

# Under Graduate Course Structure For **CIVIL ENGINEERING**

*(Applicable for batches admitted from 2018-2019)*

S No	Programme Code	Programme Name	Branch	No. of Sections	No. of Students	Page
1	01	B. Tech	Civil Engineering	02	120	1-3



**Autonomous Regulations – R18**

**Amrita Sai Institute of Science & Technology**

*Approved by AICTE, New Delhi; Permanently Affiliated to JNTUK, Kakinada  
ISO 9001:2015 Certified Institution; Accredited by NAAC with "A" grade  
Recognized by UGC under 2(f) and 12(B) of UGC 1956 Act*

**Amrita Sai Nagar, Paritala, Krishna District Andhrapradesh – 521 180**

[www.amritasai.edu.in](http://www.amritasai.edu.in), 0866-2428399

## Outcome-Based Education – Dept of Civil Engineering

The following curriculum for B.Tech. Civil Engineering programmes with regulations-R18 are conventional to outcome-based teaching-learning process. In general, **TWELVE PROGRAMME OUTCOMES** (a-l) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and are able to do by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire as they progress through the program. Further, each course in the program defines clear instructional objectives that are mapped to student outcomes.

### The Programme Outcomes:

**(a) Engineering knowledge:** Graduates will be able to apply the knowledge of mathematics, science, engineering fundamentals to solve complex civil engineering problems.

**Problem analysis:** Graduates will attain the capability to identify, formulate and analyse problems related to civil engineering and substantiate the conclusions

**Design/development of solutions:** Graduates will be in a position to design solutions for civil engineering problems and design system components and processes that meet the specified needs with appropriate consideration to public health and safety.

**Conduct investigations of complex problems:** Graduates will be able to perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.

**Modern tool usage:** Graduates will be able to select and apply appropriate techniques from the available resources and modern civil engineering and software tools, and will be able to predict and model complex engineering activities with an understanding of the practical limitations.

**The engineer and society:** Graduates will be able to carry out their professional practice in civil engineering by appropriately considering and weighing the issues related to society and culture and the consequent responsibilities.

**Environment and sustainability:** Graduates will be able to understand the impact of the professional engineering solutions on environmental safety and legal issues.

**Ethics:** Graduates will transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.

**Individual and teamwork:** Graduates will be able to function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.

**Communication:** Graduates will be able to communicate fluently on complex engineering activities with the engineering community and society, and will be able to prepare reports and make presentations effectively.

**Project management and finance:** Graduates will be able to demonstrate knowledge and understanding of the engineering and management principles and apply the same while managing projects in multidisciplinary environments.

**Life-long learning:** Graduates will engage themselves in independent and life-long learning in the broadest context of technological change while continuing professional practice in their specialized areas of civil engineering.

## Program Educational Objectives – CE

PEO-1	Pursue successful careers or higher studies in civil engineering with morals and ethics through their strong foundation in mathematics, science and engineering
PEO-2	Analyze and design appropriate solutions for socially relevant problems by using current engineering techniques and tools
PEO-3	Engage in professional development through effective communication, team work and lifelong learning

## B. Tech. Course Structure – Civil Engineering

### I Semester

S. No	Course Code	Course	L	T	P	C
1	18BS1T1	English – I	3	-	--	2
2	18BS1T2	Mathematics - I	4	1	--	4
3	18BS1T3	Engineering Chemistry	4	-	--	3
4	18BS1T4	Engineering Mechanics	4	-	--	3
5	18BS1T5	Computer Programming	4	-	--	3
6	18BS1T6	Environmental Studies	4	-	--	3
7	18BS1L1	English- Communication Skills Laboratory - I	-	--	3	1
8	18BS1L2	Engineering Chemistry Laboratory	-	--	3	1
9	18BS1L3	Computer Programming Laboratory	-	--	3	1
<b>Total Credits</b>			<b>21</b>			

### II Semester

S.NO	Course Code	Course	L	T	P	C
1	18BS2T1	English – II	3	-	--	2
2	18BS2T2	Mathematics - III	4	1	--	4
3	18HS2T3	Mathematics - II	4	-	--	3
4	18CE2T4	Elements of Mechanical Engineering	4	--	--	3
5	18BS2T5	Engineering Physics	4	-	-	3
6	18ME2T6	Engineering Drawing	4	-	4	3
7	18BS2L1	English - Communication Skills Laboratory - II	-	--	3	1
8	18HS2L2	Engineering Physics Laboratory	-	--	3	1
9	18ME2L3	Engineering Workshop& IT Workshop	-	--	3	1
10	18BS2L4	Engineering Physics – Virtual Labs	-	--	2	--
<b>Total Credits</b>			<b>21</b>			

### III Semester

S. No	Course Code	Course	L	T	P	C
1	18CE3T1	Probability & Statistics	3	1	--	3
2	18CE3T2	Basic Electrical and Electronics Engineering	3	1	--	3
3	18CE3T3	Strength of Materials - I	3	1	--	3
4	18CE3T4	Building Materials and Construction	3	1	--	3
5	18CE3T5	Surveying	3	1	--	3
6	18CE3T6	Fluid Mechanics	3	1	--	3
7	18CE3L1	Surveying Field work - I	--	--	3	1
8	18CE3L2	Strength of Materials Laboratory	--	--	3	1
9	18CE3T7	Managerial Economics and Real Estate Fundamentals	2	--	--	1
<b>Total Credits</b>			<b>21</b>			

**IV Semester**

S. No	Course Code	Course	L	T	P	C
1	18CE4T1	Building Planning and Drawing	3	1	--	3
2	18CE4T2	Strength of Materials - II	3	1	--	3
3	18CE4T3	Hydraulics and Hydraulic Machinery	3	1	--	3
4	18CE4T4	Concrete Technology	3	1	--	3
5	18CE4T5	Structural Analysis - I	3	1	--	3
6	18CE4T6	Transportation Engineering - I	3	1	--	3
7	18CE4L1	FM & HHM Laboratory	--	--	3	1
8	18CE4L2	Surveying Field work - II	--	--	3	1
9	18CE4T7	Professional Ethics and Human Values	1	--	--	1
<b>Total Credits</b>			<b>21</b>			

**V Semester**

S. No	Course Code	Course	L	T	P	C
1	18CE5T1	Management Science & Financial Analysis	3	1	--	3
2	18CE5T2	Engineering Geology	3	1	--	3
3	18CE5T3	Structural Analysis - II	3	1	--	3
4	18CE5T4	Design and Drawing of Reinforced Concrete Structures	3	1	--	3
5	18CE5T5	Transportation Engineering - II	3	1	--	3
6	18CE5L1	Concrete Technology Laboratory	--	--	3	1
7	18CE5L2	Engineering Geology Laboratory	--	--	3	1
8	18CE5L3	Transportation Engineering Laboratory	--	--	3	1
9	18CE5T6	Personality Development	2	--	--	1
<b>Total Credits</b>			<b>19</b>			

**VI Semester**

S. No	Course Code	Course	L	T	P	C
1	18CE6T1	Design and Drawing of Steel Structures	3	1	--	3
2	18CE6T2	Geotechnical Engineering - I	3	1	--	3
3	18CE6T3	Environmental Engineering - I	3	1	--	3
4	18CE6T4	Water Resources Engineering - I	3	1	--	3
5	18CE6T5	Open Elective	3	1	--	3
6	18CE6L1	Geotechnical Engineering Laboratory	--	--	3	1
7	18CE6L2	Environmental Engineering Laboratory	--	--	3	1
8	18CE6L3	Computer Aided Engineering Laboratory	--	--	3	1
9	18CE6I1	Internship & Summer Training	--	--	--	1
<b>Total Credits</b>			<b>19</b>			

**VII Semester**

S. No	Course Code	Course	L	T	P	C
1	18CE7T1	Environmental Engineering - II	3	1	--	3
2	18CE7T2	Water Resources Engineering - II	3	1	--	3
3	18CE7T3	Geotechnical Engineering - II	3	1	--	3
4	18CE7T4	Remote Sensing and GIS Applications	3	1	--	3
5	18CE7T5	Elective - I	3	1	--	3
6	18CE7T6	Elective - II	3	1	--	3
7	18CE7L1	CAD and GIS Laboratory	--	--	3	1
8	18CE7L2	Irrigation Design and Drawing	--	--	3	1
9	18CE7T7	IPR & Patents	2	--	--	--
<b>Total Credits</b>			<b>20</b>			

**VIII Semester**

S. No	Course Code	Course	L	T	P	C
1	18CE8T1	Estimation Specification and Contracts	3	1	--	3
2	18CE8T2	Construction Technology and Management	3	1	--	3
3	18CE8T3	Pre-Stressed Concrete	3	1	--	3
4	18CE8T4	Elective – III	3	1	--	3
5	18CE8P1	Project Work	--	--	12	6
<b>Total Credits</b>			<b>18</b>			

Open Elective		Elective – I	
18CE6T5A	Electronic Instrumentation & Sensor Technology	18CE7T4A	Finite Element Methods
18CE6T5B	Database Management System	18CE7T4B	Ground Improvement Techniques
18CE6T5C	Alternative Engineering Source	18CE7T4C	Tall Buildings
18CE6T5D	Disaster Management	18CE7T4D	Urban Hydrology
18CE6T5E	Fundamentals of Liquefied Natural Gas	18CE7T4E	Traffic Engineering
18CE6T5F	Green Buildings		

Elective – II		Elective – III	
18CE7T5A	Advanced Structural Analysis	18CE8T3A	Bridge Engineering
18CE7T5B	Advanced Foundation Engineering	18CE8T3B	Soil Dynamics and Foundations
18CE7T5C	Environmental Impact Assessment and Management	18CE8T3C	Solid & Hazardous Waste Management
18CE7T5D	Ground Water Development	18CE8T3D	Water Resource Systems Planning
18CE7T5E	Pavement Analysis and Design	18CE8T3E	Urban Transportation Planning Engineering

**L-Lecture; T-Tutorial; P-Practical; C-Credits;**

**One Lecture/Tutorial instructional span is 50 minutes**

**Total Course Credits →21+21+21+21+19+19+20+18 = 160**

Course Code <b>18BS1T1</b>	<b>ENGLISH-I</b>				L	T	P	C
	Maximum expected contact hours : <b>50</b>				<b>3</b>	<b>--</b>	<b>--</b>	<b>2</b>
	Prerequisites : <b>Knowledge in English Language</b>							
<p><b>PURPOSE:</b> In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.</p> <p>As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The non detailed Textbooks are meant for extensive reading for pleasure and profit.</p> <p>Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.</p>								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	<p><b>LISTENING SKILLS:</b>  <b>Objectives:</b> To enable the students to appreciate the role of listening skill and improve their pronunciation. To enable the students to comprehend the speech of people belonging to different backgrounds and regions. To enable the students to listen for general content, to fill up information and for specific information</p>							
2	<p><b>SPEAKING SKILLS:</b>  <b>Objectives:</b> To make the students aware of the importance of speaking for their personal and professional communication. To enable the students to express themselves fluently and accurately in social and professional success. To help the students describe objects, situations and people. To make the students participate in group activities like role plays, discussions and debates. To make the students participate in Just a Minute talks.</p>							
3	<p><b>READING SKILLS:</b>  <b>Objectives:</b> To enable the students to comprehend a text through silent reading. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts. To enable the students to skim and scan a text. To enable the students to identify the topic sentence. To enable the students to identify discourse features. To enable the students to make intensive and extensive reading.</p>							
4	<p><b>WRITING SKILLS:</b>  <b>Objectives:</b> To make the students understand that writing is an exact formal skill. To enable the students to write sentences and paragraphs. To make the students identify and use appropriate vocabulary. To enable the students to narrate and describe. To enable the students capable of note-making. To enable the students to write coherently and cohesively. To make the students to write formal and informal letters. To enable the students to describe graphs using expressions of comparison. To enable the students to write technical reports.</p>							
<b>COURSE OUTCOMES</b>								
1	The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.							
2	The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.							
3	The lesson motivates the public to adopt road safety measures.							
4	The lesson creates awareness in the readers that mass production is ultimately detrimental to biological survival.							
5	The lesson helps to choose a source of energy suitable for rural India.							
6	The lesson creates awareness in the reader as to the usefulness of animals for the human society.							

**UNIT I:** 'Human Resources' from English for Engineers and Technologists. Past and Future tense  
**OBJECTIVE:**

1.To develop human resources to serve the society in different ways.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

**UNIT 2:** 'Transport: Problems and Solutions' from English for Engineers and Technologists. Different modes of Transport

OBJECTIVE:

1. To highlight road safety measures whatever be the mode of transport.

2. 'War' from 'Panorama: A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

**UNIT 3:** 'Evaluating Technology' from English for Engineers and Technologists. Solar bikes and Vehicles

OBJECTIVE:

1. To highlight the advantages and disadvantages of technology.

2. 'The Verger' from 'Panorama: A Course on Reading.'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

**UNIT 4:** 'Alternative Sources of Energy' from English for Engineers and Technologists. Examples; Tidal power, Bio mass energy, geothermal power

OBJECTIVE:

1. To bring into focus different sources of energy as alternatives to the depleting sources.

2. 'The Scarecrow' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

**UNIT 5:** 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

1. To highlight the fact that animals must be preserved because animal life is precious.

2. 'A Village Host to Nation' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

**UNIT 6:** 'Safety and Training' from English for Engineers and Technologists and Team working skills.

OBJECTIVE:

1. To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

2. 'Martin Luther King and Africa' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

**NOTE:** All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

**DETAILED TEXTBOOK:**

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by Orient Black swan Pvt Ltd

**NON-DETAILED TEXTBOOK:**

**PANORAMA:** A COURSE ON READING, Published by Oxford University Press India. The course content along with the study material is divided into six units.

Course Code <b>18BS1T2</b>	<b>MATHEMATICS-I</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				<b>4</b>	<b>1</b>	<b>--</b>	<b>4</b>
	Prerequisites : <b>Basics Of Mathematics</b>							
<b>PURPOSE:</b> To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.							
2	The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.							
<b>COURSE OUTCOMES</b>								
1	i) Determining the Charge and Current in electrical circuits using linear equations ii) Determining the temperature of an object and the amount of substance at any time.							
2	Determining the displacement of a particle, velocity and acceleration of a particle							
3	Calculating the highest and least values and finding the relation between the functions							
4	To express any function as a series of Sine and Cosine functions							
5	Determine the area and volume of two and three dimensional objects							
6	Evaluation of improper integrals using Beta and Gamma Functions							

**UNIT I: Differential equations of first order and first degree:** Linear-Bernoulli-Exact-Reducible to exact. Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories-Electrical circuits- Chemical reactions.

**UNIT II: Linear differential equations of higher order:** Non-homogeneous equations of higher order with constant coefficients with RHS term of the type  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}$  ( $x$ ), ( $x$ ) - Method of Variation of parameters. Applications: LCR circuit, Simple Harmonic motion.

**UNIT III: Partial differentiation:** Introduction- Homogeneous function-Euler's theorem-Total derivative-Taylor's and Maclaurin's series expansion of functions of one and two variables - Jacobian- Functional dependence. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

**UNIT IV: Fourier series:** Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions– Even and odd functions –Change of interval– Half-range sine and cosine series.

**UNIT V: Multiple integrals:** Curve tracing: Cartesian, Polar forms. Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration. Applications: Finding Areas and Volumes.

**UNIT VI: Special functions:** Beta and Gamma functions- Properties - Relation between Beta and Gamma functions -Evaluation of improper integrals. Applications: Evaluation of integrals.

#### TEXT BOOKS:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India

#### REFERENCE BOOKS:

1. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
2. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
3. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
4. Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford UniversityPress.
5. Dass H.K., RajnishVerma. Er, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd,Delhi

Course Code	<b>ENGINEERING CHEMISTRY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
-------------	------------------------------	----------	----------	----------	----------



<b>18BS1T3</b>	Maximum expected contact hours : <b>64</b>	<b>4</b>	--	--	<b>3</b>
	Prerequisites : <b>Knowledge in Basic Science</b>				
<b>PURPOSE:</b> Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Learning Objectives: Plastics are nowadays used in household appliances; They are also used as composites (FRP) in aerospace and automotive industries.				
2	Learning Objectives: Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence are introduced to create awareness on the topics.				
3	Learning Objectives: The basics for the construction of galvanic cells are introduced to have understanding on the concepts. Understanding on the concept of Corrosion and Mechanism of Corrosion with Theories like Electrochemical theory. .				
4	Learning Objectives: Understanding of crystal structures will help to understand the conductivity, semiconductors and superconductors. Magnetic properties are also studied to have better Understanding.				
5	Learning Objectives: With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced and the study can create a better understanding on the Non –Conventional Energy Sources and Storage Devices.				
<b>COURSE OUTCOMES</b>					
1	Outcomes: The advantages and limitations of plastic materials and their use in design would be understood.				
2	Outcomes: Fuels which are used commonly and their economics, advantages and limitations can be understood by the students and create awareness on the topics.				
3	Outcomes: Corrosion – its theories and controlling methods can create Understanding and awareness on the topic.				
4	Outcomes: The students will have awareness on now aware of materials like nano materials and fullerenes and their applications. Study on liquid crystals and superconductors can create Understanding for their applications in various fields. The importance of green synthesis create better Understanding for application and also can create better Understanding compared to conventional methods is also explained				
5	Outcomes: The students understand water hardness and softening methods.				
6	Outcomes: The students are exposed to some of the alternative fuels and their advantages and imitations.				

