SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
Course Structure

I YEAR – I SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1	18HS0848	Physics	3	1	-	4
2	18HS0830	Mathematics – I	3	-	-	3
3	18CS0501	Programming for Problem Solving	3	-	-	3
4	18CE0101	Engineering Mechanics	2	1	-	3
5	18HS0852	Physics Lab	-	-	3	1.5
6	18CS0503	Programming for Problem Solving Lab	-	-	3	1.5
7	18ME0301	Workshop Practice Lab	-	-	4	2
		Induction Program (3weeks)	-	-	-	-
Contact periods / week			11	2	10	**18**
			Total/Week 23			

I YEAR – II SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1	18HS0801	Chemistry	3	1	-	4
2	18HS0831	Mathematics – II	3	1	-	4
3	18EE0240	Basic Electrical and Electronics Engineering	3	-	-	3
4	18HS0810	English	3	-	-	3
5	18ME0302	Engineering Graphics & Design	1	-	4	3
6	18HS0802	Chemistry Lab	-	-	3	1.5
7	18HS0811	English Lab	-	-	3	1.5
Non – Credit Course						
8	18HS0816	Indian Constitution	3	-	-	-
Contact periods / week			16	2	10	**20**
			Total/Week 28			

II YEAR – I SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1	18HS0803	Biology for Engineers	3	-	-	3
2	18HS0832	Transform & Discrete Mathematics	3	1	-	4
3	18CE0102	Introduction to Civil Engineering	3	-	-	3
4	18CE0103	Introduction to Solid Mechanics	3	-	-	3
5	18CE0104	Introduction to Fluid Mechanics	3	-	-	3
6	18CE0105	Solid Mechanics Lab	-	-	3	1.5
7	18CE0106	Fluid Mechanics Lab	-	-	3	1.5
8	18CE0107	Computer Aided Building Drawing	-	-	2	1
Non – Credit Course						
9	18HS0804	Environmental Sciences	3	-	-	-
Contact Periods / Week			18	1	8	**20**
			Total/Week 27			

II YEAR – II SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1	18ME0346	Mechanical Engineering	3	-	-	3
2	18CE0108	Engineering Geology	3	-	-	3
3	18CE0109	Surveying & Geomatics	3	-	-	3
4	18CE0110	Materials, Testing & Evaluation	3	1	-	4
5	18CE0111	Mechanics of Solids	3	-	-	3
6	18CE0112	Engineering Geology Lab	-	-	3	1.5
7	18CE0113	Surveying Lab – I	-	-	3	1.5
Credit Course						
8	COE – I	Comprehensive Online Exam – 1	-	-	-	1
Non – Credit Course						
9	18HS0817	Essence of Indian Traditional Knowledge	3	-	-	-
Contact Periods / Week			18	1	6	**20**
			Total/Week 25			

III YEAR – I SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1	18CE0114	Hydraulic Engineering	3	-	-	3
2	18CE0115	Structural Design	3	1	-	4
3	18CE0116	Geotechnical Engineering	3	-	-	3
4	18CE0117	Hydrology & Water Resources Engineering	3	-	-	3
5	18CE0118	Estimation, Costing and Valuation	3	-	-	3
6	18CE0119	Geotechnical Engineering Lab	-	-	3	1.5
7	18CE0120	Construction Materials Lab	-	-	3	1.5
8	18CE0121	Surveying Lab – II	-	-	2	1
Non – Credit Course						
9	18HS0842	Aptitude Practices	3	-	-	-
Contact Periods / Week			18	1	8	20
			Total/Week **27**			

III YEAR – II SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1	18CE0122	Construction Project Management	3	-	-	3
2	18CE0123	Environmental Engineering	3	-	-	3
3	18CE0124	Transportation Engineering	3	-	-	3
4	**Professional Elective Course (PEC) – I**		3	-	-	3
	18CE0133	Foundation Engineering				
	18CE0134	Water Technology				
	18CE0135	Maintenance & Rehabilitation of Structures				
5	**Open Elective – I**		3	-	-	3
	18EE0234	Industrial Instrumentation				
	18ME0307	Non-Conventional Energy Resources				
	18EC0449	Introduction to IOT				
	18CS0517	Python Programming				
	18HS0814	Intellectual Property Rights				
6	18CE0125	Transportation Engineering Lab	-	-	2	1
7	18CE0126	Environmental Engineering Lab	-	-	2	1
8	18CE0130	Mini Project	-	-	-	2
	Credit Course					
9	COE – II	Comprehensive Online Exam – 2	-	-	-	1
	Non – Credit Course					
10	18HS0859	English for Corporate Communication skills lab	-	-	2	-
	Contact Periods / Week		15	-	6	**20**
			Total/Week **21**			

IV YEAR – I SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1	18HS0812	Managerial Economics and Financial Analysis	3	-	-	3
2	18CE0136	Concrete Technology	3	-	-	3
3		**Professional Elective Course (PEC) – II**	3	-	-	3
	18CE0137	Finite Elements Methods				
	18CE0138	Fundamentals of Urban Planning				
	18CE0139	Traffic Engineering and Management				
4		**Professional Elective Course (PEC) – III**	3	-	-	3
	18CE0140	Advanced Structural Design				
	18CE0141	Environmental Impact Assessment & Management				
	18CE0142	Airport Planning and Design				
5		**Professional Elective Course (PEC) – IV**	3	-	-	3
	18CE0143	Prestressed Concrete				
	18CE0144	Ground Improvement Techniques				
	18CE0145	Design & Drawing of Irrigation Structures				
6		**Open Elective – II**	3	-	-	3
	18EE0236	Solar Photovoltaic Systems				
	18ME0353	Computer Aided Process Planning				
	18EC0450	MATLAB Programming				
	18CS0544	Software Development & Testing				
	18HS0815	Entrepreneurship Development				
8	18CE0128	Computer Aided Design Lab	-	-	3	1.5
9	18CE0129	Civil Engineering Lab (Virtual Lab)	-	-	3	1.5
10	18CE0131	Project Phase – I			4	2
Contact Periods / Week			18	-	10	23
			Total/Week **28**			

IV YEAR – II SEMESTER

S No.	COURSE CODE	SUBJECT	L	T	P/ Drg	C
1		**MOOC – I**	3	-	-	3
2		**MOOC – II**	3	-	-	3
3	18CE0132	Project Phase – II	-	-	22	11
4	18CE0147	Comprehensive Viva Voce	-	-	-	2
Contact Periods / Week			6	-	22	**19**
			Total/Week **28**			

Note: L – Lecture hours, T – Tutorial, P – Practical, Drg. – Drawing, C – Credits

Year	I Year		II Year		III Year		IV Year		Total
Semester	I Sem	II Sem	I Sem	II Sem	I Sem	II Sem	I Sem	II Sem	
Credits	18	20	20	20	20	20	23	19	160

Total Credits: 160

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(18HS0848) PHYSICS

COURSE OBJECTIVES

1. Basic concepts of related to vectors & Scalars and Newton's laws of motion.

2. Key points related to forces.

3. Basic concepts related to Mechanical Vibrations.

4. Key points related to Mechanics of Solids.

5. To understand the fundamentals of Nano materials.

COURSE OUTCOMES (COs)

Studies will be familiar with

1. Various basic terms related to Vectors & Scalars and Newton's laws of motion.

2. Some of the basic concepts related to forces.

3. Simple terms related to Mechanical Vibrations.

4. Recognize importance of various mechanical properties of materials.

5. Understand the importance of Nanotechnology.

UNIT – I

MOTION OF PARTICLES: Scalars and Vectors – Types of Forces in Nature-Newton's laws and its completeness in describing particle motion – Motion of a variable mass system, motion of a rocket.

UNIT – II

FRAMES OF REFERENCES: Inertial & Non inertial frames of reference; Rotating coordinate system – Inertial forces and Properties - Centripetal and Coriolis forces– Effect of Coriol is force duetotherotationoftheEarth-ApplicationsofCentrifugalandCoriolisforces-Weathersystems.

UNIT –III

HARMONIC OSCILLATORS: Simple Harmonic oscillator and solution of differential equation, Damped harmonic motion and solution of differential equation–over damped, critically damped and lightly damped oscillators-Force do oscillations' and resonance(qualitative treatment).

UNIT –IV

MECHANICS OF SOLIDS: Elasticity and isotropic materials, stress, strain and Hooke's Law- Elastic constants of Isotropic solids - Internal energy due to strain – longitudinal strain, volume strain and shearing strain - Beams- classification-types of support

UNIT-V

PHYSICS OF NANOMATERIALS: Introduction, significance of nano scale–Surface are and Quantum confinement- Quantum dot, Quantum well ,Quantum wire -Synthesis of nano materials- Top Down Process- Ball Milling ; Bottom Up Process: Sol-Gel method– CNT-Properties of Graphene-Applications.

