

**VELAGAPUDI RAMAKRISHNA** **12.05.2019**  
**SIDDHARTHA ENGINEERING COLLEGE**  
**SCHEME OF INSTRUCTION FOR FOUR-YEAR UG PROGRAMME [VR17]**  
**CIVIL ENGINEERING**

**SEMESTER I**

**Contact Hours: 26**

S.No	Course Code	Title of the Course	L	T	P	Credits
1.	17MA1101	Matrices And Differential Calculus	3	1	0	4
2.	17CH1102	Engineering Chemistry	3	0	0	3
3.	17CS1103	Problem Solving Methods	2	1	0	3
4.	17ME1104A 17ME1104B	Engineering Mechanics – I(ME and CE) Mechanics for Engineers (EEE)	3	0	0	3
5.	17ME1105	Engineering Graphics	2	0	4	4
6.	17CH1151	Engineering Chemistry Laboratory	0	0	3	1.5
7.	17CS1152	Computing and Peripherals Laboratory	0	0	2	1
		<b>Total</b>	<b>13</b>	<b>2</b>	<b>9</b>	<b>19.5</b>
8.	17MC1106B	Professional Ethics& Human Values	2	0	0	-
9.	17MC1107	Induction Program				-

**SEMESTER II**

**Contact Hours: 27**

S.No	Course Code	Course	L	T	P	Credits
1.	17MA1201	Laplace Transforms And Integral Calculus	3	1	0	4
2.	17PH1202	Engineering Physics	3	0	0	3
3.	17CS1203	Programming in C	3	0	0	3
4.	17ME1204 17EE1204	Engineering Mechanics – II(ME and CE) Network Analysis-1 (EEE)	3	0	0	3
5.	17HS1205	Technical English and Communication Skills	2	0	2	3
6.	17PH1251	Engineering Physics Laboratory	0	0	3	1.5
7.	17CS1252	Computer Programming Laboratory	0	0	3	1.5
8.	17ME1253	Basic Workshop	0	0	3	1.5
		<b>Total</b>	<b>14</b>	<b>1</b>	<b>11</b>	<b>20.5</b>
9.	17MC1206A	Technology and Society	1	0	0	-

**L – Lecture, T – Tutorial, P – Practical, C – Credits**

**SEMESTER III**

**CONTACT HOURS: 28**

S.No	Course Code	Course	Subject	L	T	P	Credits
1	17MA1301A	Mathematics III	Complex Analysis and Numerical Methods	3	1	0	4
2	17CE3302	Programme Core	Introduction to Mechanics of Solids	3	1	0	4
3	17CE3303	Programme Core	Fluid Mechanics	3	1	0	4
4	17CE3304	Programme Core	Surveying&Geomatics	4	0	0	4
5	17CE3305	Programme Core	Engineering Geology	2	0	0	2
6	17TP1306	Soft Skills 1	Logic and Reasoning	0	0	2	1
8	17CE3351	LABORATORY 1	Surveying Laboratory	0	0	2	1
9	17CE3352	LABORATORY 2	SM Laboratory	0	0	2	1

	17CE3353	LABORATORY 3	Engineering Geology Laboratory	0	0	2	1
10	17MC1307B	HS	Indian Constitution	2	0	0	
				Total Credits			22

#### SEMESTER IV

CONTACT HOURS:27

S.No	Course Code	Course	Subject	L	T	P	Credits
1	17CE3401	Programme Core	Building materials and construction	3	0	0	3
2	17CE3402	Programme Core	Concrete technology	3	0	2	4
3	17CE3403	Programme Core	Mechanics of Materials	3	1	0	4
4	17CE3404	Programme Core	Hydraulics and Hydraulics machines	3	1	0	4
5	17TP1405	Soft Skills 2	English for Professionals	0	0	2	1
6	17HS2406	Humanities Elective		1	0	0	1
7	17CE3451	LABORATORY 1	Fluid Mechanics and Hydraulic Machines Lab	0	0	2	1
8	17CE3452	LABORATORY 2	Building Planning and Design Lab	0	0	2	1
9	17HS1453	LABORATORY 3	Communication Skills Laboratory	0	0	2	1
10	17MC1407A	HS	Environmental Studies	2	0	0	
				Total Credits			20

#### List of Humanities Electives

A	Yoga & Meditation	G	Film Appreciation
B	Music	H	Sanskrit Bhasa
C	Human Rights and Legislative Procedures	I	Foreign Languages (German/French)
D	Philosophy	J	Law for Engineers
E	Development of societies	K	Psychology
F	Visual Communication		

#### SEMESTER V

CONTACT HOURS: 25

S.No	Course Code	Course	Subject	L	T	P	Credits
1	17CE3501	Programme Core	Water Resources Engineering	3	0	0	3
2	17CE3502	Programme Core	Environmental Engineering	3	0	0	3
3	17CE3503	Programme Core	Structural Analysis	3	0	0	3
4	17CE2504	Open Elective -I		3	0	0	3
	17CE2504 A		Geospatial Technologies				
	17CE2504 B		Quality Control and Quality Assurance				
5	17CE2505	Open Elective –II		3	0	0	3

		(Inter Disciplinary Elective)				
	17CE2505 A		Air and Noise Pollution			
	17CE2505 B		Environmental Impact Studies			
6	17CE2506	Open Elective –III (Self Learning Elective Course)		0	0	0 2
	17CE2506/A		Green buildings and sustainability			
	17CE2506/B		Advanced Construction Materials			
7	17TP1507	HS	Personality Development & Campus Recruitment Training	0	0	2 1
8	17CE3508	Programme core	Geotechnical Engineering	2	0	2 3
9	17CE3509	Programme Core	Design of Concrete Structures	2	0	0 2
10	17CE3551	LABORATORY 1	Environmental Engineering Lab	0	0	2 1
				Total Credits		24

\*Students can opt any one of the self-learning courses prescribed by the Department. Students register and complete the opted course in approved MOOCS platform on or before the Last Instruction Day of V semester. They have to submit the certificate before the Last Instruction Day of V semester

#### SEMESTER VI

**CONTACT HOURS: 29**

S.No	Course Code	Course	Subject	L	T	P	Credits
1	17CE3601	Programme Core	Design of Steel Structures	2	0	0	2
2	17CE3602	Programme Core	Transportation Engineering	3	0	2	4
3	17CE4603	Programme Elective -1		3	0	0	3
4	17HS1604	HS	Engineering Economics and Finance	2	0	0	2
5	17CE2605	Open Elective –IV		3	0	0	3
	17CE2605/A		Traffic Safety				
	17CE2605/B		Building Services Engineering				
6	17TP1606	HS	Quantitative Aptitude	0	0	2	1
7	17MC1607	HS	Biology for Engineers	2	0	0	0
8	17CE3608	Programme Core	Foundation Engineering	3	0	0	3
9	17CE3651	LABORATORY 1	Computer Applications in Civil Engg Lab-1	0	0	2	1

10	17CE3652	LABORATORY 2	Advanced Surveying Lab	0	0	2	1
11	17CE5653	Project work	Engineering Project for Community Services	0	1	2	2
				Total Credits			22

\* Students will go to the society (Villages/ Hospitals / Towns etc.,) to identify the problem and survey the literature for a feasible solution. The work will be carried out during summer vacation after IV Semester. The student is encouraged to take up real life problems leading to innovative model building

#### SEMESTER VII

**CONTACT HOURS: 23**

S.No	Course Code	Course	Subject	L	T	P	Credits
1	17CE3701	Programme Core	Construction Engineering and Management	3	0	0	3
2	17CE4702	Programme Elective -2		3	0	0	3
3	17CE4703	Programme Elective -3		3	0	0	3
4	17CE4704	Programme Elective -4		3	0	0	3
5	17CE4705	Programme Elective -5		3	0	0	3
6	17CE3706	Programme Core	Estimation, Costing and Valuation	2	0	0	2
8	17CE4751	LABORATORY 1	Computer Applications in Civil Engg Lab-II	0	0	2	1
9	17CE5752	Mini Project*	Design Project 1	0	0	4	2
10	17CE6753	A) Internship B) Industry Offered Course C) Global Professional Certification					2
				Total Credits			22

#### SEMESTER VIII

**CONTACT HOURS: 19**

S.No	Course Code	Course	Subject	L	T	P	Credits
1	17CE4801	Programme Elective -6		3	0	0	3
2	17CE2802	Open Elective –V*		3	0	0	3
	17CE2802/A		Water Quality Engineering				
	17CE2802/B		Appropriate Course will be offered based on Certificate Courses offered by NPTEL at that point of time				
3	17CE5851	Major Project**	Project work	0	5	8	9
Total				6	5	8	15

List of Open Electives

#### OPEN ELECTIVE-I (Open for All)

#### SEMESTER-V

17CE2504

- A) Geospatial Technologies
- B) Quality Control and Quality Assurance

### **OPEN ELECTIVE-II (Inter Disciplinary Elective)**

#### **SEMESTER-V**

17CE2505

- A) Air and Noise Pollution
- B) Environmental Impact Studies

### **OPEN ELECTIVE-III (Open for All- Self Learning Elective)**

#### **SEMESTER-V**

17CE2506

- A) Green Building and Sustainability
- B) Advanced Construction Materials

### **OPEN ELECTIVE-IV (Open for All)**

#### **SEMESTER-VI**

17CE2605

- A) Traffic Safety
- B) Building Services Engineering

### **OPEN ELECTIVE-V (Open for All, option for Self-Learning)**

#### **SEMESTER-VIII**

17CE2802

- A) Water Quality Engineering
- B) Appropriate Course will be offered based on Certificate Courses offered by NPTEL at that point of time

Sl.No	Specialization	Program Electives					
		Elective 1	Elective 2	Elective 3	Elective 4	Elective 5	Elective 6
1	<b>Structural Engineering</b>	Advanced structural analysis	Advanced Design of concrete structures	Advanced Design of steel structures	Design of prestressed concrete	Finite element analysis	Earthquake resistant design
2	<b>Geotechnical Engineering</b>		Soil dynamics and machine foundations		Environmental Geo-technology		Ground improvement techniques
3	<b>Environmental Engineering</b>	Advanced environmental engineering	Solid waste management	Industrial effluent treatment		Environmental impact assessment	Air pollution and control
4	<b>Transportation Engineering</b>	Airport planning and Design	Railway Engineering, Docks and Harbor Engineering	Pavement design and construction	Traffic Engineering	Highway safety	Urban transport planning

5	Hydrology & Water Resources Engineering	Irrigation structures			Open channel flow and river engineering		Ground water Hydrology
6	Miscellaneous	Remote sensing and GIS	Town planning and Architecture	Instrumentation and Sensor technology in Civil Engineering	Construction equipment and automation	Repair and rehabilitation of structures	
7				Forensics in Civil Engineering		Disaster preparedness and planning management	

**17MA1101**

**MATRICES AND DIFFERENTIAL CALCULUS**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	4
<b>Course Type:</b>	Theory	<b>Lecture -Tutorial-Practice:</b>	3 - 1 - 0
<b>Prerequisites:</b>	Fundamentals of Matrices, Fundamentals of Calculus, Integration, Differentiation.	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Determine Eigen values, Eigen vectors of a matrix.
<b>CO2</b>	Estimate Maxima and Minima of Multi Variable Functions
<b>CO3</b>	Solve the Linear differential equations with constant coefficients.
<b>CO4</b>	Solve the Linear differential equations with variable coefficients.

**Contribution of Course Outcomes towards achievement of Program Outcomes  
(L – Low, M - Medium, H – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	H			L	H						M			
<b>CO2</b>	H			L	H						M			
<b>CO3</b>	H			L	H						M			
<b>CO4</b>	H			L	H						M			

**COURSE CONTENT**

**UNIT I**

**Matrices:** Rank of a Matrix, Elementary transformations, Inverse of a Matrix (Gauss Jordan Method), Consistency of Linear System of Equations, Linear Transformations, Vectors, Eigen values, Properties of Eigen values, Finding Inverse and Powers of a Matrix by Cayley-Hamilton Theorem. Reduction to Diagonal form, Reduction of Quadratic form to Canonical form, Nature of a Quadratic form, Complex matrices.

**UNIT II**

**Differential Calculus:** Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's Theorem, Maclaurin's Series.

**Application:** Curvature, Radius of Curvature.

**Functions of two or more Variables:** Partial Derivatives, Change of Variables, Jacobians, Taylor's

Theorem for Function of two Variables, Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers.

### UNIT III

**Differential Equations of First Order:** Formation of a Differential Equation, Solution of a Differential Equation, Linear Equations, Bernoulli's Equation, Exact Differential Equations, Equations Reducible to Exact Equations.

**Applications:** Orthogonal Trajectories, Newton's Law of Cooling.

**Linear Differential Equations of Higher Order:** Definitions, Operator D, Rules for Finding the Complementary Function, Inverse Operator, Rules for finding Particular Integral, Working Procedure to Solve the Equation.

### UNIT IV

Linear Dependence of Solutions, Method of Variation of Parameters, Method of Undetermined Coefficients, Equations Reducible to Linear Equations with Constant Coefficients: Cauchy's Homogeneous Linear Equation, Legendre's Linear Equation, Simultaneous Linear Differential Equations with Constant Coefficients.

**Applications:** L-C-R Circuits.

### TEXT BOOKS

- [1] B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43<sup>rd</sup> Edition, 2014.

### REFERENCE BOOKS

- [1]. Pal Bhunia, Engineering Mathematics, Oxford University Press, 2015.  
[2]. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Edition, 2015  
[3]. B.V. Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1<sup>st</sup> Edition, 2007  
[4]. N.P. Bali, Dr. Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9<sup>th</sup> Edition, 2014.

### E-RESOURCES AND OTHER DIGITAL MATERIAL

- [1]. [www.nptel.videos.com/mathematics/](http://www.nptel.videos.com/mathematics/) (Math Lectures from MIT, Stanford, IIT'S)  
[2]. [nptel.ac.in/courses/122104017](http://nptel.ac.in/courses/122104017)  
[3]. [nptel.ac.in/courses/111105035](http://nptel.ac.in/courses/111105035)  
[4]. Engineering Mathematics Open Learning Project.  
[www.3.ul.ie/~mlc/support/Loughborough%20website/](http://www.3.ul.ie/~mlc/support/Loughborough%20website/)



**17CH1102**  
**ENGINEERING CHEMISTRY**

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

**COURSE OUTCOMES**

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

<b>CO1</b>	Analyze various water treatment methods and boiler troubles.
<b>CO2</b>	Apply the principles of spectroscopic techniques to analyse different materials and apply the knowledge of conventional fuels for their effective utilisation.
<b>CO3</b>	Apply the knowledge of working principles of conducting polymers, electrodes and batteries for their application in various technological fields.
<b>CO4</b>	Evaluate corrosion processes as well as protection methods.

**Contribution of Course Outcomes towards achievement of Program Outcomes (1-Low, 2-Medium, 3- High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
<b>CO1</b>		H												
<b>CO2</b>	M													
<b>CO3</b>														
<b>CO4</b>			M						H					

**COURSE CONTENT**

**UNIT I**

**Water technology-I:** WHO standards - Water treatment for drinking purpose - sedimentation, coagulation, filtration, disinfection by chlorination, breakpoint chlorination and its significance - Desalination of brackish water - principle and process of electrodialysis and reverse osmosis, advantages and disadvantages.

**Water technology-II:** Boiler troubles - scales-formation, disadvantages and internal conditioning methods - phosphate conditioning, calgon conditioning and sodium aluminate, caustic embrittlement- reasons, mechanism and its control, and boiler corrosion – causes and control.

**UNIT II**

**Spectroscopic Techniques and Applications:** Interaction of electromagnetic radiation with matter - Ultraviolet-visible spectroscopy: Frank-Condon principle, types of electronic transitions, Lambert-Beer's law – definition and numerical problems, problems on interpretation of UV-visible spectra of simple molecules of arenes, aldehydes and ketones. Infrared (IR) spectroscopy: Principle, types of vibrations, problems on interpretation of IR spectra of simple molecules of amines, alcohols, aldehydes and ketones.

**Fuel Technology:** Fuel-definition, calorific value- lower and higher calorific values, analysis of coal – proximate analysis and ultimate analysis, refining of petroleum, flue gas analysis by Orsat's apparatus, numericals based on calculation of air required for combustion

### UNIT III

**Conducting polymers:** Definition, examples, classification-intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped polyacetylene, doping of conducting polymers- mechanism of conduction of p-doped and n-doped polyacetylenes – applications of conducting polymers.

**Electrochemistry:** Construction and working of Calomel electrode, silver-silver chloride electrode and principle, construction and working of glass electrode, determination of pH using glass electrode - Chemistry of modern batteries - Li/SOCl<sub>2</sub> battery and Li<sub>x</sub>C/LiCoO<sub>2</sub> battery - construction, working and advantages, Chemistry of H<sub>2</sub>-O<sub>2</sub> fuel cell-advantages.

### UNIT IV

**Corrosion principles:** Introduction, definition, reason for corrosion, examples – electrochemical theory of corrosion, types of electrochemical corrosion - hydrogen evolution and oxygen absorption – corrosion due to dissimilar metals, galvanic series – differential aeration corrosion – pitting corrosion and concept of passivity.

**Corrosion control methods:** Cathodic protection- principle and types - impressed current method and sacrificial anode method, anodic protection-principle and method, corrosion inhibitors – types and mechanism of inhibition – principle, process and advantages of electroplating and electroless plating.

#### TEXT BOOKS

- [1] Shikha Agarwal, “Engineering Chemistry – Fundamentals and Applications”, Cambridge University Press, New Delhi, 1<sup>st</sup> edition (2015).

#### REFERENCE BOOKS:

- [1] Sunita Rattan , “A Textbook of Engineering Chemistry”, S.K. Kataria & Sons, New Delhi, First edition 2012.
- [2] P.C. Jain , “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) Limited, New Delhi, 15<sup>th</sup> edition.
- [3] B.S. Bahl, G. D. Tuli and Arun Bahl, “Essentials of Physical Chemistry”, S. Chand and Company Limited, New Delhi.
- [4] O. G. Palanna, “ Engineering Chemistry”, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
- [5] Y.Anjaneyulu, K. Chandrasekhar and Valli Manickam, Text book of Analytical Chemistry, , Pharma Book Syndicate, Hyderabad.
- [6] H. Kaur, Spectroscopy, I Edition, 2001, Pragati Prakashan, Meerut.

#### E-RESOURCES AND OTHER DIGITAL MATERIAL

- [1] <http://www.cip.ukcentre.com/steam.htm>
- [2] <http://corrosion-doctors.org/Modi/es/mod-basics.htm>
- [3] <http://nopr.niscair.res.in/bitstream/123456789/5475/1/JSIR%2063%289%29%20715-728.pdf>
- [4] [https://chem.libretexts.org/Core/Analytical\\_Chemistry/Electrochemistry/Basics\\_of\\_Electrochemistry](https://chem.libretexts.org/Core/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry)
- [5] <http://www.filtronics.com/blog/tertiary-treatment/stages-in-typical-municipal-water-treatment/>
- [6] <https://www.khanacademy.org/test-prep/mcat/physical-processes/infrared-and-ultraviolet-visible-spectroscopy/e/infrared-and-ultraviolet-visible-spectroscopy-questions>
- [7] NPTEL online course, "Analytical Chemistry", offered by MHRD and instructed by Prof. Debashis Ray of IIT Kharagpur.
- [8] NPTEL online course, "Corrosion Part-I" offered by MHRD and instructed by Prof. Kallol Mondal of IIT Kanpur

**17CS1103**  
**PROBLEM SOLVING METHODS**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture -Tutorial-Practice:</b>	2 -1- 0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Understand the Computer problem solving approaches, efficiency and analysis of algorithms
<b>CO2</b>	Apply the factoring methods to solve the given problem
<b>CO3</b>	Apply the array techniques to find the solution for the given problem
<b>CO4</b>	Solve the problems using MATLAB

**Contribution of Course Outcomes towards achievement of Program Outcomes  
(L – Low, M - Medium, H – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
<b>CO1</b>	H	M							L					
<b>CO2</b>	L		H											
<b>CO3</b>	L		H											
<b>CO4</b>	L	L							H					

**COURSE CONTENT**

**UNIT - I**

**Introduction to Computer Problem Solving:** Programs and Algorithms, characteristics of an algorithm, Requirements for solving problems by computer; Flowchart, pseudo-code  
**The Problem – Solving Aspect:** Problem definition phase, Getting started on a problem, Similarities among problems, Working backwards from the solution, General problem-solving strategies;  
**Top-Down design:** Breaking a problem into sub-problems, Construction of loops, Establishing initial conditions for loops, Finding the iterative construct, Termination of loops;

**The Efficiency of Algorithms:** Redundant Computations, Referencing array elements, Inefficiency due to late termination, Early detection of desired output conditions, Trading storage for efficiency gains;

**Analysis of Algorithms:** Computational complexity, The order notation, Worst and average case behavior.

## UNIT - II

**Fundamental Algorithms:** Problem, Algorithm Development, Algorithm Description - Exchanging values of two variables, Counting, Summation of a set of numbers, Factorial computation, Generation of Fibonacci sequence, Reversing the digits of an Integer. Using pseudo-codes and flowcharts to represent fundamental algorithms.

**Factoring Methods:** Finding the Square Root of a number: Smallest Divisor of an Integer, GCD of two Integers, Generating Prime numbers, Computing the Prime Factors of an Integer, Raising a Number to a Large Power, Pseudo random number generation, Computing  $n^{\text{th}}$  Fibonacci number.

## UNIT – III

**Array Techniques:** Introduction, Array Order Reversal, Array counting, Finding the maximum number in a set, Removal of duplicates from an ordered array, Partitioning an array, Finding The  $K^{\text{th}}$  Smallest Element.

**Merging, Sorting and Searching:** Sorting By Selection, Sorting By Exchange, Linear Search, Binary search;

## UNIT – IV

**Introduction to MATLAB:** MATLAB Environment, **Constants, Variables and Expressions:** Data types, Constants and Variables, Operators, Built-in Functions, **Vectors and Matrices:** Introduction, Scalars and Vectors, Matrix Manipulations, **Control Structures:** Loops, Branches.

**Input-Output Statements:** Reading/Storing File Data, **MATLAB Graphics:** Introduction, Two-Dimensional Plots.

## TEXT BOOKS

- [1] R.G. Dromey , “How to Solve it By Computer”, Prentice-Hall International Series in Computer Science,1982.
- [2] Bansal.R.K, Goel.A.K, Sharma.M.K, “MATLAB and its Applications in Engineering”, Pearson Education, 2012.

## REFERENCE BOOKS

- [1] Michael Schneider, Steven W. Weingart, David M. Perlman, “An Introduction to Programming and Problem Solving With Pascal”, John Wiley and Sons Inc ,1984.
- [2] David Gries, “The Science of Programming”, Springer Verlag, 1981.
- [3] ReemaThareja, “Computer Fundamentals and C Programming”, Oxford, 2012

## E-RESOURCES AND OTHER DIGITAL MATERIAL

MATLAB Getting Started Guide [http://www.mathworks.com/help/pdf\\_doc/matlab/getstart.pdf](http://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf)

**17ME1104A**  
**ENGINEERING MECHANICS-I**

<b>Course Category:</b>	Engineering Science	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture -Tutorial-Practice:</b>	3 - 0 - 0
<b>Prerequisites:</b>	Basic Mathematics, Physical Science	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Analyze coplanar concurrent forces
<b>CO2</b>	Analyze coplanar parallel forces and determine centroids for plane figures.
<b>CO3</b>	Analyze coplanar general case of force systems
<b>CO4</b>	Analyze spatial concurrent and parallel forces

**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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO1</b>	H				M									
<b>CO2</b>	H				M									
<b>CO3</b>	H				M									
<b>CO4</b>	H				M									

**COURSE CONTENT**

**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, Theorem of Varignon, Method of moments.

**UNIT II**

**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:**Introduction, Determination of centroids by integration method, Centroids of composite plane figures. Distributed forces in a plane.

**UNIT III**

**General Case of Forces in a Plane:** Composition of forces in a plane – Equilibrium of forces in a plane -

Plane Trusses: Method of joints

**Friction:** Introduction, Laws of dry friction. Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Frictional forces on wheel, Wedge friction.

#### **UNIT IV**

**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, Moment of a force, Component of a vector and moment about an axis, Equilibrium of concurrent and parallel forces in space.

#### **TEXT BOOKS**

- [1] S.Timoshenko, D.H.Young, J.V.Rao & Sukumar Pati, “Engineering Mechanics”, V<sup>th</sup> edition, Mc Graw Hill Education (India) Pvt Ltd, 2013 (For Concepts and symbolic Problems).
- [2] A.K.Tayal , “Engineering Mechanics Statics and dynamics”, Umesh Publications, XIII<sup>th</sup> edition, 2006 (For numerical Problems using S.I.System of Units).

#### **REFERENCE BOOKS**

- [1] Beer and Johnston, “Vector Mechanics for Engineers Statics and Dynamics”, Tata McGraw Hill, III<sup>rd</sup> edition, 2010.
- [2] SS Bhavikatti and KG Rajasekharappa, “Engineering Mechanics”, New Age International Private Limited, IV<sup>th</sup> Edition, 2012
- [3] K.Vijaya Kumar Reddy and J Suresh Kumar, “ Singer’s Engineering Mechanics Statics and Dynamics”, BS Publications, IIIrd Edition 2010.

#### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1] <http://emweb.unl.edu/>, Accessed On 15-06-2017

**17ME1105**  
**ENGINEERING GRAPHICS**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	4
		<b>Lecture-Tutorial –Practice:</b>	2-0-4
<b>Course Type:</b>	Theory & Practice	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
<b>Prerequisites:</b>		<b>Total Marks:</b>	100

**COURSE OUTCOMES:**

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

<b>CO1</b>	Understand the Scales, conics and Cycloidal curves.
<b>CO2</b>	Draw Orthographic projections of points, Lines, Planes and Solids
<b>CO3</b>	Understand Sectional views of Solids, Development of surfaces and their representation
<b>CO4</b>	Construct isometric scale, isometric projections ,isometric views and convert pictorial views to orthographic projections

**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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO1</b>	H			H							L			
<b>CO2</b>	M			H							M			
<b>CO3</b>	M			M							M			
<b>CO4</b>	L			H							M			

**COURSE CONTENT**

**UNIT – I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance

**Scales:** Construction of plain and diagonal Scales

**Conic Sections:** Construction of ellipse, parabola and hyperbola (Treatment is limited to Eccentricity or General method only)

**Engineering Curves:** Cycloidal curves - Cycloid, Epicycloid and Hypocycloid

**UNIT – II**

**Orthographic Projections:** Principles of Orthographic Projections –Projections of Points, Lines (Treatment is limited to First Angle Projection) and Projections of Plane regular geometric figures (Up to Plane Inclined to both of the Reference planes)

**UNIT – III**

**Projections of Solids:** Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions (Limited to Solid Inclined to one of the Reference planes)

**Sections of Solids:** Sections of solids such as Cubes, Prisms, Pyramids, Cylinders and Cones. True shapes of sections(Limited to the solids perpendicular to one of the Principal Planes)

**UNIT – IV**

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

**Cones**

**Isometric Projections:** Isometric Projection and conversion of isometric views into Orthographic Projections (Treatment is limited to simple objects only)

**Conventions Auto CAD:** Basic principles only (Internal assessment only)

**Text Books**

- [1] N.D. Bhatt & V.M. Panchal, “Elementary Engineering Drawing”, Charotar Publishing House, Anand. 49th Edition – 2006
- Basanth Agrawal & C M Agrawal,” Engineering Drawing”, McGraw Hill Education Private Limited, New Delhi

**Reference Books**

- [1] K. L. Narayana & P. Kannaiah, “Text Book on Engineering Drawing”, Scitech publications (India) Pvt. Ltd., Chennai, 2nd Edition - fifth reprint 2006
- [2] K. Venugopal, “Engineering Drawing and Graphics + Auto CAD”, New Age International, New Delhi
- [3] D M Kulkarni, AP Rastogi, AK Sarkar, “Engineering Graphics with Auto CAD”, PHI Learning Private Limited, Delhi Edition – 2013

**E-Resources and other digital material**

- [1] <http://www.youtube.com/watch?v=XCWJXrkWco>, Accessed On 01-06-2017.
- [2] <http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html#> isodrawing, Accessed On 01-06-2017.
- [3] <http://www.slideshare.net>, Accessed On 01-06-2017.
- [4] <http://edpstuff.blogspot.in>, Accessed On 01-06-2017.



**17CH1151**  
**ENGINEERING CHEMISTRY LABORATORY**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	1.5
<b>Course Type:</b>	Laboratory	<b>Lecture -Tutorial-Practice:</b>	0 - 0 - 3
<b>Prerequisites:</b>	Knowledge of chemistry practicals at intermediate level	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Analyze quality parameters of water samples from different sources
<b>CO2</b>	Perform quantitative analysis using instrumental methods.
<b>CO3</b>	Apply the knowledge of mechanism of corrosion inhibition, metallic coatings and photochemical reactions.

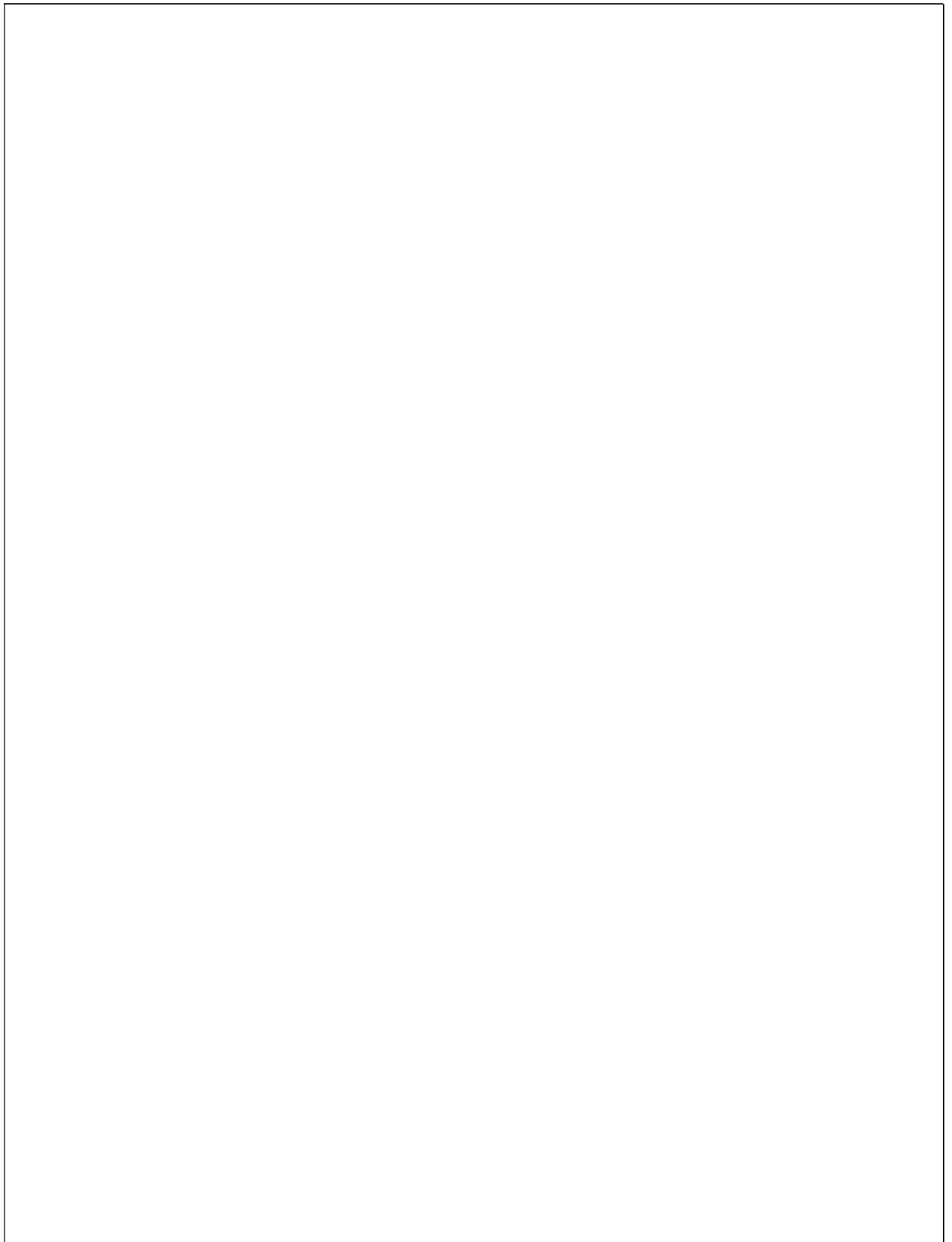
**Contribution of Course Outcomes towards achievement of Program Outcomes  
(1 – Low, 2 - Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO1</b>			H											
<b>CO2</b>									M					
<b>CO3</b>		M												

**COURSE CONTENT**

**List of Experiments:**

1. Determination of total alkalinity of water sample
2. Determination of chlorides in water sample
3. Determination of hardness of water sample
4. Determination of available chlorine in bleaching powder
5. Determination of copper in a given sample
6. Determination of Mohr's salt – Dichrometry
7. Determination of Mohr's salt – Permanganometry
8. Determination of purity of boric acid sample
9. Conductometric determination of a strong acid using a strong base
10. pH metric titration of a strong acid vs. a strong base
11. Determination of corrosion inhibition efficiency of an inhibitor for mild steel
12. Chemistry of Blue Printings
13. Preparation of Urea-Formaldehyde resin



## REFERENCE BOOKS

- [1] S.K. Bhasin and Sudha Rani, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2nd edition.
- [2] Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria & Sons, New Delhi, 2nd edition.

**17CS1152**  
**COMPUTING AND PERIPHERALS LABORATORY**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	1
<b>Course Type:</b>	Laboratory	<b>Lecture -Tutorial-Practice:</b>	0 - 0 – 2
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Understand and Apply MS Office tools
<b>CO2</b>	Configure the components on the motherboard and install different operating systems
<b>CO3</b>	Understand and configure different storage media
<b>CO4</b>	Perform Networking, troubleshooting and system administration tasks

**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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO1</b>	H								L					
<b>CO2</b>		H	M											
<b>CO3</b>	H		L											
<b>CO4</b>		M							M					

**COURSE CONTENT**

**CYCLE - I: Word Processing, Presentations and Spread Sheets**

**1. Word Processing:**

- Create personal letter using MS Word.
- Create a resume using MS Word.
- Creating project abstract: Features to be covered:- Table of Content, List of Tables, Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
- Creating a Newsletter: Features to be covered:- Table of Content, List of figures, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

**2. Spread Sheets:**

- Create a worksheet containing pay details of the employees.
- Creating a Scheduler: Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text
- Create a worksheet which contains student results: .Features to be covered:- Cell Referencing,

Formulae in excel – average, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

- d) Create a worksheet importing data from database and calculate sum of all the columns.

### **3. Presentations:**

- a) Create a presentation using themes.
- b) Save, edit, print and import images/videos to a presentation.
- c) Create a power Point presentation on business by using master layouts, adding animation to a presentation and see the presentation in different views.

### **4. MS Access:**

- a) Create simple table in MS Access for results processing.
- b) Create a query table for the results processing table.
- c) Create a form to update/modify the results processing table.
- d) Create a report to print the result sheet and marks card for the result.

## **CYCLE - II: Hardware Experiments**

1. Identification of System Layout: Front panel indicators & switches and Front side & 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.
2. Install and Configure a DVD Writer or a Blu-ray Disc writer.
3. Install windows operating system and check if all the device (graphics, sound, network etc.) drivers are installed.
4. Install Linux operating system and check the working of all devices (graphics, sound, network etc.) in the computer.
5. Assemble a Pentium IV or Pentium Dual Core Pentium Core2 Duo system with necessary peripherals and check the working condition of the PC.
6. PC system layout: Draw a Computer system layout and Mark the positions of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVDDrive add on cards in table top / tower model systems.
7. Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual 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.
8. Configure BIOS setup program to change standard and advanced settings to troubleshoot typical problems.
9. Install and configure Printer/Scanner/Web cam/Cell phone/bio-metric device with system. Troubleshoot the problems

## **CYCLE – III : Netwroking**

1. Prepare an Ethernet/UTP cable to connect a computer to network switch. Crimp the 4 pair cable with RJ45 connector and with appropriate color code.
2. Manually configure TCP/IP parameters (Host IP, Subnet Mask and Default Gateway) for a computer and verify them using IPCONFIG command. Test connectivity to a server system using PING command.
3. Creating a shared folder in the computer and connecting to that folder using Universal Naming Convention (UNC) format. (Ex: computername sharename)
4. Connects computers together via Switch/ Hub
5. Connect different devices via Switch/Hub
6. Statically configure IP address and subnet mask for each computer
7. Examine non-existent IP address and subnet conflicts
8. Configure a computer to connect to internet (using college internet settings) and troubleshoot the problems using PING, TRACERT and NETSTAT commands.
9. Using scan disk, disk cleanup, disk Defragmenter, Virus Detection and Rectifying Software to troubleshoot typical computer problems.

10. Configure DNS to establish interconnection between systems and describe how a name is mapped to IP Address.
11. Remote desktop connections and file sharing.
12. Installation Antivirus and configure the antivirus.
13. Introducing Ethereal , a packet capture tool.

#### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar,Department of Physics, IIT Madras  
[https://www.youtube.com/ watch?v=zjyR9e-#1D4&list=PLC5DC6AD60D798FB7](https://www.youtube.com/watch?v=zjyR9e-#1D4&list=PLC5DC6AD60D798FB7)
- [2] Introduction to Coding ConceptsInstructor: Mitchell Peabody View the complete course: <http://ocw.mit.edu/6-00SCS11>

**17MC1106B****PROFESSIONAL ETHICS & HUMAN VALUES**

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

**COURSE OUTCOMES**

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

<b>CO1</b>	Know the moral autonomy and uses of ethical theories.
<b>CO2</b>	Understand morals, Honesty and character.
<b>CO3</b>	Understand about safety, risk and professional rights.
<b>CO4</b>	Know the ethics regarding Global issues related to Environment, Computers and weapon's development.

**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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO1</b>	M													
<b>CO2</b>								L						
<b>CO3</b>						M								
<b>CO4</b>									M					

**COURSE CONTENT****UNIT I**

**Engineering Ethics:** Senses of 'Engineering Ethics' - variety of moral issues- types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory -Gilligan's theory - consensus and controversy - Models of Professional Roles -theories about right action - Self-interest - customs and religion- uses of ethical theories.

**UNIT II**

**Human Values:**Morals, Values and Ethics - Integrity- Work Ethic – Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring – Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment –Empathy - Self-Confidence - Character - Spirituality .

**UNIT III**

**Engineering as Social Experimentation:** Engineering as experimentation – engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study, Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and

reducing risk – the three mile island and chernobyl case studies. Collegiality and loyalty – respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

#### **UNIT IV**

**Global Issues:** Multinational corporations- Environmental ethics- computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

#### **TEXT BOOKS**

1. Mike Martin and Roland Schinzinger, “Ethics in engineering”, McGraw Hill, New York (1996).
2. Govindarajan M, Natarajan S, Senthil Kumar V. S., “Engineering Ethics”, Prentice Hall of India, New Delhi(2004).

#### **REFERENCE BOOKS**

- [1] Baum, R.J. and Flores, A., “Ethical Problems in Engineering, Center for the studyof the Human Dimensions of Science and Technology”, Rensellae Polytechnic Institute,Troy, New York, 335 pp. eds. (1978)
- [2] Beabout, G.R., Wennemann, D.J. , “Applied Professional Ethics: A Developmental Approach for Use with Case Studies”, University Press of America Lanham, MD, 175 pp (1994).



**17MA1201**  
**LAPLACE TRANSFORMS AND INTEGRAL CALCULUS**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	4
<b>Course Type:</b>	Theory	<b>Lecture -Tutorial-Practice:</b>	3 - 1 - 0
<b>Prerequisites:</b>	Vectors, Curve Tracing.	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Solve Linear Differential Equations using Laplace Transforms.
<b>CO2</b>	Examine the nature of the Infinite series.
<b>CO3</b>	Evaluate areas and volumes using Double, Triple Integrals.
<b>CO4</b>	Convert Line Integrals to Area Integrals and Surface Integrals to Volume Integrals.

**Contribution of Course Outcomes towards achievement of Program Outcomes  
(L – Low, M - Medium, H – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	<b>H</b>				<b>M</b>									
<b>CO2</b>	<b>H</b>				<b>M</b>									
<b>CO3</b>	<b>H</b>				<b>M</b>									
<b>CO4</b>	<b>H</b>				<b>M</b>									

**COURSE CONTENT**

**UNIT I**

**Laplace Transforms:** 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  $t^n$ , Division by 't', Inverse Transforms, Method of partial fractions, Other methods of finding Inverse Transform, Convolution Theorem, Unit Step and Unit Impulse functions.

**Applications:** Evaluation of Improper Integrals, Solving Differential equations by Laplace Transform.

**UNIT II**

**Partial Differential Equations:** Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations Solvable by Direct Integration, Linear Equations of First Order.

**Sequence and Series:** Convergence of series, Comparison test, Integral test, D'Alembert's Ratio test,

Cauchy's Root Test, Alternating series test, Absolute and Conditional convergence.

### UNIT III

**Integral Calculus:** Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Triple Integrals, Change of Variables. **Applications:** Area enclosed by Plane Curves, Volumes of Solids.

**Special Functions:** Beta Function, Gamma Function, Relation between Beta and Gamma Function, Error Function.

### UNIT IV

**Vector Calculus:** Scalar and Vector point functions, Del applied to Scalar point functions, Del applied to Vector point functions, Physical interpretation of Divergence, Del applied twice to point functions, Del applied to products of point functions. Integration of Vectors, Line Integral, Surface Integral, Green's Theorem in a plane, Stokes's Theorem, Volume Integral, Gauss Divergence Theorem, Irrotational Fields.

### TEXT BOOKS

[1] B.S.Grewal, "Higher Engineering Mathematics, Khanna Publishers", 43<sup>rd</sup> Edition, 2014.

### REFERENCE BOOKS

[1].Erwin Kreyszig , "Advanced Engineering Mathematics" , John Wiley & Sons, 10<sup>th</sup> Edition,2015

[2].B.V.Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1<sup>st</sup> Edition,2007

[3].N.P.Bali, Dr.Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9<sup>th</sup> Edition,2014

### E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. [www.nptel.videos.com/mathematics/](http://www.nptel.videos.com/mathematics/) (Math Lectures from MIT,Stanford,IIT'S)

[2]. [nptel.ac.in/courses/122104017](http://nptel.ac.in/courses/122104017)

[3]. [nptel.ac.in/courses/111105035](http://nptel.ac.in/courses/111105035)

[4]. Engineering Mathematics Open Learning Project.  
[www.3.ul.ie/~mlc/support/Loughborough%20website/](http://www.3.ul.ie/~mlc/support/Loughborough%20website/)

**17PH1202**  
**ENGINEERING PHYSICS**

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

**COURSE OUTCOMES**

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

<b>CO1</b>	Analyse and understand various types of crystal structures and their characterization.
<b>CO2</b>	Understand various concepts of acoustics and thermal performance.
<b>CO3</b>	Understand the classification, properties, preparation and applications of various engineering materials.
<b>CO4</b>	Understand the fabrication of nanomaterials and carbon Nanotubes.

**Contribution of Course Outcomes towards achievement of Program Outcomes  
(L – Low, M - Medium, H – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
<b>CO1</b>	H													
<b>CO2</b>	H		M											
<b>CO3</b>	H													
<b>CO4</b>	H	L												

**COURSE CONTENT**

**Unit – I**

**Crystallography:** Introduction, Fundamental terms of crystallography, Types of crystals: Bravais lattices, Miller indices; Relation between inter planar distance and inter atomic distance, Crystal structures of materials: SC, BCC, FCC.

**Characterization of materials:** Introduction, diffraction of X-rays (Derivation for Bragg's law, Bragg's X-ray spectrometer), Determination of crystal structure by Powder crystal method.

**Unit – II**

**Acoustics:** Introduction, Classification of sound, Sound absorption: Absorption coefficient, Sabine's formula for reverberation time and its limitations, Factors effecting acoustics of building and their remedies and acoustic design of a hall.

**Thermal Performance:** Heat transfer through fenestrations, thermal insulation and its benefits- heat gain and heat loss estimation- factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices-central

heating. **Unit – III**

**Engineering Materials: Composite materials:** Introduction, classification, processing technique for composite materials (Fiber reinforced) and applications.

**Ceramics:** Introduction, classification, ceramic fabrication (Isostatic pressing) and applications.

**Dielectric Materials:** Fundamental definitions, Types of Polarization: Electronic and Ionic polarizations, ferroelectric materials and their applications.

**Shape memory alloys:** Introduction, properties, commercial shape memory alloys (Ni-Ti and copper based alloys) and applications.

#### **Unit- IV**

**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, Chemical vapour deposition, Characterization of nano materials: SEM, TEM. 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

- [1]. V. Rajendran, Materials science, Mc Graw Hill Publications, 4<sup>th</sup> Edition, 2014.
- [2]. M.N. Avadhanulu & P.G. Kshirsagar, Engineering Physics, S. Chand publications, Revised Edition, 2014.

### REFERENCE BOOKS

- [1]. S.O. Pillai, “Solid State Physics”, New age international publishers, 7<sup>th</sup> Edition, 2015.
- [2]. M.R. Srinivasan, “Engineering Physics”, New age international publishers, First Edition, 2011.
- [3]. Severns, W.H. & Fellows, J.R., “Air Conditioning and Refrigeration”, John Wiley and sons, London, 1988. (Unit-I).

### E-RESOURCES AND OTHER DIGITAL MATERIAL

- 1. <http://nptel.ac.in/courses/112106227/>
- 2. <https://ocw.mit.edu/courses/materials-science-and-engineering/3-60-symmetry-structure-and-tensor-properties-of-materials-fall-2005/video-lectures/introduction-to-crystallography-part-1/>
- 3. <https://architecture.mit.edu/subject/spring-2014-4431>
- 4. <http://freevidelectures.com/Course/3048/Physics-of-Materials/36>
- 5. <https://www.peterindia.net/NanoTechnologyResources.html>

### 17CS1203 PROGRAMMING IN C

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture -Tutorial-Practice:</b>	3 -0 – 0

<b>Prerequisites:</b>	Problem Solving Methods	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

## COURSE OUTCOMES

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

<b>CO1</b>	Understand the fundamentals and structure of a C programming language
<b>CO2</b>	Apply the loops, arrays, functions and string concepts in C to solve the given problem.
<b>CO3</b>	Apply the pointers and text input output files concept to find the solution for the given applications.
<b>CO4</b>	Use the Enumerated, Datatypes, Structures and Unions.

**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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO1</b>	M				L			L						
<b>CO2</b>	M				L			L						
<b>CO3</b>	H				M			L			L			
<b>CO4</b>	H				H			L			L			

## COURSE CONTENT

### UNIT - I

**Introduction to the C Language :** Background, C Programs, Identifiers, Types, Variables, Constants, Input/Output, Programming Examples.

**Structure of a C Program:** Expressions, Precedence and Associativity, Evaluating Expressions, Type Conversion, Statements, Sample Programs.

**Selection:** Storage Class, Logical Data and Operators, Two -Way Selection, Multiway Selection, More Standard Functions

### UNIT - II

**Repetition:** Concept of a Loop, Loops In C, Loop Examples, Recursion, The Calculator Program.

**Arrays:** Concepts, Using Array in C, Inter-Function Communication, Array Applications, Two Dimensional Arrays, Multidimensional Arrays.

**Functions:** Functions in C, User Defined Functions, Inter Function Communication, Standard Functions, Scope.

**Strings:** String Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions, String- Data Conversion.

### UNIT - III:

**Pointers:** Introduction, Pointers For Inter Function Communications, Pointers to Pointers, Compatibility,

Lvalue and Rvalue.

**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, Command-Line Arguments.

#### **UNIT - IV:**

**Enumerations:** The Type Definition(Typedef) , 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, Initializers, Unions and Structures, Internet Address, Programming Applications.

#### **TEXT BOOKS**

Behrouz A. Forouzan & Richard F. Gilberg , “Computer Science A Structured Programming Approach using C” , CENGAGE Learning, Third Edition.

#### **REFERENCE BOOKS**

- [1] Kernighan and Ritchie , “The C programming language” , The (Ansi C Version), PHI, second edition.
- [2] Yashwant Kanetkar , “Let us C” , BPB Publications, 2<sup>nd</sup> Edition 2001.
- [3] Paul J. Dietel and Dr. Harvey M. Deitel, “C: How to Program”, Prentice Hall ,7<sup>th</sup> edition (March 4,2012).
- [4] Herbert Schildt, “C:The Complete reference”, McGraw Hill, 4<sup>th</sup> Edition, 2002.
- K.R.Venugopal, Sundeep R Prasad, “Mastering C”, McGraw Hill, 2<sup>nd</sup> Edition, 2015

**17ME1204**  
**ENGINEERING MECHANICS – II**

<b>Course Category:</b>	Engineering Sciences	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture -Tutorial-Practice:</b>	3 -0 - 0
<b>Prerequisites:</b>	Basic Mathematics, Physical Science, Engineering Mechanics-I (Statics)	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Analyze the rectilinear motion of particles.
<b>CO2</b>	Analyze the curvilinear motion of particles.
<b>CO3</b>	Evaluate the moment of inertia of areas and material bodies.
<b>CO4</b>	Analyze the motion of rigid bodies.

**Contribution of Course Outcomes towards achievement of Program Outcomes  
(L – Low, M - Medium, H – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	H				M									
<b>CO2</b>	H				M									
<b>CO3</b>	H													
<b>CO4</b>	M				H									

**COURSE CONTENT**

**UNIT – I**

**Kinematics of Rectilinear Translation:** Introduction, displacement, velocity and acceleration. Motion with Uniform and Variable acceleration.

**Kinetics of Rectilinear Translation:** Equations of rectilinear motion. Equations of Dynamic Equilibrium: D'Alembert's Principle. Work and Energy, Conservation of energy, Impulse and Momentum, Impact-Direct central Impact.

**UNIT – II**

**Kinematics of Curvilinear Motion:** Introduction, rectangular components of velocity and acceleration. Normal and Tangential acceleration, Motion of projectiles.

**Kinetics of Curvilinear Motion:** D'Alembert's Principle, and Work and Energy in curvilinear motion.

**UNIT –III**



**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, Radius of gyration – Parallel axis theorem, MI of composite plane figures.

**Moment of Inertia of Material Bodies:** Moment of inertia of a rigid body – Moment of inertia of slender bar, laminas (2D), Radius of gyration, Parallel axis theorem, Moment of inertia of 3D bodies- cone, cylinder, sphere and parallelepiped.

#### UNIT – IV

##### **Kinematics of Rigid Body:**

Rotation: Linear and angular Velocity, linear and angular acceleration in uniformly accelerated rotation.

Plane motion: Concepts of relative velocity and Instantaneous center.

##### **Kinetics of Rigid Body:**

Rotation: Equation of motion for a rigid body rotating about a fixed axis – Rotation under the action of a constant moment.

#### TEXT BOOKS

- [1] S. Timoshenko & D. H. Young , “Engineering Mechanics” , McGraw Hill International Edition. (For Concepts and symbolic Problems), 4th Edition, 2007.
- [2] A. K. Tayal, “Engineering Mechanics Statics and dynamics” , Umesh Publication, Delhi, (For numerical Problems using S.I. System of Units), 13th Edition, 2006.

#### REFERENCE BOOKS

- [1] Beer and Johnston, “Vector Mechanics for Engineers Statics and Dynamics”, Tata McGraw Hill, III<sup>rd</sup> edition 2010.
- [2] SS Bhavikatti and KG Rajasekharappa, “Engineering Mechanics”, New Age International Private Limited, IV<sup>th</sup> Edition 2012
- [3] K. Vijaya Kumar Reddy and J Suresh Kumar, “ Singer’s Engineering Mechanics Statics and Dynamics”, BS Publications, III<sup>rd</sup> Edition 2010.