**UNIT I: HIGH POLYMERS AND PLASTICS:** Polymerisation:- Introduction- Mechanism of polymerization - Stereo regular polymers –Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates **Poly styrene:**Elastomers :- Natural rubber-compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokoland polyurethanes – Applications of elastomers.

#### **UNIT II: FUEL TECHNOLOGY**

**Fuels** – Introduction – Classification – Calorific value - HCV and LCV – Dulong’s formula – Bomb calorimeter– Numerical problems – Coal -- Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas, LPG and CNG, **Watergas,Producer gas** - Orsat apparatus .

#### **UNIT III: ELECTROCHEMICAL CELLS AND CORROSION**

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell Li cells - **Lead Acid Battery Corrosion :-** Definition – Theories of Corrosion (chemical & electrochemical) – Formation of galvanic cells by different

metals, by concentration cells, – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating) **Organic surface Coatings-Paints.**

#### **UNIT IV: CHEMISTRY OF ADVANCED MATERIALS**

**Nano materials:-** Introduction -chemical reduction method of preparation –Carbon nano tubes and fullerenes: Types, preparation, properties and applications **Liquid crystals:-** Introduction – Types – Applications **Super conductors:-**Type –I, Type II – Characteristics and applications **Green synthesis:-** Principles - 3or 4 methods of synthesis with examples.

#### **UNIT V: WATER TECHNOLOGY**

**Hard water:-** Reasons for hardness – units of hardness - determination of hardness and alkalinity - Water for steam generation - Boiler troubles – Priming and Foaming, Scale formation, Boiler corrosion, Caustic embrittlement - Internal treatments - Softening of Hard water : Lime – Soda process, Zeolite process and numerical problems based on these processes and Ion Exchange process - Water for drinking purposes- Purification – Sterilization and disinfection : Chlorination, Break point chlorination and other methods – Reverse Osmosis and Electro Dialysis.**Turbine Deposits**

**UNIT VI: CHEMISTRY OF ENGINEERING MATERIALS AND FUEL CELLS: Lubricants: -** Definition, function, Theory and mechanism of lubricants, properties (Definition and importance) **Cement: -** Constituents, manufacturing, hardening and setting, deterioration of cement **Effect of Chlorides Insulators: -** Thermal and electrical insulators **Fuel cells: -** Hydrogen Oxygen fuel cells – Methanol Oxygen fuel cells.

#### **TEXT BOOKS:**

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

#### **REFERENCE BOOKS:**

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM.

Course Code <b>18BS1T4</b>	<b>ENGINEERING MECHANICS (Common to MECH,CIVIL,EEE&amp;CSE)</b>	L	T	P	C
	Maximum expected contact hours : <b>60</b>	4	--	--	3
	Prerequisites : <b>Basic foundation of Mathematics &amp; Physics</b>				
<b>PURPOSE:</b> To make the students be able to understand the basic laws of physics & Mechanics and to apply them to simple practical problems					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To make students understand how to apply Newtonian physics to analyse relatively simple physical mechanisms. - with some emphasis on commonly encountered engineering applications				
2	To study the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering				
3	To understand the concept of centroid and moment of inertia				
4	To be able to understand the effects of friction under static and kinetic conditions.				
<b>COURSE OUTCOMES</b>					
1	To make the students able to recognize different force systems, moments and couple.				
2	To induce the ability to draw Free Body Diagram and to apply the equations of equilibrium.				
3	To study different kinds of beams and to generate the shear force and bending moment diagrams applying variety of loads.				
4	To study simple trusses and quantify all forces associated with a static framework.				
5	To estimate the effect of friction on bodies in different positions.				
6	To learn the concepts of centroid, centre of gravity.				
7	To study about rigid body and its analysis				
8	To study work, energy and particle motion				

**UNIT I: Systems of Forces:** Introduction to Engg. Mechanics – Basic Concepts. Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. **Friction:** Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction.

**UNIT II: Equilibrium of Systems of Forces:** Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

**UNIT III: Centroid:** Centroids of simple figures (from basic principles) – Centroids of Composite Figures **Centre of Gravity:** Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

**UNIT IV: Area moments of Inertia:** Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

**UNIT V: Kinematics:** Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

**UNIT VI: Work – Energy Method:** Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

#### TEXT BOOKS :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.

#### REFERENCES :

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.

2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum’s outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.

Course Code <b>18BS1T5</b>	<b>COMPUTER PROGRAMMING THROUGH C</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				<b>4</b>	--	--	<b>3</b>
	Prerequisites : <b>Knowledge in Mathematics</b>							
<b>PURPOSE:</b> This fundamental course will enable the students to learn the concepts of Programming Language and design principles along with understanding of C Language.								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	To understand the conceptual writing of an algorithm and computational procedure							
2	To learn basics of Control Structures and its applications							
3	To Learn the importance of the modular programming							
4	To learn on the manipulation of Arrays, strings and Pointers							
5	To innovate user defined data types and its applications.							
6	Comprehension of file operations.							
<b>COURSE OUTCOMES</b>								
1	Illustrate the flowchart and design an algorithm for a given problem and to develop C programs using operators.							
2	Develop conditional and iterative statements to write C programs.							
3	Apply user defined functions to solve real time problems.							
4	Identify use Pointers to access arrays, strings and functions.							
5	Make use of user defined data types including structures and unions to solve problems.							
6	Identify pointers and to allocate memory using Dynamic Memory Management functions and files and show input and output of files in C.							

**UNIT I: History and Hardware**-Computer Hardware-Memory Hierarchy, Different kinds of Programming Languages-Flowchart-Algorithm; **Introduction to C Programming**- identifiers, importance of the main() function, stream input and output functions-Comments, Data Types, Variables and Constants, Operators, Expressions, Operator Precedence and associativity. **Assignment**-Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Formatted Output, Format Modifiers.

**UNIT II: Control Flow**-Relational Expressions - Logical Operators; **Selection:** if-else, nested if, **Multi-way selection:** switch, else-if, examples; **Repetition:** Basic Loop Structures, Pre-test and Post-test Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, the for Statement, Nested Loops, The do-while statement

**UNIT III: Modular Programming:** Function and classification of parameter, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function. **Case Study:** Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

**UNIT IV: Arrays, Strings & Structures; Arrays:** One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices; **Strings:** String Fundamentals, String Input and Output, String Processing, Library Functions; **Pointers:** Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers.

**UNIT V: Structures:** Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, pointers to structures, self referential structures, structures and functions, typedef, bit-fields

**UNIT VI: Pointers Contd.** Dynamic memory management functions, command line arguments. **Files Data Files:** Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

#### TEXT BOOKS:

1. Programming with C, Byron Gottfried, Schaum's Outline Series, 3rd edition, Tata McGraw Hill publications.
2. Programming in C, Reema Thareja, OXFORD.

#### REFERENCE BOOKS:

1. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

2. ANSI C Programming, Gary J. Bronson, Cengage Learning.
3. C by Example, Noel Kalicharan, Cambridge.
4. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.

Course Code <b>18BS1T6</b>	<b>ENVIRONMENTAL STUDIES</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				<b>4</b>	<b>--</b>	<b>--</b>	<b>3</b>
	Prerequisites : <b>MINIMUM AWARENESS ON THE SUBJECT</b>							
<b>PURPOSE:</b> This course aims at study giving a minimum awareness and practicability for the human beings to preserve and protect the environment, environmental conditions.								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	Basic understanding of the environment, global problems and ecosystems.							
2	Over all understanding of the natural resources							
3	Basic understanding of Biodiversity.							
4	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.							
5	Awareness on the social issues, environmental legislation and global treaties							
6	An understanding of the environmental impact of developmental activities							
<b>COURSE OUTCOMES</b>								
1	The importance of environment and global environmental problems. The concepts of the ecosystem and its function in the environment. The need protecting the producers and consumers in various ecosystems and their role in the food web.							
2	The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.							
3	The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity							
4	Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices							
5	Social issues both rural and urban environment and the possible means to combat the challenges. The environmental legislations of India and the first global initiatives towards sustainable development.							
6	About environmental assessment and the stages involved in EIA and the environmental audit. Self Sustaining Green Campus with Environment Friendly aspect of Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking & curriculum.							

**UNIT I: Multidisciplinary nature of Environment and Ecology:** Definition, Scope and Importance, Introduction to Brief works of noted Environmentalists & Naturalists (Wangari Mathai, Salim Ali and Sunderlal Bahuguna), Sustainability: Stockholm and Rio Summit–Global environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

**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. Classification of ecosystems-characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems: Estuaries and Mangroves.

**UNIT II: Natural Resources:** Natural resources and associated problems Forest resources –Use and over-exploitation, deforestation – Timber extraction –Mining, dams and other effects on forest and tribal people Water resources –Use and over utilization of surface and ground water –Floods, drought, conflicts over water, dams –benefits and problems Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction. Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

**UNIT III: Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity-classification -Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation -Hot-spots of biodiversity -Threats to biodiversity: habitat loss, man-wildlife conflicts -Endangered and endemic species of India-Conservation of biodiversity.

**UNIT-IV Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Heavy Metal pollution, Soil pollution, Noise pollution, radioactive pollution: Sources and risks. Role of an individual in prevention of pollution. Pollution case studies, Sustainable Life Style, Impact of Fire Crackers on Man and his well being.**Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solidwastes. Consumerism and waste products, Biomedical, Hazardous and e -waste managementUNIT-V Network synthesis: **Positive real function - basic synthesis procedure - LC immittance functions - RC impedance functions and RL admittance function - RL impedance function and RC admittance function - Foster and Cauer methods.**

**UNIT-V Social Issues and the Environment:** Urban problems related to energy -Water conservation-Coastal Regulatory zone management, rainwater harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air(Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

**UNIT-VI Environmental Management:** Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Environmental Modeling: Definition (Box Model and Gaussian Plume Modeling), Ecotourism, Green Campus-Green business, Green politics and Green Building.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

#### **TEXT BOOKS:**

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2ndEdition, 2011, Oxford University Press.
3. Environmental Studies, P.N. Palanisamy, P. Manikandan, A. Geetha, and K.Manjula Rani; Pearson Education, Chennai

#### **REFERENCE:**

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, CengageLearning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
5. Environmental pollution, Monitoring and Control by Khopkar. S.M, New Age Publishers.
6. A Text Book of Fundamentals of Ecology, E.P.Odam, Philadelphia: W.B. Saunders Company.



Course Code <b>18BS1L1</b>	<b>ENGLISH COMMUNICATION SKILLS LAB-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>36</b>	--	--	<b>3</b>	<b>1</b>
	Prerequisites : <b>Knowledge in English Language</b>				
<b>PURPOSE:</b> In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.					
<b>COURSE OBJECTIVES</b>					
1	To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.				
<b>COURSE OUTCOMES</b>					
1	A study of the communicative items in the laboratory will help the students become successful in the competitive world..				

**PRESCRIBED LAB MANUAL FOR SEMESTER I: INTERACT:** English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

**UNIT 1:** Greet people and taking leave

Introduce yourself to someone/someone to someone else

**UNIT 2:** WHY study Spoken English?

Making Inquiries on the phone, thanking and responding to Thanks and Practice work.

**UNIT 3:** Responding to Requests and asking for Directions

Practice work

**UNIT 4:** Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating

Apologizing, Advising, Suggesting, Agreeing and Disagreeing

Practice work.

**UNIT 5:** Letters and Sounds Practice work.

**UNIT 6:** The Sounds of English Practice work.

**UNIT 7:** Pronunciation

Stress and Intonation Practice work.

**UNIT 8: Body language**

Facial Expression, Eye contact,

Gestures, Postures, Personal appearance

**UNIT 9 :** Small Talk & JAM session

**UNIT 10:** Oral presentations

Prepared and Extempore

#### **REFERENCE BOOKS:**

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient Black Swan.
5. A Practical Course in effective English speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

Course Code <b>18BS1L2</b>	<b>ENGINEERING CHEMISTRY LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>30</b>				
	Prerequisites : <b>Knowledge in Basic tools / instruments of Chemistry</b>	--	--	<b>3</b>	<b>1</b>
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.					
<b>COURSE OUTCOMES</b>					
Chemistry lab curriculum gives fundamental understanding of volumetric titrations and water analysis.					

Note: Any 12 of the following Listed Experiments.

**I year - II semester Subject Code: 16BH2L05 ENGINEERING/APPLIED CHEMISTRY LAB  
LIST OF EXPERIMENTS:**

1. Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Quantitative analysis etc.,
2. Trial experiment – Estimation of HCl using standard Na<sub>2</sub>CO<sub>3</sub> solutions
3. Estimation of KMnO<sub>4</sub> using standard Oxalic acid solution.
4. Estimation of Ferric iron using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution
5. Estimation of Copper using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.
6. Estimation of Total Hardness water using standard EDTA solution.
7. Estimation of Copper using standard EDTA solution.
8. Estimation of Copper using Colorimeter
9. Estimation of pH of the given sample solution using pH meter.
10. Conductometric Titrations between strong acid and strong base
11. Conductometric Titrations between strong acid and Weak base
12. Potentiometric Titrations between strong acid and strong base
13. Potentiometric Titrations between strong acid and Weak base
14. Estimating of Zinc using standard potassium ferrocyanide solution
15. Estimation of Vitamin – C.

**STANDARD BOOKS:**

1. Dr.Jyotsna Cherukuis(2012)Laboratory Manual of Engineering Chemistry-II, VGS Techno Series
2. Chemistry Practical Manual, Lorven Publications.
3. K. Mukkanti (2009) Practical Engineering Chemistry, B.S.Publication

Course Code <b>18BSIL3</b>	<b>COMPUTER PROGRAMMING LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>14 Weeks</b>	--	--	<b>3</b>	<b>1</b>
	Prerequisites : <b>Knowledge in Mathematics</b>				

#### **PURPOSE**

This fundamental course will enable the students to learn the concepts of Programming Language and design principles along with understanding of C Language. **All the Programs must be executed in the Linux Environment. (Mandatory)**

#### **INSTRUCTIONAL COURSE OBJECTIVES**

1	Acquire knowledge about the basic concept of writing a program
2	Role of constants, variables, operators, type conversion and other building blocks of C Language.
3	Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4	Role of Functions involving the idea of modularity.
5	Understand the concepts of Arrays, Strings
6	Understand the concepts of pointers, structures and sequential & random access files

#### **COURSE OUTCOMES**

1	Apply and practice logical ability to solve the problems.
2	Understand C programming development environment, compiling, debugging, and linking and executing of a program.
3	Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
4	Understand and apply the in-built functions and customized functions for solving the problems.
5	Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
6	Document and present the algorithms, flowcharts and programs in form of user-manuals.

### **Programming**

#### **Exercise-1: Basics of Unix Operating System**

- What is an OS Command, Familiarization of Editors - vi, Emacs
- Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

#### **Exercise - 2 Basic Math**

- Write a C program to find the gross salary taken by an employee based on Basic Pay. Note: Assume your own percentages for finding HRA, TA, DA, PF, etc.
- Write a C Program to convert Celsius to Fahrenheit and vice versa

#### **Exercise - 3 Control Flow - I**

- Write a C Program to Find Whether the Given Year is a Leap Year or not.
- Write a C Program to Add Digits & Multiplication of a number
- Write a C program to generate roots of a quadratic equation
- Printing ASCII value using c program
- Write a C program to check whether given number is an Even or an odd number.
- Write a C program to check whether given number is a positive or negative or a zero.

#### **Exercise – 4 Control Flow - II**

- Write a C program to display the factors of a given number.
- Write a C program to print Floyd Triangle
- Write a C Program to print Pascal Triangle
- Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
- Write a C Program to convert decimal to binary and hex (using switch call function the function)

### \* Exercise – 5 Control Flow - III

- A. Write a C program to find whether the given number is palindrome number or not.
- B. Write a C Program to Find Whether the given number is Prime number or not
- C. Write a C program to generate prime number series between 1 and n, where n could be taken an input from the keyboard.
- D. Write a C program to generate prime number series between 'm' and 'n', where m and n could be taken an input from the keyboard.
- E. Write a C program to generate twin prime number series between 1 and n, where n could be taken an input from the keyboard.
- F. Write a C Program to Find Whether the Given Number is Armstrong number or not
- G. Write a C program to generate Armstrong number series between 1 and n, where n could be taken an input from the keyboard.
- H. Write a C program to generate Armstrong number series between 'm' and 'n', where m and n could be taken an input from the keyboard.
- I. Write a C Program to Find Whether the Given Number is Perfect number or not
- J. Write a C program to generate perfect number series between 1 and n, where n could be taken an input from the keyboard.
- K. Write a C program to generate perfect number series between 'm' and 'n', where m and n could be taken an input from the keyboard.
- L. Write a C Program to Find Whether the Given Number is Strong number or not
- M. Write a C program to generate strong number series between 1 and n, where n could be taken an input from the keyboard.
- N. Write a C program to generate strong number series between 'm' and 'n', where m and n could be taken an input from the keyboard.
- O. Write a C program to generate Febonacii Series up to n, where n could be taken an input from the keyboard.