TEXT / REFERENCE BOOKS

1. Engineering Mechanics, 2nd ed. — M K Harbola
2. Introduction to Mechanics — M K Verma .
3. Engineering Mechanics - Dynamics, 7th ed. – J L Meriam
4. An Introduction to the Mechanics of Solids, 2nd ed. with SI Units — SH Crandall, NC Dahl & T J Lardner.
5. Engineering Mechanics of Solids — EP Popov.
6. B.E.A. Saleh and M.C, Tech, Fundamentals of photonics, John Wiley &Sons.
7. Mechanics and Properties of Matter – J.C.Upadhyaya, Himalaya Publishing House.
8. Waves & Oscillations – D.V.Bhrahmaji and A.Srinivasa Rao, Vivek Publications
9. Engineering Physics – K.Thyagarajan, McGraw Hill Education Private Ltd, New Delhi.

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(18HS0830) MATHEMATICS – I

COURSE OBJECTIVES

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

1. To introducetheideaofapplyingdifferentialandintegralcalculustonotionsofcurvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.

2. To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

3. To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.

4. To familiarize the student with functions of several variables that is essential in most branches of engineering.

5. To develop the essential tool of matrices and linear algebra in a comprehensive manner.

COURSE OUTCOMES (COs)

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT – I
Matrices: Inverse and rank of a matrix; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigen values and eigen vectors; Diagonalization of matrices; Cayley- Hamilton Theorem, and Orthogonal transformation.

UNIT – II
Calculus: Evaluation of definite and improper integrals; Applications of definite integrals to evaluate surface areas and volumes of revolutions; Beta and Gamma functions and their properties. Rolle's Theorem, Mean value theorems (without proof) Taylor's and Maclaurin's theorems.

UNIT – III
Multivariable Calculus: Limit, continuity and partial derivatives, total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, directional derivatives,

curl and divergence.

UNIT – IV
Sequences and Series: Convergence of sequence and series, tests for convergence (Geometric test, P- test, limit comparison test, D' Alember ratio test, Cauchy' s nth root test); Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.

UNIT-V
Fourier series: Determination of Fourier coefficients- Fourier series- Even and odd functions, Fourier Series in an arbitrary interval, Periodic function, Half range sine and cosine series

TEXT BOOKS
1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers- 42ndEdition(2012)
2. Engineering Mathematics Volume-I, by T.K.V. Iyengar, S.Chandpublication-12thEdition
3. A Text book of B.Sc. mathematics volume-II, V.Venkateswara Rao S.Chand Publications

REFERENCES
1. Ramana B.V. Higher Engineering Mathematics, Tata McGraw Hill NewDelhi,11th Reprint, 2010.
2. Engineering mathematics, volume-I&II, E.Rukmangadachari & E.Keshava Reddy, Pearson Publishers.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
5. Bhavanari Satyanarayana, T.V.Pradeep kumar & D.Srinivasulu ―Linear Algebra & Vector Calculus, Studera Press, New Delhi.

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(18CS0501) PROGRAMMING FOR PROBLEM SOLVING

COURSE OBJECTIVES

1. To understand the core aspects of computer problem solving techniques
2. To understand the programming language constructs
3. To understand the programming paradigms

COURSE OUTCOMES (COs)

1. Able to design the flowchart and algorithm for real world problems
2. Able to learn and understand new programming languages
3. Able to construct modular and readable programs
4. Able to write C programs for real world problems using simple and compound data types

UNIT I

OVERVIEW OF COMPUTERS AND C-PROGRAMMING: Description of Computer Hardware &Software.

INTRODUCTION TO C:overview of C, executing a ‗c' program, c-character set, constants, variables, data types, declaration of variables, assigning values to variables, managing input & output operations, operators and expressions, basics of algorithm and flow chart

UNIT II

DECISION&LOOPCONTROLSTATEMENTS: Introduction, If Statement, If-else Statement, Nested- If-else Statement, Else if Ladder, Switch case – break – continue – go to Statement ,for loop, nested for loop, while loop, do-while, do-while statement with while loop

UNIT III

ARRAYS: Introduction, one-dimensional (1D)-Arrays, declaration and initialization of one-dimensional (1D) - Arrays, Two – dimensional (2D) - Arrays, initialization of Two-dimensional (2D) - Arrays, Multi-dimensional Arrays

FUNCTIONS: Introduction, need for user-defined functions, a multi-function program, elements of user-defined functions, definition of functions, return values and types, category of functions, recursion, scope and life time of variables, preprocessor commands:#define, #include, multi file programs

UNIT IV

POINTERS: Introduction, understanding pointers, accessing address of a variable, declaring and initialization of pointer variables, accessing variable through pointers, chain of pointers,

pointer expressions, pointer increment and scale factor, pointers and arrays, passing arrays to functions, array of pointers, pointers as function arguments, functions returning pointers.

STRINGS: Introduction, declaring and initializing string variables, reading and writing strings, arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions, table of strings (array of strings)

UNIT V

STRUCTURES: Introduction , defining a structure , declaring structure variables ,accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members , arrays of structures ,arrays within structures, structures with in structures, structures and functions, unions, typed ef, enum

File Management in C: Introduction, Types of Files, Defining and Opening a File, Closing a File, Input / Output Operations on Files, Error handling during IO Operations, Random access to files, Command line arguments

TEXT BOOKS
1. C and Data Structures – Ashok Kamthane Pearson education
2. Programming in C and Data Structures – E Balagurusamy – McGraw Hill.

REFERENCES
1. Computer Fundamentals and C Programming - Dr. P. Chenna Reddy, ISBN: 9789351045885, Publisher:Pothi.com
2. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, and Oxford University Press.
3. C from Theory to Practice – George S. Tselikis – Nikolaos D.Tselikas – CRC Press.
4. Programming with C-R S Bichkar – University Press.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.(UNIT-I)

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2	1	-	3

(18CE0101) ENGINEERING MECHANICS

COURSE OBJECTIVES
1. To learn about forces and force systems and their applications
2. To learn about friction and to use the concept of Friction.
3. To learn how to find centroid of different objects using Mathematical formula.
4. To learn how to find Moments of Inertia of different objects using Mathematical formula.

COURSE OUTCOMES (COs)
On completion of this course, the student will be able to
1. Construct free body diagrams and develop appropriate equilibrium equations.
2. Understand the concepts of friction and to apply in real life problems.
3. Determine the centroid for composite sections.
4. Determine the Moment of Inertia for composite sections.

UNIT-I
Forces & Force Systems: Fundamental Principles – Resolution and Composition of Forces and Equilibrium of Particles – Lami's Theorem – Principle of Transmissibility –Principles of Continuum – Types of Force Systems –Resultant of Coplanar, Concurrent and Non-Concurrent Force Systems - Varignon's Theorem – Equilibrium of Coplanar Force Systems – Types of Beams and Supports – Support Reactions.

UNIT-II
Friction: Types of Friction– Laws of Friction–Limiting Friction–Cone of Limiting Friction - Ladder Friction - Wedge, Screw jack and differential Screw Jack

UNIT-III
Centroid: Centroids of Simple Figures (From Basic Principles) – Centroids of Composite Figures
Centre of Gravity: Centre of Gravity of Simple Body -Centre of Gravity of Composite Bodies- Pappus Theorem

UNIT-IV
Moment of Inertia: Definition – Parallel Axis Theorem and Perpendicular Axis Theorem– Polar Moment of Inertia – Radius of Gyration – Moment of Inertia of Basic Shapes - Composite Sections - Simple Solids.

UNIT-V
Analysis of Perfect Trusses: Types of Trusses – Perfect, Deficient and Redundant Trusses -

Cantilever Trusses and Simply Supported Trusses – Analysis of Trusses using Method of Joints and Methods of Sections.

TEXT BOOKS
1. A Text book of Engineering Mechanics, 3rd Edition, Bhavikatti SS, New Age International, 2016.
2. Engineering Mechanics, Dr. R. K. Bansal, 4th Edition, Laxmi Publications, 2011.

REFERENCES
1. Engineering Mechanics, D.S. Kumar, 3rd Edition, S.K. KATARIA &SONS
2. Singer's Engineering Mechanics: Statics and Dynamics, 3rd Edition, K. Vijaya Kumar Reddy,
3. J. Suresh Kumar, B.S. Publications, 2011.
4. Engineering Mechanics: Statics, 6th Edition, J L Meriam, L G Kraige, Wiley India Pvt. Ltd, 2001.
5. Engineering Mechanics: Dynamics, 6thEdition, JLMeriam, LGKraige, Wiley India Pvt .Ltd, 2010.

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-	-	3	1.5

(18HS0852) PHYSICS LAB

COURSE DESCRIPTION

Physics practical course is meant for making the students to gain practical knowledge to correlate with the theoretical studies. It covers experiments on principle of mechanics and optics, measurement of magnetic field and studying resonance using lcr circuit.