#### E-RESOURCES AND OTHER DIGITAL MATERIAL

- [1] <http://emweb.unl.edu/>, Accessed On 15-06-2017

**17HS1205**

**TECHNICAL ENGLISH & COMMUNICATION SKILLS**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture -Tutorial-Practice:</b>	2 - 0 - 2

<b>Prerequisites:</b>	Basic understanding of the language skills ,viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	<b>Continuous Evaluation:</b> <b>Semester end Evaluation:</b> <b>Total Marks:</b>	30 70 100
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## COURSE OUTCOMES

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

<b>CO1</b>	Develop administrative and professional compilations including web related(On-line) communication with felicity of expression
<b>CO2</b>	Demonstrate Proficiency in Interpersonal Communication, in addition to standard patterns of Pronunciation
<b>CO3</b>	Apply the elements of functional English with sustained understanding for authentic use of language in any given academic and/or professional environment
<b>CO4</b>	Execute tasks in Technical communication with competence

**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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO1</b>			M	M		H	H	M	M	H	L	M		
<b>CO2</b>				M		H	H	H	M	H		M		
<b>CO3</b>	M			M		H	H	H	H	H	L	M		
<b>CO4</b>	L	M		M		H	H	H	H	H	L	M		

## COURSE CONTENT

### UNIT I

#### Professional Writing Skills

Professional Letter- Business, Complaint and Transmittal ,  
Essay Writing- Descriptive and Analytical ,  
Administrative and On-line drafting skills –Minutes and Web notes including e-mail

### UNIT II

#### Interpersonal Communication Skills

**Communicative Facet-** Speech acts- Extending Invitation, Reciprocation, Acceptance,  
Concurrence, Disagreeing without being disagreeable ,  
**Articulation-oriented Facet-** Transcription using International Phonetic Alphabet, Primary Stress.

### UNIT III

#### Vocabulary and Functional English

A basic List of 500 words – Overview ,  
Verbal analogies, Confusables, Idiomatic expressions and Phrasal Collocations,  
Exposure through Reading Comprehension- Skimming, Scanning and Understanding ,  
the textual patterns for tackling different kinds of questions ,  
Functional Grammar with special reference to Concord, Prepositions, use of Gerund and Parallelism .

#### **UNIT IV**

##### **Technical Communication skills:**

Technical Proposal writing,  
Technical Vocabulary- a representative collection will be handled ,  
Introduction to Executive Summary ,  
Technical Report writing( Informational Reports and Feasibility Report.

#### **TEXT BOOKS**

- [1] Martin Cutts, “ Oxford guide to Plain English”, Oxford University Press, 7<sup>th</sup> Impression 2011.
- [2] TM Farhathullah, “Communication skills for Technical Students”, Orient Longman, I Edition 2002
- [3] John Langan, “College Writing Skills”, McGraw Hill, IX Edition, 2014.
- [4] “Eclectic Learning materials offered by the Department”

#### **REFERENCE BOOKS**

- [1] Randolph Quirk, “Use of English”, Longman, I Edition (1968) Reprinted 2004.
- [2] Thomson A.J & A.V, Martinet, “Practical English Grammar”, Oxford University Press, III Edition 2001
- [3] V.Sethi and P.V. Dhamija, “A Course in Phonetics and Spoken English”, PHI, II Edition 2006

#### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1] <https://www.britishcouncil.org/english> Accessed on 15<sup>th</sup> June 2017
- [2] [www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=online](http://www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=online) Accessed on 15<sup>th</sup> June 2017
- [3] [https://www.uni-marburg.de/sprachenzentrum/selbstlernzentrum/ /apps\\_for\\_esl. pdf](https://www.uni-marburg.de/sprachenzentrum/selbstlernzentrum/apps_for_esl.pdf) Accessed on 15<sup>th</sup> June 2017

**17MC1206A**  
**TECHNOLOGY AND SOCIETY**

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

**COURSE OUTCOMES**

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

<b>CO1</b>	Understand the origins of technology and its role in the history of human progress.
<b>CO2</b>	Know the Industrial Revolution and its impact on Society
<b>CO3</b>	Interpret the developments in various fields of technology till Twentieth Century.
<b>CO4</b>	Distinguish the impacts of Technology on the Environemnt and achievements of great scientists.

**Contribution of Course Outcomes towards achievement of Program Outcomes**  
**(L – Low, M - Medium, H – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	H								L					
<b>CO2</b>	H							M						
<b>CO3</b>	H								L					
<b>CO4</b>	H							M						

## COURSE CONTENT

### UNIT – I

**Introduction:** Origins of technology, The Agriculture revolution, Technological contributions of ancient civilizations- Mesopotamian, Egyptians, Greeks, Romans, Indians and Chinese.

### UNIT - II

**Industrial revolution:** The social and political background, The technical background, Steam: The power behind the Industrial Revolution, The revolution in Textile Industry, The Impact of Industrial Revolution on Society.

### UNIT - III

**The Flowering of modern technology:** Manufacturing Technologies, Prime Movers, Internal Combustion engines, Production of Metals and Alloys, The Birth of Electrical Technology, Twentieth Century: The Flowering of modern technology

### UNIT - IV

**Technology, Science and Society:** Impact of technology on society, The Impacts of Technology on the environment, Sustainable development.

**Achievements of famous scientists:**

**(World):** Einstein, Newton, Faraday, Graham Bell, Edison, S.Hawking.

**(India):** CV Raman, S.Chandrasekhar, Aryabhata, Homi J Bhabha, Vikram Sarabhai, APJ Abdulkalam, S.Ramanujan, M.Visweswarayya.

## TEXT BOOKS

- [1] Dr. R.V.G Menon, “Technology and Society”, Pearson Education, 2011

## REFERENCE BOOKS

- [1] Quan-Haase, A., “ Technology and Society: Inequality, Power, and Social Networks”, Oxford University Press, 2013.

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**17PH1251**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	1.5
<b>Course Type:</b>	Lab	<b>Lecture -Tutorial-Practice:</b>	0 - 0 - 3
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

## COURSE OUTCOMES

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

<b>CO1</b>	Use spectrometer and travelling microscope in various experiments
<b>CO2</b>	Determine the V-I characteristics of solar cell and photo cell and appreciate the accuracy in measurements
<b>CO3</b>	Test optical components using principles of interference and diffraction of light

**Contribution of Course Outcomes towards achievement of Program Outcomes  
(L – Low, M - Medium, H – High)**

[illegible]

## COURSE CONTENT

1. Melde's apparatus- Determine the frequency of tuning fork
2. Wedge method- Measurement of thickness of a foil
3. Variation of magnetic field along the axis of current-carrying circular coil
4. Fibre Optics- Determination of Numerical aperture
5. Photo cell-Study of V-I Characteristics, determination of work function
6. Solar cell –Determination of Fill Factor
7. Torsional Pendulum-Determination of Rigidity modulus
8. Determination of Dielectric constant of a sample
9. Diffraction grating-Measurement of wavelength of mercury source
10. Hall effect –Hall coefficient measurement
11. Compound pendulum-Determination of 'g'
12. Figure of merit of a galvanometer

## TEXT BOOKS

- [1] Madhusudhan Rao, "Engineering Physics Lab Manual", Ist ed., Scitech Publications, 2015
- [2] Ramarao Sri, Choudary Nityanand and Prasad Daruka, "Lab Manual of Engineering Physics", Vth ed., Excell Books, 2010

## E-RESOURCES

- [1] <http://plato.stanford.edu/entries/physics-experiment>
- [2] <http://www.physicsclassroom.com/The-Laboratory>
- [3] <http://facstaff.cbu.edu/~jvarrian/physlabs.html>

## VIRTUAL LAB REFERENCES

- [1] <http://vlab.amrita.edu/?sub=1&brch=201&sim=366&cnt=1>
- [2] <http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1>
- [3] <http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1>

17CS1252

### COMPUTER PROGRAMMING LABORATORY

Course Category:	Institutional Core	Credits:	1.5
Course Type:	Laboratory	Lecture -Tutorial-Practice:	0 - 0 – 3





## **COURSE CONTENT**

### **CYCLE – I : PROGRAMMING CONSTRUCTS AND CONTROL STRUCTURES**

1. Introduction to C Programming:
  - a) Use of Turbo C IDE
  - b) The Structure of C Program with Sample program
2. Data Types and Variables:
  - a) Programs to usage of keywords and identifiers in c
  - b) Programs on declaration of variables, rules for naming a variable, constants and different type of constants, data types
  - c) Programs to perform on various operators in C
3. Branching and Selection:
  - a) To specify the conditions under which a statement or group of statements should be executed.
  - b) To choose exactly one out of two statements (possibly compound statements) to be executed; specifies the conditions under which the first statement is to be executed and provides an alternative statement to execute if these conditions are not met.
  - c) To choose one statement (possibly compound) to be executed from among a group of statements (possibly compound); specifies the conditions under which each statement may be executed and may contain a default statement (in an else clause at the end) to be executed if none of these conditions are met. Note that in the absence of a final else clause, it may be the case that none of the statements are executed.
4. Unconditional control Transfer statements in C:
  - a) Design and develop programs that use of goto Statement
  - b) Design and develop programs that the use of Break Statement
  - c) Design and develop programs that use of Continue Statement
5. Looping constructs:

Design and develop programs based on

  - a) Iterative loops using While, Do While, For, Nested For
  - b) Selection Statement using the switch-case Statement
  - c) Multiple way selections that will branch into different code segments based on the value of a variable or expression
6. Arrays
  - a) Design and develop programs which illustrates the implementation of single-dimensional arrays and Multi dimensional arrays
7. Strings
  - a) Create programs to initialize strings and usage of them for various input, output operations.
  - b) Design and develop programs to handle String functions

### **CYCLE - II: ADVANCED PROGRAMMING CONSTRUCTS**

1. Concept of user defined functions
  - a) Design and develop programs depending on functions both user defined and standard library functions in C with different approaches.
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) Programs on declaration of pointers and their usage in C

- b) Programs to relate between arrays and pointers and use them efficiently in a program
- c) To pass pointers as an argument to a function, and use it efficiently in program
- 4. Command Line Arguments
  - a) Design and develop programs that accept arguments from command line to perform different kinds of operations
- 5. Structures and Unions
  - a) Programs to define, declare and access structure and union variables
  - b) Design and develop programs to work with pointers to access data within a structure
  - c) Programs to pass structure as an argument to a function

#### **TEXT BOOKS**

- [1] Ashok N Kamthane, “C And Data Structures”, Pearson Education; First edition, 2008

#### **REFERENCE BOOKS**

- [1] Brain W Kernighan and Dennis Ritchie, “The C Programming language”, Pearson Education India, 2015
- [2] David Griffiths and Dawn Griffiths, “Head First C”:A Brain Friendly Guide, O:Reilly media, 2012

#### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1] Introduction to Programming C: <http://nptel.ac.in/courses/106104128/>
- [2] C-Programming - IIT Kharagpur lectures  
[https://www.youtube.com/watch?v=S47aSEqm\\_0I&list=PLcXvb23g7hrw27XlekHtfygUTQ0TmFfP](https://www.youtube.com/watch?v=S47aSEqm_0I&list=PLcXvb23g7hrw27XlekHtfygUTQ0TmFfP)
- [3] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras  
<https://www.youtube.com/watch?v=zjyR9e-N1D4&list=PLC5DC6AD60D798FB7>

**17ME1253**  
**BASIC WORKSHOP**

<b>Course Category:</b>	Engineering Sciences	<b>Credits:</b>	1.5
<b>Course Type:</b>	Laboratory	<b>Lecture -Tutorial-Practice:</b>	0 - 0 - 3
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Model and develop various basic prototypes in the Carpentry trade.
<b>CO2</b>	Develop various basic prototypes in the trade of Welding.
<b>CO3</b>	Model and develop various basic prototypes in the trade of Tin Smithy.
<b>CO4</b>	Familiarize with various fundamental aspects of house wiring.

**Contribution of Course Outcomes towards achievement of Program Outcomes**  
**(L – Low, M - Medium, H – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	H	H									L			
<b>CO2</b>	M	H									L			
<b>CO3</b>	M	H									L			
<b>CO4</b>	L	H									L			

**COURSE CONTENT**

**UNIT I**

**Carpentry:**

- Study of tools & operations and various carpentry joints.
- Practice of open bridge joint, Cross half lap joint, Half LapT Joint, and Dove tail joint
- Simple group exercise like preparation of single widow frame.

**UNIT II**

**Welding:**

- Study of tools and operations of Gas welding and arc welding.
- Practice of various joints like weld layer practice, V- Butt Joint, Double parallel fillet joint, T-Joint, and Corner Joint.

**UNIT III**

**Tin Smithy:**

- Study of tools & operations

- b. Practice of various joints like Saw Edge, Wired Edge, Lap Seam, and Grooved Seam.
- c. Simple exercise like Fabrication of square tray.

#### **UNIT IV**

##### **House Wiring:**

- a. To connect one lamp with one switch.
- b. To connect two lamps with one switch.
- c. To connect a fluorescent Tube.
- d. Stair case wiring.
- e. Godown wiring.
- f. Study of single phase wiring for a office room.
- g. Nomenclature & measurement of wire gauges and cables.
- h. Estimation of cost of indoor wiring for a wiring diagram (plan of a building).
- i. Test procedure for continuity of wiring in a electric installation.
- j. Measurement of electric energy by using meter.

#### **TEXT BOOKS**

- [1] Kannaiah P. & Narayana K. C., “Manual on Workshop Practice”, Scitech Publications, Chennai, 1999.
- [2] Venkatachalapathy, V. S., “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai, 1999.

#### **REFERENCE BOOKS**

- [1] Gopal, T.V., Kumar, T., and Murali, G., “A first course on workshop practice – Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.

<p align="center"><b>17MA1301A</b></p> <p align="center"><b>COMPLEX ANALYSIS &amp; NUMERICAL METHODS</b></p>
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<b>Course Category:</b>	Programme Core	<b>Credits:</b>	4
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	3 - 1 - 0
<b>Prerequisites:</b>	Algebra of Complex numbers, convergence of infinite series, theory of equations	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

Course outcomes	Upon 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.													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO1	PSO 2
	CO1	H				M		M							
	CO2	H				M		M							
	CO3	H	M			H						M			
	CO4	H	M			H						M			
Course Content	<p><b>UNIT I:</b>  <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</p> <p><b>UNIT II:</b>  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.</p> <p><b>UNIT III:</b>  <b>Numerical Methods:</b> Solution of Algebraic and Transcendental Equations: Introduction, Newton - Raphson method, Solution of simultaneous linear equations – Gauss Elimination Method - Gauss - Seidel iterative method.  <b>Interpolation:</b> 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.</p>														

	<p><b>UNIT – IV</b></p> <p><b>Numerical Differentiation And Integration:</b> Finding first and second order differentials using Newton's formulae. Trapezoidal rule and Simpsons 1/3 Rule</p> <p><b>Numerical Solutions of Differential Equations:</b> Taylor's series method Picard's method. Euler's method, Runge - Kutta method of 4th order, Boundary value problems, Solution of Laplace's and Poisson's equations by iteration.</p>
<b>Text books and Reference books</b>	<p><b>Text Book:</b></p> <p>[1] B.S.Grewal, “Higher Engineering Mathematics”, 42<sup>nd</sup> Edition Khanna Publishers, 2012.</p> <p><b>Reference Books:</b></p> <p>[1] Krezig, “Advanced Engineering Mathematics”, 8<sup>th</sup> Edition, JohnWiley &amp; Sons.2007,</p> <p>[2] R.K.Jain and S.R.K.Iyengar, “Advanced Engineering Mathematics”, 3<sup>rd</sup> Edition, Narosa Publishers.</p> <p>[3] N.P.Bali, Manish Goyal, “A Text book of Engineering Mathematics”, 1<sup>st</sup> Edition, Lakshmi Publications (P) Limited, 2011</p> <p>[4] H.K.Das, Er. RajnishVerma, “Higher Engineering Mathematics”, 1<sup>st</sup> Edition, S.Chand&amp; Co., 2011.</p> <p>[5]S. S. Sastry, “Introductory Methods of Numerical Analysis”, PHI , 2005.</p>
<b>E-resources and other digital material</b>	<p>[1]. <a href="http://faculty.gvsu.edu/fishbacp/complex/complex.html">faculty.gvsu.edu/fishbacp/complex/complex.html</a>.</p> <p>[2]. <a href="http://nptelvideolectures/iitm.ac.in">nptelvideolectures/iitm.ac.in</a></p>

**17CE3302**  
**INTRODUCTION TO MECHANICS OF SOLIDS**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	4
<b>Course Type:</b>	Mandatory course	<b>Lecture -Tutorial-Practice:</b>	3-1-0
<b>Prerequisites:</b>	Engineering Mechanics 17ME1104A	<b>Continuous Evaluation:</b> <b>Semester end Evaluation:</b> <b>Total Marks:</b>	30 70 100

<b>Course outcomes</b>	<b>Upon successful completion of the course, the student will be able to:</b>														
	CO1	Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships;													
	CO2	Define the characteristics and calculate the magnitude of principal stresses and strain, shear force and bending moment diagrams.													
	CO3	Calculate the bending stresses and deflection at any point on a beam subjected to a combination of loads.													
	CO4	Understanding the shear stress in beams, torsion in shafts and spring													

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M- Medium, H - High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	M	M	M	-	M	-	-	-	-	-	M	-		
	CO2	H	H	M	-	M	-	-	-	-	-	L	-		
	CO3	M	M	M	-	M	-	-	-	-	-	L	-		
	CO4	M	M	M	-	M	-	-	-	-	-	L	-		

<b>Course content</b>	<p><b>UNIT I :</b></p> <p><b>Stresses and Strains</b> Stress and strain - Hooke's law -tension -compression and shear-Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses- Simple problems.</p> <p><b>UNIT II:</b></p> <p><b>Principal Stresses and Strains</b> Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress. Principal strains and principal axis of strain, circle of strain. –Simple problems.</p>
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**Shear Force and Bending Moment diagrams of statically determinate beams**

Types of beams and supports, shear force and bending moment diagram–Simple problems.

**UNIT III:****Flexural Stresses**

Theory of simple bending – Assumptions – Derivation of bending equation - Neutral axis – Determination of bending stresses – Section modulus of across various beam sections.

**Slope and deflection**

Relationship between moment, slope and deflection, Double integration method, Macaulay's method Moment area method, conjugate beam method Use of these methods to calculate slope and deflection for determinant beams–Simple problems.

**UNIT IV:****Shear Stresses and Torsion**

Derivation of formula of shear stress– Shear stress distribution across various beam sections - Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, Torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs- Simple problems.

**Text books  
and  
Reference  
Books****Text Books:**

1. Strength of Materials (Mechanics of solids) by Er. R.K.Rajput;  
S.Chand&Company Ltd., New Delhi.
2. Strength of Materials by S Ramamrutham& R Narayan; DhanpatRai  
Publishing Co.(P) Ltd, New Delhi.

**Reference Books:**

1. Structural analysis by S SBhavikatti – V K Publishers
2. Theory of structures by S P Timoshenki& D H Young.
3. Mechanics of materials by E P Popov; Prentice-Hall of India Pvt. Ltd.,New Delhi.



<b>17CE 3303</b> <b>FLUID MECHANICS</b>
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<b>Course Category:</b>	Programme Core	<b>Credits:</b>	4
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	3 - 1- 0
	17MA 1101 & 17 MA 1201 - Maths	<b>Continuous Evaluation:</b>	30
	17PH 1202 – Engineering Physics	<b>Semester end Evaluation:</b>	70
	17ME 1204 – Engineering Mechanics - II	<b>Total Marks:</b>	100

Course Outcomes	Upon successful completion of the course, the student will be able to:															
	CO1	Measure the pressure of the flowing fluid.														
	CO2	Understand the kinematic and dynamic behavior of flow.														
	CO3	Measure the flow of fluid through pipes and Orifices/ Mouthpieces.														
	CO4	Analyze the flow through pipes.														
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	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO1	PSO 2	
	CO1	H	M	H											H	
	CO2	H	M	H											H	
	CO3	H	M	H										M	H	
	CO4	H	M	H										M	H	
Course Content	<p><b>UNIT I:</b> <b>Properties of Fluid:</b> Introduction; Properties of Fluid; Units of measurement; Fluid Continuum; Newtonian and Non - Newtonian fluids; Vapour pressure, Surface Tension and Capillarity.</p> <p><b>Fluid Statics:</b> Variation of static pressure; Pressure the same in all directions – Pascal’s Law; Atmospheric, Absolute and gauge pressure; Pressure measurement by manometers; Hydrostatic pressure on horizontal, vertical and inclined plane surfaces.</p> <p><b>UNIT II:</b> <b>Kinematics of Fluid Flow:</b> Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Stream line; Path line; Streak line; Continuity equation; Velocity potential and stream function.</p> <p><b>Dynamics of Fluid Flow:</b> Euler’s equation of motion; Bernoulli’s equation; Energy correction factor; Momentum principle; Application of Momentum equation; Force exerted on a pipe bend.</p> <p><b>UNIT III:</b> <b>Measurement of Flow through Pipes:</b> Measurement of flow through Pipes – methods and various devices; Discharge through Venturi meter; Discharge through orifice meter; Measurement of velocity by Pitot tube.</p> <p><b>Measurement of Flow through Orifices and Mouthpieces:</b> Flow through orifices; Determination of</p>															

	<p>coefficients for an orifice; Flow through small orifice and large rectangular orifice; Classification of mouthpieces; Flow through external cylindrical mouthpiece.</p> <p><b>UNIT – IV</b></p> <p><b>Analysis of Flow through Pipes:</b> Energy losses in pipelines; Darcy – Weishbach equation; Minor losses in pipelines; Concept of equivalent length; Pipes in series and parallel.</p> <p><b>Laminar Flow:</b> Relation between shear and Pressure Gradients in Laminar Flow; Reynold’s experiment; Critical velocity; Steady laminar flow through a circular pipe – Hagen Poiseuille’s Law; Laminar Flow between Parallel Plates – Both plates at rest.</p>
<b>Text books and Reference books</b>	<p><b>Text Books:</b></p> <p>[1] P.N. Modi &amp; S.N. Seth, “Hydraulics &amp; Fluid Mechanics”, 18<sup>th</sup> ed., Standard Book House, New Delhi, 2015.</p> <p>[2] A.K. Jain, “Fluid Mechanics”, 11<sup>th</sup> ed., Khanna Publishers, New Delhi, 2014.</p> <p><b>Reference Books:</b></p> <p>[1] R. K. Bansal, “Fluid Mechanics and Hydraulic Machines”, 9<sup>th</sup> ed., Laxmi Publications; New Delhi, 2015.</p> <p>[2] Rajput R.K., “Fluid Mechanics and Hydraulic Machines”, 3<sup>rd</sup> ed., S.Chand and Company Ltd., New Delhi, 2014.</p> <p>[3] K. Subramanya, “Theory and Applications of Fluid Mechanics”, 3<sup>rd</sup> ed., Tata McGraw Hill Publishing Company, New Delhi, 2013.</p>
<b>E-resources and other digital material</b>	<p>[1] Dr. T. I. Eldho, IIT/Bombay – Fluid Mechanics – “<a href="http://www.nptel.ac.in/courses/105101082/">www.nptel.ac.in/courses/105101082/</a>”</p> <p>[2] Dr. Subhashiva Dutta &amp; Dr. N. Sahoo, IIT/Guwahati – Fluid Mechanics – “<a href="http://www.nptel.ac.in/courses/105103095/">www.nptel.ac.in/courses/105103095/</a>”</p>

**17CE3304**  
**SURVEYING & GEOMATICS**

Course Category:	<b>Programme Core</b>	Credits:	4
Course Type:	<b>Theory</b>	<b>Lecture - Tutorial - Practice:</b>	4 - 0 - 0
Prerequisites:	<b>Mathematics, Science</b>	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 principles of surveying.
	CO2	Measure horizontal and vertical angles in surveying.
	CO3	Compute areas and volumes of a given section
	CO4	Understand the concepts of leveling and location of contour.