### Exercise – 6 Functions

- a. Write a C Program demonstrating of parameter passing in Functions and returning values.
- b. Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion.
- c. Write a C Program to compute the values of  $\sin(x)$  and  $\cos(x)$  and  $e^x$  values using Series expansion.(use factorial function)

### \* Exercise – 7 Functions

- a. Write a C program to illustrate GCD with recursion and without Recursion.
- b. Perform all programs in Exercise-4 using Functions.

### Exercise – 8 Arrays: Demonstration of arrays

1. Search-Linear
2. Sorting-Bubble
3. Selection
4. Operations on Matrix
  - a. Matrix Addition
  - b. Matrix Multiplication
  - c. Transpose of a matrix
  - d. Trace and Norm of a matrix

### Exercises - 8 Structures

- a. Write a C Program to Store Information of a Movie Using Structure
- b. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c. Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

### \* Exercise - 10 Arrays and Pointers

- a. Write a C Program to Access Elements of an Array Using Pointer
- b. Write a C Program to find the sum of numbers with arrays and pointers.
- c. Write a C program to implement selection sort of an array using pointers.

### \* Exercise – 11 Dynamic Memory Allocations

- a. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.
- b. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs
- c. Write a C program to multiply two matrices using Dynamic memory allocation method.

### Exercise – 12 Strings

- a. Implementation of string manipulation operations with library function.
  - i) copy            ii) concatenate    iii) length            iv) compare
- b. Implementation of string manipulation operations without library function.
  - i) copy            ii) concatenate    iii) length            iv) compare

### Exercise -13 Files

- a. Write a C programming code to open a file and to print its contents on screen.
- b. Write a C program to copy files
- c. Write a C program merges two files and stores their contents in another file.
- d. Write a C program to delete a file.

### \* Exercise -14 Files

- A. Write a C program to implement CP command using command line arguments.
- B. Write a C program to implement MV command using command line arguments.
- C. Write a C program to implement CAT command using command line arguments.

### Exercise - 15

- a. System Assembling, Disassembling and identification of Parts / Peripherals.
- b. Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

### Exercise - 16

- a. MS-Office / Open Office
  - a. Word - Formatting, Page Borders, Reviewing, Equations, symbols
  - b. Spread Sheet - organize data, usage of formula, graphs, charts.
  - c. Powerpoint - features of power point, guidelines for preparing an effective presentation.
- b. Network Configuration & Software Installation-Configuring TCP/IP, Proxy, and firewall settings.

### \* Add-on Experiments

Course Code <b>18BS2T1</b>	<b>ENGLISH-II</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>50</b>				<b>3</b>	<b>--</b>	<b>--</b>	<b>2</b>
	Prerequisites : <b>Knowledge in English Language</b>							
<p><b>PURPOSE:</b> In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering. As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The non detailed Textbooks are meant for extensive reading for pleasure and profit. Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.</p>								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	<p><b>LISTENING SKILLS:</b>  <b>Objectives:</b> To enable the students to appreciate the role of listening skill and improve their pronunciation. To enable the students to comprehend the speech of people belonging to different backgrounds and regions. To enable the students to listen for general content, to fill up information and for specific information</p>							
2	<p><b>SPEAKING SKILLS:</b>  <b>Objectives:</b> To make the students aware of the importance of speaking for their personal and professional communication. To enable the students to express themselves fluently and accurately in social and professional success. To help the students describe objects, situations and people. To make the students participate in group activities like role plays, discussions and debates. To make the students participate in Just a Minute talks.</p>							
3	<p><b>READING SKILLS:</b>  <b>Objectives:</b> To enable the students to comprehend a text through silent reading. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts. To enable the students to skim and scan a text. To enable the students to identify the topic sentence. To enable the students to identify discourse features. To enable the students to make intensive and extensive reading.</p>							
4	<p><b>WRITING SKILLS:</b>  <b>Objectives:</b> To make the students understand that writing is an exact formal skill. To enable the students to write sentences and paragraphs. To make the students identify and use appropriate vocabulary. To enable the students to narrate and describe. To enable the students capable of note-making. To enable the students to write coherently and cohesively. To make the students to write formal and informal letters. To enable the students to describe graphs using expressions of comparison. To enable the students to write technical reports.</p>							
<b>COURSE OUTCOMES</b>								
1	The lesson underscores that the ultimate aim of Education is to enhance wisdom. Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.							
2	The lesson enables the students to promote peaceful co-existence and universal harmony among people and society. The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.							
3	The lesson imparts the students to manage different cultural shocks due to globalization. The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.							
4	The theme projects society's need to re-examine its traditions when they are outdated. The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.							
5	The lesson offers several inputs to protect environment for the sustainability of the future generations. Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.							
6	Pupil get inspired by eminent personalities who toiled for the present day advancement of							

software development. The lesson provides inspiration to the readers to think and tap their innate talents.
---

**UNIT 1:**

1. 'The Greatest Resource- Education' from English Encounters

**OBJECTIVE:**

1. Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

2. 'A P J Abdul Kalam' from The Great Indian Scientists.

**OBJECTIVE:**

1. The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

**UNIT 2:**

1. 'A Dilemma' from English Encounters

**OBJECTIVE:**

1. The lesson centres on the pros and cons of the development of science and technology.

2. 'C V Raman' from The Great Indian Scientists.

**OBJECTIVE:**

1. The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

**UNIT 3:**

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

**OBJECTIVE:**

1. The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

**OBJECTIVE:**

1. The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

**UNIT 4:**

1. 'The Lottery' from English Encounters.

**OBJECTIVE:**

1. The lesson highlights insightful commentary on cultural traditions.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

**OBJECTIVE:**

1. The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

**UNIT 5:**

1. 'The Health Threats of Climate Change' from English Encounters.

**OBJECTIVE:**

1. The essay presents several health disorders that spring out due to environmental changes

2. 'Prafulla Chandra Ray' from The Great Indian Scientists.

**OBJECTIVE:**

1. The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

**UNIT 6:**

1. 'The Chief Software Architect' from English Encounters

**OBJECTIVE:**

1. The lesson supports the developments of technology for the betterment of human life.

2. 'Srinivasa Ramanujan' from The Great Indian Scientists.

**OBJECTIVE:**

1. The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

**DETAILED TEXTBOOK:**

**1. ENGLISH ENCOUNTERS** Published by **Maruthi Publishers.**

**DETAILED NON-DETAIL:**

**THE GREAT INDIAN SCIENTISTS** Published by **Cengage learning.** The course content along with the study material is divided into six units.



Course Code <b>18BS2T2</b>	<b>MATHEMATICS-III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>4</b>	<b>1</b>	<b>--</b>	<b>4</b>
	Prerequisites : <b>Basics Of Mathematics</b>				
<b>PURPOSE:</b> To make the students be able to understand the basic laws of physics & Mechanics and to apply them to simple practical problems					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.				
2	The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.				
3	Understand the most basic numerical methods to solve simultaneous linear Equations				
<b>COURSE OUTCOMES</b>					
1	Determine Rank and solving simultaneous linear equations numerically using various matrix methods				
2	Determining Eigen values and Eigen vectors of a given matrix				
3	Calculate Gradient of a scalar function and Divergence, Curl of a vector function				
4	Determine Line. Surface and volume integrals and applying Integral Theorems				
5	Solving first order PDE				
6	Identify/Classify and solve the different types of Partial differential equations.				

**UNIT I: Linear systems of equations: Rank-Echelon form-Normal form** – Solution of linear systems – Gauss elimination – Gauss Jordan- Gauss Jacobi and Gauss Seidel methods. Applications: Finding the current in electrical circuits.

**UNIT II: Eigen values:** Eigen vectors Eigen values - Eigen vectors- Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization. Applications: Free vibration of a two-mass system.

**UNIT III: Vector Differentiation Gradient:** Divergence- Curl - Laplacian and second order operators -Vector identities. Applications: Equation of continuity, potential surfaces

**UNIT IV: Vector Integration: Line integral** – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

**UNIT V: First Order Partial Differential Equations:** Introduction-Formation of PDE by eliminating arbitrary constants and functions- solution of first order linear(Lagrange's) equation Non linear(Standard types) equations.

**UNIT VI: Higher order Partial Differential Equations Method of separation of variables-** solution of one dimensional Wave and Heat-Two dimensional Laplace equation.

#### TEXT BOOKS:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

#### REFERENCE BOOKS:

1. Greenberg, Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. Peter O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning.
3. D.W. Jordan and T.Smith, Mathematical Techniques, Oxford University Press.
4. Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford University Press.
5. Dass H.K., RajnishVerma. Er., Higher Engineering Mathematics, S. Chand Co.Pvt.Ltd, Delhi.

Course Code <b>18HS2T3</b>	<b>MATHEMATICS-II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	4	--	--	3
	Prerequisites : <b>Basics Of Mathematics</b>				

**PURPOSE:** To make the students be able to understand the basic laws of physics & Mechanics and to apply them to simple practical problems

#### **INSTRUCTIONAL COURSE OBJECTIVES**

1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3	Understand the most basic numerical methods to solve simultaneous linear Equations

#### **COURSE OUTCOMES**

1	Determining an approximate root of Exponential, Logarithmic, Trigonometric and algebraic equations.
2	Explaining relation between finite difference operators Compute interpolating polynomial for the given data
3	Determine the general solution of linear ODE
4	Solve ODE numerically
5	Determining the Fourier transform of certain functions
6	Ability to find Z-Transform and Inverse Z-Transform and Solving Difference equations

**UNIT I: Solution of Algebraic and Transcendental Equations:** Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equation).

**UNIT II: Interpolation:** Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences – Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

**UNIT III: Laplace transforms:** Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals –Unit step function –Dirac delta function. Inverse Laplace transforms – Shifting Theorems - Transforms of derivatives and integrals – Convolution theorem (without proof). Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

**UNIT IV: Numerical Integration and solution of Ordinary Differential equations:** Trapezoidal rule- Simpson's 1/3rd and 3/8th rule-Solution of ordinary differential equations by Taylor's series, Picard's method of successive approximations-Euler's method – Runge - Kutta method (second and fourth order).

**UNIT V: Fourier Transforms:** Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

**UNIT VI: Z-Transforms:** Introduction– properties – Damping rule – Shifting rule – Initial and final value theorems Inverse Z transforms—Convolution theorem—Solution of difference equation by Z-transforms.

#### **TEXT BOOKS:**

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

#### **REFERENCE BOOKS:**

1. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
2. V.Ravindranath and P.Vijayalakshmi, Mathematical Methods, Himalaya Publishing House.
3. David Kincaid, Ward Cheney, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
4. Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford University

Course Code <b>18CE2T4</b>	<b>ELEMENTS OF MECHANICAL ENGINEERING</b>				L	T	P	C
	Maximum expected contact hours : <b>64</b>				4	--	--	3
	Prerequisites : <b>Knowledge in Mechanical engineering</b>							
<b>PURPOSE:</b> The content of this course shall provide the student the basic concepts of various mechanical systems and exposes the student to a wide range of equipment and their utility in a practical situation. It shall provide the fundamental principles of materials, I.C. Engines, Steam boilers and transmission systems that usually exist in any process plant.								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	To study the concepts of simple stresses and strains for different materials.							
2	To study the SF & BMD for different loads and supports.							
3	To study the various manufacturing methods in engineering fields.							
4	To study and understand the internal and external combustion engines							
5	To study the various power transmission systems							
<b>COURSE OUTCOMES</b>								
1	Students shall be able to solve stress/strain of a mechanical component subjected to loading.							
2	Students shall be able to draw SFD & BMD for different loads and supports							
3	Students shall be able to identified manufacturing methods for industries							
4	Students shall be able to calculate the performance parameters of IC & EC engines							
5	Students shall be able to find type of mechanical component suitable for the required power transmission.							

**UNIT –I:Stresses and strains:** Kinds of – stress-strains, mechanical properties of material, Hooks law, stress – strain diagrams for different materials , modules of elasticity, Poisson’s ratio, linear and volumetric strain, relation between E, N, and K, bars of uniform strength, compound bars and temperature stresses and simple problems.

**UNIT– II: Shear force and bending moments:** Definition of shear force and bending moments, Types of loads and supports – Shear force and bending moment for cantilever and simply supported beams for all types of loads. Theory of simple bending: simple bending formula, Distribution of Flexural and Shear stress in Beam section – Shear stress formula – Shear stress distribution for some standard sections

**UNIT-III: Manufacturing methods:** Types of various Manufacturing methods-welding-classification of welding, arc welding, gas welding and MIG, TIG and resistance welding, soldering and brazing Metal forming: forging – operations, rolling and extrusion principles Machine tool: lathe classification, specifications, and operations.

**UNIT-IV: Internal combustion engines:** Heat engine-classification of heat engines, comparison between I.C and EC Engines,basic engine components and nomenclature, classification of IC engines, working principle of two stroke and four stroke engines, comparison between two stroke and four stroke and petrol and diesel engines, Evaluation of I.C engine performance parameters.

**UNIT-V: Steam boilers:** Classification of boilers, essentialities of boilers, selection of different types of boilers, working principals of different types of water tube and fire tube boilers, boiler mountings and accessories, performance of boilers.

**UNIT-VI: Power Transmission :** Types of drives for power transmission–belt and rope drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, centrifugal tension in a belt, power transmitted by belts and ropes, initial tensions in the belt, simple problems. Gear trains: classification of gears, gear trains velocity ratio, simple, compound – reverted and epicyclic gear trains.

**TEXT BOOKS:**

1. Strength of Materials and Mechanics of Structures, B.C.Punmia, Standard Publications and distributions, 9<sup>th</sup> edition, 1991.
2. Thermal Engineering, R.K.RAJPUT Lakshmi publications.
3. Elements of Mechanical Engineering, A.R.Asrani, S.M.Bhatt and P.K.Shah, B.S. Publications.
4. Elements of Mechanical Engineering, M.L.Mathur, F.S.Metha&R.P.Tiwari Jain Brothers Publications, 2009.
5. Production Technology by P.N.Rao by I & II McGraw-Hill publications

**REFERENCE BOOK:**

1. Theory of Machines, S.S. Rattan, Tata McGraw Hil., 2004

Course Code <b>18BS2T5</b>	<b>ENGINEERING PHYSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>4</b>	--	--	<b>3</b>
	Prerequisites : <b>Knowledge in Basic Science</b>				

**PURPOSE:** Physics curriculum which is re-vented to the needs of non Circuital branches of graduate engineering courses. That serves as a transit to understand the branch specific advanced topics.

**INSTRUCTIONAL COURSE OBJECTIVES**

1	To Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization required to design optical instruments with higher resolution - Concepts of coherent sources, its realization and utility optical instrumentation.
2	The students will learn to analyze the applications of the Optical fibers in the field of communication
3	To Study the Structure-property relationship exhibited by solid crystal materials for their utility.
4	Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.
5	To explore the Nuclear Power as a reliable source required to run industries.
6	To impart the knowledge of materials with characteristic utility in appliances.

**COURSE OUTCOMES**

1	The students will learn to apply the concepts of interference undergo analysis of optical effects and contribute to engineering applications.
2	The students will learn to study diffraction pattern of light to utilize in the analysis of the materials and their properties.
3	The students will learn polarization phenomenon, Lasers and their practical implications in engineering applications.
4	The student will learn the basics of architectural acoustics for structural designing & production of Ultrasonic waves for practical applications.
5	The students will learn the structures and properties of solid state materials and will learn the fundamentals of Nuclear Physics & production of nuclear energy using technology.
6	The students will learn effects of magnetic & dielectric properties of materials & will apply such materials in various applications of engineering.

**UNIT I: INTERFERENCE:** Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) –Newton’s rings –working principle of Interferometer, Applications.

**UNIT II: DIFFRACTION:** Introduction -Fraunhofer diffraction at single slit - Cases of double slit, N-slits -Grating equation - Resolving power of a grating – dispersive power of grating-applications of diffraction

**UNIT III: POLARIZATION:** Introduction -Types of Polarization – Methods of production – double refraction-Nicol Prism-Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter)-Applications.