COURSE OBJECTIVES

1. *To explore the application of Interference and Diffraction by doing concerned experiments.*
2. *Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.*
3. *To understand the concept of energy gap, B-H curve and resonance phenomena in LCR circuits.*
4. *Develop an ability to apply the knowledge of physics experiments in the later studies.*

Suggested list of experiments: (Perform any EIGHT experiments from the following)

1. Determination of wavelengths of various colors of Mercury spectrum using Diffraction Grating – Normal Incidence method.
2. Determination of Dispersive power of prism.
3. Rigidity Modulus – Torsional Pendulum
4. Study of Resonance effect in Series and Parallel LCR circuit.
5. Determination of thickness of thin object by wedge method.
6. Determination of radius of curvature of Plano convex lens – Newton's Rings.
7. Determination of wavelength of a given laser source by using diffraction grating.
8. Determination of particle size using laser source.
9. Determination of energy gap of a semi-conductor using p – n junction diode.
10. B- H curve.
11. Magnetic field along the axis of current carrying coil – Stewart & Gee's Method.
12. Determination of frequency of tuning fork - Melde's Apparatus.
13. Determination of spring constant – Coupled Oscillator.
14. Study of Characteristics of Solar Cell.
15. Determination of Numerical Aperture of an Optical fiber.

REFERENCE BOOKS

1. Engineering Physics practical – NU Age Publishing House, Hyderabad.
2. Engineering Practical Physics – Cengage Learning, Delhi.

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-	-	3	1.5

(18CS0503) PROGRAMMING FOR PROBLEM SOLVING LAB

COURSE OBJECTIVES

1. *To make the student learn C Programming language.*
2. *To make the student solve problems, implement those using C & C++ programming languages.*
3. *Tostrengthentheabilitytoidentifyandapplythesuitabledatastructureforthegivenrealworld problem.*

COURSE OUTCOMES (COs)

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

1. *Apply problem solving techniques of C to find solution.*
2. *Use C language features effectively to implement solutions.*
3. *Use C++ language features effectively to solve problems.*
4. *Identify and develop apt searching and sorting technique for a given problem.*
5. *Identity, design and develop the appropriate data structure for a given problem or application.*

EXPERIMENTS LIST

1. a)Acquainting students to ‒c programming environment and DOS commands
   b) Calculate sum of three numbers using c-program
2. a) swap(exchange) values of two integer variables using c-program
   b) Read an integer, a character and a float values through keyboard and display
   c) Check operators precedence and associativity using c-program
   d) Write a c-program using all basic data types of clan gauge
3. a) Read 3 integer values through keyboard and display largest among them
   b) Readmarksof5subjectsobtainedbyastudentthroughkeyboardanddisplay‒failor‒pass message on console
   c) Using switch () statement implement arithmetic operations
4. a) Check whether entered number is prime number
   b) Display factorial of entered number
   c) Display all multiples of an entered number up to given value(n)
5. a) Generate fibonacci series up to entered number(n)
   b) Find out sum of the digits of a number
6. a) Find the binary equivalent of entered decimal number
   b) Generation multiplication table of entered number(n)
7. a) Calculate sum of two integer matrices

b) Calculate product of two integer matrices
8. a) Create your header file by including 2 user(your) defined functions and include them in a c-program student
b) Find out factorial of a number using recursive function
c) Findsquareofanenterednumberusing–callbyaddress(reference) technique
d) A program that tells us purpose of few predefined functions in–math.h header file
9. a) check whether entered string is palindrome
b) Write a program to sort the entered set of strings using structure concept
10.   a) Count number of vowels, consonants, digits, white spaces and special characters in entered string(a line of text)
b) Swap (exchange) values of two integer variables using pointers
11. a) For 3 students with 3 subjects, calculate total marks and grade obtained by each
b) Read data from a file (text) and display it on the monitor
12.   a) Copy contents of one file(text) to other created file
b) Merge contents of two files (text) and store it in another created file

REFERENCES
1. How to solve it by Computer, R.G. Dromey, Pearson.
2. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. Let us C Yeswant Kanetkar, BPB publications
4. Pointers in C, Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education

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(18ME0301) WORKSHOP PRACTICE LAB

COURSE OBJECTIVES

The course provides hands-on training in the trades of Carpentry, Fitting, House- wiring, Tin Smithy, and Foundry. Overview of metal cutting processes, plumbing and welding is provided through live demonstrations.

COURSE OUTCOMES (COs)

After completion of this course, a successful student will be able to:
1. *Utilize workshop tools for engineering practice.*
2. *Employ skills for the production a component for real time applications.*
3. *Appreciate the hard work and intuitive knowledge of the manual workers.*

LIST OF EXPERIMENTS

1. TRADES FOR EXERCISES
a. **Carpentry shop**: Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, Cross lap joint, Mortise and tenon T joint, Bridle T joint from soft wood stock.
b. **Fitting shop**: Two joints (exercises) from: Square joint, V joint, half round joint or Dovetail joint out of 100 x 50 x 5 mm M.S. stock.
c. **Sheet metal shop**: Two jobs (exercises) from: Tray, Cylinder, Hopper or Funnel from out of 22 or 20 gauge G.I. sheet.
d. **House-wiring**: Two jobs (exercises) from: Wiring for ceiling rose and two lamps (bulbs)with independent switch, two way switch, controls with or without looping, wiring for stair case lamp, wiring for water pump with single phase starter.
e. **Foundry**: Preparation of two mould (exercises): for a single pattern and a double pattern.
f. **Welding**: Preparation of two welds (exercises): Single V butt joint, Lap joint, Double V butt joint or T fillet joint.

2. TRADES FORDEMONSTRATION:
a. **Plumbing**
b. **Machine Shop**
c. **Metal Cutting**
   Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop

safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge fall shop practices may be stressed upon rather than skill acquired in making the job.

REFERENCES

1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd.,2009
2. Work shop Manual, P.Kannaiah & K.L.Narayana, and SciTech Publishers. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.

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3	1	-	4

(18HS0801) CHEMISTRY

COURSE OBJECTIVES

1. *Developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools*
2. *Technology is being increasingly based on the electronic, atomic and molecular level modifications.*
3. *Quantum theory is more than 100 years old and to understand phenomena at Nanometer levels, one has to base the description of all chemical processes at molecular levels.*

COURSE OUTCOMES (COs)

1. *Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.*
2. *Able to design the flowchart and algorithm for real world problems*
3. *Able to learn and understand new programming languages*
4. *Able to construct modular and readable programs Rationalise bulk properties and processes using thermodynamic considerations.*
5. *Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.*

UNIT-I
ATOMIC, MOLECULAR STRUCTURE AND PERIODIC PROPERTIES: Schrodinger Wave equation, Molecular orbital's of diatomic molecules. Energy level diagrams of diatomic. Pi - molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties Effective Nuclear charge, variations of s, p, d and f orbital energies of atoms in the periodic table, atomic and ionic sizes, oxidation states, hard soft acids and bases, molecular geometries.

UNIT-II
USES OF FREE ENERGY AND CHEMICAL EQUILIBRIA: Thermodynamic functions: Energy Entropy and free energy, Cell potentials, Nernest equations and Its Applications. Acid base Oxidation, reduction and Solubility Equilibria
Corrosion: Types of Corrosion, Factors Influencing the rate of Corrosion, Prevention of Corrosion (Sacrificial anodic protection, Impressed Cathodic Protection), Anodic and Cathodic Inhibitors, Electro plating (Copper, Nickel, Chromium) and Electro less Plating.

UNIT-III

WATER TECHNOLOGY: Hardness of water and its units, Estimation of Hardness by EDTA method - Boiler Troubles: Scale & Sludge, Priming and Foaming and Boiler corrosion. Municipal Solid waste water Treatment-Break point chlorination, Water softening methods (Lime-Soda, Zeolite, Ion-Exchange resins) - Demineralization of Brackish Water: Reverse Osmosis and Electro Dialysis.

UNIT-IV

ORGANIC REACTIONS AND ORGANIC POLYMERS: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, Synthesis of a commonly used drug molecules (Paracetamol, Penicillin, Prodrugs - Asprin, Sulfa drugs)

Organic polymers types (Thermosetting and Thermoplastics), Preparation, Properties and Engineering Applications of PVC, Teflon, Nylon6,6, Bakelite), Moulding Process and its uses, Conducting polymers (polyacetylene, Polyaniline).

UNIT-V

SPECTROSCOPIC TECHNIQUES AND APPLICATIONS: Principles, selection rules and applications of absorption (UV/Visible, Atomic Absorption, Infrared) and Emission spectroscopy (Flame photometry and Fluorescence and its applications in medicine. Advanced Instrumental Techniques and their Significance: XRD, Scanning Electron microscope (SEM) and Transmission electron microscopy (TEM)

TEXT BOOKS

1. University chemistry, by B. H.Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A.Plane
3. Fundamentals of Molecular Spectroscopy, by C. N.Banwell
4. EngineeringChemistry(NPTELWeb-book),byB.L.Tembe,KamaluddinandM.S.Krishnan
5. Physical Chemistry, by P. W.Atkins
6. Organic Chemistry: Structure and Function by K.P.C.Volhardt and N.E. Schore, 5th Edition
7. http://bcs.whfreeman.com/vollhardtschore5e/default.asp

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(18HS0831) MATHEMATICS – II

COURSE OBJECTIVES

The objective of this course is to familiarize the prospective engineers with techniques in Multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

1. *To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.*
2. *To introduce effective mathematical tools for the solutions of differential equations that model physical processes.*
3. *To introduce the tools of differentiation and integration of functions of complex variable those are used in various techniques dealing engineering problems.*

COURSE OUTCOMES (COs)

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariable calculus and complex analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of Mathematics and applications that they would find useful in their disciplines.