	CO5	Understand the principles of modern field survey system.													
	CO6	Setting out of a simple curve.													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1	L													
	CO2	L				H				M		M			
	CO3	L				H				M		M			
	CO4	L				H				M		M			
	CO5	L								M		M			
	CO6	L								M					
Course Content	<p><b>UNIT – I</b></p> <p><b>BASICS OF SURVEYING:</b>            Surveying: Definition; Classification; Principles of surveying; Plan and map; Scales used for Maps and plans. Accuracy; Precision; Sources of errors; Types of errors;</p> <p><b>CHAIN SURVEYING:</b>            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.</p> <p><b>UNIT-II</b></p> <p><b>AREAS &amp; VOLUMES:</b>            Introduction; Boundaries with offsets at irregular intervals ; Planimeter: Area of cross sections- two level sections only; Trapezoidal rule; Prismoidal formula; Capacity of a reservoir.</p> <p><b>THEODOLITE SURVEYING:</b>            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.</p> <p><b>UNIT – III</b></p> <p><b>LEVELLING:</b>            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.</p> <p><b>CONTOURING:</b>            Contouring; contour interval; Characteristics of contours; Methods of locating contours; Interpolation and Sketching of contours; Uses of contour maps;</p> <p><b>UNIT-IV</b></p> <p><b>MODERN FIELD SURVEY SYSTEMS:</b>            Principle of Electronic Distance Measurement, Types of EDM instruments, Total Station: GPS- Applications of GPS in Civil Engineering,</p>														

	<p><b>CIRCULAR CURVES:</b> Basic definitions; Designation of a curve; Relationship between radius and degree of curve; Elements of a simple curves; setting out of simple curve.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Surveying Vol I &amp; II by K R Arora, 15<sup>th</sup> Edition, 2015; Standard Book house.</li> <li>2. Plane Surveying by AM Chandra, New Age International (P) Ltd.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Surveying Vol.I &amp; II by B.C. Punmia, Laxmi Publications.</li> <li>2. Fundamentals of surveying by S.K. Roy 1999, Prentice- Hall of India, New Delhi.</li> <li>3. Advanced Surveying, by S. Gopi, R.S. Kumar and N. Madhu, 2007, Pearson education, New Delhi.</li> </ol>
E-resources and other digital material	<p><a href="http://nptel.ac.in/courses/webcourse-contents/IIT-ROORKEE/SURVEYING/home.htm">http://nptel.ac.in/courses/webcourse-contents/IIT-ROORKEE/SURVEYING/home.htm</a></p>

**17CE3305-ENGINEERING GEOLOGY**

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

Course outcomes	On successful completion of the course, the student will be able to:														
	CO1	acquire basic knowledge on geology in civil engineering													
	CO2	Understand the geological process influence the civil engineering projects													
	CO3	Understand the geological and geophysical methods for planning and designing projects													
	CO4	identify the solution of geological problems in the context of major civil engineering projects													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1	H													H
	CO2	H													H
	CO3	H	H		H										H
	CO4	H	H		H										H
Course Content	<b>UNIT-I</b>  <b>FUNDAMENTALS OF MINERALS, ROCKS AND SOILS</b> <b>Introduction of Engineering Geology</b> Branches of Geology useful to Civil Engineering: Scope of geological studies in various Civil engineering projects: Central and State Departments dealing with geology <b>Mineralogy</b> -Introduction to mineralogy Mineral Identification by Physical properties . Modern Methods of mineral identification- SEM, XRD, EPMA and XRF. Physical properties of rock forming minerals  <b>Petrology</b> -Rock cycle Igneous rocks – Formation –Classification and Textures Sedimentary rocks – Formation –Classification and Textures, Metamorphic rocks and metamorphism – Formation –Classification and Texture, Engineering concerns of rocks  <b>UNIT-II</b>  <b>GEOLOGICAL PROCESS</b>														

	<p><b>Physical geology</b>-Weathering-Erosion- Denudation, Engineering classification of weathered rocks ; Types of Land forms- Alluvial- Glacial- Desert and Coastal</p> <p><b>Geological Hazards- Land slides</b> -Type of landslides ,Factor of Safety ,Slope Protection and Maintenance <b>Earthquakes</b> - Causes and effects of earthquakes Earthquake Magnitude and intensity scales. seismic zones of India: <b>Groundwater</b>- Factors control water bearing capacity of rocks;</p> <p><b>Deformation and strength Behavior of Rocks</b> – Stress –strain behavior of rock, Concept of rock deformation Rock outcrops- Types- strike and Dip <b>Folds</b>- Types-Effects on construction <b>Faults</b>-Types-Effects on construction : <b>joints</b>-Types- Effects on construction</p> <p><b>UNIT-III</b></p> <p><b>Sub surface investigation Methods</b></p> <p><b>Maps and their interpretation</b>- Topographic Map and Geological Map</p> <p><b>Geophysical Methods</b>- Principles of exploration geophysical Methods Electrical Resistivity method- Interpretation, Seismic refraction method- Interpretation</p> <p><b>Rock mechanics</b>- Rock mass as construction material- Definition of rock mass, Engineering characters of rock mass ,Measurement of velocity in rocks-Core logging- Rock quality designation Index</p> <p><b>UNIT-IV</b></p> <p><b>Geology for Major projects</b>  <b>Dams</b> - Site selection for dams , Geological investigation methods for dams  <b>Reservoirs</b>- Failure of reservoirs , Reservoir suitable rocks, Reservoir induced seismicity  <b>Tunnels</b>- Site selection for tunnels , Geological investigation methods for Tunnels</p>
<p><b>Text books and Reference books</b></p>	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <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> </ol>



Prerequisites:		Continuous Evaluation:	100
		Semester end Evaluation:	0
		Total Marks:	100

## COURSE OUTCOMES

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

CO1	Think reason logically in any critical situation
CO2	Analyze given information to find correct solution
CO3	To reduce the mistakes in day to day activities in practical life
CO4	Develop time-management skills by approaching different shortcut methods
CO5	Use mathematical based reasoning to make decisions
CO6	Apply logical thinking to solve problems and puzzles in qualifying exams in any competitive exam.

Contribution of Course Outcomes towards achievement of Program Outcomes  
(1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						M								
CO2		M												
CO3								M						
CO4									M					
CO5	M													
CO6	L													

## COURSE CONTENT

### UNIT I :

1. Series Completion,
2. Coding-Decoding,
3. Blood Relation Blood,
4. Puzzles test

### UNIT II:

1. Direction sense test,
2. Logical Venn diagrams,



3. Number test, ranking test,
4. Mathematical operations

**UNIT III:**

1. Arithmetical Reasoning,
2. Inserting missing character,
3. Syllogism.

**UNIT IV: Non – Verbal:**

1. Water images,
2. Mirror images,
3. Paper folding,
4. Paper cutting,
5. Embedded Figures,
6. Dot situation,
7. Cubes & Dice

**TEXT BOOK**

R. S. Aggarwal, “ Verbal and non-verbal reasoning”, Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6

**17CE3351 SURVEYING LABARATORY**

Course Category:	Programme Core	Credits:	1
Course Type:	Practical	Lecture -Tutorial-Practice:	0-0-2
Prerequisites:	Mathematics, Science	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

**Course  
outcomes**

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

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	Determine the horizontal & vertical angles by using Theodolite.													
	CO5	Determine the elevations by using different leveling instruments.													
<b>Contribution of Course Outcomes towards achievement of Program Outcomes</b>  <b>(L – Low, M - Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
	<b>CO1</b>	L								L	L				L
	<b>CO2</b>	L								L	L				L
	<b>CO3</b>	L								L	L				L
	<b>CO4</b>	L								L	L				L
	<b>CO5</b>	L								L	L				L
<b>Course Content</b>	<b>CHAIN SURVEY:</b> <ol style="list-style-type: none"> <li>Survey of an Area by chain survey (Closed Traverse). <b>Practical Application : To find the area of a given feild</b></li> <li>Chaining across Obstacles. <b>Practical Application : To find the obstacles length</b></li> </ol> <b>COMPASS SURVEY</b> <ol style="list-style-type: none"> <li>Surveying of a given area by prismatic compass (Open Traverse). <b>Practical Application:</b> To find the horizontal angles between the objects.</li> <li>Surveying of a given area by prismatic compass (Closed Traverse). <b>Practical Application:</b> To find the horizontal angles between the objects.</li> </ol> <b>PLANE TABLE SURVEY:</b> <ol style="list-style-type: none"> <li>Traversing by plane table survey. <b>Practical Application:</b> To plot the given area.</li> </ol> <b>THEODOLITE:</b> <ol style="list-style-type: none"> <li>Measurement of horizontal angles by using Repetition Method. <b>Practical Application:</b> To find the horizontal angles between the two points.</li> <li>Measurement of horizontal angles by using Reiteration Method. <b>Practical Application:</b> To find the horizontal angles between more than two points.</li> <li>Measurement of Vertical angles. <b>Practical Application:</b> To find the height of the object using vertical angles.</li> </ol> <b>LEVELLING:</b> <ol style="list-style-type: none"> <li>Differential Levelling:</li> </ol>														

	<p><b>Practical Application:</b> To find the R.L's of the ground for laying the pipe line using any leveling Instrument.</p> <p>2. Reciprocal Levelling:  <b>Practical Application:</b> Elevation difference between two points on both sides of river banks.</p>
<b>Text books and Reference books</b>	<p>1. Surveying Vol I &amp; II by K R Arora, Standard Book house.</p> <p>2. Plane Surveying by AM Chandra, New Age International (P) Ltd.</p> <p>3. Surveying Vol.I &amp; II by B.C. Punmia, Laxmi Publications.</p> <p>4. Fundamentals of surveying by S.K. Roy 1999, Prentice- Hall of India, New Delhi.</p>
<b>E-resources and other digital material</b>	<p><a href="http://gauravtandon.wikspacaes.com">http://gauravtandon.wikspacaes.com</a></p>

## 17CE3352 STRENGTH OF MATERIALS LABORATORY

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

<b>Course outcomes</b>	<b>Upon successful completion of the course, the student will be able to:</b>														
	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>Contribution of Course Outcomes towards achievement of Program Outcomes</b>  <b>(L – Low, M - Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
	<b>CO1</b>	L			M					L	M				L
	<b>CO2</b>	L			M					L	M				L
	<b>CO3</b>	L			M	M				L	M				L
<b>Course Content</b>	1. Study the stress-strain characteristics of mild steel/tor steel by Universal testing machine. 2. Determine the ultimate shear strength of mild steel rod in single and double shear. 3. Find the Brinell's hardness number and Rockwell's hardness number of the given material.														

	<ol style="list-style-type: none"> <li>4. Find the Young's modulus of the given material (Wood/Steel/Aluminum) by conducting bending test on simply supported beam.</li> <li>5. Find the Young's modulus of the given material by conducting bending test on cantilever beam and propped cantilever.</li> <li>6. Find the impact resistance of the given material by conducting Charpy test and IZOD test on Impact testing machine.</li> <li>7. Find the modulus of rigidity by conducting torsion test on solid circular shaft.</li> <li>8. Determine the modulus of rigidity of the material of the spring.</li> <li>9. Determine the ductility of steel wire.</li> <li>10. Tests on timber.</li> <li>11. Strain gauge application and evaluation of stress.</li> </ol>
<b>Text books and Reference books</b>	<ol style="list-style-type: none"> <li>1. Strength of Materials by S Ramamrutham &amp; R Narayan; Dhanpat Rai Publishing Co.(P) Ltd, New Delhi.</li> </ol>
<b>E-resources and other digital material</b>	<a href="https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.pdf">https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.pdf</a>

## 17CE3353-ENGINEERING GEOLOGY LABORATARY

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

Course outcomes	On successful completion of the course, the student will be able to:															
	CO1	Identify the common rocks and minerals and their engineering properties														
	CO2	Interpret the subsurface geological structures using models														
	CO3	Practice the topographic and geologic cross sections														
	CO4	Calculate the engineering parameters from the rock samples														
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	
	CO1	H													H	
	CO2	H													H	
	CO3	H	H		H										H	
	CO4	H	H		H										H	
Course Content	<p><b>EXP.1.</b>Identification of the following common rock forming Minerals by Physical properties a).Quartz group b) Feldspar group c) Mica group d) Carbonate group</p> <p><b>EXP.2.</b> Identification of the following common rocks by Texture a).Granite b) Basalt c)Sandstone d) Limestone e)Marble f)Gneiss</p> <p><b>EXP.3</b> Identification and sketching of the structural models a)Folds b) Faults c) Un conformities d) Tunnels in geological structures</p> <p><b>EXP.4.</b> Drawing and interpretation of geological cross sections. a)Topographic maps b) Geological maps</p>															

	<p><b>EXP.5.</b> Determination of point load strength index of rocks</p> <p><b>EXP.6.</b> Determination of tensile strength of rocks from Brazilian test.</p> <p><b>EXP.7.</b> Determination of Compressive strength of rocks..</p>
Text books and Reference books	Engineering Geology by SK Duggal, HK Pandey And N.Rawal –McGraw Hill Education
E-resources and other digital material	<a href="https://www.fugro.com/our-services/land-site-characterisation/testing-monitoring/laboratory-testing-of-soils-and-rocks">https://www.fugro.com/our-services/land-site-characterisation/testing-monitoring/laboratory-testing-of-soils-and-rocks</a>

#### 17MC1307 B – INDIAN CONSTITUTION

<b>Course Category:</b>	Humanities elective	<b>Credits:</b>	-
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	2- 0 - 0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	100M

Course outcomes	Upon successful completion of the course, the student will be able to:															
	CO1	Know the fundamental law of the land														
	CO2	Understand how fundamental rights are protected														
	CO3	Perceive the structure and formation of the Indian Government System														
	CO4	Explain when and how an emergency can be imposed and what are the consequences.														
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSPO 1	PSPO 2	
	CO1						M									
	CO2						M									
	CO3						M									
	CO4						M									
Course Content	<b>UNIT I:</b> <b>Introduction to Constitution of India:</b> Meaning of the Constitution Law and Constitutionalism, Historical perspective of constitution of India, Salient features of Constitution of India.															
	<b>UNIT II:</b> <b>Fundamental rights:</b> Scheme of the fundamental rights, scheme of the fundamental right to equality, scheme of the fundamental right to certain freedoms under Article 19, scope of the right of life and personal liberty under Article 21, writs jurisdiction.															
	<b>UNIT III: Nature of the Indian constitution:</b> Federal structure and distribution of legislative and financial powers between the Union and states <b>Parliamentary form of government in India:</b> The Constitution powers and status of the President of India, Amendment of the Constitutional powers and Procedure, Historical Perspectives of the constitutional amendments in India <b>Local Self Government:</b> Constitutional Scheme in India															
	<b>UNIT IV:</b> <b>Emergency Provisions:</b> National Emergency, President rule, financial emergency.															
Text books and Reference books	<b>Text Book(s):</b> [1] Dr. J.N. Pandey, Constitutional Law of India published by Central law Agency, Allahabad, Edition 2018															

<b>COURSE OUT COMES</b>	<b>On successful completion of the course, the student will be able to:</b>														
	CO1	Understand physical properties, uses, manufacturing processes of building materials that are used in structural components.													
	CO2	Understand application of protective materials for structural members.													
	CO3	Distinguish different types of constructional procedures for different components of a building.													
	CO4	Apply the knowledge of different support systems for construction and repairs.													
<b>Contribution of Course Outcomes Towards achievement of Program Outcomes (L – Low, M-Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
	<b>CO1</b>	L		M		L		M	L						H
	<b>CO2</b>	L		M			M	M							H
	<b>CO3</b>	L		M		H									M
	<b>CO4</b>														
		L				H	H								M
<b>Course Content</b>	<b>UNIT – I</b>														
	<b>STONES:</b> Qualities of a good building stone; Stone quarrying; Tools for blasting; Materials for blasting; Process of blasting; Precautions in blasting; Common building stones of India.  <b>BUILDING BLOCKS:</b> <b>BRICKS:</b> General; Composition of good brick earth; Manufacture of bricks; Comparison between clamp burning and kiln burning; Qualities of good bricks; Tests for bricks; Classification of bricks; Colours of bricks, Size and weight of bricks; Shape of bricks; Fire – clays; Fire – bricks; AAC blocks.  <b>CONCRETE BLOCKS:</b> Raw materials; manufacturing; advantages; <b>FLY ASH BRICKS:</b> Fly-														



	<p>Ash; use of fly ash; fly ash building bricks;</p> <p><b>TIMBER:</b> Definition; Structure of a tree; Defects in timber; Qualities of good timber; Decay of timber; Preservation of timber; Fire resistance of timber; Seasoning of timber; Advantages of timber construction; Use of timber. Indian timber trees.</p> <p><b>UNIT – II</b></p> <p><b>STEEL:</b> General; Manufacture of steel; Uses of steel; Market forms of steel; Properties of mild steel; Properties of hard steel;</p> <p><b>PAINTS, VARNISHES AND DISTEMPERS:</b> General; Painting; Varnishing; Distempering; Wall paper; White washing; Colour washing; Emulsion Paints.</p> <p><b>UNIT – III</b></p> <p><b>BRICK MASONRY:</b> Technical terms; Types of bonds in brickwork- Stretcher, header, English, Flemish.</p> <p><b>STONE MASONRY:</b> Technical terms; Classification of stone masonry.</p> <p><b>WALLS AND LINTELS</b> Classification of walls, Classification of Lintels- timber, stone, brick, steel, reinforced concrete lintels.</p> <p><b>UNIT – IV</b></p> <p><b>DAMPNESS AND DAMP PROOFING:</b> Causes of dampness; Methods of preventing dampness; Damp proofing materials and their classification;</p> <p><b>FLOORS:</b> Technical terms; Types of flooring materials.</p> <p><b>ROOFS:</b> Technical terms; Types of roofs; Trusses- 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;</p> <p><b>SCAFFOLDING, SHORING, UNDER PINNING AND FORM WORK:</b> Types of scaffolding; Types of shoring; Methods of underpinning; Types of form work;</p>
<b>Text books and Reference books</b>	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Engineering Materials by S. C. Rangwala; Charotar Publishing House.</li> <li>2. Building construction by B. C. Punmia -Laxmi Publications, New Delhi.</li> </ol> <p><b>Reference books:</b></p> <ol style="list-style-type: none"> <li>1. Building construction and construction materials by G.S.Birdie and T.D.Ahuja, Dhanpathrai publishing company,newdelhi..</li> </ol>

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<http://nptel.ac.in/courses/105102088/>

## 17CE3402 CONCRETE TECHNOLOGY

<b>Course Category:</b>	<b>Programme Core</b>	<b>Credits:</b>	<b>4</b>
<b>Course Type:</b>	<b>Theory</b>	<b>Lectures; Tutorial; Practicals:</b>	<b>3-0-2</b>
		<b>Continuous Evaluation:</b>	<b>30</b>
		<b>Semester end Evaluation:</b>	<b>70</b>
		<b>Total Marks:</b>	<b>100</b>

<b>COURSE OUTCOMES</b>	<b>On successful completion of the course, the student will be able to:</b>														
	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.													
	CO5	Design concrete mixes using Indian Standard method and apply statistical quality control techniques to concrete quality.													
<b>Contribution of Course Outcomes Towards achievement of Program Outcomes (L – Low, M- Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
	<b>CO1</b>	L				L		L	L					L	H
	<b>CO2</b>	L	L		M			M	L					M	H
	<b>CO3</b>	L	H		M	M	L	L						L	M
	<b>CO4</b>	L			L	M	M							L	M
	<b>CO5</b>														
<b>Course Content</b>	<b>UNIT- I</b>  <b>CEMENT:</b> General; Cement and lime; Chemical composition of ordinary Portland cement; Functions of cement ingredients; Hydration of cement; Water requirements for hydration, Storage of cement; Uses of cement. Types of cements including blended cements, properties and their applications; Field tests for cement; Grades of cement as per IS specifications. <b>LABORATORY TESTS:</b> fineness of cement, specific gravity, consistency, initial and final setting time.  <b>AGGREGATES:</b> Classification; Fine aggregate-Natural and artificial; coarse aggregate, Source; Grading of Aggregates; IS: 383 requirements for aggregates; Alkali – Aggregate reaction. <b>LABORATORY TESTS:</b> sieve analysis, sp.gravity, bulk density of both fine and coarse														

aggregate, bulking of sand.

## **UNIT-II**

### **WATER:**

General; Quality of water; Use of sea water; IS: 456 requirements.

### **MORTAR:**

Functions of sand in mortar; Classification of mortars; Properties of good mortar mix and mortar; Uses of mortar; Precautions in using mortar; Selection of mortar;

**LABORATORY TESTS:** compressive strength, adhesiveness.

### **CONCRETE:**

Definition; Proportioning of concrete; Water – cement ratio.

### **ADMIXTURES IN CONCRETE:**

General; Air-entraining agents; Plasticizers; Mineral and chemical admixtures; Accelerators; Retarders; Miscellaneous admixtures for damp proofing and Surface hardening.

### **FRESH CONCRETE:**

Workability of concrete; Segregation; Bleeding; Yield of Concrete.

**LABORATORY TESTS:** workability tests: slump cone, compaction factor;

## **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; 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; 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.

**LABORATORY TESTS:** Compressive strength, flexural strength, split tensile test, NDT tests.

## **UNIT – IV**

### **DURABILITY OF CONCRETE:**

Permeability of concrete; Sulphate attack; Methods of controlling sulphate attack; Durability

	<p>of concrete in sea water; Corrosion mechanism of reinforcement in concrete.</p> <p><b>SPECIAL CONCRETES &amp; CONCRETING METHODS:</b>            Light weight concrete and No fines concrete; High density concrete; Polymer concrete and Fiber reinforced concrete; Cold weather concreting, Hot weather concreting, Guniting or shotcrete; Ferro cement; Vacuum concrete, Vacuum Dewatered Concrete, Self compacting concrete, Self healing Concrete.</p> <p><b>CONCRETE MIX DESIGN:</b>            Concept of mix design; Variables in proportioning; List of Mix design methods; Indian standard method of mix design. Ready Mixed Concrete.</p>
<b>Text books and Reference books</b>	<p><b>Text Book:</b>            1. Concrete Technology by M. S. Shetty; S. Chand &amp; Company (Pvt.) Ltd., New Delhi.</p> <p><b>Reference Books:</b>            2. Properties of Concrete by A. M. Neville; Published by Dorling Kindersley(India) Pvt. Ltd. Licensees of Pearson Education in south Asia, New Delhi.            3. Concrete Technology by M. L. Gambhir; Tata Mc Graw – Hill Publishing Company Ltd., New Delhi.            4. Concrete Technology by A.R.Santhakumar; Oxford University press-New Delhi.            Concrete Microstructure, Properties and Materials., by P.Kumar Mehta, Paulo J.M.Monteiro, Mc.Graw Hill Publications.</p>
<b>E-resources and other digital material</b>	<p><a href="http://nptel.ac.in/courses/105102012">http://nptel.ac.in/courses/105102012</a></p>

**17CE3403 MECHANICS OF MATERIALS**

<b>Course Category:</b>	Programme Core	<b>Credits:</b>	4
<b>Course Type:</b>	Theory	<b>Lecture : Tutorial :Practice:</b>	3-1-0
<b>Prerequisites:</b>	Engineering Mechanics 17ME1104A Introduction to Solid Mechanics 17CE3302	<b>Continuous Evaluation:</b> <b>Semester end Evaluation:</b> <b>Total Marks:</b>	30 70 100

<b>COURSE OUT COMES</b>	<b>Upon successful completion of the course, the student will be able to:</b>														
	CO1	Understand the analysis of trusses and cylinders													
	CO2	Understand the compound stresses and behaviour of columns under various end conditions													
	CO3	Understand the various failure theories, strain energy, shear centre and composite beams													
	CO4	Understand the energy methods used to derive the equations to solve engineering problems													
<b>Contribution of Course Outcomes Towards achievement of Program Outcomes (L – Low, M- Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
	CO1	H				H								L	H
	CO2	H				H								L	H
	CO3	H				H								L	H
	CO4														
		H				H								L	H

<b>Course Content</b>	<b>UNIT - I</b> <b>Analysis of statically determinate trusses;</b> Analysis of statically determinate trusses using method of sections  <b>Thin Cylinders and Spheres</b> Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures, strain calculations Simple problems.  <b>Thick wall cylinders</b> Introduction, Stresses in thick walled cylinders, variation of stresses.
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	<p><b>UNIT – II</b>  <b>COMPOUND STRESSES:</b>  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.</p> <p><b>COLUMNS:</b>  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.</p> <p><b>UNIT III</b>  <b>STRAIN ENERGY:</b>  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.</p> <p><b>FAILURE THEORIES:</b>  Introduction; Maximum normal stress theory; Maximum shearing stress theory; Maximum strain energy theory; Maximum distortion energy theory; Comparison of theories.  <b>Stresses in beams (Advanced topic);</b>  Introduction, analysis of composite beams, shear centre.</p> <p><b>UNIT IV</b>  <b>DISPLACEMENTS OF DETERMINATE STRUCTURES USING ENERGY METHODS:</b>  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.</p>
<p><b>Text books and Reference Books</b></p>	<p><b>Text Books:</b>  1. Strength of Materials (Mechanics of solids) by Er. R.K.Rajput; S.Chand&amp;Company Ltd., New Delhi.  2. Strength of Materials by S Ramamrutham&amp; R Narayan; DhanpatRai Publishing Co.(P) Ltd, New Del</p> <p><b>Reference Books:</b>  1. Structural analysis by S SBhavikatti – V K Publishers  2. Theory of structures by S P Timoshenki&amp; D H Young.  3. Mechanics of materials by E P Popov; Prentice-Hall of India Pvt. Ltd.,New Delhi.  4. Norris, C.H. and Wilber, J. B. and Utku, S. “Elementary Structural Analysis” Mc Graw Hill, Tokyo, Japan.</p> <p>5. Timoshenko, S. and Young, D. H., “Elements of Strength of Materials”, DVNC, NewYork, USA.</p> <p>6. Kazmi, S. M. A., ‘Solid Mechanics’ TMH, Delhi, India.</p> <p>7. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice</p>

	<p>Hall, 2004</p> <p>8. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979</p> <p>9. Gere, J. M., and S. P. Timoshenko. Mechanics of Materials. 5th ed. Boston: PWS Kent Publishing, 1970.</p> <p>10. Ashby, M. F., and D. R. H. Jones. Engineering Materials, An Introduction to their Properties and Applications. 2nd ed. Butterworth Heinemann.</p> <p>11. Collins, J. A. Failure of Materials in Mechanical Design. 2nd ed. John Wiley &amp; Sons, 1993.</p> <p>12. Courtney, T. H. Mechanical Behavior of Materials. McGraw-Hill, 1990.</p> <p>13. Hertzberg, R. W. Deformation and Fracture Mechanics of Engineering Materials. 4<sup>th</sup> Ed. John Wiley &amp; Sons, 1996.</p> <p>14. Nash, W. A. Strength of Materials. 3d ed. Schaum's Outline Series, McGraw-Hill 1994.</p>
<b>E-resources and other digital material:</b>	<p><a href="http://nptel.ac.in/courses/105105108/">http://nptel.ac.in/courses/105105108/</a></p> <p><a href="http://nptel.ac.in/courses/105106116/13">http://nptel.ac.in/courses/105106116/13</a></p>



<b>Course Category:</b>	Programme Core	<b>Credits:</b>	4
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial -Practice:</b>	3 - 1 – 0
<b>Prerequisites:</b>	17CE 3303 – Fluid Mechanics	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

Course Outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Determine the most economical dimensions of different channel sections.													
	CO2	Analyze the flow through an open channel.													
	CO3	Formulate an equation for a phenomenon using dimensional analysis.													
	CO4	Analyze and select suitable type of turbine / Pump.													
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	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
	CO1	H	M	H										H	
	CO2	H	M	H											H
	CO3	H	M	H											H
	CO4	H	M	H										M	H
Course Content	<p><b>UNIT I:</b>  <b>Open Channel Flow: Uniform Flow:</b> 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.</p> <p><b>Non-Uniform Flow:</b> 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.</p> <p><b>UNIT II:</b>  <b>Gradually Varied Flow:</b> Dynamic equation; Types of Surface Profiles; Computation of surface profiles by single step method; Back water Curves and Draw down curves.</p> <p><b>Rapidly Varied Flow:</b> Hydraulic jump; Elements and characteristics of hydraulic jump; Types of hydraulic jumps; Applications of hydraulic jump; Energy loss in a hydraulic jump.</p> <p><b>UNIT III:</b>  <b>Dimensional Analysis and Similitude:</b> 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.</p> <p><b>Impact of Jets:</b> Force exerted by fluid jet on stationary and moving flat plates and curved plates; Force</p>														

	<p>exerted by fluid jet on series of flat vanes; Angular momentum principle; Torque exerted on a wheel with radial curved vanes.</p> <p><b>UNIT – IV</b></p> <p><b>Hydraulic Turbines:</b> Classification; Impulse; Reaction; Radial, Axial, mixed and tangential flow turbines; Pelton, Francis and Kaplan turbines; Velocity triangles; Head and efficiency; Draft tube theory; Characteristic curves; Concept of specific speed and unit quantities.</p> <p><b>Centrifugal Pumps:</b> Types of pumps, Manometric head; Losses and efficiencies; Working Principle and Work done; Priming; Velocity triangles; Characteristic curves; Multistage pumps; Specific speed; Cavitation.</p>
<b>Text books and Reference books</b>	<p><b>Text Books:</b></p> <p>[1] P.N. Modi &amp; S.N. Seth, “Hydraulics &amp; Fluid Mechanics”, 18<sup>th</sup> ed., Standard Book House, New Delhi, 2015.</p> <p>[2] A.K. Jain, “Fluid Mechanics”, 11<sup>th</sup> ed., Khanna Publishers, New Delhi, 2014.</p> <p><b>Reference Books:</b></p> <p>[1] Jagadhisilal, “Hydraulic Machines”, 9<sup>th</sup> ed., Metropolitan Company, New Delhi, 2012.</p> <p>[2] R. K. Bansal, “Fluid Mechanics and Hydraulic Machines”, 9<sup>th</sup> ed., Laxmi Publications; New Delhi, 2015.</p> <p>[3] Rajput R.K., “Fluid Mechanics and Hydraulic Machines”, 3<sup>rd</sup> ed., S.Chand and Company Ltd., New Delhi, 2014.</p> <p>[4] K. Subramanya, “Flow in Open Channels” – 3<sup>rd</sup> ed., Tata McGraw Hill Publishing Company, New Delhi, 2013.</p>
<b>E-resources and other digital material</b>	<p>[1] Prof. Arup Kumar Sharma, IIT/ Guwahati – Hydraulics – “<a href="http://www.nptel.ac.in/courses/105103096/">www.nptel.ac.in / courses/ 105103096/</a>”</p> <p>[2] Prof. B.S. Murthy and Dr. B.S. Thandaveswara, IIT/Madras – Hydraulics – “<a href="http://www.nptel.ac.in/courses/105106114/">www.nptel.ac.in / courses/ 105106114/</a>”</p>

**17TP1405**  
**ENGLISH FOR PROFESSIONALS**

<b>Course Category:</b>	Institutional Core	<b>Credits:</b>	1
<b>Course Type:</b>	Learning by Doing	<b>Lecture -Tutorial-Practice:</b>	0 - 0 - 2
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	100
		<b>Semester end Evaluation:</b>	0
		<b>Total Marks:</b>	100

**COURSE OUTCOMES**

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

<b>CO1</b>	Present themselves effectively in the professional world
<b>CO2</b>	Introduce themselves as well as others appropriately.
<b>CO3</b>	Use vocabulary to form sentences and narrate stories by using creative thinking skills

<b>CO4</b>	Involve in practical activity oriented sessions.
<b>CO5</b>	Learn about various expressions to be used in different situations.
<b>CO6</b>	Respond positively by developing their analytical thinking skills.