**LASERS:** Introduction- Characteristics– Stimulated emission – Einstein’s Transition Probabilities-Pumping schemes –Types of lasers- Ruby laser – Helium Neon laser-Semiconductor laser-applications of lasers.

**UNIT IV: ACOUSTICS:** Reverberation time–Sabine’s formula -Absorption Coefficient and its Measurement-Effecting factors and Remedies.

**ULTRASONICS:** Introduction-Production by Magnetostriction & Piezo electric effect-Detection Methods-Types of Ultrasonic transducers- Nondestructive Testing-Applications.

**UNIT V: CRYSTALLOGRAPHY & X-RAY DIFFRACTION:** Introduction-Basis and lattice –Unit cell-Coordination number-Bravais lattice-Crystal Systems-Packing fractions–Crystal directions and planes- Miller indices–Separation between successive (h k l) planes–Bragg’s law

**NUCLEAR ENERGY –SOURCE OF POWER:** Mass defect & Binding Energy –Fusion and Fission as sources-chain reaction –Nuclear reactors-Fast breeder reactor.

**UNIT VI: MAGNETISM:** Introduction-Basics of Magnetism-Origin of Magnetic Moment-Classification of Magnetic Materials-Domain Theory-Hysteresis-Hard and soft Magnetic materials-applications

**DIELECTRICS:** Electric Polarization processes-Dielectrics Alternating fields -Loss, Breakdown and strength of dielectric materials–Ferroelectric Hysteresis and applications.

**TEXT BOOKS:**

1. A Text book of Engineering Physics–by Dr. M.N.Avadhanulu and Dr.P.G.Kshirasagar, S.Chand& Company Ltd., (2014)
2. Physics for Engineers by M.R.Srinasan, New Age international publishers (2009).
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon , Oxford press (2015)

**REFERENCE BOOKS :**

1. Physics by Resnick,Halliday & Krane ,Volume I&II ,John Wiley&sons (2002)
2. Applied Physics by P.K.Palanisamy , Scitech publications (2014)
3. Lasers and Non-Linear optics by B.B.Laud , Newage international publishers (2008).
4. A Text book of Engineering Physics by Dr D Thirupathi Naidu, M Veeranjanyulu, VGS Publications.

Course Code <b>18ME2T6</b>	<b>ENGINEERING DRAWING-I</b> <b>( Common to CSE,ECE,MECH,EEE&amp;CIVIL)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>65</b>	<b>4</b>	<b>--</b>	<b>4</b>	<b>3</b>
	Prerequisites : <b>Knowledge in Geometry</b>				
<b>PURPOSE:</b> This course aims to provide the students with basic knowledge of Engineering Drawing which will be useful designing and modelling for industry and practical.					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Provide basic conventions and standards used in Engineering Graphics.				
2	Impart knowledge on various Engineering curves and their significance.				
3	To draw orthographic, sectional and pictorial views of a given solid.				
4	To develop skills in three dimensional visualization of engineering components				
5	To inculcate CAD packages on modelling and drafting				
<b>COURSE OUTCOMES</b>					
1	Familiarize with BIS standards and conventions used in engineering graphics.				
2	Draw various engineering curves e.g ellipse, parabola, cycloids and involutes etc and construct various reduced scales e.g plain, diagonal and vernier scales				
3	Differentiate between first angle and third angle methods of projection and distinguish parallel and perspective projection.				
4	Visualize different views like elevation and plan for a given line, plane figures or solid objects.				
5	Apply drafting techniques and use 2D software e.g AutoCAD to sketch 2D plane figures.				
6	Identify internal features of an object from the sectional views of the object.				
7	Develop the solid surfaces and estimate material required to produce various engineered products like chimney, ducts etc				

**UNIT I: Polygons:** Constructing regular polygons by general methods, inscribing and describing polygons on circles. Conic sections: Parabola, Ellipse and Hyperbola by general methods.

**UNIT II: Engineering curves:** cycloids, involutes, tangents & normals for the curves.

**Scales:** Plain scales, diagonal scales and vernier scales.

**UNIT III: Orthographic Projections:** Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants. Projections of straight lines: of lines, lines parallel either to of the reference planes, inclined to both the planes, determination of true lengths, angle of inclination. Traces of line- HT, VT, Trapezoid method.

**UNIT IV: Projections of planes:** regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

**UNIT V: Projections of Solids** – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes. Projections of Regular Solids inclined to both planes.

**UNIT VI: Projection on auxiliary planes:** Lines, Planes and Solids.

#### TEXT BOOKS:

1. Engineering Drawing by N.D. Bhatt/Charotar
2. Engineering Drawing/ N.S.Parthasarathy and Vela Murali/Oxford

#### REFERENCES:

1. Engineering Graphics. By Basanth Agrawal/CM Agrawal/McGraw Hill Education
2. Engineering Drawing by K.Venu Gopal/New Age Publications.
3. Computer Aided Engineering Drawing / K Balaveerareddy et al-CBS publishers

Course Code <b>18BS2L1</b>	<b>ENGLISH COMMUNICATION SKILLS LAB-II</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>36</b>		--	--	<b>3</b>	<b>1</b>
	Prerequisites : <b>Knowledge in English Language</b>					
<b>PURPOSE:</b> In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.						
<b>COURSE OBJECTIVES</b>						
1	To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.					
<b>COURSE OUTCOMES</b>						
1	A study of the communicative items in the laboratory will help the students become successful in the competitive world..					

**PRESCRIBED LAB MANUAL FOR SEMESTER II:**

'**INTERACT:** English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

**UNIT 1:** Debating

Practice work

**UNIT 2:** Group Discussions

Practice work

**UNIT 3:** Presentation Skills

Practice work

**UNIT 4:** Interview Skills

Practice work

**UNIT 5:** Email,

Curriculum Vitae

Practice work

**UNIT 6:** Idiomatic Expressions

Common Errors in English

Practice work.

**UNIT 7:** Information Transfer

**UNIT 8:** Technical Report Writing

**UNIT 9:** Reading Comprehension

**UNIT 10: SOFT SKILLS**

Positive Thinking, Stress Management

Time Management, Team Building



**REFERENCE BOOKS:**

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient Black Swan.
5. A Practical Course in effective English speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

Course Code <b>18HS2L2</b>	<b>ENGINEERING PHYSICS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>30</b>				
	Prerequisites : <b>Knowledge in Basic tools / instruments of Physics</b>	<b>--</b>	<b>--</b>	<b>3</b>	<b>1</b>
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.					
<b>COURSE OUTCOMES</b>					
Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements					

Note: Any 12 of the following Listed Experiments.

#### LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

#### REFERENCE:

1. Engineering Physics Lab Manual by Dr.Y.Aparna & Dr.K.Venkatesswara Rao. (V.G.S. Book Links)
2. Physics Manual cum Observation book (College Designed Manual).

Course Code <b>18ME2L3</b>	<b>ENGINEERING WORKSHOP LAB &amp; IT WORKSHOP (Common to All branches)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>50</b>	--	--	<b>3</b>	<b>1</b>
	Prerequisites : <b>Basic Geometry Skills</b>				
<b>PURPOSE:</b> To make the students be able to understand the basic skills of Equipment, tools handling and to develop Manufacturing ethics. This course aims at study of is the use of computers to store, retrieve, transmit, and manipulate data or information, often in the context of a business or other enterprise.					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To train students towards general machining, carpentry and soldering skills.				
2	To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude.				
3	Understand the basic components and peripherals of a computer				
4	To become familiar in configuring a system				
5	Learn the usage of productivity tools.				
6	Acquire knowledge about the netiquette and cyber hygiene				
7	Get hands on experience in trouble shooting a system?				
<b>COURSE OUTCOMES</b>					
1	Ability to design and model different prototypes in the carpentry trade such as Cross lap joint, T-Lap joint.				
2	Ability to design and model various basic prototypes in the trade of fitting such as Square fit, V- fit.				
3	Ability to make various basic prototypes in the trade of Tin smithy such as Square tray, and Taper Tray.				
4	Ability to perform various basic House Wiring techniques				
5	Ability to design and join various prototypes using the technique of soldering				
6	Students are able to understanding of concepts, patterns of decentralization implementation in Africa				
7	Students are able to Identified opportunities for coordinated policy responses, capacity building and implementation of best practices				

### **List of Experiments:**

#### **Carpentry:**

1. T-Lap Joint
2. Cross Lap Joint

#### **Fitting:**

1. Vee Fit
2. Square Fit

#### **Soldering:**

1. Soldering of Square Tray
2. Soldering for Frustum of Cone

#### **House Wiring:**

1. Parallel / Series Connection of three bulbs
2. Stair Case wiring/Godown Wiring

#### **Tin Smithy:**

1. Taper Tray
2. Square Box without lid

### **IT WORKSHOP**

#### **1. System Assembling, Disassembling and identification of Parts / Peripherals**

**2. Operating System Installation:** Install Operating Systems like Windows, Linux along with necessary Device Drivers.

**MS-Office / Open Office**

- a. **Word:** Formatting, Page Borders, Reviewing, Equations, symbols.
- b. **Spread Sheet:** Organize data, usage of formula, graphs, charts.
- c. **Power point:** Features of power point, guidelines for preparing an effective presentation.
- d. **Access:** Creation of database, validate data.

**4. Network Configuration & Software Installation:** Configuring TCP/IP, proxy and firewall settings. Installing application software, system software & tools.

**5. Internet and World Wide Web:** Search Engines, Types of search engines, netiquette, cyber hygiene.

**6.** Trouble Shooting-Hardware trouble shooting, Software trouble shooting.

**7. MATLAB:** Basic commands, subroutines, graph plotting.

**8. LATEX:** Basic formatting, handling equations and images.

**TEXT BOOKS:**

1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition by Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press, 2002.
5. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

Course Code <b>18BS2L4</b>	<b>ENGINEERING PHYSICS- VIRTUAL LABS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>30</b>	--	--	<b>2</b>	--
	Prerequisites : <b>Knowledge in Physics Concepts</b>	--	--	<b>2</b>	--
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
Training Engineering students to prepare a technical document and improving their writing skills.					
<b>COURSE OUTCOMES</b>					
Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/experimental report with scientific temper.					

**LIST OF EXPERIMENTS:**

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fibre
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

**URL:** [www.vlab.co.in](http://www.vlab.co.in)

Course Code <b>18CE3T1</b>	<b>PROBABILITY AND STATISTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>--</b>	<b>3</b>
	Prerequisites : <b>Basics Of statistics</b>				
<b>PURPOSE:</b> Fundamentals of this course useful in Engineering subjects					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To acquaint students with the fundamental concepts of probability and statistics and to develop an understanding of the role of statistics in engineering				
2	Introduce numerical techniques to solve the real world applications				
<b>COURSE OUTCOMES</b>					
1	Examine, analyze, and compare various Probability distributions for Discrete random variable				
2	Examine, analyze, and compare various Probability distributions for continuous random variable				
3	Describe and compute confidence intervals for the mean of a population. Describe and compute confidence intervals for the proportion and the variance of a population				
4	Test the hypothesis concerning mean, proportion and variance and perform ANOVA test.				
5	Fit a curve to the numerical data and establish a relationship between two are more variables.				
6	Preparing different control charts and check whether the process is in control or not				

**UNIT I: Discrete Random variables and Distributions:** Introduction-Random variables- Discrete Random variable-Distribution function- Expectation-Moment Generating function Moments and properties. Discrete distributions: Binomial, Poisson and Geometric distributions and their fitting to data.

**UNIT II: Continuous Random variable and distributions:** Introduction-Continuous Random variable-Distribution function- Expectation-Moment Generating function-Moments and properties. Continuous distribution: Uniform, Exponential and Normal distributions, Normal approximation to Binomial distribution -Weibull, Gamma distribution.

**UNIT III: Sampling Theory:** Introduction - Population and samples- Sampling distribution of means ( $\sigma$  known)-Central limit theorem- t-distribution- Sampling distribution of means ( $\sigma$  unknown)- Sampling distribution of variances-Chi-Square and F-distributions- Point estimation- Maximum error of estimate - Interval estimation.

**UNIT IV: Tests of Hypothesis:** Introduction -Hypothesis-Null and Alternative Hypothesis-Type I and Type II errors -Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

**UNIT V: Curve fitting and Correlation:** Introduction - Fitting a straight line -Second degree curve-exponential curve-power curve by method of least squares-Goodness of fit. Correlation - Linear Regression and Multiple Regression

**UNIT VI: Statistical Quality Control Methods:** Introduction - Methods for preparing control charts - Problems using  $\bar{x}$ -bar, R charts, Sigma Chart and attribute charts.

#### TEXT BOOKS:

1. Jay I.devore, Probability and Statistics for Engineering and the Sciences.8th edition,Cengage.
2. Richards A Johnson, Irvin Miller and Johnson E Freund. Probability and Statistics for Engineering, 9th Edition,PHI.

#### REFERENCE BOOKS:

1. Shron L.Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. William Menden Hall, Robert J. Bever and Barbara Bever, Introduction to probability and statistics, Cengage learning.2009
3. Sheldon, M. Rosss, Introduction to probability and statistics Engineers and the Scientists, 4th edition, Academic Foundation,2011

4. Johannes Ledolter and Robert V.Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson,2010

Course Code <b>18CE3T2</b>	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING</b>				L	T	P	C
	Maximum expected contact hours : <b>64</b>				<b>3</b>	<b>1</b>	<b>--</b>	<b>3</b>
	Prerequisites : <b>Knowledge in machines and circuits</b>							
<b>PURPOSE:</b> This fundamental course will enable the students to learn the concepts of dc and ac motors & transformers.								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	To learn the basic principles of electrical circuit law's and analysis of networks.							
2	To understand the principle of operation and construction details of DC machines & Transformers.							
3	To understand the principle of operation and construction details of alternator and 3-Phase induction motor							
4	To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.							
5	To learn the operation of PNP and NPN transistors and various amplifiers.							
<b>COURSE OUTCOMES</b>								
1	Able to analyse the various electrical networks.							
2	Able to analyse the performance of single-phase transformer.							
3	Able to explain the operation of 3-phase alternator and 3-phase induction motors							
4	Able to analyse the operation of half wave, full wave bridge rectifiers and OP-AMPs.							
5	Able to explain the single stage CE amplifier and concept of feedback amplifier.							

### UNIT – I

Electrical Circuits: Basic definitions - Types of network elements - Ohm's Law - Kirchoff's Laws - Inductive networks - Capacitive networks – Series - Parallel circuits - Star-delta and delta-star transformations.

### Unit - II

Dc Machines: Principle of operation of DC generator – EMF equation - Types of DC machine – Torque equation – Applications – Three point starter - Speed control methods of DC motor – Swinburne's Test.

### Unit - III

Transformers: Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests - Efficiency and regulation.

### Unit - IV

AC Rotating Machines: Principle of operation and construction of alternators– Types of alternators – Principle of operation of synchronous motor - Principle of operation of induction motor – Slip-torque characteristics - Efficiency – Applications-Turbines

### Unit V

Rectifiers & Linear ICs: PN junction diodes - Diode applications(Half wave and bridge rectifiers).Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPs (inverting, non-inverting,integrator and differentiator).

### Unit VI

Transistors: PNP and NPN junction transistor, transistor as an amplifier- Transistor amplifier - Frequency response of CE amplifier - Concepts of feedback amplifier.

### TEXT BOOKS:

- 1.Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

### REFERENCES:

- 1.Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications



3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2<sup>nd</sup> edition.
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2<sup>nd</sup> edition.
5. Industrial Electronics by G.K. Mittal, PHI.

Course Code <b>18CE3T3</b>	<b>STRENGTH OF MATERIALS - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites: <b>18BS1T4</b>				
<b>PURPOSE:</b> To know the basics of solid mechanics. To understand the concepts of mechanics of structures.					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To introduce the concepts of stress, strain and elastic constants and their relations for use in elastic design of prismatic bars.				
2	To familiarize with shear force, bending moment and torsion induced and shear stresses and bending stresses developed for different sections of beams and Shafts.				
3	To impart the knowledge on calculating forces in pin-jointed plane frames.				
<b>COURSE OUTCOMES</b>					
1	Analyse and design the bars elastically by stress and strain relationship.				
2	To Construct SF and BM diagrams for various beams carrying different types of loads.				
3	Evaluate flexure and shear stresses for different beam sections.				
4	Analyse and design shafts and springs using principle of torsion.				
5	Determine the forces in frames by the method of joints and method of sections.				

**UNIT I: Simple Stresses And Strains And Strain Energy:** Elasticity and plasticity – Types of stresses and strains – Hooke’s law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson’s ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section, **Tapering bars** – composite bars – Temperature stresses.