UNIT-I

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-II

Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

UNIT-III

Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Triple integrals (Cartesian), orthogonal curvilinear coordinates.

UNIT-IV

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

UNIT-V

Complex Variable–Integration: Contour integrals, Cauchy- Goursat theorem (without proof), Cauchy Integral formula (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

TEXT BOOKS
1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers
2. Engineering Mathematics Volume-I &III by T.K.V. Iyengar, S.Chand publication

REFERENCES
1. Engineering Mathematics, volume-I&III, E. Rukmangadachari & E.Keshava Reddy Pearson Publishers
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Engineering Mathematics-I & III, T.K.V.Iyengar S.Chand Publications.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. N.P.Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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(18EE0240) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OBJECTIVES

1. *To understand the nature of different circuit elements, fundamental laws and network Theorems.*
2. *Understand the operation of dc machines and single phase transformers.*
3. *Understand the characteristics of the p-n junction diode.*
4. *Understand the characteristics of BJT, FET, MOSFET and characteristics of special purpose electronic devices.*

COURSE OUTCOMES (COs)

Upon completion of the course, students will:

1. *Determine the equivalent impedance of given network by using network reduction techniques.*
2. *Determine the current through any element and voltage across any element*
3. *Apply the network theorems suitably.*
4. *Analyze the operating principles of motor and transformer.*
5. *Analyze the operating principles of major electronic devices, its characteristics and applications.*
6. *Design and analyze the DC bias circuitry of BJT and FET.*

PART-A

UNIT I

INTRODUCTION TO ELECTRICAL ENGINEERING

Ohm's Law, Basic Circuit Components, Kirchhoff's Laws, Types of Sources, Resistive Networks, Inductive Networks, Capacitive Networks, Series Parallel Circuits, Star Delta and Delta Star Transformation. Principle of AC Voltages, Root Mean Square and Average Values of Alternating Currents and Voltage, Form Factor and Peak Factor, Phasor Representation of Alternating Quantities.

UNIT- II

NETWORK THEOREMS & TWO PORT NETWORKS

Network Theorems: Thevenin's, Norton's, Maximum Power Transfer, Reciprocity and Superposition Theorems for DC Excitations.

Two Port Networks: Two Port Network Parameters – Impedance, Admittance, Transmission and Hybrid Parameters and Their Relations

UNIT-III
DC MOTORS and TRANSFORMERS

DC Motors: Principle of Operation of DC Motors, Types of DC Motors, Torque Equation, Losses and Efficiency Calculation in DC Motor - Swinburne's Test and Applications.

Transformers: Principles of Operation, EMF equation, Losses and Efficiency, Regulation of Transformer, Testing: OC & SC Tests.

PART-B

UNIT I

Semiconductor Devices: Intrinsic semiconductors-Electron-Hole Pair Generation, Conduction in Intrinsic Semiconductors, Extrinsic Semiconductors-N-Type and P-Type Semiconductors, Comparison of N-Type and P-Type Semiconductors. The p-n Junction – Drift and Diffusion Currents, The p-n Junction Diode-Forward Bias, Reverse Bias, Volt-Ampere Characteristics- Diode Specifications, Applications of Diode, Diode as a Switch. Diode as a Rectifier-Half-wave Rectifier, Full-Wave Rectifier, Full-Wave Bridge Rectifier, Rectifiers with Filters, Zener Diode- Volt-Ampere Characteristics, Zener Diode as Voltage Regulator.

UNIT II

BJT: Bipolar Junction Transistor (BJT) – Types of Transistors, Operation of NPN and PNP Transistors, Input-Output Characteristics of BJT-CB, CE and CC Configurations, Relation between IC, IB and IE. Transistor Biasing- Fixed Bias, Voltage Divider Bias, Transistor Applications- Transistor as an Amplifier, Transistor as a Switch.

UNIT III

JFET & MOSFET: Junction Field Effect Transistor (JFET)- Theory and Operation of JFET, Output Characteristics, Transfer Characteristics, Configurations of JFET-CD, CS and CG Configurations, JFET Applications-JFET as an Amplifier, JFET as a Switch, Comparison of BJT and JFET,MOSFET-The Enhancement and Depletion MOSFET, Static Characteristics of MOSFET, Applications of MOSFET.

TEXT BOOKS
1. Basic Electrical Engineering, M.S.Naidu and S.Kamakshiah – TMH.
2. Basic Electrical Engineering, T.K.Nagasarkar and M.S.Sukhija Oxford University Press.

REFERENCES
1. Theory and Problems of Basic Electrical Engineering, D.P.Kothari & I.J.Nagrath, PHI.
2. Principles of Electrical Engineering, V.KMehta, S.Chand Publications.
3. Fundamentals of Electrical Electronics Engineering, T.Thyagarajan, SCITECH Publications 5th Edition - 2007.
4. Electrical and Electronic Technology, Hughes–Pearson Education, 2012.

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(18HS0810) ENGLISH

COURSE OBJECTIVES

1. To develop interest in reading English Literature for language learning.

2. To improve knowledge and understanding of Grammar.

3. To enhance the ability for making use of grammar in writing English.

4. To enrich communication skills among the students.

5. To develop their insight and positive attitude towards English language.

6. To impart LSRW skills and inculcate the habit of learning.

7. To build vocabulary.

COURSE OUTCOMES (COs)

Students will be able:

1. To understand the rules of English grammar and their usage in writing English.

2. To use LSRW skills through the prescribed text and develop their ability to communicate effectively.

3. To get the mastery of language to express ideas, views, feelings and experience.

4. To communicate well among themselves.

5. To inculcate values and ideal characteristic qualities in themselves.

UNIT - I

Reading:

1. *All the World's a Stage* by William Shakespeare. (Act-II, Scene-VII).

2. *After Twenty Years* by O.Henry.

Writing: Nature and Style of Sensible Writing: Describing & Defining.

Speaking: Oral Communication (involves interactive practice sessions) Self -introduction and introducing a friend.

Listening: Listening activity (Present tense)

Vocabulary: The concept of word formation & root words from foreign languages.

Grammar: Subject – Verb Agreement. Sentence Structures & use of phrases and clauses in sentences. Identify in common errors in noun, pronoun and adjectives

UNIT - II

Reading:

1. *I Have a Dream* Martin Luther Kingjr.

2. *Knowledge and Wisdom* by Bertr and Russell.

Writing: Importance of proper punctuation and creating coherence- Simple sentences.

Speaking: Expressing apology.

Listening: Listening activity.(Past tense)

Vocabulary: Prefixes and Suffixes.
Grammar: Identifying common errors in Articles, Modifiers and degrees of comparison.

UNIT - III
Reading:
1) Nelson Mandela(Biography)
2) The Happy Prince by Oscar wilde.
Writing: Paragraph writing – letter writing.
Speaking: Situational dialogues **Listening:** Listening activity (Future tense) **Vocabulary:** Synonyms and Antonyms.
Grammar: Identifying common errors in Prepositions and Link words and complex sentences.

UNIT - IV
Reading:
1. *Where the Mind is without Fear* by Rabindra Nath Tagore.
2. Cause, Effect and Control Measures of Pollution (Air, Water, Noise) and Nuclear Hazards.
Writing: Essay writing - Organizing principles of essay writing - Introduction and Conclusion. **Speaking:** Public speaking dynamics
Listening: Listening activity (Active voice and passive voice)
Vocabulary: Abbreviations and Acronyms.
Grammar: Identifying common errors in redundancies and compound sentences.

UNIT -V
Reading:
1. *The Road not Taken* by Robert Frost.
2. *An Astrologer's Day* by R K Narayan.
Writing: Techniques for writing precisely.
Speaking: Interviews and formal presentations
Listening: speeches of A P J Abdul Kalam, Steve Jobs and so on
Vocabulary: One word substitutes.
Grammar: Identifying common errors in clichés.

REFERENCE BOOKS
1. Practical English Usage. Michael Swan. OUP.1995
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book,2000
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press,2006
5. CommunicationSkills.SanjayKumarandPushpLata.OxfordUniversityPress,2011
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyd. Oxford University Press,2005
7. Oscar Wilde, Create Independence Publisher, Kindle Edition,2017
8. The Complete Works of William Shakespeare, Kindle Edition,2017
9. G. P. Editors, the Complete Works of William Shakespeare, Global Classic,2018
10. Robert Frost, Robert Frost Collection, Wider Publication,2011

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(18ME0302) ENGINEERING GRAPHICS & DESIGN

COURSE OBJECTIVES

1. To familiarize the students in basic concept of conic sections, projections and development of objects.
2. To develop the imagination and drafting skills of students.

COURSE OUTCOMES (COs)

Students undergoing this course are able to
1. Frame ideas based on the conceptual modeling and design
2. Provide good understanding of the methods involved in preparing various views in Engineering drawings
3. Can prepare 2D and 3D diagrams of various objects

UNIT-I
Introduction to Engineering Drawing - Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections, Cycloids and Involutes.