**Contribution of Course Outcomes towards achievement of Program Outcomes  
(1 – Low, 2 - Medium, 3 – High)**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
<b>CO1</b>										H	H			
<b>CO2</b>									H	H	H			
<b>CO3</b>										H	H			
<b>CO4</b>								M		H	H			
<b>CO5</b>										H	H			
<b>CO6</b>														

<b>COURSE CONTEN T:</b>	<p><b>UNIT-I</b></p> <ol style="list-style-type: none"> <li>1. Beginners, Functional, Situational Conversations</li> <li>2. Practicing on Functional Conversations.</li> </ol> <p><b>UNIT-II</b></p> <ol style="list-style-type: none"> <li>1. Errors in usage of Parts of Speech with a thrust on Verbs, Adjectives and Conjunctions, Idioms/Phrases.</li> <li>2. B. Introducing Basic Grammar</li> <li>3. C. Practicing on Functional Conversations.</li> </ol> <p><b>UNIT-III</b></p> <ol style="list-style-type: none"> <li>1.Introducing Self &amp; Others</li> <li>2. Structures and Forming Sentences</li> <li>3. Telephonic Etiquette, Social Etiquette and Table Manners</li> <li>4. Practicing on Functional Conversations.</li> </ol> <p><b>UNIT-IV</b></p> <ol style="list-style-type: none"> <li>1. Direct, Indirect/Reporting Speech</li> <li>2. Public Speaking Basics</li> <li>3. Versant Test Preparation</li> <li>4. Practicing on Situational Conversations.</li> </ol>
<b>Standard References</b>	<ol style="list-style-type: none"> <li>1. Swaroopa Polineni, “Strengthen Your Communication Skills”, I ed., Maruthi Publications, 2013. ISBN:978-81-907052-2-6</li> <li>2. Mamta Bhatnagar&amp;Nitin Bhatnagar, “Communicative English”, I ed., Pearson India, 2010. ISBN:8131732045</li> </ol>

**17HS2406/A– Yoga & Meditation**

<b>Course Category:</b>	Humanities elective	<b>Credits:</b>	1
<b>Course Type:</b>	Practical	<b>Lecture - Tutorial - Practice:</b>	1- 0 - 0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	<b>100M</b>

Course outcomes		Upon successful completion of the course, the student will be able to:													
	CO1	Equip better attitude and behaviour.													
	CO2	Imbibe set of values enabling a balanced life focused on an ethical material life.													
	CO3	Develop levels of concentration through mediation													
	CO4	Apply conscience for the missions of life													
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	P O6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1						M								
	CO2						M								
	CO3						M								
	CO4						M								

Course Content	<p><b>UNIT I :</b></p> <p><b>Understanding Yoga :</b> Orientation, Introduction to Values , The positive impact of yoga , Application of Values in real life , Universal values</p> <p><b>(Lec-demo pattern with illustrations representing Yogic Postures and value system related pictorial is followed)</b></p>
	<p><b>UNIT II:</b></p> <p><b>Yogic Practices:</b> Yoga, Self and Ultimate goal of yoga, Introduction to various types of yoga, Integration of values in Yoga</p> <p><b>(Activity based processes with Assanas and Pranayama are implemented).</b></p>
	<p><b>UNIT III:</b></p> <p><b>Practice of Meditation:</b> Art of Meditation, Observation, Introspection, Contemplation, Meditation and Concentration</p> <p><b>(Activity based processes involving Meditation sessions followed by demonstrations are implemented)</b></p>

	<b>UNIT IV:</b> <b>Towards professional excellence through Yoga and meditation:</b> Stress Management, Choices we make, Excellence and Integration <b>(Lec-demo pattern is followed).</b>
<b>Text books and Reference books</b>	<b>Text Book(s):</b> 1. Common Yoga protocol, Ministry of Ayush, Govt of India 2. Journey of the Soul- Michael Newton, 2003, Llewellyn <b>Reference Books:</b> 1. Lectures from Colombo to Almora, Swami Vivekakanada, 2010 Ramakrishna Mission 2. Essays of Ralph Waldo Emerson, 1982, Eastern press 3. Eclectic materials Offered by English Dept.
<b>E-resources and other digital material</b>	<a href="http://www.heartfulness.org">www.heartfulness.org</a> accessed on 27 <sup>th</sup> April 2018 <a href="http://www.ayush.gov.in">www.ayush.gov.in</a> accessed on 27 <sup>th</sup> April 2018 <a href="http://www.belurmath.org">www.belurmath.org</a> accessed on 27 <sup>th</sup> April 2018



**17HS2406/I – Foreign Language (German)**

<b>Course Category:</b>	<b>Humanities elective</b>	<b>Credits:</b>	1
<b>Course Type:</b>	Theory/Practical	<b>Lecture - Tutorial - Practice:</b>	1- 0 - 0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	100M

<b>Cours e outco mes</b>		<b>Upon successful completion of the course, the student will be able to:</b>													
	CO1	Learn basics of German Language.													
	CO2	Write German Writing													
	CO3	Understand German Hearing													
	CO4	Form sentence in Present , past and future tense													
<b>Contributio n of Course Outcomes</b>  <b>towards achievement of Program Outcomes</b>  <b>(L – Low, M - Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO1 0</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
	<b>CO1</b>										<b>M</b>				
	<b>CO2</b>										<b>M</b>				
	<b>CO3</b>										<b>M</b>				
	<b>CO4</b>										<b>M</b>				
<b>Course Content</b>	<b>UNIT I:</b> Alphabets, Numbers, Exact articles and not exact Articles  <b>UNITII:</b> Prepositions, Present Tense  <b>UNIT III:</b> Past Tense and about family  <b>UNIT – IV:</b> Future Tenses														
<b>Text books and Reference books</b>	<b>Text Book:</b> [1] Studio d A1Cornelsen Goyalaas Publications New Delhi.														
<b>E-resources and other digital material</b>															



## 17HS2406/K – Psychology

<b>Course Category:</b>	<b>Humanities elective</b>	<b>Credits:</b>	1
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	1 - 0 - 0
<b>Prerequisites:</b>	Introduction to Philosophy PSYCHOLOGICAL PROCESSES	<b>Continuous Evaluation:</b>	<b>100M</b>

<b>Course outcomes</b>		<b>Upon successful completion of the course, the student will be able to:</b>													
	CO1	Relate biological and socio-cultural factors in understanding human Behaviour.													
	CO2	Understand the nature of sensory processes, types of attentions.													
	CO3	Explain different types of learning and the procedures, distinguishes between different types of memory,													
	CO4	Demonstrate an understanding of some cognitive processes involved in Problem solving and decision-making.													
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSPO 1</b>	<b>PSPO 2</b>
	<b>CO1</b>						<b>M</b>								
	<b>CO2</b>						<b>M</b>								
	<b>CO3</b>						<b>M</b>								
	<b>CO4</b>						<b>M</b>								
<b>Course Content</b>	<p><b>UNIT I:</b></p> <p>Introduction: Psychology as a scientific study of behaviour. Biological and sociocultural bases of behaviour, fields of psychology</p> <p><b>UNIT II:</b></p> <p>Sensory and perceptual processes: Sensation, attention and perception</p> <p><b>UNIT III:</b></p> <p>Cognition and Affect: Learning and memory. Emotion and motivation</p> <p><b>UNIT – IV</b></p> <p>Thinking, problem solving and decision making, Personality and intelligence</p>														

<b>Text books and Reference books</b>	<p><b>Text Book:</b> 1 Zimbardo, P. G. (2013). Psychology and Life (20th Ed.). New York: Pearson Education</p> <p><b>Reference Books:</b> 1. Baron, R. A. (2006). Psychology (5th Ed.). New Delhi: Pearson Education. 2. Coon, D., &amp; Mitterer, J. O. (2007). Introduction to Psychology: Gateway to mind and behaviour. New Delhi: Cengage. 3. Feldman, R. S. (2013). Psychology and your life (2nd Ed.). New York: McGraw Hill.</p>
<b>E-resources and other digital material</b>	

**17CE3451**

**FLUID MECHANICS AND HYDRAULIC MACHINES LAB**

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

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Determine the total energy at various sections of pipe flow and Classify different types of flows.													
	CO2	Determine the discharge through tanks and pipes													
	CO3	Determine the discharge through Open channel.													
	CO4	Determine the performance of various Hydraulic machines													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1				H										H
	CO2				H										H
	CO3				H										H
	CO4				H										H
Course Content	<ol style="list-style-type: none"> <li>Verification of Bernoulli's theorem. <b>Practical Application:</b> To find the total energy in a pipe line by verifying the Bernoulli's theorem</li> <li>Determination of Coefficient of discharge of a Venturimeter. <b>Practical Application:</b> To find the discharge in pipe line</li> <li>Determination of Coefficient of discharge of an Orifice meter. <b>Practical Application:</b> To find the discharge in pipe line.</li> <li>Orifice: Determination of Coefficient of discharge by steady and unsteady flow methods water. <b>Field Application:</b> To find the discharge in village water tanks and agricultural tanks in agricultural fields.</li> <li>Mouthpiece: Determination of Coefficient of discharge by steady and unsteady flow methods. <b>Field Application:</b> To find the discharge in village water tanks and agricultural tanks in agricultural fields.</li> <li>Determination of friction factor of Pipes. <b>Field Application:</b> To find the loss of head in pipe lines due to friction.</li> </ol>														

	<p>7. Determination of loss of head in pipes due to bends, sudden contractions and sudden expansion.  <b>Field Application:</b> To find the losses of head in pipe line fittings such as bends, Elbows, sudden contraction and sudden enlargements, etc.</p> <p>8. Determination of Coefficient of discharge for a Rectangular Notch / Triangular / Trapezoidal Notch.  <b>Field Application:</b> Determination of discharge in canals and village water tanks and agricultural tanks in agricultural fields.</p> <p>9. Characterization of laminar and turbulent flows by Reynolds's apparatus.  <b>Practical Application:</b> 1. Flow through blood vessels, increase in viscosity increases blood pressure.  2. Flow through aquifers.</p> <p>10. Measurement of force due to impact of jets on vanes of different types.  <b>Practical Application:</b> Power generation through hydro power houses.</p> <p>11. Performance studies on single stage centrifugal pump.  <b>Practical Application:</b> Design the pump from model to prototype by using characteristic curves.</p> <p>12. Performance studies on Pelton turbine/Francis turbine.  <b>Practical Application:</b> Efficiency studies.</p> <p><b>Demonstration Experiments:</b></p> <ol style="list-style-type: none"> <li>1. Determination of Manning's and Chezy's coefficients in open channel.</li> <li>2. Performance studies on Reciprocating pump.</li> <li>3. Demo on Francis/Kaplan Turbine.</li> <li>4. Performance studies on Gear Pump.</li> </ol>
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<b>Text books and Reference books</b>	<ol style="list-style-type: none"> <li>1. Fluid Mechanics and Hydraulic machinery laboratory manual by Dr. N.KumaraSwamy, Charrotar Publishing House Pvt. Ltd.</li> <li>2. Experiments in fluid mechanics by Dr. Baljeet Kapoor, Khanna Publications.</li> <li>3. Hydraulics and fluid mechanics including hydraulic machines by Dr. P.N.Modi and Dr. SM Seth, Standard book house, New Delhi</li> </ol>
<b>E-resources and other digital material</b>	<p>[1] Prof. Arup Kumar Sharma, IIT/ Guwahati – Hydraulics –  <a href="http://www.nptel.ac.in/courses/105103096/">“www.nptel.ac.in/courses/105103096/”</a></p> <p>[2] Prof. B.S. Murthy and Dr. B.S. Thandaveswara, IIT/Madras–Hydraulics –  <a href="http://www.nptel.ac.in/courses/105106114/">“www.nptel.ac.in/courses/105106114/”</a></p>

**17CE3452**  
**BUILDING PLANNING AND DESIGN LABORATORY**

<b>Course Category:</b>	Programme Core	<b>Credits:</b>	1
<b>Course Type:</b>	Lab	<b>Lecture - Tutorial - Practice:</b>	0 - 0 - 2
<b>Prerequisites:</b>	Engineering graphics 17ME1105	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

[illegible]



<b>Text books and Reference books</b>	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Building planning, designing and scheduling by Gurucharan Singh and Jagdish Singh. – Standard Publishers-Delhi.</li> <li>2. Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki; Tata McGrawHill Publishing Co. Ltd., New Delhi.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. National Building Code, Bureau of Indian Standards, New Delhi, 2005.</li> <li>2. Planning &amp; Designing Buildings by Yashwant S. Sane; Allies Book Stall, Pune</li> <li>3. Residential Interior Design: A Guide To Planning Spaces 3rd Edition by Maureen Mitton (Author), Courtney Nystuen (Author)</li> </ol>
<b>E-resources and other digital material</b>	<p><b>NPTEL :</b> NPTEL, <a href="http://www.floorplanner.com">www.floorplanner.com</a></p>

Course Category:	soft skills	Credits:	1
Course Type:	Laboratory	Lecture-Tutorial-Practice:	0-0-2
Prerequisites:	Technical English & Communication skills 17HS1205	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	<b>Upon successful completion of the course, the student will be able to:</b>	
	CO1	Execute rational pronunciation of speech sounds including accentuation.
	CO2	Apply elements of listening comprehension in professional environments.
	CO3	Develop the abilities of rational argumentation and skills of public speaking.
	CO4	Demonstrate proficiency in the elements of professional communication including the competitive examination

Contribution of Course Outcomes towards achievement of Program Outcomes (H- Highly Mapped, M- Moderately Mapped, L- Low)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
	CO1										H				
	CO2						H		L	H	H	M	H		
	CO3				M	M	H	H	M	H	H	M	H		
	CO4	M	L	L	M	L	H	M	H	H	H	H	M		

Course Content	<p>UNIT:I :Elements of Spoken Expression and processes of Listening comprehension:</p> <ul style="list-style-type: none"> <li>➤ Speech Mechanism</li> <li>➤ Articulation of vowels and consonants</li> <li>➤ Patterns of Accentuation</li> </ul> <p>Types and processes of Listening comprehension</p>
	<p>UNIT II: Patterns of Substantiation and Refutation in Public Speaking:</p> <ul style="list-style-type: none"> <li>➤ Group Discussion(Open and Monitored)</li> <li>➤ Pyramid Discussion</li> <li>➤ PNI</li> </ul> <p>Seminar Talk and Power Point Presentation</p>



	<p>UNIT III: Professional Communication:</p> <ul style="list-style-type: none"> <li>➤ Self Affirmation</li> <li>➤ Textual Patterns</li> <li>➤ Advanced Composition including Memo and e-mail</li> <li>➤ Résumé Preparation</li> </ul> <p>Corporate ethic of Non-Verbal Communication</p> <p>UNIT IV: Life Skills and Vocabulary for Competitive Examinations:</p> <ul style="list-style-type: none"> <li>➤ Select Life Skills(50)</li> <li>➤ Select Logies, Isms, Phobias and Manias (25 each)</li> <li>➤ Sentence Completion and Double Unit Verbal Analogies (50 items)</li> </ul> <p>Fundamentals of Syllogisms(Descriptive and Pictorial)</p>
Text books and Reference books	<p>Text Book(s):</p> <ol style="list-style-type: none"> <li>1. Martin Cutts, Oxford Guide to Plain English, 7<sup>th</sup> Impression, OUP, 2011</li> <li>2. Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21<sup>st</sup> Impression, 2003</li> </ol> <p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon &amp; Schuster UK Ltd, 2004</li> </ol> <p>Eclectic Learning Materials offered by the Department</p>
E-resources and other digital material	<ol style="list-style-type: none"> <li>1. ODII Language Learner's Software, 27-6-2012 Orell Techno Systems</li> <li>2. Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015</li> <li>3. <a href="http://www.natcorp.ox.ac.uk">www.natcorp.ox.ac.uk</a>, <i>British National Corpus accessed on 28-11-2017</i></li> </ol>
E-resources and other digital material	<ol style="list-style-type: none"> <li>1. ODII Language Learner's Software, 27-6-2012 Orell Techno Systems</li> <li>2. Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015</li> <li>3. <a href="http://www.natcorp.ox.ac.uk">www.natcorp.ox.ac.uk</a>, <i>British National Corpus accessed on 28-11-2017</i></li> </ol>

**17MC1407A**  
**ENVIRONMENTAL STUDIES**

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

<b>Course outcomes</b>	<b>Upon successful completion of the course, the student will be able to:</b>														
	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.													
<b>Contribution of Course Outcomes towards achievement of Program Outcomes</b>  (L – Low, M - Medium, H – High)		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO1</b>	<b>PSO2</b>
	<b>CO1</b>	L							H						
	<b>CO2</b>					L			H						
	<b>CO3</b>				L		H								
	<b>CO4</b>				L				H	H					
<b>Course Content</b>	<b>UNIT -I</b>														
	<b>The Multidisciplinary Nature of Environmental Studies</b>														
	Definition, scope and importance Need for public awareness.														
	<b>Natural Resources</b>														
	<b>Renewable and Non-renewable Resources:</b>  Natural resources and associated problems. <p>(a) Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.</p> <p>(b) Water resources: Use and over-utilization of surface and ground water, floods, drought,</p>														

- conflicts over water, dams-benefits and problems.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
- (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
- (f) Land 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   | (b) Water pollution   |
| (c) Soil pollution  | (d) Marine pollution  |
| (e) Noise pollution | (f) Thermal pollution |
| (g) Nuclear hazards |                       |

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

Role of an individual in prevention of pollution.

Diaster management: Floods, earthquake, cyclone and landslides.

	<p><b>UNIT IV</b></p> <p><b>Social Issues and the Environment</b></p> <p>From unsustainable to sustainable development.</p> <p>Urban problems related to energy.</p> <p>Water conservation, rain water harvesting, watershed management.</p> <p>Resettlement and rehabilitation of people; its problems and concerns.</p> <p>Environmental ethics: Issues and possible solutions.</p> <p>Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.</p> <p>Wasteland reclamation.</p> <p>Consumerism and waste products.</p> <p><b>Environment Protection Act.</b></p> <p>Air (Prevention and Control of Pollution) Act.</p> <p>Water (Prevention and Control of Pollution) Act.</p> <p>Wildlife Protection Act.</p> <p>Forest Conservation Act.</p> <p>Issues involved in enforcement of environmental legislation.</p> <p>Public awareness.</p> <p><b>Human Population and the Environment</b></p> <p>Population growth, variation among nations.</p> <p>Population explosion—Family Welfare Programme.</p> <p>Environment and human health.</p> <p>Human rights.</p> <p>Value education.</p> <p>HIV/AIDS.</p> <p>Women and Child Welfare.</p> <p>Role of Information Technology in environment and human health.</p> <p><b>Field Work/Case Studies:</b></p> <p>Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain.</p> <p>Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.</p> <p>Study of common plants, insects, birds.</p> <p>Study of simple ecosystems—pond, river, hill slopes, etc.</p>
<b>Text books and Reference books</b>	<p><b>Text Book:</b></p> <p>1.Text book for <b>ENVIRONMENTAL STUDIES</b> for under graduate courses of all branches of higher education – ErachBharucha -- For University Grants Commission. First edition 2004.</p> <p><b>Reference Book:</b></p> <p>1.Anjaneyulu Y. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad 2004</p>
<b>E-resources and other digital material</b>	<p>collegesat.du.ac.in/UG/Envirnromental%20Studies_ebook.pdf</p>



<b>17CE3501</b>	<b>WATER RESOURCES ENGINEERING</b>
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<b>Course Category</b>	Program Core	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	3 - 0 - 0
<b>Prerequisites:</b>	--	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

Course outcomes	Upon successful completion of the course, the student will be able to															
	CO1	understand various irrigation methods and Irrigation management practices in the field.														
	CO2	evaluate the Run-off and evaluate the ground water yield.														
	CO3	evaluate and Design of various Channel sections.														
	CO4	evaluate reservoir capacity and summarize various types of hydraulic structures														
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	
	CO1	H						M			L					
	CO2	H		M	M									M		
	CO3	H		M	M									H		
	CO4	H		H		M		M			L			H		
Course Content	UNIT – I															
	1. IRRIGATION:WATER APPLICATION METHODS Definition; Necessity; Scope of irrigation science; Benefits of irrigation; Ill-effects of irrigation; Types of irrigation and methods of applying water to crops; Uncontrolled or wild flooding; Free flooding; Contour laterals; Border strip method; Check flooding; Basin flooding; Zig zag method; Furrow method; Contour Farming; Sub-surface irrigation; Sprinkler Irrigation; Drip irrigation.															
	2. WATER REQUIREMENT OF CROPS: Saturation capacity; Field capacity; Wilting point; Available moisture and readily available moisture; Duty and Delta; Base period; Relation between Duty and Delta; Factors affecting duty; Methods of improving duty; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; Standards of irrigation water; Assessment of irrigation water.															
	UNIT – II															
	3. 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, 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

**4. 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; Constant level pumping test, Recuperation test.

**UNIT-III**

**5. 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

**6. WATERLOGGING, CANAL LINING**

Waterlogging, causes, effects and remedial measures. Lining of Irrigation canals, Types of lining; Design of lined canal

**UNIT-IV**

**7. DAMS IN GENERAL:**

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

**8. RESERVOIR PLANNING:**

Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Life of reservoir;

<b>Text books and Reference books</b>	<b>Learning Resources:</b>  <b>Text Books:</b> <ol style="list-style-type: none"> <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> <li>2. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna publishers New Delhi, 2006.</li> <li>3. Irrigation Engineering and Hydraulic structures by SR Sahasrabudhe, Katson Publishing house.2005</li> </ol> <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Irrigation, Water Resources &amp; Water Power Engineering by Dr. P.N. Modi; standard Book House, New Delhi.,2006</li> <li>2. Irrigation water power and water resources engineering by K R ARORA, Standard published distributors, New Delhi.,2006.</li> <li>3. A text book of hydrology by Dr.P.Jayarami Reddy, published by Laxmi Publications.</li> <li>4. Journals in Water resources</li> </ol>
<b>E-resources and other digital material</b>	<a href="http://www.nptel.ac.in/courses/105104103">www.nptel.ac.in/courses/105104103</a>

<b>17CE3502</b>	<b>ENVIRONMENTAL ENGINEERING</b>
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Course Category:	Programme core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	17CH1102 - Engineering chemistry 17MC1407A -Environmental studies	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will have an ability to														
	CO1	understand source of water for water supply scheme with reference to quantity and quality of water													
	CO2	understand and apply the methods of treatment for purification of water													
	CO3	analyse the distribution of water													
	CO4	understand the concepts of collection & conveyance, Quality and quantity of sewerage													
	CO5	apply appropriate treatment and disposal methods of sewage and septage													
Contribution of Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	



<b>Outcomes towards achievement of Program Outcomes</b>  (L – Low, M - Medium, H – High)	CO1										L	L			
	CO2				H									L	L
	CO3	H	H	M				M			M			H	
	CO4	M	M	H										M	
	CO5	H	M	H	H		H	M						H	H

Course Content	<p><b>UNIT – I</b></p> <p><b>1.INTRODUCTION, QUANTITY AND COLLECTION &amp; CONVEYANCE OF WATER</b> Objectives of water supply systems, Per capita consumption; Design period; Types of demands; Fluctuations in demand; Prediction of population.</p> <p>Types of intakes; Capacity and design of pipes; Materials for pipes; Types of pumps.</p> <p><b>2. QUALITY OF WATER</b> Impurities in water; Routine water analysis - physical, chemical and bacteriological tests; Standards for drinking water; Water borne diseases.</p>
	<p><b>UNIT – II</b></p> <p><b>3. PURIFICATION OF WATER</b> Purification of water; Plain sedimentation; coagulation and types of Coagulants; Sedimentation and coagulation tanks; Design aspects; Theory of filtration; Slow sand and rapid sand filters; Construction and Operation; Disinfection methods-chlorination; Removal of hardness, Methods of removal; De-fluoridation.</p> <p><b>4. DISTRIBUTION SYSTEMS</b> Methods of supply; Layouts; Distribution reservoirs; Capacity of balancing tank; Methods of analysis of distribution systems; valves. Plumbing-pipes and fittings; Traps; One pipe and Two pipe systems.</p>
	<p><b>UNIT – III</b></p> <p><b>5. INTRODUCTION TO SANITARY ENGINEERING AND SEWERS AND SEWER APPURTENANCES</b> Sanitation; Conservancy and water carriage system; Sewerage systems; Relative merits, Sanitary and storm water sewage; Estimation of their quantities.</p> <p>Sewers-types, design, construction and maintenance; sewer appurtenances-types.</p> <p><b>6.QUALITY OF SEWAGE AND PRIMARY TREATMENT OF SEWAGE</b> Characteristics of sewage-physical, chemical and biological; decomposition cycles; BOD and COD</p>

	<p>Primary treatment- theoretical concepts of Screens; Grit chamber; Skimming tanks; design aspects of Sedimentation tanks.</p>
	<p><b>UNIT – IV</b></p> <p><b>7.SECONDARY TREATMENT OF SEWAGE</b> Trickling filters; high rate trickling filters at primary level, Principles of action; Recirculation; Operational problems and remedies; Activated sludge process; Principle of action; Methods of aeration; Sludge bulking; Sludge volume index.</p> <p><b>8. SEWAGE DISPOSAL; SEPTIC TANKS &amp; FEACAL WASTE AND SEPTAGE MANAGEMENT</b></p> <p>Methods; Disposal by dilution; Self purification process; Oxygen sag; Zones of pollution of river; Disposal by irrigation.</p> <p>Septic tank-Design; effluent disposal; Septage Management, government policies and programs, value chain, environmental aspects, on site contaminant system, waste characterisation and treatment options.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Elements of public health engineering by K. N. Duggal; S. Chand &amp; Company Ltd., New Delhi, 2014.</li> <li>2. Environmental Engineering Vol. I&amp; II - Water supply engineering by S. K. Garg; Khanna Publishers, New Delhi, 2017.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Water Supply and Sanitary Engineering Vol. 1 by Gurucharan Singh; Standard Publishers Distributors, Delhi, 2009</li> <li>2. Water Supply and Sanitary Engineering by G.S. Birde; Dhanpatrai and sons, Delhi, 1998.</li> <li>3. Manual on Water Supply &amp; Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi, 2005</li> </ol>
E-resources and other digital material	<p>NPTEL: <a href="http://nptel.ac.in/courses/105104102/">http://nptel.ac.in/courses/105104102/</a>  <a href="http://nptel.ac.in/courses/105106119/">http://nptel.ac.in/courses/105106119/</a></p>



Temperature variation.