**Strain Energy** – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

**UNIT II: Shear Force And Bending Moment:** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam. **Freely supported beam with end couple.**

**UNIT III: Flexural Stresses:** Theory of simple bending – Assumptions – Derivation of bending equation:  $M/I = f/y = E/R$ , Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections. **Strain energy due to bending.**

**UNIT IV: Shear Stresses:** Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections, built up beams, shear centre.

**UNIT V: Deflection Of Beams:** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay’s methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. Uniformly varying load. Mohr’s theorems – Moment area method – application to simple cases including overhanging beams.

**UNIT VI: Thin And Thick Cylinders:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.

**Thick Cylinders:** Introduction Lamé’s theory for thick cylinders – Derivation of Lamé’s formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

#### TEXT BOOKS:

1. Strength of Materials by Strength of materials, R. K. Rajput, S. Chand & Co, New Delhi
2. Strength of Materials by S. Ramamrutham,

#### REFERENCES:

**1.Strength of Materials by R.K Bansal, Lakshmi Publications**

Course Code <b>18CE3T4</b>	<b>BUILDING MATERIALS AND CONSTRUCTION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites: <b>NIL</b>				
<b>PURPOSE:</b> To get exposed to the glimpses of Civil Engineering topics that is essential for an Engineer.					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped and flat roofs.				
2	The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes.				
3	Imparting the students with the techniques of formwork and scaffolding.				
4	The students should be exposed to classification of aggregates, moisture content of the aggregate.				
<b>COURSE OUTCOMES</b>					
1	The student should be able to identify different building materials and their importance in building construction.				
2	The student is expected to differentiate brick masonry, stone masonry construction and use of lime and cement in various constructions.				
3	The student should have learnt the importance of building components and finishings.				
4	The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required in building construction.				

**UNIT I: Stones, Bricks And Tiles** Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. **Qualities of bricks, tests and classification of bricks.** Characteristics of good tile - manufacturing methods, types of tiles.uses materialsaluminium ,gypsum,glass and bituminous materials

**UNIT II Masonry & wood:** Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls. Wood: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber-**Preservation of timber and advantages.** Alternative materials for wood.galvanized iron, fiber Reinforced Plastics,steel

**UNIT III: Lime, Cement and Concrete** **Lime- Sources of lime:** Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime.□**Cement:** Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.

**UNIT IV: Building Components** Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.

**UNIT V: Aggegates** Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.

**UNIT VI: Finishings** Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings.

#### **TEXT BOOKS:**

1. Building Materials, S. S. Bhavikatti, Vices publications House private ltd.
2. Building Construction, S. S. Bhavikatti, Vices publications House private ltd.
3. Building Materials, B. C. Punmia, Laxmi Publications private ltd.

4. Building Construction, B.C. Punmia, Laxmi Publications (p) Ltd.

**REFERENCE BOOKS:**

1. Building Materials, S. K. Duggal, New Age International Publications.
2. Building Materials, P. C. Verghese, PHI learning (P) Ltd.
3. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction, P. C. Verghese, PHI Learning (P) Ltd.
5. Building Materials, Construction and Planning, S. Mahaboob Basha, Anuradha Publications, Chennai.

Course Code <b>18CE3T5</b>	<b>SURVEYING</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>			<b>3</b>	<b>1</b>	<b>--</b>	<b>3</b>
	Prerequisites : <b>NIL</b>						
<b>PURPOSE:</b> To measure the land area, to prepare map and to find out the elevation of a point for constructional purpose.							
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>							
1	To introduce the students to basic principles of surveying, various methods of linear and angles measuring instruments and enable the students to use surveying equipments.						
<b>COURSE OUTCOMES</b>							
1	To demonstrate the basic surveying skills						
2	To use various surveying instruments.						
3	To perform different methods of surveying.						
4	To compute various data required for various methods of surveying.						
5	To integrate the knowledge and produce topographical map.						

**UNIT I: Introduction:** definition-Uses of surveying- overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications – Errors in survey measurements.

**UNIT II: Distances And Direction:** Electronic distance measurements (EDM)- principles of electro optical EDM-Errors and corrections to linear measurements- Compass survey- Meridians, Azimuths and Bearings, declination, computation of angle. Traversing-Purpose-types of traverse-traverse computation-traverse adjustments-Introduction omitted measurements

**UNIT III: Leveling And Contouring:** Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. Characteristics and Uses of contours- methods of conducting contour surveys.

**UNIT IV: Theodolite:** Description, principles-uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite – Introduction to Trigonometrical leveling. **Heights and Distances Closing error and distribution-**

**Trigonometric leveling. Tachometric Surveying:** Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

**UNIT V: Curves:** Types of curves, design and setting out – simple and compound curves- Introduction to geodetic surveying, Total Station and Global positioning system

**UNIT VI: Computation Of Areas And Volumes:** Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

#### TEXT BOOKS:

1. Surveying, Vol No.1, 2 &3, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications Ltd, New Delhi.
2. Advance Surveying, Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
3. Text book of Surveying, C. Venkataramaiah, University press, India Limited.
4. Surveying and levelling, R. Subramanian, Oxford University press.

#### REFERENCES:

1. Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Text book of Surveying, Arora (Vol No. 1&2), Standard Book House, Delhi.
3. Higher Surveying, A.M. Chandra, New Age International Pvt Ltd.
4. Fundamentals of surveying, S.K. Roy – PHI learning (P) Ltd.
5. Plane Surveying, Alak de, S. Chand & Company, New Delhi.

Course Code <b>18CE3T6</b>	<b>FLUID MECHANICS</b>		L	T	P	C
	Maximum expected contact hours : <b>64</b>		<b>3</b>	<b>1</b>	<b>--</b>	<b>3</b>
	Prerequisites: <b>Basics of Fluid Mechanism</b>					
<b>PURPOSE:</b> The purpose of this course is to get exposure about the application of hydraulic engineering in the field by means of studying the various devices, equipments, machinery, and structures.						
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>						
1	To derive the equation of conservation of mass and its application.					
2	To solve kinematic problems such as finding particle paths and stream lines					
3	To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems.					
4	To analyze laminar and turbulent flows					
5	To understand the various flow measuring devices					
6	To study in detail about boundary layers theory					
<b>COURSE OUTCOMES</b>						
1	Understand the various properties of fluids and their influence on fluid motion and analyse a variety of problems in fluid statics and dynamics.					
2	Calculate the forces that act on submerged planes and curves.					
3	Identify and analyse various types of fluid flows.					
4	Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.					
5	Draw simple hydraulic and energy gradient lines.					
6	Measure the quantities of fluid flowing in pipes, tanks and channels.					

**UNIT I: Introduction :** Dimensions and units – Physical properties of fluids - specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

**UNIT II: Hydrostatics:** Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. **Equation of acceleration & types.**

**Fluid Kinematics:** Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flow net analysis.

**UNIT III: Fluid Dynamics:** Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line - Momentum equation and its application – forces on pipe bend. **Energy correction**

**UNIT IV: Laminar Flow And Turbulent Flows:** Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseuille Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows.

**Closed Conduit Flow:** Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula, Hard- Cross Method,

**UNIT V: Measurement of Flow:** Pitot tube, Venturi meter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular, trapezoidal and Stepped notches - –Broad crested weirs.

**UNIT VI: Boundary Layer Theory:** Boundary layer (BL) – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers(no deviations)- BL in transition, separation of BL, Control of BL. **flow around submerged objects-Drag and Lift- Magnus effect.**

#### TEXT BOOKS:

1. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi

2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) Ltd., New Delhi

**REFERENCES:**

1. Mechanics of Fluids, Merle C. Potter, David C. Wiggert and Bassem H. Ramadan, CENGAGE Learning
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford Higher Education.



Course Code <b>18CE3L1</b>	<b>SURVEYING FIELD WORK - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>30</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

### List of Field Works

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse)
5. Plane table survey; finding the area of a given boundary by the method of Radiation
6. Plane table survey; finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling : Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling; Longitudinal Section and Cross sections of a given road profile.

Course Code <b>18CE3L2</b>	<b>STRENGTH OF MATERIALS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>30</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

**List of Lab Works**

1. Tension test on Steel bar
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simple support beam
4. Torsion test
5. Hardness test
6. Compression test on wood or concrete
7. Impact test
8. Shear test
9. Verification of Maxwell's Reciprocal theorem on beams.
10. Use of Electrical resistance strain gauges
11. Continuous beam – deflection test.

**List of Major Equipment:**

1. UTM for conducting tension test on rods.
2. Steel beam for flexure test.
3. Wooden beam for flexure test.
4. Torsion testing machine.
5. Brinnell's / Rock well's hardness testing machine.
6. Setup for spring tests.
7. Compression testing machine.
8. Izod Impact machine.
9. Shear testing machine.
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup.
12. Electrical Resistance gauges

Course Code <b>18CE3T7</b>	<b>MANAGERIAL ECONOMICS AND REAL ESTATE FUNDAMENTALS</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				<b>2</b>	<b>--</b>	<b>--</b>	<b>1</b>
	Prerequisites :							
<b>PURPOSE:</b> The purpose of managerial economics is to provide economic terminology and reasoning for the improvement of managerial decisions.								
<b>Course Objectives</b>								
1	The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.							
2	To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.							
3	Upon completion of the sections, "land, real estate and real property" and "public and private land controls," the student will be able to extrapolate information from the appropriate sources to help the customer or client make an informed decision about the purchase or lease of real estate.							
4	Upon completion of the section, "environmental issues," the student will be knowledgeable about the hazardous substances which are of concern to a real estate transaction in his/her locale and be able to alert customers or clients to such concerns and their ramifications.							
<b>COURSE OUTCOMES</b>								
1	This outline for the Pre-Sales license course, Real Estate Fundamentals, specifies the minimum content of the 30-hour course.							
2	The course content may be presented in any order and supplemented in any way an educational provider deems appropriate to achieve the objectives/competencies of the course, consistent with prevailing laws and contemporary business practices.							

**UNIT I: Introduction to Managerial Economics and demand Analysis:** □ Definition of Managerial Economics – Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

**UNIT II: Production and Cost Analysis:** Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs – Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)- Managerial significance and limitations of Breakeven point.

**UNIT III: Introduction to Markets, Theories of the Firm & Pricing Policies:** □ Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

**UNIT IV: Types of Business Organization and Business Cycles:** Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

**UNIT V: Land, Real Estate And Real Property:** Definitions-Land, Real Estate, Real Property. Real Estate vs Personal Property - Fixtures, Personal Property, Trade Fixtures .Characteristics of Real Estate - Economic, Physical. Ownership of Real Property - Bundle Of Legal Rights, Laws Affecting Real Estate Practice

**UNIT VI: Public and Private Land Use Controls:** Public-Local, State and Federal Ownership Of Land. Local Planning- Comprehensive Plan, Zoning Ordinances, Subdivision Regulations, Building Codes. Environmental Protection Legislation. Interstate Land Sales Full Disclosure Act. Private Deed Restrictions and Covenants.

**TEXT BOOKS**

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.
4. GRIHA Manual, Volume 1 - Introduction to National Rating System – GRIHA An evaluation tool to help design, build, operate, and maintain a resource-efficient built environment Ministry of New and Renewable Energy, Government of India and The Energy and Resources Institute New Delhi.

**REFERENCES:**

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. Suma Damodaran: Managerial Economics, Oxford 2011.
3. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
4. Maheswari: Financial Accounting, Vikas Publications.
5. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
6. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
7. Shailaja Gajjala and Usha Muniapalle, Universities press, 2015
8. Real Estate Fundamentals Course Outlines- Roy L. Ponthier -[www.Proeducate.Com](http://www.Proeducate.Com)

Course Code <b>18CE4T1</b>	<b>BUILDING PLANNING AND DRAWING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b> To learn the fundamental concepts of planning and orientation of Residential Buildings & Miscellaneous building. To instill a broad understanding about architecture in students of civil engineering					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Initiating the student to different building bye-laws and regulations.				
2	Imparting the planning aspects of residential buildings and public buildings.				
3	Giving training exercises on various signs and bonds and different building units.				
4	Imparting the skills and methods of planning of various buildings.				
<b>COURSE OUTCOMES</b>					
1	Upon successful completion of the course.				
2	Student should be able to plan various buildings as per the building by-laws.				
3	The student should be able to distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.				
4	The student is expected to learn the skills of drawing building elements and plan the buildings as per requirements.				

**UNIT I: Building Byelaws and Regulations** Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

**UNIT II: Residential Buildings** Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions

**UNIT III: Public Buildings** Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

**UNIT IV: Sign Conventions And Bonds** Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond - odd and even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

**UNIT V: Doors, Windows, Ventilators And Roofs** Panelled door, panelled and glazed door, glazed windows, panelled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof and buildings: drawing plans, Elevations and Cross Sections of given sloped and flat roof buildings.

**UNIT VI: Planning And Designing Of Buildings.**

Draw the Plan, Elevation and Sections of a Residential and Public buildings from the given line diagram.

#### **Text Books:**

1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh.
2. Building planning and drawing by M. Chakravarthi.
3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.

#### **References:**

1. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning, B.P. Verma, Khanna publishers, New Delhi.
4. Civil Engineering Building practice, Suraj Singh, CBS Publications, New Delhi and Chennai.
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, Mcgraw Hill Education (P) India Ltd. New Delhi.

Course Code <b>18CE4T2</b>	<b>STRENGTH OF MATERIALS- II</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :							
<b>PURPOSE:</b> To understand the behaviour, determine the internal forces and analyse the stresses of various structural elements under action of different types of forces								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	To give concepts of Principal stresses and strains developed in cross section of the beams on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories.							
2	To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.							
3	To classify columns and calculation of load carrying capacity and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses on different engineering structures.							
4	Introduce the concept of unsymmetrical bending in beams Location of neutral axis Deflection of beams under unsymmetrical bending.							
5	Impart concepts for determination of Forces in members of plane pin-jointed perfect trusses by different methods.							
<b>COURSE OUTCOMES</b>								
1	The student will be able to understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections.							
2	The student can asses stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions.							
3	The student will be able to assess forces in different types of trusses used in construction.							

**UNIT I: Principal Stresses And Strains And Theories Of Failures:** Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr’s circle of stresses – Principal stresses and strains – Analytical and graphical solutions. **Theories Of Failures:** Introduction – Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

**UNIT II: Torsion Of Circular Shafts And Springs:** Theory of pure torsion – Derivation of Torsion equations:  $T/J = q/r = N\phi/L$  – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

**Springs:** Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

**UNIT III: Columns And Struts:** Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler’s theorem for long columns- assumptions- derivation of Euler’s critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler’s critical stress – Limitations of Euler’s theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry’s formula.

Laterally loaded struts – subjected to uniformly distributed and concentrated loads – Maximum B.M. and stress due to transverse and lateral loading.

**UNIT IV: Direct And Bending Stresses:** Stresses under the combined action of direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

**UNIT V: Unsymmetrical Bending:** Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of

rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis Deflection of beams under unsymmetrical bending.

**UNIT VI: Analysis Of Pin-Jointed Plane Frames:** Determination of Forces in members of plane pin-jointed perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections.

**Text Books:**

1. Mechanics of Materials- by R. C. Hibbler
2. 2. Strength of materials by R. K Rajput, S.Chand and Co.

**References:**

1. Strength of Materials by R. Subramanian, Oxford Publications
2. 2. Mechanics of Materials by B.C Punmia, Jain and Jain. □ 3. Strength of materials by R. K. Bansal, Lakshmi Publications.

Course Code <b>18CE4T3</b>	<b>HYDRAULICS AND HYDRAULIC MACHINERY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To study about uniform and non uniform flows in open channel and also to learn about the characteristics of hydraulic jump				
2	To introduce dimensional analysis for fluid flow problems.				
3	To understand the working principles of various types of hydraulic machines and Pumps.				
<b>COURSE OUTCOMES</b>					
1	Solve uniform and non uniform open channel flow problems.				
2	Apply the principals of dimensional analysis and similitude in hydraulic model testing.				
3	Understand the working principles of various hydraulic machineries and pumps.				

### **UNIT – I UNIFORM FLOW IN OPEN CHANNELS:**

Types of channels –Types of flows - Velocity distribution – Energy and momentum correction factors – Chezy’s, and Manning’s formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth

**UNIT II NON-UNIFORM FLOW IN OPEN CHANNELS:** Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles- direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

**UNIT – III HYDRAULIC SIMILITUDE:** Dimensional analysis-Rayleigh’s method and Buckingham’s pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

**UNIT – IV BASICS OF TURBO MACHINERY:** Hydrodynamic force of jets on stationary and moving flat , inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.

**UNIT – V HYDRAULIC TURBINES – I:** Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines. Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity-cavitation.

**UNIT – VI CENTRAIFUGAL-PUMPS:** Pump installation details-classification-work done-Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves- NPSH-Cavitation. **RECIPROCATING PUMPS:** Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

### **Text Books:**

1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers.
2. A text of Fluid mechanics & hydraulic machines, R.K. Bansal, Laxmi Publications New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

### **References:**

1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P, OJHA, R.P.N. Chandramouli, Oxford higher education BERNDTSSON
3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Higher Education.