UNIT-II
Projections of Points - Principles of Orthographic Projections-Conventions - Projections of Points, Traces
Projections of straight lines Inclined to both the planes - simple problems only, Traces

UNIT-III
Projections of Planes – Planes (Inclined to single plane only)
Projections of Solids- Introduction– Projections of right regular solids-Prisms, Pyramids in different positions (Single plane only)

UNIT-IV
Sections of solids - Sectional Views of Right regular Solids - Prisms, Pyramids
Development of surfaces - Development of surfaces of Right Regular Solids - Prisms, Pyramids

UNIT-V
Orthographic Projections - Principles of Orthographic projection, Conversion of objects from 3D to 2D
Isometric Projections - Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids, Conversion of 2D to 3D.

Auto CAD (for Practice only not for External Exam)

Introduction to CAD, Applications, commands, Tool bar, modeling of Simple parts, isometric problems

TEXT BOOKS

1. Engineering Drawing, N.D.Bhatt, Charotar Publishers
2. A text Book of Engineering Drawing, K.L.Narayana, Kannaiah, Scitech Publishers, 2010
3. Engineering Graphics with using AutoCAD, 2007. Jeyapoovan.T, Vikas Publishing House

REFERENCES

1. Fundamentals of Engineering Drawing, WarrenJ. Luzadder and Jon. M.Duff, Prentice Hall of India Pvt., Ltd., Eleventh Edition,2001
2. Engineering Graphics, Bhattacharyya, S.C.Bera, I.K .International Pvt Ltd.2009.
3. A text Book of Engineering Drawing and Graphic, K.Venugopal New Age Publishing New Delhi, 2008.

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(18HS0802) CHEMISTRY LAB

LABORATORY OUTCOMES

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

1. *Estimate rate constants of reactions from concentration of reactants/products as a function of time.*
2. *Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.*
3. *Synthesize a small drug molecule and analyse a salt sample.*

LIST OF EXPERIMENTS

1. Estimation of copper by EDTA method
2. Determination of chloride content of water
3. Determination of acidity of water sample.
4. Determination of alkalinity of water sample
5. Potentiometric determination of Fe^{2+} by potassium permanganate.
6. Determination of Viscosity of an oil by Redwood Viscometer
7. Determination of dissolved oxygen in a water sample by Winkler's method
8. Conductometric titrations of strong acid against strong base.
9. Chemical analysis of a salt
10. Synthesis of a polymer/drug

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(18HS0811) ENGLISH LAB

COURSE OBJECTIVES

To get the job students dream of today largely depends on the way they communicate. Due to globalization, civilization and fast growing technologies, communication has become a very important factor. Good communication skills increase the possibilities of getting good jobs. To meet the requirement of corporate word one has to be capable of expressing oneself.

1. *To provide Computer Assisted Language Learning facility for the students on self-instructional method for improving language.*
2. *To improve the correct articulation as English is international language.*
3. *To enhance the communication skills with a variety of activities and practice sessions.*

COURSE OUTCOMES

Students will be able:

1. *To recognize sounds of English language with different classifications.*
2. *To know phonetic transcription and phonemic symbols of English language.*
3. *To understand international accent and utilize the same in their daily conversation.*
4. *To crease confidence for public speaking, for facing interviews, for making effective oral presentations, for having discussions, and for delivering impromptu speeches.*

UNIT - I

Importance of Phonetics – Introduction, organs of speech, classification of sounds, and Phonetic transcriptions.

UNIT - II

a) Syllable, Syllabification, Word stress, Stress Rules and Intonation.
b) Intonation (Falling, Raising, and fall-raise) - Pitch and Rhythm.
c) Influence of mother tongue (MTI) - Common Indian Variants in pronunciation.
d) Difference between British and American Pronunciation

UNIT - III

a) Vocabulary building.
b) Functional English; Telephone skills; Giving Directions; Situational dialogues; Role play.
c) JAM, Oral presentation-Prepared and extempore and PPT presentation.

UNIT - IV

a) Describing people, places, things and situations- Body language–- listening some

UNIT - V

a) Preparation of resume (C.V) & Cover Letter.
b) Interview Skills – mock interviews.
c) Group Discussion, Debate and Dress code

Minimum requirement for ELCS LAB

1. Computer Assisted Language Learning (CALL) Lab: The Computer Aided Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.
2. TheCommunicationSkillsLabwithmovablechairsandaudiovisualaidswithaP.A.   system, Projector, a Digital stereo audio & video system and Camcorder etc.
   System Requirement (Hardware component):
   Computer network with: LAN with minimum 60 multimedia systems with the following. Specifications:
i) P- IV Processor
a) Speed 2.8GHZ
b) RAM – 512 MB Minimum
c) Hard Disk – 80GB
ii) Headphones of High quality.

SUGGESTED SOFTWARE

1. Clarity pronunciation power--- Part 1(sky pronunciation)
2. Clarity pronunciation power--- Part2
3. K-Van Advanced Communication Skills.
4. Walden Info tech Software.

REFERENCES

1. A Text book of English Phonetics for Indian Students, second edition T. Balasubramanian. (Mcmillian) 2012
2. A Course in Phonetics and spoken English, Dhamija Sethi, Prentice-hall of India Pvt. Ltd, 2000.
3. Speaking English Effectively, second Edition Krishna Mohan & NP Singh 2011(Mcmillian).
4. A Hand Book of English Laboratories, E.Sureshkumar , P.Sreehari, Foundation books,2011.
5. Spring Board Success, Sharada Koshik, Bindu Bajwa, Orient Black Swan, Hyderabad, 2010.

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(18HS0816) INDIAN CONSTITUTION

COURSE OBJECTIVES

Students will be able to:

1. *Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.*
2. *To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.*
3. *To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.*

COURSE OUTCOMES (COs)

Students will be able to:

1. *Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.*
2. *Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.*
3. *Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.*
4. *Discuss the passage of the Hindu Code Bill of1956.*

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of Indian its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few

critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times.

These amendments reflect political, social and economic developments since the year1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

COURSE CONTENT
1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India.
9. Amendment of the Constitutional Powers and Procedure.
10. The historical perspectives of the constitutional amendments in India.
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self-Government – Constitutional Scheme in India.
13. Scheme of the Fundamental Right to Equality.
14. Scheme of the Fundamental Right to certain Freedom under Article19
15. Scope of the Right to Life and Personal Liberty under Article21

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(18HS0803) BIOLOGY FOR ENGINEERS

COURSE OBJECTIVES

1. *Describe how biological observations of 18th Century that lead to major discoveries.*
2. *Convey that classification is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological*
3. *Highlight the concepts of recessive ness and dominance during the passage of genetic material from parent to off spring*
4. *Convey that all forms of life have the same building blocks and yet the manifestations areas diverse as one can imagine*

COURSE OUTCOMES (COs)

1. *Classify enzymes and distinguish between different mechanisms of enzyme action.*
2. *Identify DNA as a genetic material in the molecular basis of information transfer.*
3. *Analyse biological processes at the reduction istic level*
4. *Apply thermodynamic principles to biological systems.*
5. *Identify and classify microorganisms.*

UNIT I
INTRODUCTION & CLASSIFICATIONS OF ORGANISMS

Introduction - classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) Energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes
(d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial
(e) Molecular taxonomy- three major kingdoms of life. Model organisms - study of different groups - E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

UNIT II
GENETICS PURPOSE

Concept of allele - Gene mapping, Gene interaction, Epistasis - Meiosis- Concepts of recessiveness and dominance - Concept of mapping of phenotype to genes - single gene disorders in humans - Complementation in human genetics.

UNIT III
BIOMOLECULES PURPOSE & ENZYMES PURPOSE

Building blocks of Molecules of life & it's types. Introduction & Concepts- Monomer units and polymeric structures, Sugars, starch, cellulose, Amino acids, proteins, Nucleotides, DNA/RNA, Two carbon units and lipids.
Role of catalysis life in existed on earth Enzymology: Enzyme classification. Mechanism of

enzyme action. Enzyme kinetics and kinetic parameters related to Biology. RNA catalysis Classifications and Procedure for Enzyme catalyzed reactions with two examples.

UNIT IV
INFORMATION TRANSFER PURPOSE & MACROMOLECULAR ANALYSIS PURPOSE

Molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. Genetic material of DNA, Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Introduction and Explanation of genetic code and degeneracy of genetic code Gene - complementation and recombination

Biological processes at the reductionist level Proteins - structure and function. Hierarch in protein structure - Primary secondary, tertiary and quaternary structure - Proteins as enzymes, transporters, receptors and structural elements

UNIT V
METABOLISM PURPOSE

The principles of energy transactions - in physical and biological world - Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions - Concept of Keq and its relation to standard free energy - Spontaneity ATP as an energy currency- including breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis) - Energy yielding and energy consuming reactions

Microbiology -single celled organisms -species and strains - Identification and classification of microorganisms – Microscopy - Ecological aspects of single celled organisms - Sterilization and media compositions - Growth kinetics

REFERENCES

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown

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(18HS0832) TRANSFORM & DISCRETE MATHEMATICS

COURSE OBJECTIVES

The objective of this course is to familiarize the prospective engineers with techniques in Transform Calculus and Discrete Mathematics. It aims to equip the students to deal with advanced level of mathematic and applications that would be essential for their disciplines. More precisely, the objectives are:

1. *To acquaint the student with mathematical tools needed in evaluating Transform Calculus and their usage.*
2. *To train the students thoroughly in Mathematical concepts of Algebraic structures, Recurrence Relation, Graph Theory.*
3. *To develop the skill pertinent to the practice of the mathematical concepts including the student's abilities to formulate and modeling the problems, to think creatively and to synthesize information.*

COURSE OUTCOMES (COs)

The objective of this course is to familiarize the prospective engineers with techniques in Transform Calculus and Discrete Mathematics. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT- I
Transform calculus-I:
Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, Convolution theorem. Evaluation of integrals by Laplace transforms. Solving ODEs by Laplace Transform method

UNIT- II
Transform calculus-II:
Fourier transforms: Fourier sine and cosine transform, properties, inverse Fourier transforms, finite Fourier transforms.