### **UNIT III**

#### **ANALYSIS OF INDETERMINATE STRUCTURES:**

##### **5.FORCE METHOD**

Propped cantilever by consistent deformation method.

Fixed beams for different loadings, Effect of sinking and rotation of support.

Clapeyron's theorem of three moments.

##### **6. DISPLACEMENT METHODS:**

Slope deflection method for continuous beam and portal frames.

Moment distribution method for continuous and portal frames.

### **UNIT IV**

#### **APPROXIMATE METHODS OF ANALYSIS FOR MULTISTORY FRAMES:**

##### **7.KANI'S METHOD:**

Introduction and principles of the kani's method, Application of the method to continuous beams, Application of method to the analysis of portal frames without side sway,

##### **8.ANALYSIS OF GRAVITY & LATERAL LOADS**

Substitute frame method with various examples, Portal method and cantilever method .

<p><b>Text books and Reference Books</b></p>	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Analysis of structures by Volume I –17<sup>th</sup> Edition by Vazirani &amp; Ratwani; &amp; Volume –II 16<sup>th</sup> Edition by Vazirani &amp; Ratwani, Khanna Publications; Delhi, 2015.</li> <li>2. Structural Analysis by S.S. Bhavikatti, Volume-I and II, 4<sup>th</sup> Edition, Vikas Publishing house PVT Ltd, 2014.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Structural analysis by Hibbeler, 6<sup>th</sup> Edition, Pearson India Education Services Pvt Ltd.2015</li> <li>2. Structural Analysis by R.Vaidyanathan Volume-I and II, 3<sup>rd</sup> Edition, Laxmi Publications (P) Ltd, 2012.</li> <li>3. Theory of structures by S. Ramamrutham, 9<sup>th</sup> Edition, Dhanapat Rai Publications, 2014.</li> <li>4. Basic Structural Engineering by C.S Reddy, Tata McGraw Hill, Third Edition.</li> <li>5. Theory of structures Vol – I by G.S. Pandit and S.P Gupta and R. Gupta by Tata McGraw Hill Ltd., New Delhi.</li> </ol>
<p><b>3.E-resources and other digital material:</b></p>	<p> <a href="http://nptel.ac.in/courses/105101085">http:// nptel.ac.in/courses/105101085</a>  <a href="http://nptel.ac.in/courses/105105166">http://nptel.ac.in/courses/105105166</a>  <a href="http://nptel.ac.in/courses/105101086">http://nptel.ac.in/courses/105101086</a> </p>

## **OPEN ELECTIVES**

<b>17CE2504 A</b>	<b>GEOSPATIAL TECHNOLOGIES</b>
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<b>Course Category:</b>	Open Elective -I	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	3 - 0 - 0
<b>Prerequisites:</b>	NIL	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

Course outcomes		Upon successful completion of the course, the student will be able to													
		CO1	Apply the recent advances GIS technology in various fields of engineering												
		CO2	Evaluate the opportunities and available methods for integrating GIS in various engineering applications												
		CO3	Understand large scale maps using GIS.												
Contribution of Course Outcomes towards achievement of		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1					H				L	M		L		M

Program Outcomes (L – Low, M - Medium, H – High)	CO2					H	H			L	M		L		M
	CO3					H				L	M		L		M

Course Content	<p><b>UNIT I</b></p> <p><b>1.INTRODUCTION TO GIS</b></p> <p>Introduction to GIS, History of GIS, Early developments in GIS, Applications of GIS</p> <p><b>2.MAP AND MAP SCALES</b></p> <p>Introduction to Maps, History of Maps, Map Scales, Types of Maps, Map and Globe</p> <p><b>UNIT II</b></p> <p><b>3.GEOREFERENCING AND PROJECTION</b></p> <p>Understanding Earth ,Coordinate System, Map Projection, Transformation, Georeferencing</p> <p><b>4.SPATIAL DATABASE MANAGEMENT SYSTEMS</b></p> <p>Introduction, Data Storage, Database Structure Models, Database Management system, Entity Relationship, Model Normalization.</p> <p><b>UNIT III</b></p> <p><b>5.DATA MODELS AND DATA STRUCTURES</b></p> <p>Introduction, GIS Data Model, Vector Data Structure, Raster Data structure ,Geo database and metadata.</p> <p><b>6.SPATIAL DATA INPUT AND EDITING</b></p> <p>Primary Data, Secondary Data, Data Editing, Data types – Spatial and Non Spatial (attribute) data.</p> <p><b>UNIT IV</b></p> <p><b>7.MODELLING IN GIS:</b></p> <p>Introduction to Web GIS, Digital Terrain Modelling, Digital Elevation Modelling, Triangular Irregular Network.</p> <p><b>8.APPLICATIONS OF GIS:</b></p>
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	Multidisciplinary applications of GIS.
Text books and Reference books	<p>Text books</p> <ol style="list-style-type: none"> <li>1. Remote Sensing &amp; Geographical Information Systems by M.Anji Reddy, BPS Publications-Hyderabad,4<sup>th</sup> edition 2011.</li> <li>2. Remote Sensing &amp; GIS by Basudeb Bhatta, Oxford University Press, New Delhi 2011</li> </ol> <p>Reference books</p> <ol style="list-style-type: none"> <li>1.Remote sensing and Image interpretation by TM Lillesand and RWKiefer; John Willey and sons.7<sup>th</sup> edition, 2015</li> <li>2. Remote sensing and Geographical information System by AM Chandra &amp; SK Ghosh;Narosa Publishing House, Second Edition New Delhi,2015</li> </ol>
E-resources and other digital material	NPTEL : <a href="http://nptel.ac.in/courses/105102015">http://nptel.ac.in/courses/105102015</a>

<b>17CE2504 B</b>	<b>QUALITY CONTROL AND QUALITY ASSURANCE</b>
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Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	-----	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to													
		CO1	understand meaning of quality, quality standards												
		CO2	apply provisions of IS codes												
		CO3	apply QC techniques												
		CO4	analyze methods to improve quality												
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
	CO1	H					M	M		H	M				H
	CO2						M	M	M	H	M				H
	CO3	H	H			H	M	M		H	M		M		H
	CO4	H	H				M	M		H	M		M		H



Course Content	<p><b>UNIT – I</b></p> <p><b>1.QUALITY MANAGEMENT</b></p> <p>Introduction – Definitions and objectives – Factors influencing construction quality – Responsibilities and authority – Quality Management Guidelines. TQM Guidelines</p> <p><b>2.QUALITY SYSTEMS</b></p> <p>Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification. Quality circles.</p>
	<p><b>UNIT – II</b></p> <p><b>3.QUALITY PLANNING</b></p> <p>Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion, IS code on sampling, sampling plans, acceptance criteria, Inspection procedures - Total QA / QC programme.</p> <p><b>4.QUALITY PROCEDURES:</b></p> <p>Develop, schedule and implement procedures for tracking control phase meetings for definable features of work in the QC Plan. Notify appropriate personnel of time, date and agenda.</p> <p><b>UNIT – III</b></p> <p><b>5.QUALITY CONTROL:</b></p> <p>Definition, Objectives, Regulatory agencies, statically tolerances, Taguchi concept, Statistical methods: Mean, variance, standard deviation, coefficient correlation, coefficient regression, control charts, methods to evaluate deviation, Contractor Quality Control, Quality Control Personnel, The Three-Phase Control System: Preparatory Phase, Initial Phase and Follow-up Phase. Conduct Meetings (preparatory and initial). Safety considerations and Activity Hazard Analyses (AHAs).</p> <p><b>6.QUALITY ASSURANCE:</b></p> <p>Checklists for - Quality of Materials and processes, factors influencing construction quality , Quality Assurance Personnel and their role, Document actual discussions and provide minutes to attendees. Monitor work in place through follow-up phase. Conduct additional control phase meetings, as needed. Quality Management Record Keeping, The Contractor Quality Control Report,</p>
	<p><b>UNIT – IV</b></p> <p><b>7.QUALITY IMPROVEMENT TECHNIQUES</b></p> <p>Definition, objectives, quality appraisal, techniques of quality assurance, Quality manual ,specification for few items.</p> <p><b>8.FORENSIC ANALYSIS FOR BAD QUALITY</b></p> <p>Deficiency Tracking System/Rework Items List, Pareto analysis, cause effect diagram.</p>

Text books and Reference books	<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Juran Frank, J.M. and Gryna, F.M. "Quality Planning and Analysis", McGraw Hill, 2001</li> <li>2. Thoms Pyzdec; Rozeer W. Berger, "Quality Engineering Hand Book", TATA MC GRAW- HILL, New Delhi, 1995.</li> <li>3. Statistical Quality Control 7th Edition , Eugene L Grant, McGraw-Hill Series, 1980.</li> </ol>		
Course Category:	Open Elective - I	Credits:	3
	<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Dale Besterfield, Carl Besterfield-Michner, Glan Besterfield, mary Besterfield-Sacre, 2nd edition, Total Quality Management, printice Hall, 1999.</li> <li>2. Shridhara Bhat, " Total Quality Management- Cases", Himalaya Publihing House, Mumbai, 2009.</li> </ol>		
E-resources and other digital material	NPTEL: <a href="http://nptel.ac.in/courses/">http://nptel.ac.in/courses/</a>		

17CE2505 A	AIR AND NOISE POLLUTION
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	<p>Stack sampler; Sampling Procedure-Sampling point – size - Isokinetic Conditions- sampling of Particulate matter and Gases. Sampling methods. – Indian standard methods of analysis of SO<sub>2</sub> and NO<sub>x</sub> gases- Air Quality and Emission standards</p>
	<p><b>UNIT – III</b></p> <p><b>5. METHODS OF CONTROLLING AIR POLLUTION</b> 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</p> <p><b>6. CONTROL OF GASEOUS POLLUTANTS</b> Controlling methods of Gaseous Emissions- combustion, adsorption, absorption, closed collections and recovery systems- Control of SO<sub>2</sub> and NO<sub>x</sub> gases</p>
	<p><b>UNIT – IV</b></p> <p><b>7.SOURCES AND EFFECTS OF NOISE POLLUTION</b> Sources Of Noise – Units And Measurements Of Noise – Characterization Of Noise From Construction, Mining, Transportation And Industrial Activities, Airport Noise – General Control Measures – Effects Of Noise Pollution – Auditory Effects, Non-Auditory Effects</p> <p><b>8. CONTROL OF NOISE POLLUTION</b> Prevention And Control Of Noise Pollution – Control Of Noise At Source, Control Of Transmission, Protection Of Exposed Person – Control Of Other Types Of Noise Sound Absorbent-standards</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1.Air Pollution and Control by Rao, M.N and Rao, H.N., Tata McGraw Hill, New Delhi, 2007</li> <li>2. Environmental Engineering and Management, (2nd Edition) by Suresh, I.S.K.Kartarai &amp; Sons, 2005.</li> <li>3.Environmental Engineering vol. II – Sewage disposal and air pollution engineering by S. K. Garg; Khanna Publishers, Delhi.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. An Introduction to Air pollution by Trivedi, R.K., B.S.Publications, 2005.</li> <li>2. Air pollution by Wark and Warner, Addison-Wesley Publications, 1998.</li> </ol>
E-resources and other digital material	<p><b>NPTEL:</b><a href="http://nptel.ac.in/courses/webcourse-contents/IIT-delhi/Environmental%20Air%20Pollution/">http://nptel.ac.in/courses/webcourse-contents/IIT-delhi/Environmental%20Air%20Pollution/</a></p>

<b>17CE2505 B</b>	<b>ENVIRONMENTAL IMPACT STUDIES</b>
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Course Category:	Open Elective - II	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	17MC1407A-Environmental Studies	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will have an ability to														
		CO1	understand impacts of the project on individual, society and environment													
		CO2	analyse the various indicators to assess the state of health, economy and standard of life either prospering or deteriorating													
		CO3	apply the methodologies of EIA for projects under suitable conditions													
		CO4	assess the impacts on environment-case studies													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	
	CO1					L									M	
	CO2	L			M							H		L		
	CO3				M							L		L	H	
	CO4	L												M	L	
Course Content		<b>UNIT – I</b>														
		<b>1.INTRODUCTION TO EIA</b>														
		Environment and its interaction with human activities-Environment Imbalances- Attributes, impacts, Indicators, and measurements														
		<b>2.SCOPE AND OBJECTIVES OF EIA</b>														
		Concept of Environmental Impact assessment (EIA), Environmental Impact Statement, Objectives of EIA, Advantages and limitations of EIA.														

	<p><b>UNIT – II</b></p> <p><b>3.ENVIRONMENTAL INDICATORS FOR CLIMATE</b></p> <p>Indicators for climate-Indicators for terrestrial subsystems-Indicators for aquatic subsystems-Selection of indicators-</p> <p><b>4.SOCIO-ECONOMIC INDICATORS</b></p> <p>Socio-economic indicators-Basic information-Indicators for economy-Social indicators-indicators for health and nutrition-Cultural indicators-Selection of indicators</p> <hr/> <p><b>UNIT – III</b></p> <p><b>5.METHODOLOGIES OF EIA</b></p> <p>Overview of methodologies, Adhoc, Checklist, Matrix, Network, Overlays, Benefit cost analysis choosing a methodology, review criteria.</p> <p><b>6.PREDICTION AND ASSESSMENT</b></p> <p>Assessment of Impact on land, water, air, social &amp; cultural activities and on flora &amp; fauna-Mathematical models- Public participation</p> <hr/> <p><b>UNIT – IV</b></p> <p><b>7.ENVIRONMENTAL MANAGEMENT PLAN</b></p> <p>Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora &amp; fauna</p> <p><b>8.CASE STUDIES</b></p> <p>Case studies -water quality impact assessment – attributes, water quality impact assessment of water resources projects-data requirements of water quality impact assessment for dams impacts of dams on environment-case studies-On site and off site impacts during various stages of industrial development, long term climatic changes, greenhouse effect, industrial effluents and their impact cycle, Environment Impact of high ways, mining and energy development.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Anjaneyulu, VallManickam, “Environmental Impact Assessment Methodologies”, 2nd Edition ,B.S.Publications, 2007.</li> <li>2. CANTER L.W, “Environmental Impact Assessment”, Mcgraw Hill Pub.Co. New York, 1996.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Join, R.K. Urban L.V.Stracy, G.S. “Environmental Impact Analysis”, 2nd Edition, VauNostrand Reinhold Co, 2004.</li> <li>2. Ran, J.G. &amp; Wooten, D.C., “Environmental Impact Assessment”, 2nd Edition,</li> </ol>

	McGraw Hill Pub. Co. Ltd, 2008.
E-resources and other digital material	<a href="https://nptel.ac.in/courses/120108004/5">https://nptel.ac.in/courses/120108004/5</a>

**17CE2506 A**

**GREEN BUILDINGS AND SUSTAINABILITY**

Course Category:	Open Elective - III	Credits:	2
Course Type:	Theory	Lecture - Tutorial - Practice:	0 - 0 - 0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to													
	CO1	understand green building and green building materials.													
	CO2	apply different rating agencies and features of green buildings.													
	CO3	understand sources of carbon emissions and its impact on climate.													
	CO4	apply Zonal regulation while preparing land use plans.													
Contribution of Course Outcomes towards achievement		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1						M	H					M		M
	CO2			H			M	H			H	M	M	L	

of Program Outcomes (L – Low, M - Medium, H – High)	CO3						M	H					M		M
	CO4			M		L	M	H			H	M	M	L	
Course Content	<b>UNIT I</b>  <b>1.INTRODUCTION</b>  Green Building, Why to go for Green Building, Benefits of Green Buildings.  <b>2.GREEN BUILDING MATERIALS</b>  Green Building Materials and Equipment in India, What are key Requisites for Constructing a Green Building, Important Sustainable features for Green Building														
	<b>UNIT II</b>  <b>3.GREEN BUILDING CONCEPTS</b>  Indian Green Building Council, Green Building Movement 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,														
	<b>4.GREEN BUILDING PRACTICES</b> Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings and Energy Efficiency,														
	<b>UNIT III</b> <b>5.SUSTAINABILITY</b> Introduction, Human development index, Sustainable development and social ethics, definitions of sustainability, populations and consumptions.														
	<b>6.THE CARBON CYCLE AND ENERGY BALANCES</b> 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														
<b>UNIT IV</b>  <b>7.SUSTAINABILITY IN PLANNING</b> Introduction, Land use and land; cover change, Land use planning and its role in sustainable development-Zoning and land use planning, smart growth.															
<b>8.SUSTAINABILITY IN BUILT ENVIRONMENT</b> Environmentally sensitive design- low impact development, green infrastructure and conservation design, Green buildings and land use planning, Energy use and buildings															



Course Category:	Open Elective - III	Credits:	2
Course Type:	Theory	Lecture - Tutorial - Practice:	0-0-0
Prerequisites:	-----	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

<b>17CE2506 B</b>	<b>ADVANCED CONSTRUCTION MATERIALS</b>
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Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1) International Green Construction Code Powered by Standard 189.1-2017.</li> <li>2) Engineering Applications in Sustainable Design and Development By Bradley A. Striebig, Adebayo A. Ogundipe and Maria Papadakis. First edition, 2016, CENGAGE Learning.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <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> </ol>
E-resources and other digital material	<p><a href="https://igbc.in/igbc/">https://igbc.in/igbc/</a></p> <p><a href="http://www.grihaindia.org/">http://www.grihaindia.org/</a></p>

Course outcomes	Upon successful completion of the course, the student will be able to
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		CO1	understand different types of modern materials , Paints, Enamels and Varnishes that are used in construction.												
		CO2	understand the importance of special concretes and glass materials used in Building Construction.												
		CO3	understand the classification and usage of materials like plastics, tar and sound absorbent materials												
		CO4	understand building material like gypsum and various adhesives.												
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1	L	L				M				L				M
	CO2	L	L				M				L				M
	CO3	L	L				M				L				M
	CO4	L	L				M				L				M
Course Content		<b>UNIT – I</b> <b>1.MODERN MATERIALS:</b> Ceramics, Sealants for joints, fibre glass reinforced plastic, refractories- composite materials, Geosynthetics.  <b>2. PAINTS, ENAMELS AND VARNISHES:</b>  Introduction, rubber paints, plastic emulsion paints, plastic paints, enamel paints, texture paints, varnish, wax polish.													
		<b>UNIT – II</b> <b>3.SPECIAL CONCRETES:</b>  Light Weight concrete, High density concrete, Fiber reinforced concrete, polymer concrete.  <b>4.GLASS</b>  Composition, classification, properties and types of glass.													
		<b>UNIT – III</b> <b>5. PLASTICS, BITUMEN:</b>  Composition, polymerization, Classification of plastics, biodegradable plastic, Grades of Bitumen.													

	<p><b>6. SOUND ABSORBENT MATERIALS:</b></p> <p>Porous materials, porous-cum-elastic materials, perforated materials, Baffle materials.</p>
	<p><b>UNIT – IV</b></p> <p><b>7. Gypsum:</b></p> <p>Introduction, plaster of Paris, gypsum wall plasters, gypsum plaster boards, Non-load bearing Gypsum partition blocks.</p> <p><b>8. Miscellaneous materials:</b></p> <p>Adhesives- advantages and disadvantages, properties, types of Adhesives; Different types of Building faced cladding materials; heat insulating materials; water proofing materials.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Engineering Materials by S. C. Rangwala; Charotar Publishing House, 33 Edn 2017.</li> <li>2. Building materials by S.K Duggal; New Age International publishers, 3<sup>rd</sup> Edn, 2009.</li> </ol> <p><b>Reference books:</b></p> <ol style="list-style-type: none"> <li>1. Building materials by P.C Varghese; PHI Learning, 2<sup>nd</sup> Edn 2005.</li> </ol>
E-resources and other digital material	<p><b><a href="http://nptel.ac.in/courses/105102088/">www:http://nptel.ac.in/courses/105102088/</a></b></p>



	<b>STANDARD OPERATION METHODS &amp; VERBAL ABILITY</b>  5. Note Making, Note Taking, Minutes Preparation, Email & Letter Writing  6. Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work  <b>UNIT – IV</b> <b>CAREER-ORIENTED SKILLS</b>  7. Group Discussion, Mock Group Discussions 8. Resume Preparation, Interview Skills, Mock Interviews
<b>Reference books</b>	[1] Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011. [2] S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010. [3] R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018. [4] Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
<b>E Sources &amp; Other Digital Material:</b>	<a href="http://www.Indiabix.com">www. Indiabix.com</a> <a href="http://www.freshersworld.com">www.freshersworld.com</a>
<div> <div>17CE3508</div> <div>GEOTECHNICAL ENGINEERING</div> </div>	

Course Category:	Programme Core	Credits:	3
Course Type:	Theory with practical	Lecture - Tutorial - Practice:	2-0-2
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
	CO5	to determine the basic engineering properties of soil

[illegible]

Course Content	<p><b>UNIT – I</b></p> <p><b>1.INTRODUCTION, BASIC DEFINITIONS AND RELATIONS:</b>  Scope of Geotechnical Engineering; Origin of Soils; Formation of soils; Types of soils; Transportation of soils; Major soil deposits of India.  Phase diagrams; Volumetric relationships; Weight relationship; Volume-weight relationships; Specific gravity of soils; Three phase diagram in terms of void ratio; Inter-relationships;</p> <p><b>2.INDEX PROPERTIES AND SOIL CLASSIFICATION:</b>  Index Properties – Introduction, Particle Size Distribution Curve and its uses, Relative Density, Plasticity of soils, Consistency Limits and uses, Plastic, consistency and liquidity indices; Flow index &amp; toughness index; Sensitivity; Thixotropy; Activity of soils.  Unified soil classification system; Indian standard soil classification system</p> <p><b>Experiments:</b></p> <ol style="list-style-type: none"> <li>1. Determination of water content by oven drying method</li> <li>2. Determination of specific gravity by Density bottle &amp; Pycnometer</li> <li>3. Grain Size analysis – Mechanical analysis – wet and 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> </ol>
	<p><b>UNIT – II</b></p> <p><b>3.SOIL MOISTURE AND PERMEABILITY:</b>  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 &amp; Indirect methods; Seepage velocity; General expression for laminar flow; Laminar flow through porous media; Factors affecting permeability; Permeability of stratified soil deposits.</p> <p><b>4.EFFECTIVE STRESS PRINCIPLE:</b>  Effective stress principle; Effective stress in a soil mass under different loading conditions – effect of depth of water table, surcharge loading, capillary water</p> <p><b>Experiments:</b></p> <ol style="list-style-type: none"> <li>8. Determination of permeability by Constant head and Variable head methods</li> </ol>
	<p><b>UNIT – III</b></p> <p><b>5.SEEPAGE THROUGH SOILS</b>  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.</p> <p><b>6.COMPACTION OF SOILS:</b>  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.</p> <p><b>Experiments:</b></p> <ol style="list-style-type: none"> <li>9. Standard proctor compaction test- Determination of OMC, MOD</li> </ol>
	<p><b>UNIT – IV</b></p> <p><b>7.CONSolidATION OF SOILS:</b>  Introduction; Initial and secondary consolidation; Spring analogy for primary consolidation; Terzaghi's theory of consolidation; Solution of basic differential equation;</p>