Course Code <b>18CE4T4</b>	<b>CONCRETE TECHNOLOGY</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :							
<b>PURPOSE:</b>								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	To learn the concepts of Concrete production and its behaviour in various environments.							
2	To learn the test procedures for the determination of properties of concrete.							
3	To understand durability properties of concrete in various environments.							
<b>COURSE OUTCOMES</b>								
1	Understand the basic concepts of concrete.							
2	Realize the importance of quality of concrete.							
3	Familiarize the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.							
4	Test the fresh concrete properties and the hardened concrete properties.							
5	Evaluate the ingredients of concrete through lab test results. Design the concrete mix by BIS method.							
6	Familiarize the basic concepts of special concrete and their production and applications. Understand the behaviour of concrete in various environments.							

**UNIT I : Ingredients Of Concrete Cements & Admixtures:** Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume. **Aggregates:**–Deleterious substance in aggregate –Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size, Quality of mixing water.

**UNIT II: Fresh Concrete:** Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete–Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

**UNIT III: Hardened Concrete:** Water / Cement ratio – Abram’s Law – Gel space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests –Splitting tests – Non-destructive testing methods – codal provisions for NDT.

**UNIT IV: Elasticity, Creep & Shrinkage,** Modulus of elasticity, Dynamic modulus of elasticity , Poisson’s ratio, Creep of concrete, Factors influencing creep, Relation between creep & time, Nature of creep, Effects of creep – Shrinkage –types of shrinkage.

**UNIT V: Mix Design:** Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design.

**UNIT VI: Special Concretes:** Ready mixed concrete, Shotcrete, Light weight aggregate concrete, Cellular concrete, No-fines concrete, High density concrete, Fibre reinforced concrete, Different types of fibres, Factors affecting properties of F.R.C, Polymer concrete, Types of Polymer concrete, Properties of polymer concrete, High performance concrete – Self consolidating concrete, SIFCON, self healing concrete.

#### **Text Books:**

1. Concrete Technology, M. S. Shetty. – S. Chand & Company
2. Concrete Technology, A. R. Santha Kumar, Oxford University Press, New Delhi

**References:**

1. Properties of Concrete, A. M. Neville – PEARSON – 4th edition
2. Concrete Technology, M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

Course Code <b>18CE4T5</b>	<b>STRUCTURAL ANALYSIS - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.				
2	To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions.				
3	The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.				
4	The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warren trusses.				
<b>COURSE OUTCOMES</b>					
1	Distinguish between the determinate and indeterminate structures.				
2	Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure.				
3	Estimate the bending moment and shear forces in beams for different fixity conditions.				
4	Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.				
5	Draw the influence line diagrams for various types of moving loads on beams/bridge.				
6	Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.				

**UNIT – I Propped Cantilevers:** Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

**Fixed Beams** – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support, effect of rotation of a support.

**UNIT – II Continuous Beams:** Introduction-Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed- continuous beams with overhang, continuous beams with different moment of inertia for different spans- Effects of sinking of supports-shear force and Bending moment diagrams.

**UNIT-III Slope-Deflection Method:** Introduction, sign conventions. derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

**UNIT – IV Energy Theorems:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem- Deflections of simple beams and pin jointed trusses, Castigliano's second theorem- Statically indeterminate beam and portal frame.

**UNIT – V Moving Loads:** Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.

**UNIT – VI INFLUENCE LINES:** Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a sections, single point load, U.D. load longer than the span, U.D. load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

**Text Books:**

1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.

3. Analysis of Structures- Vol. I & II, V.N. Vazirani and M.M. Ratwani, Khanna Publishers.

**References:**

1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications.

2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.

3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.

4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledgeware, Mumbai.

5. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli, Yesdee Publishing Pvt Limited, Chennai.

Course Code <b>18CE4T6</b>	<b>TRANSPORTATION ENGINEERING - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To impart different concepts in the field of Highway Engineering.				
2	To acquire design principles of Highway Geometrics and Pavements				
3	To learn various highway construction and maintenance procedures				
<b>COURSE OUTCOMES</b>					
1	Plan highway network for a given area.				
2	Determine Highway alignment and design highway geometrics				
3	Design Intersections and prepare traffic management plans				
4	Judge suitability of pavement materials and design flexible and rigid pavements				
5	Construct and maintain highways				

**UNIT I Highway Planning and Alignment:** Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

**UNIT – II Highway Geometric Design:** Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment- Gradients- Vertical curves.

**UNIT – III Traffic Engineering:** Basic Parameters of Traffic- Volume, Speed and Density- Traffic Volume Studies; Speed studies – spot speed and speed & delay studies; Parking Studies; Road Accidents- Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals – Webster Method – IRC Method.

**UNIT – IV, Highway Materials:** Subgrade soil: classification – Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

**UNIT – V, Design Of Pavements:** Types of pavements; Functions and requirements of different components of pavements; Design Factors  
**Flexible Pavements:** Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

**Rigid Pavements:** Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

**UNIT – VI Highway Construction and Maintenance:** Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements. □ Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing pavements

**TEXT BOOKS:**

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.
2. Traffic Engineering and Transportation Planning, Kadiyali L.R Khanna Publishers.

**REFERENCES:**

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi.
2. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi.
3. Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi.
4. Transportation Engineering - An Introduction, JotinKhisty C, Prentice Hall, Englewood Cliffs, New Jersey.
5. Traffic & Highway Engineering by Nicholas J. Garber, Lester A. Hoel, Fifth Edition, published in 2015, CENGAGE Learning, New Delhi.
6. Transportation Engineering and Planning, Papacostas C.S. and P.D. Prevedouros, Prentice Hall of India Pvt.Ltd; New Delhi.
7. Highway Engineering, Srinivasa Kumar R, Universities Press, Hyderabad
8. Practice and Design of Highway Engineering, Sharma S. K., Principles, S. Chand & Company Private Limited, New Delhi.
9. Highway and Traffic Engineering, Subhash C. Saxena, CBS Publishers, New Delhi.
10. Transportation Engineering Volume I by C. Venkatramaiah, Universities Press, New Delhi.

Course Code <b>18CE4L1</b>	<b>FM &amp; HHM LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>30</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

**List of Experiments**

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

**List of Equipment:**

1. Venturimeter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal and Reciprocating pumps.

Course Code <b>18CE4L2</b>	<b>SURVEY FIELD WORK- II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>30</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

**List of Experiments**

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tacheomatic Survey: Heights and distance problems using tacheomatic principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station: Traversing
10. Total Station: Contouring
11. Total Station: Determination of Remote height.
12. Total Station: distance between two inaccessible points.

**Note:** Any 10 field work assignments must be completed.



Course Code <b>18CE4T7</b>	<b>PROFESSIONAL ETHICS AND HUMAN VALUES</b>	L	T	P	C
	Maximum expected contact hours : <b>64</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>Course objectives</b>					
1	To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.				
2	Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.				
<b>outcomes</b>					
1	It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.				
2	It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.				

**UNIT I: Human Values:** Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self- confidence – Spirituality- Character.

**UNIT: II: Principles for Harmony:** Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

**UNIT III: Engineering Ethics and Social Experimentation:**

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism --Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg’s Theory - Gilligan’s Argument – Heinz’s Dilemma - Comparison with Standard Experiments -- Learning from the Past – Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

**UNIT IV: Engineers’ Responsibilities towards Safety and Risk:**

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

**UNIT V: Engineers’ Duties and Rights:**

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

**UNIT VI: Global Issues:**

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics - Intellectual Property Rights.

**References:**

1. Professional Ethics, R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering, Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals, A. R. Aryasri, Dharanikota Suyodhana - Maruthi

Publications.

4. Engineering Ethics, Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics, S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values, M. Govindarajan, S. Natarajan and V. S. SenthilKumar-PHI Learning Pvt. Ltd - 2009.
7. Professional Ethics and Human Values, A. Alavudeen, R.Kalil Rahman and M. Jayakumaran - University Science Press.
8. Professional Ethics and Human Values, D. R. Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics, Jayshree Suresh and B. S. Raghavan, S.Chand Publications.

Course Code <b>18CE5T1</b>	<b>MANAGEMENT SCIENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To familiarize with the process of management and to provide basic insight into select contemporary management practices				
2	To provide conceptual knowledge on functional management and strategic management.				
<b>COURSE OUTCOMES</b>					
1	After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.				
2	Will familiarize with the concepts of functional management project management and strategic management.				

**UNIT Introduction to Management:** Concept –nature and importance of Management – Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

**UNIT II Operations Management:** Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

**UNIT III Functional Management:** Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationlizing change through performance management.

**UNIT IV Project Management:** (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

**UNIT V Strategic Management:** Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies, theories of Multinational Companies.

**UNIT VI Contemporary Management Practice:** Basic concepts of MIS, MRP, Justin-Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

#### **Text Books**

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science*' Cengage, Delhi, 2012. 2. Dr. A. R. Aryasri, '*Management Science*' TMH 2011.

#### **References**

1. Koontz & Wehrich: '*Essentials of management*' TMH 2011
2. Seth & Rastogi: '*Global Management Systems*, Cengage learning, Delhi, 2011
3. Robbins: '*Organizational Behaviour*, Pearson publications, 2011
4. Kanishka Bedi: '*Production & Operations Management*, Oxford Publications, 2011
5. Philip Kotler & Armstrong: '*Principles of Marketing*, Pearson publications
6. Biswajit Patnaik: '*Human Resource Management*, PHI, 2011
7. Hitt and Vijaya Kumar: '*Starategic Management*, Cengage learning
8. Prem Chadha: '*Performance Management*, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.) Delhi 2015.

Course Code <b>18CE5T2</b>	<b>ENGINEERING GEOLOGY</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>			<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :						
<b>PURPOSE:</b>							
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>							
1	To introduce the Engineering Geology as a subject in Civil Engineering						
2	To enable the student to use subject in civil engineering applications.						
3	To know the Geological history of India.						
<b>COURSE OUTCOMES</b>							
1	Identify and classify the geological minerals						
2	Measure the rock strengths of various rocks						
3	Classify and measure the earthquake prone areas to practice the hazard zonation						
4	Classify, monitor and measure the Landslides and subsidence						
5	Prepares, analyses and interpret the Engineering Geologic maps						
6	Analyses the ground conditions through geophysical surveys.						
7	Test the geological material and ground to check the suitability of civil engineering project construction.						
8	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc...						

**UNIT-I: Introduction:** Branches of Geology, Importance of Geology in Civil Engineering with case studies. **Weathering:** Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

**UNIT-II Mineralogy And Petrology:** Definitions of mineral, Structures of silicates and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate and their importance in Civil Engineering.

**UNIT-III Structural Geology:** Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering-Indian stratigraphy. Aims of statigrtaphy, Principles, Geological time scour, Geological division in India, Major stratigraphic units in India.

**UNIT-IV Ground Water:** Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. **Earthquakes And Land Slides:** Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. Case studies.

**UNIT-V Geophysics:** Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

**UNIT-VI Geology of Dams, Reservoirs And Tunnels:** Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

**Text Books:**

1. Engineering Geology, N. Chenn Kesavulu, Laxmi Publications, 2<sup>nd</sup> Edition, 2014.
2. Engineering Geology, Subinoy Gangopadhyay, Oxford University press.

**References:**

1. Engineering Geology, D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. Engineering Geology, Vasudev Kanithi, University Press.
3. Engineering Geology for Civil Engineers P. C. Varghese, PHI learning pvt. Ltd.
4. G Fundamentals of Engineering Geology' P.G. Bell, B. S. P. Publications, 2012
5. Geology for Engineers and Environmental Society, Alan E Kehew, person publications, 3<sup>rd</sup> edition.
6. Engineer's Geology by S. K. Duggal, H.K. Pandey, N. Rawd, McGraw Hill education.
7. Engineering Geology, K. S. Valdiya, McGraw Hill.
8. Environmental Geology, K. S Valdiya, Mcgraw Hill Publications, 2<sup>nd</sup> Edition.

Course Code <b>18CE5T3</b>	<b>STRUCTURAL ANALYSIS - II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Familiarize Students with Different types of Structures				
2	Equip student with concepts of Arches				
3	Understand Concepts of lateral Load analysis				
4	Familiarize Cables and Suspension Bridges				
5	Understand Analysis methods Moment Distribution, Kanis Method and Matrix methods				
<b>COURSE OUTCOMES</b>					
1	Differentiate Determinate and Indeterminate Structures				
2	Carryout lateral Load analysis of structures				
3	Analyze Cable and Suspension Bridge structures				
4	Analyze structures using Moment Distribution, Kani's Method and Matrix methods				

**UNIT I Three Hinged Arches:** Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels. **Two Hinged Arches:** Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question).

**UNIT-II, Lateral Load Analysis Using Approximate Methods:** application to building frames. (i) Portal Method (ii) Cantilever Method.

**UNIT-III, Cable Structures and Suspension Bridges:** Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges. □

**UNIT-IV Moment Distribution Method:** Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway-Substitute frame analysis by two cycle.

**UNIT-V Kani's Method:** Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway.

**UNIT-VI Introduction to Matrix Methods:** Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements. Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

#### **Text Books:**

1. Structural Analysis, T. S. Thandavamoorthy, Oxford university press, India.
2. Structural Analysis, R.C. Hibbeler, Pearson Education, India
3. Theory of Structures – II, B. C. Punmia, Jain & Jain, Laxmi Publications, India.
4. Structural Analysis, C.S. Reddy, Tata Mc-Graw hill, New Delhi.

#### **Reference Books:**

1. Intermediate Structural Analysis, C. K. Wang, Tata McGraw Hill, India
2. Theory of structures, Ramamuratham, Dhanpatrai Publications.
3. Analysis of structures, Vazrani & Ratwani – Khanna Publications.
4. Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi
5. Structural Analysis I, P.N. Chandramouli. Yesdee Publishing Pvt Limited
6. Structural Analysis, Aslam Kassimali, Cengage Learning
7. Matrix Methods of Structural Analysis, P.N. Godbole, R. S.. Sonaparote, PHI Learning Pvt Limited.

Course Code <b>18CE5T4</b>	<b>DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Familiarize Students with different types of design philosophies				
2	Equip student with concepts of design of flexural members				
3	Understand Concepts of shear, bond and torsion				
4	Familiarize students with different types of compressions members and Design				
5	Understand different types of footings and their design				
<b>COURSE OUTCOMES</b>					
1	Work on different types of design philosophies				
2	Carryout analysis and design of flexural members and detailing				
3	Design structures subjected to shear, bond and torsion				
4	Design different type of compression members and footings				

**UNIT –I Introduction:** a) **Working stress method:** Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, Elastic theory: design constants, modular ratio, neutral axis depth and moment of resistance for balanced, under-reinforced and over-reinforced sections. Design of singly and doubly reinforced beams. **b) Limit State Design:** Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

**All units i.e. from unit II to unit VI are to be taught in Limit State Design.**

**UNIT –II Design for Flexure:** Limit state analysis and design of singly reinforced sections-effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections-Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange –Behavior- Analysis and Design.

**UNIT – III Design for Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing. **Limit state design for serviceability:** Deflection, cracking and code provision, Design of formwork for beams and slabs.

**UNIT – IV Slabs:** Classification of slabs, design of one - way slabs, one way continuous slab using IS Coefficients (Conventional) –Design of two - way slabs-simply supported and various edge conditions using IS Coefficients .

**UNIT – V Design of Compression members:** Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

**UNIT –VI Footings:** Different types of footings – Design of isolated footings – pedestal, square, rectangular and circular footings subjected to axial loads, uni-axial and bi-axial bending moments.

Course Code <b>18CE5T4</b>	<b>TRANSPORTATION ENGINEERING - II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To know various components and their functions in a railway track				
2	To acquire design principles of geometrics in a railway track.				
3	To know various techniques for the effective movement of trains.				
4	To acquire design principles of airport geometrics and pavements				
5	To know the planning, construction and maintenance of Docks and Harbours.				
<b>COURSE OUTCOMES</b>					
1	Design geometrics in a railway track.				
2	Design airport geometrics and airfield pavements.				
3	Plan, construct and maintain Docks and Harbours.				

### A.RAILWAY ENGINEERING

**UNIT – I Components of Railway Engineering:** Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

**UNIT – II Geometric Design of Railway Track:** Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

**UNIT – III Turnouts & Controllers:** Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations. □

### B.AIRPORT ENGINEERING

**UNIT – IV Airport Planning & Design:** Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

**UNIT – V Runway Design:** Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

### C.DOCKS & HARBOURS

**UNIT – VI Planning, Layout, Construction & Maintenance Of Docks & Harbors:**

Classification of ports – Requirement of a good port – classification of Harbors – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbors – Navigational aids.

### TEXT BOOKS:

1. Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi.
2. Airport Engineering, Khanna & Arora - Nemchand Bros, New Delhi.
3. Docks and Harbor Engineering, Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.