UNIT- III
Algebraic Structures:
Algebraic structures with one binary operation – semi group, monoid and group Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup.

UNIT-IV

Introduction to Counting:

Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, Combination, summations - Introduction to recurrence relation and generating functions

UNIT-V

Introduction to Graphs:

Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees

TEXT BOOKS

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics II by T.K.V. Iyengar, S.Chand publications.
3. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.

REFERENCES

1. E.Rukmangadachari & E.Keshava Reddy, Engineering mathematics, volume-II, Pearson Publishers N. Deo, Graph Theory, Prentice Hall of India, 1974.
2. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill,1999
3. J.P.Tremblaya nd R.P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill,1997

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR (AUTONOMOUS)

II B.Tech – I Sem.

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(18CE0102) INTRODUCTION TO CIVIL ENGINEERING

COURSE OBJECTIVES

1. *To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering*
2. *To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.*
3. *To import knowledge of construction practices*
4. *This subject provides the knowledge of building bye laws, registration, planning of various types of buildings.*

COURSE OUTCOMES (COs)

1. *Introduction to what constitutes Civil Engineering*
2. *Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering*
3. *Highlighting the depth of engagement possible within each of these areas*
4. *Supervise the construction activities*
5. *Able to understand the Building Bye laws*
6. *Able to plan a residential & public building*

UNIT I

INTRODUCTION TO CIVIL ENGINEERING: Engineering and Civil Engineering - History of Civil Engineering - Early Constructions and Developments over Time

BROAD DISCIPLINES OF CIVIL ENGINEERING: Environmental Engineering & Sustainability - Geotechnical Engineering - Structural Engineering - Traffic & Transportation Engineering – Architecture – Photogrammetry, Remote Sensing and GIS, Hydraulics, Hydrology &Water Resources Engineering:

UNIT II

FOUNDATION: Functions of Foundation – Requirements of Good Foundation – Type of Foundation – Foundation Failures and Remedial Measures.

MASONRY: Definition of Terms Used in Masonry – Stone Masonry - Classification of Stone Masonry–Brick Masonry- English and Flemish Bonds in Brick Masonry–Defects in Brick Masonry

UNIT III

FLOORS: Components of Floor – Types of Floors: Cement Concrete Flooring - Marble Flooring Tiled Flooring - Timber Flooring – Rubber Flooring.

ROOFS: Pitched, Flat and Curved Roofs - Lean-to-Roof, Coupled Roofs -Trussed Roofs- King and Queen Post Trusses

DOORS AND WINDOWS: Location of Doors and Windows-Types of Doors–Types of Windows.

UNIT IV
LINTELS & ARCHES: Classification of Lintels–Classification of Arches.
PLASTERING AND POINTING: Types of Mortars for Plastering – Methods of Plastering – Defects in Plastering – Pointing.
STAIRS: Technical terms – Requirements of Good Stair – Classification of Stairs.

UNIT -V
PLANNING OF BUILDINGS: Types of Buildings: Types of Residential Buildings – Site Selection for Residential Building – Green Buildings-Orientation of Buildings: Aspect; Prospect; Privacy; Furniture Requirement; Grouping; Circulation; Sanitation; Lighting; Ventilation; Cleanliness; Flexibility; Elegancy; Economy; Practical Considerations.
BUILDING BYELAWS AND REGULATIONS: Introduction – Terminology – Objectives of Building Byelaws - Minimum Plot Sizes - Open Space Requirements - Plinth Area, Floor Area, Carpet Area - Floor Area Ratio (FAR), Floor Space Index (FSI) - Areas for Different Units - Principles Underlying Building Byelaws - Built up Area Limitations – Height of Buildings - Wall Thickness - Lighting and Ventilation Requirement - Safety from Fire - Drainage and Sanitation - Applicability of the Byelaws.

TEXT BOOKS
1. Elements of Civil Engineering, Saikia, Mimi Das, Bhargab Mohan, Das, Madan Mohan, PHI Learning Pvt. Ltd. NewDelhi
2. Building Planning, Designing and Scheduling, Gurcharan Singh, Standard Publisher Distributors
3. Building Planning and Design,8th Revised Edition, N. Kumaraswamy and A.Kameswara Rao, Charotar Publishing House Pvt. Ltd.,
4. Building Construction, 11th Edition, Dr. B.C. Punmia, Dr. Ashok Kumar Jain, Dr.Arun Kumar Jain, Laxmi Publications.

REFERENCES
1. Building by Laws by State and Central Governments and Municipal Corporations.
2. National Building Code.
3. Building Drawing with an Integrated Approach to Built Environment, 4th Edition, M. Shah, C. Kale, S. Patki, Tata McGraw Hill Education
4. A Textbook on Building Construction, Dr. S.K. Sharma, S. Chand Publishers.

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(18CE0103) INTRODUCTION TO SOLID MECHANICS

COURSE OBJECTIVES

1. To learn about simple stresses and strains and their applications.

2. To learn how to find shear force and bending moment and construction of SFD &BMD.

3. To understand about the concept of simple bending and shear stress distribution.

4. To learn about deflections of Beams by using different methods.

5. To learn about columns their applications.

COURSE OUTCOMES (COs)

Students undergoing this course are able to:

1. The students would be able to understand the behavior of materials under different stress and strain conditions.

2. The students would be able to draw bending moment, shear force diagram, bending stress and shear stress distribution for beams under the different conditions of loading.

3. The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams under various loading conditions

4. Determine shear stress in the shaft subjected to torsional moments.

UNIT-I

SIMPLESTRESSESANDSTRAINS: Concept of stress and strain, St.Venant's principle, stress and strain diagram, Elasticity and plasticity–Types of stresses and strains–Hooke's law– Factor of safety - Poisson's ratio and volumetric strain–Elastic moduli and there relationship between them – Bars of varying section – composite bars – Temperature stresses.

COMPOUND STRESSES AND STRAINS: Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain. Relationship between elastic constants

UNIT-II

SHEARFORCEANDBENDINGMOMENTS:Typesofsupportsandbeams–Shearforceand bending moment diagrams for cantilever, simply supported and over hanging beams with point loads, uniformly distributed load, uniformly varying loads and couples – Relationship between bending moment, shear force and loading.

THEORY OF SIMPLE BENDING: Assumptions in the theory of simple bending – Derivation of bending equation: $M/I = f/y = E/R$.

UNIT-III

SHEAR STRESS DISTRIBUTION: Derivation of formula – Shear stress distribution in

rectangular, triangular, circular, I and T sections.

TORSION OF CIRCULAR SHAFTS AND SPRINGS: Theory of pure torsion - Torsional theory applied to circular shafts – Power transmission-Close and open coiled helical springs under axial loads and axial twist – Carriage springs

UNIT-IV

DEFLECTIONS OF BEAMS: Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and Deflection for determinant beams

UNIT-V

COLUMNS: 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.

TEXT BOOKS
1. Strength of Materials (Mechanics of Solids), 6th Edition, Dr. R.K. Rajput, S.Chand Publishing
2. A Textbook of Strength of Materials, 6th Edition, Dr. R. K. Bansal, Laxmi Publications.
3. An Introduction to the Mechanics of Solids. 2nd Edition, New York, NY: McGraw Hill, 1979.
4. Strength of Materials, fundamentals and applications, Dr.T D Gunneswara Rao, Cambridge University Press.