	<p>Consolidation test; 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</p> <p><b>8.SHEAR STRENGTH OF SOILS:</b></p> <p>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</p> <p><b>Experiments:</b></p> <p>10. Determination of C and <math>\phi</math> by direct shear test</p> <p>11. Determination of Shear strength by Vane shear test</p> <p>12. Unconfined compression test- Determination of C and <math>\phi</math></p> <p><b>Note:</b></p> <p>1. In Laboratory tests only test procedures need be studied - no need of derivations of the formulae used in the tests</p> <p>2. Only test procedures according to relevant IS codes need be studied.</p> <p>3.*methods and / or formulae only - no derivation of formulae needed.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Soil Mechanics and Foundation Engineering by K.R. Arora; Standard Publishers &amp; Distributors, Naisarak, New Delhi.</li> <li>2. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao. published by New Age International Ltd.,</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Geotechnical Engineering by B. J. Kasmalkar; Pune Vidyarthi Griha Prakashan, Pune.</li> <li>2. Modern Geotechnical Engineering by Alam Singh; CBS Publishers &amp; distributors Pvt. Ltd., Delhi.</li> <li>3. Soil Mechanics and Foundation Engineering Vol. 1 by V. N. S. Murthy; Saikripa Technical Consultants, Bangalore.</li> <li>4. Soil Mechanics and Foundation Engineering by B. C. Punmia; Laxmi Publications, Delhi.</li> <li>5. Soil Mechanics Laboratory Manual by B.M. Das, Oxford University Press, 2002</li> <li>6. Relevant Indian Standard Code Books – IS 2720</li> </ol>
E-resources and other digital material	<p><b>Introduction to Soil Mechanics - <a href="http://nptel.ac.in/courses/105103097/">http://nptel.ac.in/courses/105103097/</a></b></p> <p><b>Soil Mechanics - <a href="http://nptel.ac.in/courses/105101084/">http://nptel.ac.in/courses/105101084/</a></b></p> <p><b>Geotechnical Engineering Laboratory - <a href="https://nptel.ac.in/courses/105101160/">https://nptel.ac.in/courses/105101160/</a></b></p>



<b>17CE3509</b>	<b>DESIGN OF CONCRETE STRUCTURES</b>
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Course Category:	Programme Core	Credits:	2
Course Type:	Theory	Lecture - Tutorial - Practice:	2-0-0
Prerequisites:	17CE3402 Concrete Technology	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will have an ability to														
		CO1	design of R.C. beams													
		CO2	design of R.C slabs													
		CO3	design of R.C columns													
		CO4	design Footings													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	
	CO1	M		H		H								H		
	CO2	M		H		H								H		
	CO3	M		H		H								H		
	CO4	M		H		H								H		
Course Content		<b>UNIT – I</b> <b>1.GENERAL:</b> Loading standards as per IS 875, Grades of steel and cement, Stress- Strain characteristics of concrete and steel, Introduction to working stress method and Limit State Method (L.S.D.) of design. Characteristic load and strengths, Design values, Partial safety factors, Factored loads. <b>ALL DESIGNS IN LIMIT STATE METHOD</b>  <b>2. DESIGN OF BEAMS (IS456-2000).</b>  Design of singly reinforced rectangular section, Doubly reinforced rectangular section and singly reinforced flanged sections. Shear in R. C. beams; Diagonal tension and diagonal compression; Development length; Anchorage bond; Flexural bond; Check for development length. Deflection and cracking														

	<p><b>UNIT – II</b></p> <p><b>3. DESIGN OF ONE WAY SLAB (IS456-2000).</b> One way and Two-way action of slabs, Choosing slab thickness. Design of one way slab.</p> <p><b>4. DESIGN OF TWO WAY SLAB (IS456-2000).</b> Design of restrained and unrestrained Two way slabs as per I.S. code provision (IS456-2000).</p>
	<p><b>UNIT – III</b></p> <p><b>5. DESIGN OF COLUMNS FOR AXIAL COMPRESSION (IS456-2000).</b> Define short and long columns, estimation of effective length of a column. Code requirements on slenderness limits, minimum eccentricity and reinforcement. Design of short column under axial compression with lateral ties and helical reinforcement.</p> <p><b>6. DESIGN OF COLUMNS FOR COMBINED ACTION (IS456-2000).</b> Design of short columns subjected to combined axial load and uniaxial moment</p>
	<p><b>UNIT – IV</b></p> <p><b>7. DESIGN OF ISOLATED FOOTING (IS456-2000).</b> General aspects of footings and types of footings. Design and detailing of Isolated Column footings.</p> <p><b>8. DESIGN OF COMBINED FOOTING (IS456-2000).</b> Design and detailing of combined footings.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Reinforced Concrete Vol-1, 8th Edition by H.J. Shah, by Charotar Publication House.</li> <li>2. Reinforced Concrete (Limit State Design), 7th Edition by Ashok K. Jain, Nem Chand &amp; Bros., Roorkee</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Limit state designed of reinforced concrete – P.C. Varghese, Printice Hall of India, New Delhi</li> <li>2. Design of concrete structures by Arther H. Nilson, Tata McGraw-Hill Publishing Co. Ltd, New Delhi.</li> </ol>
E-resources and other digital material	<p><a href="http://nptel.ac.in/courses/105105105/">http://nptel.ac.in/courses/105105105/</a>  <a href="http://nptel.ac.in/courses/105105104/">http://nptel.ac.in/courses/105105104/</a></p>

<b>17CE3551</b>	<b>ENVIRONMENTAL ENGINEERING LAB</b>
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Course Category:	Programme core	Credits:	1
Course Type:	Lab	Lecture - Tutorial - Practice:	0-0-2
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to	
	CO1	test the various parameters and understand their significance and application.
	CO2	recommend the suitability of water for various applications by knowing water quality standards.
Course Content	<ol style="list-style-type: none"><li>1. Determination of total suspended and dissolved solids in water / sewage sample.</li><li>2. Determination of fixed and volatile solids in water / sewage sample.</li><li>3. Determination of turbidity of water / sewage sample.</li><li>4. Determination of alkalinity of water sample.</li><li>5. Determination of acidity of water sample.</li><li>6. Determination of temporary and permanent hardness of water sample.</li><li>7. Determination of chloride concentration of water / sewage sample.</li><li>8. Determination of PH value of water / sewage sample.</li><li>9. Determination of optimum dose of coagulant.</li><li>10. Determination of dissolved oxygen of water / sewage sample.</li><li>11. Determination of fluorides in water sample.</li><li>12. Determination of biochemical oxygen demand (BOD) of waste water.</li><li>13. Determination of Chemical oxygen demand (COD) of waste water.</li><li>14. Determination of chlorine demand and residual chlorine.</li><li>15. Determination of nitrogen in water sample.</li></ol>	

Text books and Reference books	<p><b>Text Books:</b> Environmental Engineering Vol. I - Water supply engineering by S. K. Garg; KhannaPublishers, Delhi. 18<sup>th</sup> Edn, 2004.</p> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Manual on Water Supply &amp; Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.</li> <li>2. Is 3025 (part 2): 2004 iso 11885:1996 Indian standard methods of sampling and test (physical and chemical) for water and waste water ,* part 2 determination of 33 elements by inductively coupled plasma atomic emission spectroscopy</li> </ol>
E-resources and other digital material	<a href="http://www.nitttrchd.ac.in/sitenew1/nctel/civil.php">http://www.nitttrchd.ac.in/sitenew1/nctel/civil.php</a>



	<p>strength of tension members, design of tension members and Lug angles with bolted and welded connections.</p> <p><b>4.COMPRESSION MEMBERS (IS800-2007)</b></p> <p>Possible failure modes, behaviour of compression members, Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members, built up compression members with Laced and Battened columns with bolted and welded connections.</p>
	<p><b>UNIT – III</b></p> <p><b>5. BEAMS- LATERALLY SUPPORTED (IS800-2007).</b></p> <p>Introduction; classification of sections; Lateral stability of beams; web buckling; Web crippling. Design of laterally supported beams.</p> <p><b>6. BEAMS- LATERALLY UNSUPPORTED (IS800-2007).</b></p> <p>Design of laterally unsupported beams.</p>
	<p><b>UNIT – IV</b></p> <p><b>7. COLUMN BASE - SLAB BASE (IS800-2007).</b></p> <p>Introduction to column bases and types of column bases. Allowable stress in bearing, Design of Slab base with bolted and welded connections.</p> <p><b>8.COLUMN BASE - GUSSET BASE</b></p> <p>Design of Gusset base with bolted and welded connections.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Design of Steel structures by N. Subramanian, Oxford University Press.</li> <li>2. Limit State Design of steel structures by S.K.Duggal, McGraw Hill Education Private Ltd.</li> <li>3. Limit State Design of steel structures – Ramchandra and VirendraGehlot, Scientific Publishers (India)</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Design of steel structures by K.S.Sai Ram, Pearson Education India.</li> <li>2. Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK International Publishing House, Bangalore – 560 001.</li> </ol>
E-resources and other digital material	<p><a href="http://nptel.ac.in/courses/105103094/">http://nptel.ac.in/courses/105103094/</a></p> <p><a href="http://nptel.ac.in/courses/105106112/">http://nptel.ac.in/courses/105106112/</a></p>

<b>17 CE 3602</b>	<b>TRANSPORTATION ENGINEERING</b>
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Course Category:	Program Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 2
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to
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outcomes	CO1	analyze the best alternative route for highways.													
	CO2	identify suitable Pavement materials in Highway Construction by performing various tests.													
	CO3	design geometrics, traffic control devices and pavement crust													
	CO4	understand the Construction and Maintenance of Highways													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
	CO1	H		H											
	CO2				H										H
	CO3	H	H	H										H	
	CO4			M		M									
Course Content	<p><b>UNIT – I</b></p> <p><b>1. HIGHWAY NETWORK PLANNING AND ALIGNMENT</b></p> <p>Different Modes of Transportation, Road Classification, Road Patterns, 20 Year Road Development plans. Highway Alignment: Requirements, factors controlling, Engineering Surveys</p> <p><b>2. HIGHWAY GEOMETRIC DESIGN</b></p> <p>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, Design of Vertical Alignment-Grades and Grade Compensation, Types of Vertical curves.</p> <p><b>UNIT-II</b></p> <p><b>3. TRAFFIC STUDIES</b></p> <p>Introduction, Road User Characteristics, Vehicle Characteristics, Traffic Volume Studies- objectives, methods, presentation of data(no numerical), Speed Studies- spot speed, average speed, running speed, travel speed, objectives of spot speed study, methods and presentation of data, various methods of speed and delay studies, various methods of Origin and Destination Studies, types of parking system, various methods of Parking Studies(no numerical), Traffic Flow Characteristics, Traffic Capacity and concept of Level of Service.</p> <p><b>4. DESIGN OF TRAFFIC CONTROL DEVICES</b></p>														

	<p>Traffic Operations-Traffic Regulation, Traffic Control Devices- types of Signs, Signals- advantages, disadvantages, types of traffic signals, types of traffic signal system, design of traffic signal by Webster's method.</p> <p><b>UNIT-III</b></p> <p><b>5. DESIGN OF PAVEMENTS</b></p> <p>Types of Pavement Structures, Design Factors, Design of Flexible Pavements- IRC Method, Design of Rigid Pavement- Wheel Load stresses, Temperature Stresses, Frictional Stresses.</p> <p><b>6. HIGHWAY CONSTRUCTION AND MAINTENANCE</b></p> <p>Construction Steps of Embankment, earth roads, Granular Sub Base (GSB), Wet Mix Macadam (WMM), Dense Bituminous Macadam (DBM), Bituminous Concrete (BC) as per MORTH. Pavement failures, causes, failures in flexible pavement, failures in rigid pavements, maintenance of Bituminous pavements and concrete pavements.</p> <p><b>7. HIGHWAY DRAINAGE</b></p> <p>Importance of Highway Drainage, Requirements, Surface Drainage and Sub Surface Drainage</p> <p><b>UNIT-IV</b></p> <p><b>8. PAVEMENT MATERIALS</b></p> <p>Sub grade Soil Properties, CBR Test, Plate Bearing Test (demo), Stone Aggregates-Desirable Properties, tests- Aggregate Crushing Value Test, Aggregate Impact Value Test, Aggregate Abrasion Value Test, Shape Tests, Specific gravity, Bitumen-Desirable Properties, Penetration test, ductility test, softening point test, viscosity test, flash and fire point test, Marshal Method of Bituminous Mix Design (theory only), Job mix formula for GSB, WMM.</p>
Text books and Reference books	<p><b>Learning Resources:</b></p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Khanna, S. K., C. E. G. Justo, A.Veeraragavan" Highway Engineering Revised 10th Edition Nem Chand Bros . Roorkee 2017.</li> <li>2. L R Kadyali, "Principles and Practices of Highway Engineering", Khanna Publishers, New Delhi, 2004.</li> </ol> <p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Principles of Transportation Engineering by Partha Chakraborty &amp; Animesh Das; PHI Learning Pvt. Ltd.; New Delhi, Second edition 2017</li> <li>2. Ministry of Road Transport and Highways- Specifications for Roads and Bridge Works, Fifth Revision, IRC, New Delhi, India-2013</li> <li>3. IRC 37:2012- Guidelines for the design of flexible pavements (Third Revision)</li> <li>4. IRC58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways</li> </ol>



E-resources and other digital material	<a href="https://nptel.ac.in/downloads/105101087/">https://nptel.ac.in/downloads/105101087/</a> <a href="https://nptel.ac.in/courses/105105107/">https://nptel.ac.in/courses/105105107/</a>
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## **PROGRAM ELECTIVES**



	<p><b>UNIT – II</b></p> <p><b>3. FLEXIBILITY AND STIFFNESS MATRICES:</b> Flexibility and stiffness; Flexibility matrix; Stiffness matrix; Relationship between flexibility matrix and stiffness matrix</p> <p><b>4. FLEXIBILITY METHOD (MATRIX APPROACH):</b> Analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) by flexibility method with matrix approach.</p>
	<p><b>UNIT – III</b></p> <p><b>5. STIFFNESS METHOD (MATRIX APPROACH):</b> Analysis of continuous beams, rigid jointed plane frames (Single bay, single storey with vertical legs only) by stiffness method with matrix approach</p> <p><b>6. DESCRIPTION OF MATRIX METHOD :</b> Application to plane truss (Limited to two degree of freedom)</p>
	<p><b>UNIT – IV</b></p> <p><b>7. PLASTIC ANALYSIS OF STRUCTURES:</b> 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.</p> <p><b>8. FRAMES WITH INCLINED MEMBERS:</b> Plastic analysis of a gable frame, effect of axial forces on plastic moment capacity, effect of shear on plastic moment capacity.</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1) Structural Analysis – A matrix approach by G. S. Pandit &amp; S.P. Gupta, 2008, Tata Mc. Graw – Hill Publishing Co. Ltd., New Delhi</li> <li>2) Basic Structural Analysis by C.S.Reddy, McGraw Hill Education; 3<sup>rd</sup> Edition, 2010</li> <li>3) Limit state Design of steel structures by S.K.Duggal, 2<sup>nd</sup> edition, 2017, McGraw Hill Education, New Delhi.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1) Analysis of structures Vol.2 by Prof V.N.Vazirani, Dr.M.M.Ratwani, Dr.Sk.Duggal, 16<sup>th</sup> Edition, 2016, Khanna Publishers, New Delhi.</li> <li>2) Indeterminate Structural Analysis by C.K.Wang, 5<sup>th</sup> Edn 2014, McGraw Hill Education, New Delhi.</li> </ol>
E-resources and other digital material	<p><a href="http://onlinecourses.nptel.ac.in/courses/105106050">http://onlinecourses.nptel.ac.in/courses/105106050</a></p>





	<p>contactor (RBC); An-aerobic filters; U-tube aeration system.</p>
	<p><b>UNIT – II</b></p> <p><b>3. INDUSTRIAL WASTE WATER TREATMENT AND SUGAR PLANT WASTE WATER TREATMENT</b>  Introduction; General Characteristics of Industrial wastes; Routine Treatment methods of Industrial wastes.  Quantity of liquid waste; Manufacturing process flow diagram and sources of waste; Characteristics of liquid waste; Methods of treatment and treatment flow diagram and disposal.</p> <p><b>4. DAIRY AND PULP AND PAPER INDUSTRY WASTE WATER TREATMENT</b>  Quantity of liquid waste; Manufacturing process with flow diagram and sources of waste; Characteristics of liquid waste; Methods of its treatment and treatment flow diagram and disposal.</p>
	<p><b>UNIT – III</b></p> <p><b>5. LOW COST WASTE WATER TREATMENT SYSTEMS AND THEIR DESIGN</b>  Introduction; Biological kinetics of waste water; Algal-Bacterial Symbiosis; Aerobic and Facultative Stabilization ponds-Principle and working. Design w.r.t latitude of the locality and dispersion factor; Aerated lagoons- working and design; Oxidation ditch-working and design;  Extended aeration process at preliminary level.</p> <p><b>6. SOURCES, CLASSIFICATION OF AIR POLLUTANTS AND EFFECTS OF AIR POLLUTION</b>  Stationary and mobile sources; Primary and secondary pollutants; Natural contaminants; Particulate matter- dust, SPM, smoke, Mist, Fumes, etc ; Aerosols; Gases.  Effects of air pollutants on human health; Effects on plants and Economic effects.</p>
	<p><b>UNIT-IV</b></p> <p><b>7. METEOROLOGY AND AIR POLLUTION</b>  Atmospheric stability – variation of temperature w.r.t to altitude.  Temperature inversions – Radiation Inversion, Subsidence Inversion, Advective Inversion and combined Inversion. Wind Rose and Mixing height; Measurement of following meteorological parameters Wind direction recorder; Wind speed recorder; Humidity measurement; Temperature measurement; Plume behaviour- types-looping, Coning, Fanning, Fumigation, lofting, trapping</p> <p><b>8. CONTROL OF AIR POLLUTION BY EQUIPMENT</b>  Objectives; Types of collection equipment (particulate matter only); Settling chambers; Inertial separators; Cyclones-principle, working; Filters- principle, working; Electrostatic precipitators- principle, working; Types of Electrostatic precipitators – Pipe type and Plate type; Scrubbers- principle, working; Types of Scrubbers – Spray tower, Venturi scrubber, Cyclone scrubber, Packed Scrubber.  Noise Pollution - Introduction; Sources of noise and their levels; Acceptance levels of various noise; Noise rating systems; Measures of noise; Effects of noise; Control of noise.</p>

Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Waste water treatment by M. N. Rao and A. K. Datta, 2008, Oxford &amp; IBH publishing Co. Pvt. Ltd., New Delhi.</li> <li>2. Waste Water Engineering, Treatment, Disposal and Reuse by Metcalf &amp; Eddy, 2005, Tata McGraw – Hill publishing Co. Ltd., New Delhi.</li> <li>3. Air pollution by M. N. Rao and H. V. N. Rao, 2004, Tata McGraw – Hill Publishing Co. Ltd., New Delhi.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Environmental pollution control Engineering by C. S. Rao, 2008, Wiley Eastern Ltd., New Delhi.</li> <li>2. Water Supply and waste water disposal by G. M. Fair et al. 1958, John Wiley &amp; Sons.</li> <li>3. Sewage and Sewage treatment by S. K. Kshirasagar, 1998, Roorkee Publishing House, Roorkee.</li> <li>4. Sewage Disposal and Air pollution Engineering by S. K. Garg, 2010, Khanna Publications; Delhi.</li> </ol>
E-resources and other digital material Web References:	<p><a href="https://onlinecourses.nptel.ac.in/noc18_ce29">https://onlinecourses.nptel.ac.in/noc18_ce29</a></p> <p><a href="https://onlinecourses.nptel.ac.in/noc18_bt19">https://onlinecourses.nptel.ac.in/noc18_bt19</a></p> <p><a href="https://onlinecourses.nptel.ac.in/noc18_me63">https://onlinecourses.nptel.ac.in/noc18_me63</a></p> <p><a href="https://onlinecourses.nptel.ac.in/noc18_ce26">https://onlinecourses.nptel.ac.in/noc18_ce26</a></p> <p>NPTEL</p>

17CE4603 C		AIRPORT PLANNING AND DESIGN	
Course Category:	Program Elective-1	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	-	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to														
		CO1	understand airport and aircraft characteristics.													
		CO2	understand various obstructions at airport.													
		CO3	evaluate airport runway pavement.													
		CO4	understand traffic control aids													
Contribution of Course Outcomes towards achievement of Program Outcomes  (L – Low, M - Medium, H – High)		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	
	CO1		H												M	
	CO2	H		M											M	
	CO3	H	H	M							L		L	H		
	CO4					H					L		L		M	
Course Content		<b>UNIT – I</b> <b>1.AIR TRANSPORT</b> Different modes of transportation, Introduction to NAA, IAAI, AAI and ICAO  <b>2.AIRPORT PLANNING AND CHARACTERISTICS</b> Airport classification based on ICAO, airport components, Aero plane components; Air–craft characteristics; Selection of site for airport; Surveys for site selection														
		<b>UNIT – II</b> <b>3.AIRPORT OBSTRUCTIONS</b> Zoning laws, Imaginary surfaces, Approach zone, turning zone  <b>4.RUNWAY DESIGN</b> Runway orientation- cross wind component, wind rose diagram, types of wind rose; Basic runway length; Corrections for elevation, Temperature and gradient; Runway geometric design. Runway configurations, geometric design standards of taxiway design														
		<b>UNIT – III</b> <b>5.STRUCTURAL DESIGN OF AIRFIELD PAVEMENT FLEXIBLE PAVEMENT</b> Various design factors, Design methods for flexible airfield Pavement-CBR Method, Mcleod Method and Burmister’s Method <b>6.RIGID PAVEMENT</b> rigid pavement Design- PCA Method; LCN Method of pavement design.														
		<b>UNIT – IV</b> <b>7.VISUAL AIDS</b> Necessity of visual aids, airport markings-runway markings, taxiway														



	<p>markings, runway and taxiway shoulder markings, apron markings. Wind direction indicator, landing direction indicator, airport lighting</p> <p><b>8.AIR TRAFFIC CONTROL</b></p> <p>Need of air traffic control, air traffic control aids- airway aids, landing aids</p>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Airport Planning and Design by S. K. Khanna ,M. G. Arora&amp; SS Jain; Nemchand&amp; Bros,Roorkee- 2012</li> <li>2. <b>Airport Engineering: Planning and Design, Subhash C Saxena, CBS Publisher, 2012</b></li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Airport Engineering – Rangwala, Charotar Publishing House Pvt. Ltd., 2012</li> <li>2.Virender Kumar and Satish Chandra, “Airport Planning and Design”- Galgotia Publication Pvt Ltd 2012</li> </ol>
E-resources and other digital material	<p><a href="https://nptel.ac.in/courses/105107123/">https://nptel.ac.in/courses/105107123/</a></p>

<b>17CE4603 D</b>	<b>IRRIGATION STRUCTURES</b>
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<b>Course Category:</b>	Programme Elective - I	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	3 - 0 - 0
<b>Prerequisites:</b>	17CE3501 – Water Resources Engineering	<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

<b>Course outcomes</b>	Upon successful completion of the course, the student will be able to	
	CO1	understand the basics of diversion head works and canal regulation
	CO2	apply the design principles of various cross drainage works
	CO3	evaluate various types of dams and principles of Aurther cotton technology

	CO4	understand various types of spill ways.													
<b>Contribution of Course Outcomes towards achievement of Program Outcomes</b>  <b>(L – Low, M - Medium, H – High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PS O1</b>	<b>PSO 2</b>
	<b>CO1</b>													<b>M</b>	
	<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>		<b>M</b>								<b>M</b>	
	<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>		<b>M</b>					<b>M</b>			<b>H</b>	<b>H</b>
	<b>CO4</b>										<b>M</b>				<b>M</b>
<b>Course Content</b>	<b>UNIT – I</b> <b>1. DIVERSION HEAD WORKS:</b> 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.  <b>2. CANAL REGULATION WORKS:</b> Canal regulators; Off-take alignment; Head regulators and cross-regulators; Canal escape. <b>UNIT – II</b> <b>3.CROSS DRAINAGE WORKS:</b> Introduction; Types of cross - drainage works; Selection of suitable type of cross - drainage work; Classification of Aqueducts and Syphon Aqueducts; Selection of a suitable type.  <b>4.COTTONS TECHNOLOGIES</b> Introduction to aarthur cotton technologies for present day needs, modern substitutes for aarthur cottons materials, introduction to design of Krishna anicut, introduction to design of Godavari anicut <b>UNIT – III</b>  <b>5.STABILITY ANALYSIS OF GRAVITY DAMS:</b> Introduction; Forces acting on a gravity dam; modes of failure and stability analysis of gravity dams: <b>6.DESIGN OF GRAVITY DAMS:</b> 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. <b>UNIT – IV</b>  <b>7. EARTH DAMS:</b> 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.														