**REFERENCES:**

1. Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
2. Transportation Engineering Planning Design, Wright P. H. & Ashfort N. J., John Wiley & Sons.
3. Transportation Engineering Volume II, C Venkatramaiah, 2016, Universities Press, Hyderabad.
4. Transportation Engineering, Railways, Airports, Docks & Harbours, Srinivasa Kumar R, University Press, Hyderabad.
5. Airport Engineering Planning & Design, Subhash C. Saxena, 2016, CBS Publishers, New Delhi.
6. Highway, Railway, Airport and Harbor Engineering, Subramanian K. P, Scitech Publications (India) Pvt Limited, Chennai.
7. Airport Engineering, Virendra Kumar, Dhanpat Rai Publishers, New Delhi.

Course Code <b>18CE5L1</b>	<b>CONCRETE TECHNOLOGY LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To test the basic properties ingredients of concrete, fresh and hardened concrete properties				
<b>COURSE OUTCOMES</b>					
1	Determine the consistency and fineness of cement.				
2	Determine the setting times of cement.				
3	Determine the specific gravity and soundness of cement.				
4	Determine the compressive strength of cement.				
5	Determine the workability of cement concrete by compaction factor, slump & Vee - Bee tests				
6	Determine the specific gravity of coarse aggregate and fine aggregate by Sieve analysis.				
7	Determine the flakiness and elongation index of aggregates.				
8	Determine the bulking of sand.				
9	Understand the non-destructive testing procedures on concrete.				

**List of Experiments:** At least 10 experiments must be conducted (at least one for each property)

1. Determination of normal Consistency and fineness of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of specific gravity and soundness of cement.
4. Determination of compressive strength of cement.
5. Determination of grading and fineness modulus of Coarse aggregate by sieve analysis.
6. Determination of specific gravity of coarse aggregate.
7. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.
8. Determination of bulking of sand
9. Determination of workability of concrete by compaction factor method.
10. Determination of workability of concrete by slump test
11. Determination of workability of concrete by Vee-bee test.
12. Determination of compressive strength of cement concrete and its young's modulus.
13. Determination of split tensile strength of concrete.
14. Non-Destructive testing on concrete (for demonstration)

**List of Equipment:**

1. Standard set of sieves for coarse aggregate and fine aggregate
2. Vicat's apparatus
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus
6. Compaction Factor Test Apparatus.
7. Vee- Bee test apparatus
8. Longitudinal compresso meter
9. Universal testing Machine (UTM)/Compression Testing Machine (CTM).
10. Rebound hammer, Ultrasonic pulse velocity machine, micro cover meter etc.

Course Code <b>18CE5L2</b>	<b>ENGINEERING GEOLOGY LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To identify the mega-scopic types of Ore minerals & Rock forming minerals.				
2	To identify the mega-scopic types of Igneous, Sedimentary, Metamorphic rocks.				
3	To identify the topography of the site & material selection.				
<b>COURSE OUTCOMES</b>					
1	Identify Mega-scopic minerals & their properties.				
2	Identify Mega-scopic rocks & their properties.				
3	Identify the site parameters such as contour, slope & aspect for topography.				
4	4. Know the occurrence of materials using the strike & dip problems.				

### LIST OF EXPERIMENTS

1. Physical properties of minerals:
  - a) Mega-scopic identification of Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc...
  - b) Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc...
2. Megasopic description and identification of rocks.
  - a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc...
  - b) Sedimentary rocks – Sand stone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc...
  - c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc...
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests. □ 7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology.

### LAB EXAMINATION PATTERN:

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

### REFERENCE BOOKS:

1. Applied Engineering Geology Practical, M. T. Mauthesha Reddy, New Age International Publishers, 2<sup>nd</sup> Edition.
2. Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3<sup>rd</sup> edition, 2009.

Course Code <b>18CE5L3</b>	<b>TRANSPORTATION ENGINEERING LABORATORY</b>	L	T	P	C
	Maximum expected contact hours : <b>64</b>	0	0	3	1
	Prerequisites :				

**PURPOSE:**

**INSTRUCTIONAL COURSE OBJECTIVES**

1	To test crushing value, impact resistance, specific gravity and water absorption, percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.
2	To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
3	To test the stability for the given bitumen mix
4	To carry out surveys for traffic volume, speed and parking.

**COURSE OUTCOMES**

1	Ability to test aggregates and judge the suitability of materials for the road construction
2	Ability to test the given bitumen samples and judge their suitability for the road construction
3	Ability to obtain the optimum bitumen content for the mix design
4	Ability to determine the traffic volume, speed and parking characteristics.

**I. ROAD AGGREGATES:**

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

**II. BITUMINOUS MATERIALS:**

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

**III. BITUMINOUS MIX:**

1. Marshall Stability test.

**IV. TRAFFIC SURVEYS:**

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

**V. DESIGN & DRAWING:**

1. Earthwork calculations for road works.
2. Drawing of road cross sections.
3. Rotors intersection design.

**LIST OF EQUIPMENT:**

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers.
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Length and elongation gauges
7. Bitumen penetration test setup.

8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Viscometer.
11. Marshal Mix design apparatus.
12. Enoscope for spot speed measurement.
13. Stop Watches

**Text Books:**

1. Highway Material Testing Manual, S. K. Khanna, C. E. G Justo and A. Veeraraghavan, Neam Chan Brothers New Chand Publications, New Delhi.

**Reference Books:**

1. I R C Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.

Course Code <b>18CE5T6</b>	<b>PERSONALITY DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To test crushing value, impact resistance, specific gravity and water absorption, percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.				
2	To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.				
3	To test the stability for the given bitumen mix				
4	To carry out surveys for traffic volume, speed and parking.				
<b>COURSE OUTCOMES</b>					
1	Ability to test aggregates and judge the suitability of materials for the road construction				
2	Ability to test the given bitumen samples and judge their suitability for the road construction				
3	Ability to obtain the optimum bitumen content for the mix design				
4	Ability to determine the traffic volume, speed and parking characteristics.				

Course Code <b>18CE6T1</b>	<b>DESIGN AND DRAWING OF STEEL STRUCTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Familiarize Students with different types of Connections and relevant IS codes				
2	Equip student with concepts of design of flexural members				
3	Understand Design Concepts of tension and compression members in trusses				
4	Familiarize students with different types of Columns and column bases and their design				
5	Familiarize students with Plate girder and Gantry Girder and their Design				
<b>COURSE OUTCOMES</b>					
1	Work with relevant IS codes				
2	Carryout analysis and design of flexural members and detailing				
3	Design compression members of different types with connection detailing				
4	Design Plate Girder and Gantry Girder with connection detailing				
5	Produce the drawings pertaining to different components of steel structures				

**UNIT-I Connections: Introduction: (a) Riveted connections** – Definition, rivet strength and capacity- Codal Provisions, **(b) Welded connections:** Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints. **All units i.e. from unit II to unit-VI to be taught in Limit State Design and in Welded connections only.**

**UNIT-II Beams:** Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

**UNIT-III Tension Members and compression members:** General Design of members subjected to direct tension and bending –effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc. **Roof Trusses:** Different types of trusses – Design loads – Load combinations as per IS Code □recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

**UNIT – IV Design of Columns:** Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.

**UNIT – V Design of Column Foundations:** Design of slab base and gusseted base. Column bases subjected moment.

**UNIT – VI Design of Plate Girder:** Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

**Design of Gantry Girder:** impact factors - longitudinal forces, Design of Gantry girders.

Course Code <b>18CE6T2</b>	<b>GEOTECHNICAL ENGINEERING - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To enable the student to find out the index properties of the soil and classify it.				
2	To impart the concept of seepage of water through soils and determine the seepage discharge.				
3	To enable the students to differentiate between compaction and consolidation of soils and to determine the magnitude and the rate of consolidation settlement.				
4	To enable the student to understand the concept of shear strength of soils, assessment of the shear parameters of sands and clays and the areas of their application.				
<b>COURSE OUTCOMES</b>					
1	The student must know the definition of the various parameters related to soil mechanics and establish their inter-relationships.				
2	The student should be able to know the methods of determination of the various index properties of the soils and classify the soils.				
3	The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory.				
4	The student should be able to apply the above concepts in day-to-day civil engineering practice.				

**UNIT – I Introduction:** Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship –Relative density , Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

**UNIT – II Index Properties Of Soils:** Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

**UNIT –III Permeability:** Soil water – capillary rise – One dimensioned flow of water through soils – Darcy’s law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses –quick sand condition – 2-D flow and Laplace’s equation - Seepage through soils – Flow nets: Characteristics and Uses.

**UNIT – IV Stress Distribution In Soils:** Stresses induced by applied loads - Boussinesq’s and Westergaard’s theories for point loads and areas of different shapes– Newmark’s influence chart – 2:1 stress distribution method.

**UNIT – V Consolidation:** Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi’s theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation ( $c_v$ ) - Over consolidated and normally consolidated clays.

**UNIT – VI Shear Strength of Soils:** Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions.

**Text Books:**

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age International Publishers.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

**References:**

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.
2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.
3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi.



Course Code <b>18CE6T3</b>	<b>ENVIRONMENTAL ENGINEERING - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Outline planning and the design of water supply systems for a community/town/city				
2	Provide knowledge of water quality requirement for domestic usage				
3	Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.				
4	Selection of valves and fixture in water distribution systems, Impart knowledge on design of water distribution network				
<b>COURSE OUTCOMES</b>					
1	Plan and design the water and distribution networks and sewerage systems				
2	Identify the water source and select proper intake structure				
3	Characterisation of water				
4	Select the appropriate appurtenances in the water supply				
5	Selection of suitable treatment flow for raw water treatments				

**UNIT-I Introduction:** Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities **Water Demand and Quantity Estimation:** Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting.

**UNIT-II Sources of Water:** Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries. **Collection and Conveyance of Water:** Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, laying of pipe lines.

**UNIT-III Quality and Analysis of Water:** Characteristics of water-Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water

**UNIT-IV Treatment of Water:** Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration

**UNIT-V Disinfection:** Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and manganese removal – Adsorption-fluoridation and defluoridation-aeration-Reverse Osmosis-Iron exchange-Ultra filtration

**UNIT-VI Distribution of Water:** Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods -Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, and water meters-Laying and testing of pipe lines- selection of pipe materials, pipe joints

#### Text Books

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
2. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

**References**

1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
4. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

Course Code <b>118CE6T4</b>	<b>WATER RESOURCES ENGINEERING - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	introduce hydrologic cycle and its relevance to Civil engineering				
2	make the students understand physical processes in hydrology and, components of the hydrologic cycle				
3	appreciate concepts and theory of physical processes and interactions				
4	learn measurement and estimation of the components hydrologic cycle.				
5	provide an overview and understanding of Unit Hydrograph theory and its analysis				
6	understand flood frequency analysis, design flood, flood routing				
7	appreciate the concepts of groundwater movement and well hydraulics				
<b>COURSE OUTCOMES</b>					
1	have a thorough understanding of the theories and principles governing the hydrologic processes				
2	be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects				
3	develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.				
4	be able to develop design storms and carry out frequency analysis				
5	be able to determine storage capacity and life of reservoirs.				
6	develop unit hydrograph and synthetic hydrograph be able to estimate flood magnitude and carry out flood routing.				
7	be able to determine aquifer parameters and yield of wells. be able to model hydrologic processes				

**UNIT I Introduction:** Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. **Precipitation:** Types and forms, measurement, raingauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

**UNIT-II Abstractions from Precipitation:** Initial abstractions. **Evaporation:** factors affecting, measurement, reduction **Evapotranspiration:** factors affecting, measurement, control **Infiltration:** factors affecting, Infiltration capacity curve, measurement, infiltration indices.

**UNIT-III Runoff:** Catchment characteristics, Factors affecting runoff, components, computation- empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. **Hydrograph analysis:** Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S- hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

**UNIT-IV Floods:** Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management. **Flood Routing:** Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

**UNIT-V Groundwater:** Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

**UNIT VI Advanced Topics in Hydrology:** Rainfall-runoff Modelling, instantaneous unit

hydrograph (IUH) - conceptual models - Clark and Nash models, general hydrological models-  
Chow - Kulandaiswamy model.

**Text Books:**

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd.

**References:**

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.
3. Applied hydrology, Chow V. T., D. R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
4. Water Resources Engineering, Mays L.W, Wiley India Pvt. Ltd, (2013).

Course Code <b>18CE6T5</b>	<b>ELECTRONIC INSTRUMENTATION OPEN ELECTIVE</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :							
<b>PURPOSE:</b>								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	introduce hydrologic cycle and its relevance to Civil engineering							
2	make the students understand physical processes in hydrology and, components of the hydrologic cycle							
3	appreciate concepts and theory of physical processes and interactions							
4	learn measurement and estimation of the components hydrologic cycle.							
5	provide an overview and understanding of Unit Hydrograph theory and its analysis							
6	understand flood frequency analysis, design flood, flood routing							
7	appreciate the concepts of groundwater movement and well hydraulics							
<b>COURSE OUTCOMES</b>								
1	have a thorough understanding of the theories and principles governing the hydrologic processes							
2	be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects							
3	develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.							
4	be able to develop design storms and carry out frequency analysis							
5	be able to determine storage capacity and life of reservoirs.							
6	develop unit hydrograph and synthetic hydrograph be able to estimate flood magnitude and carry out flood routing.							
7	be able to determine aquifer parameters and yield of wells. be able to model hydrologic processes							

**UNIT-I: Introduction:** (a) **Measurement Errors:** Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures. (b) **Voltmeters and Multimeters:** Introduction Multi range voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters.

**UNIT -II: Digital Instruments:**Digital Voltmeters – Introduction, DVM's based on V – T, V – F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters, Digital frequency meters, Digital measurement of time.

**UNIT -III: Oscilloscopes:**Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch. **Special Oscilloscopes:**Delayed time-base oscilloscopes, Analog storage, Sampling and Digital storage oscilloscopes.

**UNIT-IV: Signal Generators:**Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer.

**UNIT-V: Measurement of resistance, inductance and capacitance:** Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection .

**UNIT -VI: Transducers & Miscellaneous:** Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer. Thermistor, Inductive transducer, Differential output transducers, LVDT, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple.

**Display devices:** Digital display system, classification of display, Display devices, LEDs, LCD

displays; Bolometer and RF power measurement using Bolometer; Introduction to Signal conditioning.

**Text Books:**

1. Electronic Instrumentation, H. S. Kalsi, TMH, 2004.
2. Electronic Instrumentation and Measurements, David A Bell, PHI / Pearson Education, 2006.

**Reference Books:**

1. Principles of Measurement Systems, John P. Beatley, 3<sup>rd</sup> Edition, Pearson Education, 2000.
2. Modern Electronic Instrumentation and Measuring Techniques, Cooper D & A D Helfrick, PHI, 1998.
3. Electronic and Electrical Measurements and Instrumentation, J. B. Gupta, S. K. Kataria & Sons, Delhi.
4. Electronics & Electrical Measurements, A K Sawhney, Dhanpat Rai & Sons, 9<sup>th</sup> edition.  
Instrumentation & Control Systems, K. Padmaraju, Y.J. Reddy, McGraw Hill Education, 2016.

Course Code <b>18CE6L1</b>	<b>GEOTECHNICAL ENGINEERING LABORATORY</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>			<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>
	Prerequisites :						
<b>PURPOSE:</b>							
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>							
1	To impart knowledge of determination of index properties required for classification of soils.						
2	To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests; to determine permeability of soils.						
3	To teach how to determine shear parameters of soil through different laboratory tests.						
<b>COURSE OUTCOMES</b>							
1	Determine index properties of soil and classify them.						
2	Determine permeability of soils.						
3	Determine Compaction, Consolidation and shear strength characteristics.						

### LIST OF EXPERIMENTS

3. Specific gravity, G
4. Atterberg's Limits.
5. Field density-Core cutter and Sand replacement methods
6. Grain size analysis by sieving
7. Hydrometer Analysis Test
8. Permeability of soil - Constant and Variable head tests
9. Compaction test
10. Consolidation test (to be demonstrated)
11. Direct Shear test
12. Triaxial Compression test (UU Test)
13. Unconfined Compression test
14. Vane Shear test
15. Differential free swell (DFS)
16. CBR Test

At least **Ten** experiments shall be conducted.

### LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
  - a) Core cutter method
  - b) Sand replacement method
4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for
  - a) Constant head test
  - b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
- 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolidation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.

15. Hot air ovens (range of temperature  $50^{\circ}$  -  $150^{\circ}$  C)

**Reference:**

1. Determination of Soil Properties, J. E. Bowles.
2. IS Code 2720 – relevant parts.



Course Code <b>18CE6L2</b>	<b>ENVIRONMENTAL ENGINEERING LABORATORY</b>				L	T	P	C
	Maximum expected contact hours : <b>64</b>				0	0	3	1
	Prerequisites :							
<b>PURPOSE:</b>								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	Estimation some important characteristics of water and wastewater in the laboratory							
2	It also gives the significance of the characteristics of the water and wastewater							
<b>COURSE OUTCOMES</b>								
1	Estimation some important characteristics of water and wastewater in the laboratory							
2	Draw some conclusion and decide whether the water is potable or not.							
3	Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments							
4	Estimation of the strength of the sewage in terms of BOD and COD							

### List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Winklers Method and B.O.D.
8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.