REFERENCES
1. Mechanics of Materials, Revised, 2016 Edition, Dr. B. C. Punmia, Dr. Ashok Dr.Jain, Dr. Arun Kumar Jain, Laxmi Publications
2. Strength of Materials, 3rd Edition, R. Subramanian, Oxford University Press
3. Strength of Materials, 24th Edition, R. S. Khurmi, S. Chand Publishing
4. Strength of Materials, 11th Edition, Sadhu Singh, Khanna Publishers

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(18CE0104) INTRODUCTION TO FLUID MECHANICS

COURSE OBJECTIVES

1. To understand the basic concepts of Fluid properties and fluid statics.

2. To understand the applications of fluid kinematics and dynamics.

3. To understand the behavior of pipe flow and losses in pipe flow.

4. To understand the concepts of flow measurements and boundary layer flows.

COURSE OUTCOMES (COs)

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

1. Determine the properties of fluid like pressure and their measurement.

2. Apply continuity equation and energy equation in solving problems on flow through conduits.

3. Compute the frictional loss in laminar and turbulent flows.

UNIT-I

FLUID PROPERTIES: Dimensions and Units - Definition of a Fluid – Physical Properties of Fluids- Density, Specific Weight, Specific Volume, Specific Gravity, Compressibility, Vapour Pressure, Surface Tension and Capillarity and Viscosity

FLUID STATICS: Pascal's Law – Pressure Variation in a Static Fluid – Atmospheric, Gauge and Absolute Pressures - Measurement of Pressure – Piezometer – U–Tube and Inverted U–Tube Manometers - Hydrostatic Forces on Plane and Curved Surfaces - Center of Pressure - Meta Centric Height – Buoyancy Forces

UNIT-II

FLUID KINEMATICS: Fluid Kinematics- Classification of Fluid Flow- Steady and Unsteady Flow; Uniform and Non-Uniform Flow; Laminar and Turbulent Flow; Rotational and Irrotational Flow; Compressible and Incompressible Flow; Ideal and Real Fluid Flow; One, Two and Three Dimensional Flows - Stream Line, Path Line, Streak Line and Stream Tube- Stream Function – Velocity Potential Function-One, Two and Three Dimensional Continuity Equations in Cartesian Coordinates

UNIT-III

FLUIDDYNAMICS: Fluid Dynamics – Surface and Body Forces – Equations of Motion - Euler's Equation – Bernoulli's Equation - Practical Applications of Bernoulli's Equation: Venturimeter, Orifice Meter and Pitot Tube- Momentum Principle; Forces Exerted by Fluid Flow on Pipe Bend Vortex Flow – Free and Forced - Analysis of Free Liquid Jets

UNIT-IV
FLOW THROUGH PIPES: Loss of Head Through Pipes - Darcy-Weisbach Equation - Minor Losses - Total Energy Equation - Hydraulic Gradient Line - Pipes in Series - Pipes in Parallel - Equivalent Pipes - Siphon - Analysis of Pipe Networks ; Hardy Cross Method

UNIT-V
LAMINAR FLOW: Reynolds Experiment - Laminar Flow Through: Circular Pipes, Parallel Plates
TURBULENT FLOW: Definition - Causes of Turbulence - Velocity Distribution in Turbulent Flow in Pipes- Resistance of Smooth and Rough Pipes - Moody's Diagram

TEXT BOOKS
1. Hydraulics and Fluid Mechanics Including Hydraulics Machines (A-4-Size), 20thEdition, Dr. P.N. Modi & Dr. S.M. Seth, Standard Book House
2. A Textbook of Fluid Mechanics and Hydraulic Machines, 9th Edition, Dr. R. K. Bansal, Laxmi Publications

REFERENCES
1. Fluid Mechanics, 9th Edition, Victor Streeter, E.Benjamin Wylie, K.W.Bedford, McGraw Hill Education
2. Fluid Mechanics and Machinery, 1st Edition, C.S.P. Ojha, P.N. Chandamouli & R. Berndts son, Oxford University Press
3. Fluid Mechanics and Hydraulic Machines, 1st Edition, S. C. Gupta, Pearson India Education Services Pvt. Ltd.
4. Fluid Mechanics and Machinery, 1st Edition, Rama Durgaiah D., New Age International

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(18CE0105) SOLID MECHANICS LAB

COURSE OBJECTIVES

1. *To learn the testing procedures of mild steel by tension, direct shear, torsion, hardness tests*

2. *To learn the concept of modulus elasticity, and to know how to measure deflection of beams*

3. *To learn the compressive strength of wood, concrete stone and bricks*

4. *To learn the testing procedures for clay bricks and comparison with BIS standard of brick*

COURSE OUTCOMES (COs)

After completion of the course the student will be able to:

1. *Estimate Young's modulus, tensional rigidity of mild steel rods*

2. *Know the hardness of mild steel and HYSD specimens*

3. *Analyze the strength of wood, concrete, stone and bricks*

4. *Assess the quality of wood, concrete, stone and bricks*

LIST OF EXPERIMENTS:

*Cycle 1:

1. Bending test on simple support beam
2. Compression test on wood or Brick
3. Impact test on metal specimen (Izod and Charpy)
4. Compression test on helical spring
5. Tension test on mild steel rod

*Cycle 2:

6. Torsion test on mild steel rod
7. Impact test
8. Shear test
9. Continuous beam – deflection test
10. Hardness test on metals (Rockwell and Brinell Hardness Number Tests).
11. Verification of Maxwell's Reciprocal theorem on beams

LIST OF EQUIPMENT

1. UTM for conducting tension test on rods
2. Brinell's / Rock well's hardness testing machine
3. Compression testing machine
4. Izod Impact machine
5. Steel beam for flexure test
6. Beam setup for Maxwell's theorem verification
7. Torsion testing machine

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(18CE0106) FLUID MECHANICS LAB

COURSE OBJECTIVES

1. To learn the concepts of Venturimeter & Orifice meter

2. To learn the concepts of notch's

3. To learn the basic concepts of turbines

4. To learn the basics concepts of different types of pumps.

COURSE OUTCOMES (COs)

Students undergoing this course are able to

1. Calibrate Venturimeter & Orifice meter

2. Calculate losses inflows

3. Estimate the efficiency of different pumps.

4. Study the performance of different turbines.

LIST OF EXPERIMENTS:

*Cycle 1:

1. Verification of Bernoulli's equation.

2. Calibration of Coefficient of discharge for Venturimeter.

3. Calibration of Coefficient of discharge for Orificemeter.

4. Calibration of Friction factor. (major losses experiment)

5. Determination of loss of head due to sudden contraction. (minor losses experiment)

6. Calibration of Discharge over Notches (Rectangular/Triangular Notch.)

7. Determination of Coefficient of discharge for a small orifice / mouthpiece by a constant head method / variable head method.

*Cycle 2:

8. Impact of jet on vanes.

9. Performance test on Pelton wheel turbine.

10.   Performance test on Francis turbine.

11.   Efficiency test on centrifugal pump.

12.   Study on Hydraulic jump.

13.   Performance test on Kaplan turbine

*Minimum Four experiments must be conducted in the lab from each cycle

LIST OF EQUIPMENT

1. Venturimeter Setup.

2. Orifice meter setup.

3. Friction factor and Minor losses test setup.
4. Impact of jets.
5. Pelton wheel and Francis turbines.
6. Centrifugal pumps.
7. Bernoulli's theorem setup.
8. Hydraulic jump test setup.
9. Kaplan turbine.
10. Rectangular and Triangular notch setups
11. Small orifice and mouth piece setup.

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(18CE0107) COMPUTER AIDED BUILDING DRAWING

COURSE OBJECTIVES

1. A Student will able to know how to apply engineering drawing using computers.

2. A student can understand about the scope of Auto CAD software.

3. A student will know what is plan and how it should draw in Auto CAD software.

4. To learn about applications and advantages of AutoCAD.

5. To learn about the basic commands of AutoCAD.

COURSE OUTCOMES (COs)

1. The students will be able to draft the plan, elevation and sectional views of the buildings, industrial structures, and framed buildings using computer software's.

2. Draw the symbols and plan of a residential building using Auto CAD Software.

COURSE CONTENT:

1.0 **Introduction to Computer Aided Drafting(CAD):**
1.1 About AutoCAD.
1.2 Computer graphics.
1.3 Definition of CAD.
1.4 Applications of CAD.
1.5 Advantages of CAD
1.6 Introduction to Auto CAD as drafting package.
1.7 Hard ware requirements.

2.0 **Practice on AutoCAD:**
2.1 Graphical User Interface.
2.2 Study of drawing editor screen.
2.3 List out methods to access Auto CAD commands.
2.4 Practice of setting up of drawing area using utility commands & using setting commands.
2.5 Practice of File Management New, Open, Save, Save As, Export, Print, Publish, Drawing utilities, Units.
2.6 Practice of Geometrical commands line, Polyline, Circle, Erase, Oops, Snap, Arc, Ellipse, Polygon, Spline, Ellipse, Rectangle, and Donut.
2.7 Draw the given geometrical figures using draw commands
2.8 Practice of Modify Commands Move, Copy, Array, Break, Mirror, Offset, Scale, Rotate, Trim, Extend, Stretch, Solid, Fillet, Chamfer, Explode.
2.9 Draw the given figures using draw & Modifying commands.
2.10 Practice of Object Properties Color, Line type, Line weight.

2.11 Practice of view commands Zoom, Pan.

2.12 Practice of Drafting Settings.

2.13 Practice of Hatch, Gradient commands.

2.14 Practice of Block &insert commands.

3.0 **Annotations:**

3.1 Practice of Text, Text Justifications, Multi Line text, Text style, Scale text, Spell.

3.2 Practice on Leader, Multi Leader and Leader settings.

3.3 Practices on Table.

3.3 Practice On Dimensioning, Dim Linear, Dim radius, Dim Aligned, Dim Diameter, Dim center, Dim Angular, Dim Baseline, Dim continue, Dim ordinate, Dimensional settings.

3.4 Utilities, Distance, Radius, Angle, Area, volume.

3.5 Layer properties, make object Layer current, Match, previous, Isolate and Un- Isolate, Freeze, Off, turn all layers on, thaw all layers, Lock, Unlock, Change to current Layer, Copy objects to new Layer, Layer Walk, Isolate to current View port, Merge, Delete, Locked Layer fading.

