindu period)', Taraporevala and sons, Bombay, 1983
	<ol> <li>Satish Grover, The Architecture of India (Buddhist and Hindu period), Vikas Publishing House, New Brown Percy, Indian Architecture (Islamic Period) - Taraporevala and Sons, Bombay, 1983.</li> </ol>
	3. Michael Laurie, an Introduction to Landscape Architecture, Elsevier, 1986.
	4. Text book of Town Planning, A.Bandopadhyay, Books and Allied, Calcutta 2000
	<ol> <li>Mohinder Singh and L.R. Kadiyali 'Crisis in road transport' 1989 Konark Publishers Pvt. Ltd., New Delhi</li> </ol>
	Reference Books:
	<ol> <li>M.Evans – Housing, Climate &amp; Comfort, Architectural Press, London, 1980.</li> <li>Charangith shah, Water supply and sanitary engineering, Galgotia publishers.</li> <li>Dr.V. Narasimhan – An introduction to Building Physics- Kabeer printing works, Chennai -5</li> </ol>
	<ul> <li>4. L.Suri, Acoustics Design and Practice, Asia Publishing House, New York, 1963</li> <li>5. John Ratcliffe, An Introduction to Town and Country Planning, Hutchinson 1981</li> <li>6. Babur Mumtaz and Patweikly, Urban Housing Strategies, Pitman Publishing, London, 1976.</li> </ul>
	<ul> <li>7. Sinha, V.C. and Acharia, E. Elements of Demography 1984 Allied Pub., Delhi</li> <li>8. Luigi Fusco Girard and Peter Nijkamp (editors) Cultural Tourism and Sustainable</li> <li>Local Development 2009 Ashgate, Burlington</li> </ul>

	<ul> <li>9. Rakodi, C. and Llyod-Jones, T. Urban Livelihoods: A PeopleCentered Approach to Reducing Poverty. 2002 Earthscan, London</li> <li>10. S.K Dash Climate change: an Indian perspective, New Delhi 2007 Cambridge University Press.</li> </ul>
E-Learning Resources	nptel.ac.in/downloads/105106058 nptel.ac.in/courses/105107067 www.pipsc.ca/portal/page/portal/website/memberservices/representation//ar.en.pdf

# 14CE4803/6 CONSTRUCTION PLANNING AND MANAGEMENT

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14CE3403 – Building Materials &	<b>Continuous Evaluation:</b>	30
	Building Construction	Semester end Evaluation:	70
	14CE3703 – Estimation, Costing &	Total Marks:	100
	Valuation		

Course outcomes	Upon suc	Upon successful completion of the course, the student will be able to											
	CO1	attaiı proje	n knov ects	wledge	e on p	lannin	g and	sched	uling	of va	rious o	constru	iction
	CO2	solve	PER	Γ and <b>(</b>	CPM n	etworl	KS						
	CO3	have	have a better idea upon utilization of resources in construction										
	CO4 acquire knowledge on the concepts of quality control and management				and s	safety							
		PO 1	<b>PO</b> 2	PO 3	РО 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12
Contribution of Course Outcomes towards	CO1	Μ		Μ	Μ		Μ						H
achievement of Program Outcomes	CO2	Μ		Μ		Μ						Μ	H
(I – I ow M - Medium	CO3	Μ			Μ		Μ						H
(L - High)	CO4			Μ	Μ	Μ	Μ		Μ				H
Course Content	UNIT-I			-									
	1. I	1. INTRODUCTION:				oiect							

Classification of construction works; Stages of construction; Main causes of project failure; Objectives of construction management; Functions of construction management

#### 2. PLANNING AND SCHEDULING

Steps involved in planning; Objectives; Principles; Advantages; Limitations; Stages of planning; Scheduling, Preparation of construction schedules; Methods of scheduling; Bar charts; Mile stone charts; Controlling; Job layout; Factors affecting job layout; Project work break down.

#### UNIT-II

#### 3. PROJECT MANAGEMENT THROUGH NETWORKS

Objectives of network techniques; Fundamentals of network analysis; Events; Activities; Dummies; Types of networks; Choice of network type; Advantages of network techniques over conventional techniques.

## 4. PROGRAM EVALUATION AND REVIEW TECHNIQUE (PERT):

Introduction; Time estimates; Earliest expected time; Latest allowable occurrence time; Slack; Critical path; Probability of completion time for a project.

## 5. CRITICAL PATH METHOD (CPM):

Introduction; Difference between CPM and PERT; Earliest event time; Latest event time; Activity time; Float; Critical activities and critical path.

## 6. COST CONTROL:

Direct cost; Indirect cost; Total project cost; Optimization of cost through networks; Steps involved in optimization of cost.