**NOTE:** At least 10 of the above experiments are to be conducted.

### List of Equipments

- 1) pH meter
- 2) Turbidity meter
- 3) Conductivity meter
- 4) Hot air oven
- 5) Muffle furnace
- 6) Dissolved Oxygen meter
- 7) U–V visible spectrophotometer
- 8) COD Reflux Apparatus
- 9) Jar Test Apparatus
- 10) BOD incubator
- 11) Autoclave
- 12) Laminar flow chamber
- 13) Hazen’s Apparatus

### Text Books

1. Standard Methods for Analysis of Water and Waste Water – APHA
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

**Reference**

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

Course Code <b>18CE6L3</b>	<b>COMPUTER AIDED ENGINEERING LABORATORY</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>			<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>
	Prerequisites :						
<b>PURPOSE:</b>							
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>							
1	Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city						
2	Provide knowledge of characterisation of wastewater generated in a community						
3	Impart understanding of treatment of sewage and the need for its treatment.						
4	Summarize the appurtenance in sewerage systems and their necessity						
5	Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems						
6	Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers						
<b>COURSE OUTCOMES</b>							
1	Plan and design the sewerage systems						
2	Select the appropriate appurtenances in the sewerage systems						
3	Analyze sewage and suggest and design suitable treatment system for sewage treatment						
4	Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river. Suggest a suitable disposal method with respect to effluent standards.						

**UNIT-I: Introduction to Sanitation** – Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains- design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers

**UNIT-II: Pumping of wastewater:** Pumping stations – location – components- types of pumps and their suitability with regard to wastewaters. **House Plumbing:** Systems of plumbing-sanitary fittings and other accessories-one pipe and two pipe systems – Design of building drainage

**UNIT-III: Sewage characteristics** – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations Treatment of sewage: Primary treatment-Screens-grit chambers-grease traps-floatation-sedimentation – design of preliminary and primary treatment units.

**UNIT-IV: Secondary treatment:** Aerobic and anaerobic treatment process-comparison. **Suspended growth process:** Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons. **Attached Growth Process:** Trickling Filters-mechanism of impurities removal- classification-design-operation and maintenance problems. RBCs, Fluidized bed reactors

**UNIT V: Miscellaneous Treatment Methods:** Nitrification and Denitrification – Removal of Phosphates –UASB-Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design-Reuse and disposal of septic tank effluent, FAB Reactors.

**UNIT-VI: Bio-solids (Sludge) management:** Characteristics-SVI, handling and treatment of sludge-thickening – anaerobic digestion of sludge, Sludge Drying Beds. Centrifuge. **Disposal of sewage:** Methods of disposal – disposal into water bodies-Oxygen Sag Curve- Disposal into sea, disposal on land- sewage sickness.

#### Text Books

1. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition.
2. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna.
3. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New

Delhi, 2012.

### **References**

1. Environmental Engineering, Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985
2. Wastewater Treatment for Pollution Control and Reuse, Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3<sup>rd</sup> Edition
3. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, Garg, S. K., Khanna Publishers
4. Sewage treatment and disposal, P. N. Modi & Sethi.
5. Environmental Engineering, Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003
6. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

Course Code <b>18CE7T1</b>	<b>ENVIRONMENTAL ENGINEERING - II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city				
2	Provide knowledge of characterisation of wastewater generated in a community				
3	Impart understanding of treatment of sewage and the need for its treatment.				
4	Summarize the appurtenance in sewerage systems and their necessity				
5	Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems				
6	Effluent disposal method and realize the importance of regulations in the disposal of effluents in rivers				
<b>COURSE OUTCOMES</b>					
1	Plan and design the sewerage systems				
2	Select the appropriate appurtenances in the sewerage systems				
3	Analyze sewage and suggest and design suitable treatment system for sewage treatment				
4	Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river. Suggest a suitable disposal method with respect to effluent standards.				

Course Code <b>18CE7T3</b>	<b>GEOTECHNICAL ENGINEERING - II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city				
2	Provide knowledge of characterisation of wastewater generated in a community				
3	Impart understanding of treatment of sewage and the need for its treatment.				
4	Summarize the appurtenance in sewerage systems and their necessity				
5	Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems				
6	Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers				
<b>COURSE OUTCOMES</b>					
1	Plan and design the sewerage systems				
2	Select the appropriate appurtenances in the sewerage systems				
3	Analyze sewage and suggest and design suitable treatment system for sewage treatment				
4	Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river. Suggest a suitable disposal method with respect to effluent standards.				

Course Code <b>18CE7T4</b>	<b>REMOTE SENSING AND GIS APPLICATIONS</b>				L	T	P	C
	Maximum expected contact hours : <b>64</b>				<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :							
<b>PURPOSE:</b>								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	introduce the basic principles of Remote Sensing and GIS techniques.							
2	learn various types of satellite sensors and platforms							
3	learn concepts of visual and digital image analyses							
4	understand the principles of spatial analysis							
5	appreciate application of RS and GIS to Civil engineering							
<b>COURSE OUTCOMES</b>								
1	be familiar with ground, air and satellite based sensor platforms							
2	interpret the aerial photographs and satellite imageries							
3	create and input spatial data for GIS application							
4	apply RS and GIS concepts in water resources engineering							
5	applications of various satellite data							

**UNIT I Introduction to remote sensing:** Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems **Sensors and platforms:** Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER, RISAT and CARTOSAT

**UNIT II Image analysis:** Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

**UNIT III Geographic Information System:** Introduction, key components, application areas of GIS, map projections. **Data entry and preparation:** spatial data input, raster data models, vector data models.

**UNIT – IV Spatial data analysis:** Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

**UNIT – V RS and GIS applications General:** Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications,

**UNIT – VI Applications of Hydrology, Water Resources and Disaster Management:** Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

#### **TEXT BOOKS:**

1. Remote sensing and GIS, Bhatta B (2008) , Oxford University Press
2. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013), Wiley India Pvt. Ltd., New Delhi
3. Fundamentals of Geographic Information Systems, Demers, M.N, Wiley India Pvt. Ltd, 2013.

#### **REFERENCES:**

1. Fundamentals of Remote Sensing, George Joseph, Universities Press, 2013.
2. Concepts and Techniques of Geographical Information System, Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006
3. Remote Sensing and its Applications, Narayan LRA, Universities Press, 2012.

4. Introduction to Geographic Information Systems, Kand Tsung Chang, McGraw Hill Higher Education, 2009.
5. Basics of Remote sensing & GIS, Kumar S, Laxmi Publications, New Delhi, 2005.
6. Principals of Geographical Information Systems, Burrough P A and R.A. McDonnell, Oxford University Press, 1998.
7. Remote Sensing, Schowenger, R. A (2006), Elsevier publishers.



Course Code <b>18CE7T5</b>	<b>GROUND IMPROVEMENT TECHNIQUES (ELECTIVE – I)</b>	L	T	P	C
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.				
2	To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.				
3	To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.				
4	To make the student learn the concepts, purpose and effects of grouting				
<b>COURSE OUTCOMES</b>					
1	By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.				
2	The student should be in a position to design a reinforced earth embankment and check its stability.				
3	The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.				
4	The student should be able to understand the concepts and applications of grouting.				

**UNIT I** In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

**UNIT –II** Dewatering – sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis

**UNIT- III** Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

**UNIT- IV** Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

**UNIT- V** Geosynthetics – geotextiles – types – functions , properties and applications – geogrids , geomembranes and gabions - properties and applications.

**UNIT-VI** Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests

**Text Books:**

1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited, New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

**Reference:**

1. Ground Improvement, M.P. Moseley, Blackie Academic and Professional, USA.
2. Designing with Geosynthetics, R. M Koerner, Prentice Hall

Course Code <b>18CE7T6</b>	<b>GROUND WATER DEVELOPMENT (ELECTIVE – II)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1					
2					
3					
4					
5					
<b>COURSE OUTCOMES</b>					
1	Estimate aquifer parameters and yield of wells				
2	Analyse radial flow towards wells in confined and unconfined aquifers.				
3	Design wells and understand the construction practices.				
4	interpret geophysical exploration data for scientific source finding of aquifers.				
5					

**UNIT – I Introduction** Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation.

**Well Hydraulics** Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jacob and Chow's methods, Leaky aquifers.

**UNIT – II Well Design** Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery

**UNIT III Well Construction and Development** Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open-hole, bail-down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

**UNIT IV Artificial Recharge** Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge

**Saline Water Intrusion** Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

**UNIT – V Geophysics** Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications

**UNIT – VI Groundwater Modelling and Management** Basic principles of groundwater modelling- Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

**Text Books:**

1. Groundwater, Raghunath H M, New Age International Publishers, 2005.
2. Groundwater Hydrology, Todd D. K., Wiley India Pvt Ltd., 2014.
3. Groundwater Hydrology, Todd D K and L W Mays, CBS Publications, 2005.

**References:**

1. Groundwater Assessment and Management, Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. Groundwater Hydrology, Bouwer H, McGraw Hill Book Company, 1978.
3. Groundwater Systems Planning and Management, Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.

4. Groundwater Resources Evaluation, Walton W C, McGraw Hill Book Company, 1978.

Course Code <b>18CE7L1</b>	<b>CAD AND GIS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Introduce image processing and GIS software				
2	familiarize structural analysis software				
3	understand the process of digitization, creation of thematic map from toposheets and maps				
4	learn to apply GIS software to simple problems in water resources and transportation engineering				
5	earn to analyze 2 D and 3D frame steel tubular truss using structural analysis software				
6	learn to analyze and design retaining wall and simple towers				
<b>COURSE OUTCOMES</b>					
1	work comfortably on GIS software				
2	digitize and create thematic map and extract important features				
3	develop digital elevation model				
4	use structural analysis software to analyze and design 2D and 3D frames				
5	design and analyze retaining wall and simple towers using CADD software.				

Course Code <b>18CE7L2</b>	<b>IRRIGATION DESIGN AND DRAWING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	To understand design principle of various irrigation structures				
<b>COURSE OUTCOMES</b>					
1	At the end of the course the student will be able to To design various irrigation structures.				

### Design and drawing of

1. Surplus weir
2. Tank sluice with a tower head
3. Canal drop-Notch type
4. Canal regulator
5. Under tunnel
6. Syphon aqueduct type III

Final Examination pattern: Any two question of the above six designs may be asked out of which the candidated has to answer one question. The duration of the examination is three hours.

### Text Books:

1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

### Reference :

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Standard Book House. 2. Irrigation and Water Power Engineering, B. C Punmia & Lal, Lakshmi Publications Pvt. Ltd., New Delhi.

Course Code <b>18CE7T7</b>	<b>IPR &amp; PATENTS</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>			<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
	Prerequisites :						
<b>PURPOSE:</b>							
<b>OBJECTIVES</b>							
1	To know the importance of Intellectual property rights, which plays a vital role						
2	advanced Technical and Scientific disciplines. *Imparting IPR protections and regulations for further advancement.						
<b>COURSE OUTCOMES</b>							
1	IPR Laws and patents pave the way for innovative ideas which are instrumental.						
2	inventions to seek Patents. *Student get an insight on Copyrights, Patents and Software patents						

### **UNIT I: Introduction to Intellectual Property Rights (IPR)**

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

### **UNIT II: Copyrights and Neighboring Rights**

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

### **UNIT III: Patents**

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer -- Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing -- Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

### **UNIT IV: Trademarks**

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

### **UNIT V: Trade Secrets**

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

### **Unit VI: Cyber Law and Cyber Crime**

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

### **References:**

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.

3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

Course Code <b>18CE8T1</b>	<b>ESTIMATION SPECIFICATION AND CONTRACTS</b>				L	T	P	C
	Maximum expected contact hours : <b>64</b>				<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
	Prerequisites :							
<b>PURPOSE:</b>								
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>								
1	Understand the quantity calculations of different components of the buildings.							
2	Understand the rate analysis of different quantities of the buildings components.							
3	Learn various specifications and components of the buildings.							
<b>COURSE OUTCOMES</b>								
1	The student should be able to determine the quantities of different components of buildings.							
2	The student should be in a position to find the cost of various building components.							
3	The student should be capable of finalizing the value of structures.							

**UNIT-I** General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

**UNIT-II** Rate Analysis – Working out data for various items of work over head and contingent charges.

**UNIT-III** Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

**UNIT-IV** Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings Standard specifications for different items of building construction.

**UNIT-V** Detailed Estimation of Buildings using individual wall method.

**UNIT -VI** Detailed Estimation of Buildings using centre line method.

#### **FINAL EXAMINATION PATTERN:**

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

#### **Text Books:**

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2000.
2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.
3. Construction Planning and Technology, Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. Estimating and Costing, G.S. Birdie.

#### **References:**

1. Standard Schedule of rates and standard data book, Public works department.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works – B.I.S.
3. Estimation, Costing and Specifications, M. Chakraborti; Laxmi publications.
4. National Building Code



Course Code <b>18CE8T2</b>	<b>CONSTRUCTION TECHNOLOGY AND MANAGEMENT</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>			3	1	0	3
	Prerequisites :						
<b>PURPOSE:</b>							
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>							
1	to introduce to the student the concept of project management including network drawing and monitoring						
2	to introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to construction.						
3	to introduce the importance of safety in construction projects						
<b>COURSE OUTCOMES</b>							
1	appreciate the importance of construction planning						
2	understand the functioning of various earth moving equipment						
3	know the methods of production of aggregate products and concreting and usage of machinery required for the works.						
4	apply the gained knowledge to project management and construction techniques						

**UNIT- I** Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical Path Method – Applications

**UNIT -II** Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

**UNIT- III** Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

**UNIT –IV** Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets

**UNIT -V** Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing

**UNIT –VI** Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering

#### **Text Books:**

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
3. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

#### **References:**

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

Course Code <b>18CE8T3</b>	<b>PRE-STRESSED CONCRETE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>	3	1	0	3
	Prerequisites :				
<b>PURPOSE:</b>					
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>					
1	Familiarize Students with concepts of prestressing				
2	Equip student with different systems and devices used in prestressing				
3	Understand the different losses of prestress including short and long term losses				
4	Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion				
<b>COURSE OUTCOMES</b>					
1	Understand the different methods of prestressing				
2	Estimate effective prestress including the short and long term losses				
3	Analyze and design prestressed concrete beams under flexure and shear				
4	Understand the relevant IS Codal provisions for prestressed concrete				

**UNIT-I** Basic concepts of Prestressing- Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Cover Requirements.

**UNIT-II** Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems, Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

**UNIT-III** Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation stress in steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design

**UNIT-V** Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

**UNIT-IV** Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing Deflection- Prediction of short term and long term deflections.

**UNIT-VI** Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

#### **Text Books**

4. Prestressed Concrete, N. Krishna Raju, Tata McGraw hill
5. Prestressed Concrete, S. Ramamrutham

#### **References:**

1. Prestressed Concrete, P. Dayaratnam
2. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

Course Code <b>18CE8T4</b>	<b>ELECTIVE – III</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>			3	1	0	3
	Prerequisites :						
<b>PURPOSE:</b>							
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>							
1	Introduce image processing and GIS software						
2	familiarize structural analysis software						
3	understand the process of digitization, creation of thematic map from toposheets and maps						
4	learn to apply GIS software to simple problems in water resources and transportation engineering						
5	earn to analyze 2 D and 3D frame steel tubular truss using structural analysis software						
6	learn to analyze and design retaining wall and simple towers						
<b>COURSE OUTCOMES</b>							
1	work comfortably on GIS software						
2	digitize and create thematic map and extract important features						
3	develop digital elevation model						
4	use structural analysis software to analyze and design 2D and 3D frames						
5	design and analyze retaining wall and simple towers using CADD software.						

Course Code <b>18CE8P1</b>	<b>PROJECT</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Maximum expected contact hours : <b>64</b>				--	12	6
	Prerequisites :						
<b>PURPOSE:</b>							
<b>INSTRUCTIONAL COURSE OBJECTIVES</b>							
1	To enable the student apply engineering knowledge that has been taught all through the programme for solving practical engineering problem.						
2	To enable the student capable for problem solving / problem shooting.						
3	To instill and inculcate team spirit/ team work in to the minds of the students.						
4	To enable/ train the students report making/ documentation.						
5	To provide students an opportunity to use any civil engineering software for their project work.						
<b>COURSE OUTCOMES</b>							
1	Apply all levels of Engineering knowledge in solving the Engineering problems.						
2	Work together with team spirit.						
3	Use Civil Engineering software at least one.						
4	Document the projects						