	<p><b>8. 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.</p>
<b>Text books and Reference books</b>	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <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> <li>2. Water Power Engineering by M.M. Dandekar and K. K. Sharma; Vikas Publishing House Pvt. Ltd., New Delhi.,2006.</li> <li>3. Irrigation Engineering and Hydraulic Structures by S.R. Sahasra Budhe; Katson Publishing House, Ludhiana. 2000.</li> <li>4. Sir Srthur Cottons Technologies for todays anicuts, dams, aqueducts, bridges, barrages, kissing reservoirs., by Dr Gutta Lakshmana Rao, Dr KSR Prasad.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <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 Methods of Numerical Analysis, S. S. Sastry, PHI , 2005.</li> </ol>
<b>E-resources and other digital material</b>	<p><a href="http://www.nptel.ac.in/courses/105105110">www.nptel.ac.in/courses/105105110</a></p>

17CE4603 E	REMOTE SENSING AND GIS
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<b>Course Category:</b>	Programme Elective - 1	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	3 - 0 - 0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b>	30
		<b>Semester end Evaluation:</b>	70
		<b>Total Marks:</b>	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	apply the recent advances satellite based remote sensing and GIS technology in various fields of Civil engineering													
	CO2	evaluate the opportunities and available methods for integrating remote sensing and GIS in various civil engineering applications													
	CO3	understand large scale maps using satellite imageries.													
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
	CO1					<b>H</b>				<b>L</b>	<b>M</b>		<b>L</b>		<b>M</b>
	CO2					<b>H</b>	<b>H</b>			<b>L</b>	<b>M</b>		<b>L</b>		<b>M</b>
	CO3					<b>H</b>				<b>L</b>	<b>M</b>		<b>L</b>		<b>M</b>
Course Content	<b>UNIT-I</b>														
	<b>1.INTRODUCTION TO REMOTE SENSING</b> Necessity and importance; Radiant energy from the sun; The electromagnetic spectrum; Atmospheric effects on radiation; Absorption, transmission and reflection; Atmospheric windows; Black body radiation; Specular and diffuse surfaces: Multi concept of Remote Sensing: Sensor and Platforms: Satellites: Types of data products – Types of image interpretation  <b>2.IMAGE INTERPRETATION</b> – Basic Elements, visual interpretation keys - Digital Image Processing – Pre-Processing – image enhancement techniques – multispectral image classification.														
	<b>UNIT-II</b>  <b>3.REMOTE SENSING APPLICATIONS</b> Introduction, Land use and land cover mapping: urban growth studies: Agriculture: Forestry: Ground water mapping: Flood plain mapping: Hydro morphological studies: Type, extent and distribution of wastelands in India; Development of wastelands; <b>4.REMOTE SENSING APPLICATIONS IN CIVIL ENGINEERING</b>  District level planning : Disaster management: Application of Remote Sensing in Civil Engineering														
	<b>UNIT-III</b>														

	<p><b>5.INTRODUCTION TO GIS</b></p> <p>Introduction – Maps – Definitions – Map projections – types of map projections –Maps analysis GIS definition and terminology – basic components of GIS –standard GIS software’s</p> <p><b>6.DATABASE MANAGEMENT SYSTEMS</b></p> <p>Data types – Spatial and Non Spatial (attribute) data –measurement scales – Data Base Management system (DBMS): definition - DTM ,DEM ,TIN</p>
	<p><b>UNIT-IV</b></p> <p><b>7.APPLICATIONS OF GIS</b></p> <p>Introduction, Problem Identification; GIS for Site Suitability in Urban Planning – Road Accident Analysis – Irrigation water management – Tourism Information System –</p> <p><b>8.ADVANCED APPLICATION OF GIS IN CIVIL ENGINEERING</b></p> <p>Worldwide Earth quake Information System- Drainage problem in Tea Plantation Area- Knowledge Based System for Military Use.</p> <p>GIS-T; Application of GIS in Civil Engineering.</p>
<b>Text books and Reference books</b>	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Remote Sensing &amp; Geographical Information Systems by M.Anji Reddy, BPS Publications-Hyderabad. 2012</li> <li>2. Remote Sensing &amp; GIS by Basudeb Bhatta, Oxford University Press. New Delhi 2011</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Remote sensing and Image interpretation by TM Lillesand and RWKiefer; John Willey and sons.7<sup>th</sup> edition 2015</li> <li>2. Remote sensing and Geographical information System by AM Chandra &amp; SK Ghosh;Narosa Publishing House. Second edition, 2015</li> </ol>
<b>E-resources and other digital material</b>	<p>E1]<a href="http://www.sciencedirect.com/science/article/pii/S1878029612003957">www.sciencedirect.com/science/article/pii/S1878029612003957</a></p> <p>[E2] <a href="http://transportgeography.org/page_id6741">transportgeography.org /page_id6741</a></p> <p>[E3] <a href="https://www.gislounge.com/military-applications-of-gis/">https://www.gislounge.com/military-applications-of-gis/</a></p> <p>[E4] <a href="https://grindgis.com/blog/gis-applications-uses/attachment/gismap-45">https://grindgis.com/blog/gis-applications-uses/attachment/gismap-45</a></p> <p>[E5] <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5557132/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5557132/</a></p> <p>[E6] <a href="https://shodhganga.inflibnet.ac.in/bitstream/10603/174401/13/13_chapter%207.pdf">https://shodhganga.inflibnet.ac.in/bitstream/10603/174401/13/13_chapter%207.pdf</a></p> <p>[E7] <a href="http://www.researchgate.net/publication/323411930Applications_of_Remote_Sensing_and_GIS_in_Wasteland_mapping">www.researchgate.net/publication/323411930Applications_of_Remote_Sensing_and_GIS_in_Wasteland_mapping</a></p>

<b>17HS1604</b>	<b>ENGINEERING ECONOMICS AND FINANCE</b>
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<b>Course Category:</b>	Core	<b>Credits:</b>	2
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	<p><b>UNIT-II</b></p> <p><b>Introduction to Economics:</b> Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility and Total Utility, Law of Diminishing Marginal Utility, Law of Equi Marginal Utility.</p> <p><b>Demand Analysis:</b> 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.</p> <p><b>Supply Analysis:</b> Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function.</p>
	<p><b>UNIT-III</b></p> <p><b>Human Resource Management:</b> Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management.</p> <p><b>Marketing Management:</b> 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.</p>
	<p><b>UNIT-IV</b></p> <p><b>Financial Management:</b> Functions of Financial Management, Time value of money with cash flow diagrams, Concept of Simple and Compound Interest.</p> <p><b>Depreciation:</b> Causes of depreciation, Factors influencing depreciation, common methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of Year's Digits Method –Problems.</p> <p><b>Economic Alternatives:</b> Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method - Problems.</p>
<b>Text books and Reference books</b>	<p><b>Text Books</b></p> <p>[1] M. Mahajan <i>Industrial Engineering and Production Management</i> Dhanpat Rai Publications 2<sup>nd</sup> Edition.</p> <p>[2] Martand Telsang "Industrial &amp; Business Management" S.Chand publications</p> <p><b>Reference books</b></p> <p>[1] R.Paneer selvam "Production and Operations Management" PHI</p> <p>[2] Philip Kotler &amp; Gary Armstrong "Principles of Marketing" ,pearson prentice Hall,New Delhi,2012 Edition.</p> <p>[3] IM Pandey, "<i>Financial Management</i>" Vikas Publications 11<sup>th</sup> Edition</p> <p>[4] B.B Mahapatro, "<b><i>Human Resource Management</i></b>",New Age International ,2011</p>
<b>E-resources and other digital material</b>	<p>[1]<a href="https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/">https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/</a></p> <p>[2]<a href="https://keydifferences.com/difference-between-personnel-management-and-human-resource-management.html">https://keydifferences.com/difference-between-personnel-management-and-human-resource-management.html</a></p> <p>[3] <a href="http://productlifecyclestages.com/">http://productlifecyclestages.com/</a></p> <p>[4] <a href="https://speechfoodie.com/cash-flow-diagrams/">https://speechfoodie.com/cash-flow-diagrams/</a></p>

## **OPEN ELECTIVE-IV**

**17CE2605 A**

**TRAFFIC SAFETY**

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

Course outcomes	Upon successful completion of the course, the student will be able to	
	CO1	understand the road accidents and road safety improvement strategies
	CO2	analyse the crash data using statistical methods & conduct road safety audits
	CO3	understand the mechanism needed for crash reconstruction based on case



		studies													
		CO4	apply accident mitigation measures in view of safety of user on a highway.												
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1				L										
	CO2		H	H	M	L									L
	CO3			M		L									L
	CO4		M	M	H							M			
Course Content	<p><b>UNIT I</b> <b>1.INTRODUCTION TO SAFETY:</b> Road accidents, Trends, causes, Collision and Condition diagrams, Highway safety, human factors.</p> <p><b>2.SAFETY MANAGEMENT SYSTEMS AND STRATEGIES:</b> Vehicle factors Road Safety Management System, road safety improvement strategies, elements of a road safety plan, Safety Data Needs.</p> <p><b>UNIT II</b> <b>3.STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA:</b> Before-after methods in crash analysis, Discussion on Advanced statistical methods, Black Spot Identification &amp; Investigations, Case Studies.</p> <p><b>4.ROAD SAFETY AUDITS:</b> Key elements of a road safety audit, Road Safety Audits &amp; Investigations, Crash investigation and analysis, Describe methods for identifying hazardous road locations, Case Studies.</p> <p><b>UNIT-III</b> <b>5.CRASH RECONSTRUCTION:</b> Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction.</p> <p><b>6.CASE STUDIES FOR CRASHES AND ACCIDENTS:</b> Speed for various skid, friction, drag, and acceleration scenarios, crash vs accident, Case Studies.</p> <p><b>UNIT-IV</b> <b>7.MITIGATION MEASURES:</b> Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Traffic calming.</p> <p><b>8.TRAFIC MANAGEMENT EDUCATION AND ENFORCEMENT:</b></p>														

	Traffic management measures and their influence in accident prevention, legislation, enforcement, education and propaganda,
Text books & Reference Books	<p><b>Text books :</b></p> <p>1. Traffic Engineering and Transport Planning , Dr.L.R.Kadiyali, 9<sup>th</sup> Edition, 2017, Khanna Publications , New Delhi.</p> <p>2. S K Khanna C E G Justo, A. Veeraragavan. Highway Engineering. Nem Chand and Bros, Roorkee, 2001</p> <p><b>Reference books:</b></p> <p>[R1] Black Spot Manual, Traffic safety project- General Directorate of Highways, Swedish Transport Administration, December 2001.</p> <p>[R2] Guidelines for road safety audit, directorate of urban land transport, Urban development department, Govt. of Karnataka.</p> <p>[R3] Stewart, A.E. and Lord, J.H., 2002. Motor vehicle crash versus accident: a change in terminology is necessary. Journal of traumatic stress, 15(4), pp.333-335.</p>
E-resources and other digital material	<p>[E1] <a href="https://nptel.ac.in/courses/105101008/downloads/cete_42.pdf">https://nptel.ac.in/courses/105101008/downloads/cete_42.pdf</a></p> <p>[E2] <a href="https://roadsafety.piarc.org/en/road-safety-management">https://roadsafety.piarc.org/en/road-safety-management</a></p> <p>[E3] <a href="http://erso.swov.nl/knowledge/content/10_rsm/the_road_safety_management_system.htm">http://erso.swov.nl/knowledge/content/10_rsm/the_road_safety_management_system.htm</a></p> <p>[E4] <a href="http://www.nimhans.ac.in/sites/default/files/UL_BR_b007_Summary%20rprt.pdf">http://www.nimhans.ac.in/sites/default/files/UL_BR_b007_Summary%20rprt.pdf</a></p> <p>[E5] <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2700566/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2700566/</a></p> <p>[E6] <a href="https://safety.fhwa.dot.gov/provencountermeasures/">https://safety.fhwa.dot.gov/provencountermeasures/</a></p>

<b>17CE2605 B</b>	<b>BUILDING SERVICES ENGINEERING</b>
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Course Category:	Open Elective - IV	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	--	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to	
	CO1	understand the types, basic planning and specifications of buildings.
	CO2	understand ventilation and thermal insulation in structures
	CO3	understand the plumbing and electrical fixtures in structures
	CO4	understand the considerations for fire prevention and fighting and termite prevention in buildings.

Contribution of Course Outcomes towards achievement of Program 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	PSO 1	PSO 2
(L – Low, M - Medium, H – High)	CO1	H						M							M
	CO2	L						M			M				M
	CO3	L				L	L	M			M				M
	CO4	L				L	L	M			M				M
Course Content		<p><b>UNIT – I</b></p> <p><b>1. BASICS OF BUILDINGS</b></p> <p>Types of structures: Load bearing walled structures &amp; Framed structures – Different types of buildings: Residential, Public, Assembly, Hospitals, Institutional etc - Zoning regulations; Regulations regarding layouts or sub-divisions; Building height regulations; Calculation of plinth, floor and carpet area; Floor space index.</p> <p><b>2. BASIC BUILDING PLANNING AND ELEMENTS</b></p> <p>Site planning; Space requirement–Establishing areas for different units - Grouping, Circulation, Orientation, Aspect and prospect, Privacy, Elegance and economy; Climatic considerations – Basic building elements: Stair cases, doors and windows - Guidelines for staircase planning; Guidelines for selecting doors and windows; Terms used in the construction of stair case, doors and window</p>													
		<p><b>UNIT – II</b></p> <p><b>3. VENTILATION AND AIRCONDITIONING,</b></p> <p>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</p> <p><b>4. THERMAL INSULATION:</b></p> <p>Heat transfer – Thermal Insulating Materials – Thermal Insulation Methods – Economics of Thermal Insulation – Insulation of Walls – Roofs – Doors &amp; Windows.</p>													
		<p><b>UNIT – III</b></p> <p><b>5. PLUMBING SERVICES</b></p> <p>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.</p> <p><b>6. ELECTRICAL INSTALLATION IN BUILDINGS</b></p> <p>Considerations for Office Buildings, School Buildings &amp; Residential Buildings; Lighting– Fanning – 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 – Lightning arrestors</p>													

	<b>UNIT – IV</b> <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 Janardhan Jha; S.K. Sinha; 2007; Jain Book Agency, New Delhi. <b>Reference Books:</b> 1. National Building Code, 2015 2. Building Construction by P.C.Varghese, 2005, PHI Publications, New Delhi 3. Building Services Engineering by David V. Chatterton, Sixth Edition, 2013, Routledge Publications.
E-resources and other digital material	<a href="https://nptel.ac.in/courses/105102176/">https://nptel.ac.in/courses/105102176/</a>

<b>17TP1606</b>	<b>QUANTITATIVE APTITUDE</b>
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Course Category:	Institutional Core	Credits:	1
Course Type:	Learning by Doing	Lecture - Tutorial - Practice:	0 – 0 – 2
Prerequisites:		Continuous Evaluation:	100
		Semester end Evaluation:	
		Total Marks:	0

Course outcomes		Upon successful completion of the course, the student will be able to														
		CO1	solve various Basic Mathematics problems by following different methods													
		CO2	follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems													
		CO3	confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.													
		CO4	analyze, summarize and present information in quantitative forms including table, graphs and formulas													
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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	
	CO1	M														
	CO2		M													
	CO3	M														
	CO4				M											
Course Content		<b>UNIT I:</b>  <b>1.Numerical ability I:</b> Number system, HCF & LCM, Average, Simplification, Problems on numbers  <b>2.Numerical ability II:</b> Ratio & Proportion, Partnership, Percentages, Profit & Loss														
		<b>UNIT II:</b>  <b>3. Arithmetical ability I</b> Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.  <b>4.Arithmetical ability II:</b> Time & Distance, Problems on boats &Steams, Problems on Trains														

	<b>UNIT III:</b>  <b>5.Arithmetical ability III:</b> Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,  <b>6.Logical ability:</b> Permutations and Combination and Probability.
	<b>UNIT IV:</b>  <b>7.Mensuration:</b> Geometry, Areas, Volumes,  <b>8.Data interpretation:</b> Tabulation, Bar graphs, Pie charts, line graphs
Text books and Reference books	R. S. Aggarwal “Quantitative Aptitude”, Reviseded., S Chand publication, 2017 ISBN:8121924987
E-resources and other digital material	

<b>17MC1607</b>	<b>BIOLOGY FOR ENGINEERS</b>
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<b>Course Category:</b>	Mandatory Learning	<b>Credits:</b>	---
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial - Practice:</b>	2-0-0
<b>Prerequisites:</b>		<b>Continuous Evaluation:</b> 100 <b>Semester end Evaluation:</b> 0 <b>Total Marks:</b> 100	

Course outcomes		Upon successful completion of the course, the student will be able to													
	CO1	Describe the fundamental principles and methods of engineering													
	CO2	Identify the functions of different types in bio-molecules													
	CO3	Describe mechanisms underlying the working of molecular biological process including enzyme catalysis, metabolic pathways, gene expression													
	CO4	Use Excel, MATLAB and other computational tools to quantitatively analyze biological processes													
Contribution of Course Outcomes towards achievement of Program 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	PSO 1	PSO 2
(L – Low, M - Medium, H – High)	CO1	M	H												
	CO2		H												
	CO3		M		H										
	CO4		L		M	H									

<b>Course Content</b>	<p><b>UNIT – I</b></p> <p><b>Introduction and Classification of Living organisms</b></p> <p><b>Introduction:</b> Fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Biology as an independent scientific discipline. Discuss how biological observations of 18<sup>th</sup> century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor.</p> <p><b>Classification:</b> Classification of living organisms based on (a) Cellularity- Unicellular or multicellular (b) Ultrastructure- prokaryotes or eukaryotes. (c) Energy and Carbon utilization –Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitat-aquatic, terrestrial (e) Molecular taxonomy- three major kingdoms of life.</p>
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	<p><b>UNIT – II</b>  <b>Biomolecules and Enzymes</b>  <b>Biomolecules:</b>  Biomolecules: Structures of sugars (Glucose and Fructose), starch and cellulose. Nucleotides and DNA/RNA. Amino acids and lipids. Proteins- structure and functions- as enzymes, transporters, receptors and structural elements.  <b>Enzymes:</b>  Enzyme classification. Mechanism of enzyme action.  Enzyme kinetics and kinetic parameters</p> <p><b>UNIT – III</b>  <b>Genetics and Gene information Transfer</b>  <b>Genetics:</b>  “Genetics is to biology what Newton’s laws are to Physical Sciences” Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Concepts of recessiveness and dominance. Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring.  <b>Information Transfer:</b>  DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.</p> <p><b>UNIT – IV</b>  <b>Metabolism and Microbiology</b>  <b>Metabolism:</b>  Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. ATP as an energy currency. Breakdown of glucose to CO<sub>2</sub> + H<sub>2</sub>O (Glycolysis and Krebs cycle) and synthesis of glucose from CO<sub>2</sub> and H<sub>2</sub>O (photosynthesis). Energy yielding and energy consuming reactions.  <b>Microbiology:</b>  Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Growth kinetics. Ecological aspects of single celled organisms. Microscopy.</p>
<b>Text books and Reference books</b>	<p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1) Biology: A global approach: Campbell, N.A.;Reece, J.B.;Urry, Lisa;Cain,M,L.; Wasserman,S.A.; Minorsky,P. V.;Jackson, R.B.Pearason Education Ltd</li> <li>2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons</li> </ol> <p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>3) Principles of Biochemistry (V Edition), By Nelson, D.L.; and Cox, M.M.W.H. Freeman and Company</li> <li>4) Molecular Genetics (Second Edition), Stent, G.S.; and Calender, R.W.H. Freeman and Company, Distributed by Satish Kumar Jain for CBS publisher</li> <li>5) Microbiology, Prescott, L.M J.P. Harley and C.A.Klein 1995. 2<sup>nd</sup> edition Wm, C.Brown publishers</li> </ol>







<b>Course Content</b>	<p><b>UNIT – I</b></p> <p><b>1.SUB–SOIL INVESTIGATION AND SAMPLING</b> 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.</p> <p><b>2.STRESSES DUE TO APPLIED LOADS</b> Stress-strain parameters; Vertical and horizontal stresses due to concentrated loads; Boussinesq and Westergard solutions; Isobars; Influence diagram; Newmark's influence charts; Contact pressure distribution.</p>
	<p><b>UNIT – II</b></p> <p><b>3.LATERAL EARTH PRESSURE &amp; RETAINING WALLS</b> Different types of lateral earth pressure; Rankine's and Coulomb's earth pressure theories; Graphical methods; Types of retaining walls; Proportioning of retaining walls.</p> <p><b>4.STABILITY OF SLOPES</b> 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.</p>
	<p><b>UNIT – III</b></p> <p><b>5.BEARING CAPACITY OF SHALLOW FOUNDATION</b> 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.</p> <p><b>6.SETTLEMENT ANALYSIS</b> Settlement of foundations; Immediate and consolidation settlements; Allowable settlement; Proportioning of a foundation for a given settlement.</p>
	<p><b>UNIT – IV</b></p> <p><b>7.PILE FOUNDATIONS</b> 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.</p> <p><b>8.WELL FOUNDATION</b> 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.</p>

<b>Text books and Reference books</b>	<p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Basic and Applied Soil Mechanics, Gopal Ranjan and A.S.R. Rao, 8<sup>th</sup> Edition, 2018, New Age International (P) Limited Publishers, Chennai.</li> <li>2. Soil Mechanics and Foundation Engineering K.R. Arora, 2011, Standard Publishers and Distributors, New Delhi.</li> </ol> <p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Advanced Foundation Engineering, V.N.S.Murthy, 2018, CBS Publishers and Distributors, New Delhi.</li> <li>2. Foundation Analysis and Design, Joseph E. Bowles, 4<sup>th</sup> Edition, 1996, McGraw – Hill International Editions,</li> <li>3. Relevant Indian Standard Code Books.</li> </ol>
<b>E-resources and other digital material</b>	<p><a href="https://nptel.ac.in/courses/105107120">nptel.ac.in/courses/105107120</a>  <a href="https://nptel.ac.in/courses/105101083">nptel.ac.in/courses/105101083</a></p>

<b>17CE3651</b>	<b>COMPUTER APPLICATIONS IN CIVIL ENGG LAB-1</b>
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Course Category:	<b>Programme Core</b>	Credits:	1
Course Type:	<b>Practical</b>	Lecture - Tutorial - Practice:	<b>0-0-2</b>
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to	
	CO1	<b>design and prepare structural drawings themselves for various structural elements by using AUTOCAD</b>
	CO2	<b>write and execute the program using Microsoft Excel/Mat Lab</b>

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2
	CO1	M	L			M						H		M	L
	CO2	M	M			M						H		M	L
Course Content	<p><b>PART-A: AUTOCAD</b> Design and Drawing the reinforcement details of the following RCC Structural elements / steel structural elements.</p> <ol style="list-style-type: none"> <li>1. Roof/Floor System (Continuous) with flanged beams</li> <li>2. Doglegged staircase</li> <li>3. Two way slabs (Simply supported slabs corners held down / corners not held down)</li> <li>4. R.C.C Beam - Column joint</li> <li>5. Isolated and Combined footing</li> <li>6. Steel Roof Truss</li> </ol> <p><b>PART - B: PROGRAMMING</b> Students are required to write &amp; execute the programs using Microsoft Excel language</p> <ol style="list-style-type: none"> <li>1. Design of singly reinforced beam for flexure by LSM.</li> <li>2. Design of doubly reinforced beam for flexure by LSM.</li> <li>3. Design of R.C.C column of rectangular section for axial load by LSM.</li> </ol>														
Text books and Reference books	<p><b>TEXT BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Structural Design and Drawing - Dr. N. Krishnaraju</li> <li>2. Engineering Graphics using AUTOCAD, T.Jeyapoovan, Vikas Publishing House Pvt. Ltd., 2000.</li> <li>3. Engineering Drawing and Graphics and AUTOCAD, K.Venugopal, New Age International Publishers, 2001.</li> <li>4. Computer Applications in Civil Engineering, New Chand &amp; Bros., Roorkee, India,1979.</li> </ol>														
E-resources and other digital material															

<b>17CE3652</b>	<b>ADVANCED SURVEYING LAB</b>
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Course Category:	Programme Core.	Credits:	1
Course Type:	Practical	Lecture - Tutorial - Practice:	0-0-2
Prerequisites:	17CE3304: Surveying & Geomatics, 17CE3351: Surveying Laboratory	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

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	set out curves												
		CO4	transfer points from plan to field												
Contribution of Course Outcomes towards achievement of Program Outcomes  (L – Low, M - Medium, H – High)		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2
	CO1	M				H		H				H			
	CO2	M				M		H				M			
	CO3	M				H		H				H			
	CO4					M						H			

Course Content	<p><b><u>PART-A</u></b></p> <ol style="list-style-type: none"> <li>1. Setting of Boundaries and computation of area of a field by using Total Station.</li> <li>2. Calculation of Height of object by using Total station.</li> <li>3. Setting of simple curve using chain and tape.</li> <li>4. Setting of simple curve using chain, tape and Theodolite</li> <li>5. Setting of simple curve using Total Station.</li> <li>6. Setting out for a Building using chain and tape.</li> <li>7. Setting out for a Building using Total Station.</li> <li>8. Computation of area of building by using Total station.</li> <li>9. Contour Map (Levelling) using Total station</li> <li>10. Demonstration of DGPS- area measurement</li> </ol> <p><b><u>PART-B</u></b></p> <p>Survey Camp is to be conducted for a minimum period of one week Using Total Station to train in one of the following areas:</p> <ol style="list-style-type: none"> <li>1. Preparation of a contour Plan/ Map.</li> <li>2. Earth work Computations for a high way / canal projects</li> <li>3. Marking of a Sewer line/ Water supply line.</li> <li>4. Any type of Execution works.</li> </ol>
Text books and Reference books	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Surveying Vol I &amp; II by K R Arora, 15<sup>th</sup> Edn , 2016, Standard Book house New Delhi.</li> <li>2. Higher Surveying by Dr.A.M.Chandra, 2006, New Age International Publishers, Chennai.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Surveying Vol I &amp; II by B.C. Punmia, 6<sup>th</sup> Edn 2016, Laxmi Publications, New Delhi.</li> </ol>
E-resources and other digital material	NPTEL: <a href="http://www.nptelvideos.in/2012/11/surveying.html">http://www.nptelvideos.in/2012/11/surveying.html</a>

17CE 5653	ENGINEERING PROJECTS IN COMMUNITY SERVICE
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Course Category:	Programme Core	Credits:	2
Course Type:	Project Work	Lecture - Tutorial - Practice:	0 - 1- 2
Prerequisites:		Continuous Evaluation:	30





- Appendix with support data (Illustrations, Tables, Graphs, etc.,)

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

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

Date of Seminar : During the Lab. Internal Examinations

**Method of Evaluation:**

Day-to-Day work (Evaluated by the Guide) : 10 M

Seminar - 1 : 10 M

Seminar – 2 with report submission : 10 M

Semester End Evaluation : 70 M

**Total : 100 M**

<b>Text books and Reference books</b>	<b>Text Books:</b> Standard Reference Books, Journals and Magazines – both printed and online.
<b>E-resources and other digital material</b>	<a href="https://www.purdue.edu">https:// <u>www.purdue.edu</u></a> <a href="http://unnatbharatabhiyan.gov.in">http://unnatbharatabhiyan.gov.in</a>