#### UNIT-III

## 7. RESOURCE MANAGEMENT (MANPOWER):

Introduction; Resource smoothing; Resource levelling; Establishing workers productivity.

## 8. RESOURCE MANAGEMENT (MACHINERY):

Advantages and disadvantages of using equipment; Selection of equipment– Task consideration, Cost consideration; Factors affecting the selection; Factors affecting cost of owning and operating the equipment; Equipment maintenance.

## 9. CONSTRUCTION EQUIPMENT

Classification of construction equipment; Earth moving equipment; Excavation equipment; Hauling equipment, Earth compaction equipment; Hoisting equipment; Concreting plant and equipment; Pile driving equipment; Tunneling and rock drilling equipment; Paving equipment **UNIT-IV** 

#### **10. RESOURCE MANAGEMENT (MATERIALS):**

Objectives of material management; Costs; Functions of material management department; ABC classification of materials; Inventory of materials; Material procurement; Stores management.

## **11. QUALITY CONTROL:**

Importance of quality; Elements of quality; Organization for quality control; Quality assurance techniques; Documentation; Quality control circles; Total quality management; ISO – 9000.

#### **12. SAFETY MANAGEMENT:**

Causes of accidents; Importance of safety; Role of various parties in safety

	<ol> <li>Fundamentals of FERT/CFM and Froject Management by S. R. Bhattacharjee; Khanna Publishers, Nai Sarak; Delhi.</li> <li>PERT &amp; CPM Principles and applications by L. S. Srinath; Affiliated East West Press</li> </ol>
	<ol> <li>Construction Management &amp; Planning by B. Sengupta &amp; H. Guha; Tata Mc Graw – Hill Publishing Co. Ltd., New Delhi.</li> <li>Fundamentals of PERT/CPM and Project Management by S. K.</li> </ol>
	Reference Books:
	<ol> <li>Construction Planning, Equipment &amp; Methods by Peurifoy R. L.; Mc Graw – Hill International Book Company.</li> </ol>
Reference books	<ol> <li>Construction Engineering and Management by Dr. S. Seetharaman; Umesh Publications, Nai Sarark, Delhi.</li> </ol>
	management; Safety measures to be adopted in work sites Approaches to improve safety in construction; Safety benefits to employers, employees and customers; Safety budgeting; Safety equipment; Prevention of fires in construction industries;

#### 14CE 3851 – COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB-II

<b>Course Category:</b>	Programme Core	Credits:	2
<b>Course Type:</b>	Practical	Practice:	0-0-3
Prerequisites	14CE3603 Design of Concrete Structures II 14CE3704 Design of Steel Structures	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	On suce	In successful completion of the course, the student will be able to:					
	CO1	analyze and design themselves various structural elements by using STAAD.Pro					
	CO2	estimation of quantities and prepare rate analysis for various works in construction of a building using Spread Sheets.					
<b>Course Content</b>	PART-	PART-A					
	Analys	is of the following concrete & steel structural elements using STAAD. Pro Software.					
	1. Desig	gn of continuous beam.					
	2. Desig	2. Design of plane frame					
	3. Desig	3. Design of space frame.					
	4. Desig	Design of G+4 Residential building: Creating model from the given drawing, Assigning					
	Loads a	nd Load Combinations					
	5. Desig	gn of G+4 Residential building: Preparation of Design Documents and detail drawing					
	6. Desig	gn of retaining wall.					
	7. Desig	gn of Roof Truss					
	PART	<u>– B</u>					
	Estimat	te & Working out rates using spread sheets for the different items in a single story					
	building	5.					
	Demons	stration of software's ETABS, SAP, CYPE					

# 14CE5852 PROJECT

Lecture:	0	Internal Assessment:	30 Marks
Tutorial :	0	Semester End Examination:	70 Marks
Practical :	9 hrs/Week	Credits:	10

Objectives:	<ul> <li>Analyze real world problems</li> <li>Learns to implement design methodologies based on the requirements</li> <li>Learns latest and advanced techniques in problem solving</li> </ul>		
Learning Outcomes:	<ul> <li>Upon completion of the course the students will be familiar with:</li> <li>Identification of real world problems</li> <li>Awareness of design methodologies &amp; its implementation</li> <li>Advanced programming techniques</li> <li>Technical report writing</li> </ul>		
	Continuous Evaluation:		
	Day to day assessment $= 10$ Two Seminars (10+10) $= 20$ Total $= 30$		
	Method of Evaluation(Semester end): Report = 30 Presentation = 20 Project demonstration/Execution= 20 ===== Total = 70		