3.6 Practice Plans using Layers.

4.0 **Geometric constructions:**

4.1 Practice on Point, DDP type, Divide, Measure.

4.2 Divide a given line into desired number of equal parts internally.

4.3 Draw tangent lines and arcs.

4.4 Construct a hexagon from the given data.

4.5 Construct ellipse, parabola, hyperbola, cycloid and helix.

4.7 Using CAD software draws & prints the following drawings.

4.7 Draw conventional signs as per I.S. Standards, Symbols used in civil engineering drawing.

4.8 Draw the important joinery components of the building like elevation of fully paneled double leaf door, elevation of partly glazed and partly paneled window.

5.0 **Residential building:**

5.1 Plan, Elevation, Section of single roomed building.

5.2 Single storied bearing type residential building,

5.2.1 One Bed Room House.

5.2.2 Two Bed Room House.

5.3 Single storied framed structure type residential building,

5.3.1 One Bed Room House.

5.3.2 Two Bed Room House.

5.4 Drawing to be submitted for approval to corporate or municipality showing required details in one sheet such as,

5.4.1 Plan-Showing Dimensions of all rooms.

5.4.2 Section-Showing specifications and Typical Foundation Details.

5.4.3 Elevation.

5.4.4 Site Plan- Showing Boundaries of site and plinth Area, car parking, passages and

location of septic tank.

5.4.5 Key plan- Showing the location of building.

5.4.6 Title block- Showing Signature of owner & Licensed surveyor's.

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(18HS0804) ENVIRONMENTAL SCIENCES

COURSE OBJECTIVES

1. *Students have got an idea about the importance of pollution free air, water, soil and food.*
2. *They know about global environmental problems like Acid Rains, Global Warming, Green House Effects, Ozone layer depletion.*
3. *To understand the impacts of developmental activities and mitigation measures along with the environmental policies and regulations.*
4. *To recognize major concepts in environmental studies and demonstrate in-depth understanding the environment.*

COURSE OUTCOMES (COs)

1. *Based on this course, the Engineering Student will be able to understand/evaluate/develop technologies on the basis of Ecological principles and environmental regulations along with Legislation, Laws and Policies which in turn help in sustainable development.*
2. *Take preventive measures to reduce air, water, soil pollutions and contaminants in food.*
3. *Effectively carry out waste disposal at individual level.*
4. *Involve in preservation of natural resources.*

UNIT- I

INTRODUCTION: Definition, Scope and Importance-Need for Public Awareness

NATURAL RESOURCES: Classification of resources-Forest resources: Use and over-exploitation, deforestation- Mining, dams and their effects on forests and tribal people – Water resources - Use and over utilization of surface and ground water- Floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources –Energy resources: Renewable and Non- Renewable sources of energy- Solar energy, Hydro electrical energy, Wind energy, Nuclear energy, etc.

UNIT-II

ECOSYSTEMS: Concept of an ecosystem– structural features of ecosystem- Producers, Consumers and Decomposers–-Biogeochemical cycles- Ecological succession-Food chains, food webs and ecological pyramids – Energy flow in the ecosystem-Types of ecosystems (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems.

UNIT-III

BIODIVERSITY AND ITS CONSERVATION: Introduction, Definition, genetic, species and ecosystem diversity, Bio-geographical classification of India, India as a Mega-diversity Nation, Hot spots of biodiversity, Value of biodiversity, threats to biodiversity, endemic,

endangered and extinct species of India, In-Situ and Ex-situ conservation of biodiversity.

UNIT-IV
ENVIRONMENTAL POLLUTION AND GLOBAL ENVIRONMENTAL ISSUES:
Natural Disasters: Droughts, Floods, Cyclone, Landslides, Earthquake, Pollution episodes: Air pollution, Water pollution, Land pollution, Noise pollution, Automobile pollution and nuclear pollution –Effects-Global warming, Acid Rain and Ozone layer depletion and controlling measures. Global Environmental Issues: Population Growth, Urbanizations, Land Management, Water and Waste Water Management. Climate change and impacts on human environment Solid Waste Management: causes, effects and control measures of Municipal solid wastes–E-waste and management, Role of an individual in prevention of pollution – pollution case studies.

UNIT-V
ENVIRONMENTAL LEGISLATION, LAWS,POLICIES   FOR   SUSTAINABLE
DEVELOPMENT: Environmental Legislation, Environmental Protection act – Air Prevention and Control of Pollution act–Water Prevention and control of Pollution act– Wildlife protection act – Forest conservation act – Municipal Solid Waste management, International
conventions/Protocols:Earthsummit,KyotoprotocolandMontrealProtocol.FromUnsustainable to sustainable development, Role of NGO's for Sustainable development, Concepts of Green belt development, Role of IT in Environment-Remote Sensing and GIS methods for Sustainable development.

Field work- visit to a local area to document environmental assets-river forest grassland/hill, mountain and polluted sites (urban/rural/industrial/Agriculture) - study simple ecosystems (pond/river/hill slopes)

TEXT BOOKS
1. A.Kaushik and C.P.Kaushik, *Environmental Sciences*, 5th edition, New age international publishers, 2015.
2. M.AnjiReddy, *A Text Book of Environmental Science and Technology*, BS Publications.

REFERENCES
1. Anil Kumar and Arnab Kumar De, *Environmental Studies,* New Age International Publishers, New Delhi, 3rd Edition2015.
2. R.K.Trivedi, *Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards,* Vol.I and II, Enviro Media.
3. Dr.K.Mukkanthi, *Environmental Studies,* S.Chand Publishers.
4. Rajagopalan.R,*Environmental Studies*, Crisisto Cure, Oxford University Press, 2005.
5. Erach Bharucha, *A Text Book of Environmental Studies*, University Grants Commission, University Press (India) Pvt. Ltd., Hyderabad, 2010

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(18ME0346) MECHANICAL ENGINEERING

COURSE OBJECTIVES

1. To understand the basic fundamentals of mechanical engineering.

2. To study the laws of thermodynamics, Energy conversion devices, R&AC.

3. To understand the principles of welding, manufacturing processes, Power transmission devices.

4. To Know about Engineering Materials.

COURSE OUTCOMES (COs)

1. After completion of the course the student will be able to understand the fundamentals of mechanical engineering.

2. Acquire the concept of laws of thermodynamics, Energy conversion devices, R&AC.

3. Knows the principles of welding, manufacturing processes, Power transmission devices.

4. Knows about Engineering Materials.

UNIT-I

Thermodynamics: Entropy-Ideal and real gases-Ideal and real gas equations-Analysis of Carnot cycle-Otto cycle-Diesel cycle-Efficiency. Problems on cycles

UNIT-II

Energy conversion devices: Boilers-Steam turbines-Gas turbines-Working principle of 2stroke & 4stroke I.C. Engines (S.I & C.I)-Fuels-CRDI-MPFI-Hybrid Engines-Reciprocating pumps- Centrifugal pumps-Hydraulic turbines.

UNIT-III

Refrigeration & Air conditioning: Vapour compression refrigeration system-Heat pump-COP- Study of household refrigerator-Energy efficiency rating-Psychometry -Psychrometric processes- Window Air conditioner-Split Air conditioner-Refrigerants and their impact on environment.

UNIT-IV

Materials: Engineering materials-classification-properties-Alloys & applications
Power transmission devices: Belt and belt drives-Chain drive-Rope drive - Gears and gear trains- Friction clutch (Cone & Single plate)-Brakes-Types & Applications.

UNIT-V

Manufacturing Processes: Casting-Sheet metal forming-Sheet metal cutting-Forging-Rolling- Extrusion-Metal joining processes-Soldering-Brazing-Welding-Powder metallurgy

General Manufacturing Machines (Basic elements, working principle & types of operations): Lathe-Drilling-Shaper-Planer-Slotter-Milling-Grinding-Introduction to CNC machines

TEXT BOOKS
1. Engineering Thermodynamics, P.K Nag, TMH Publishers, New Delhi, 5th Edition, 2013.
2. Refrigeration and Air conditioning, C.P.Arora & Domkundwar, 3rd edition, McGraw Hill, New Delhi, 2010.
3. Manufacturing Technology Foundry, Forming and Welding, P.N. Rao, 4th Edition, Tata McGraw Hill,2003

REFERENCES
1. Principles of Refrigeration, Roy J. Dossat, 4th edition, Pearson Education Asia, 2009.
2. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen, John Wiley & sons (ASIA) Pvt Ltd, 7th Edition, 2009.

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(18CE0108) ENGINEERING GEOLOGY

COURSE OBJECTIVES

1. *The objective of this is to give the basic knowledge of geology that is required for construction of various civil engineering structures.*
2. *Thesyllabusincludesthebasicsofgeology.Geologicalhazardsandgivesasuitablepicture on the geological aspects that are to be considered for the planning and construction of major civil engineering projects.*
3. *It involves the collection, analysis, and interpretation of geological data and information required for the safe development of civil works.*

COURSE OUTCOMES (COs)

1. *This course helps to know the identification of rocks, minerals, engineering geology problems and also basics of earth science.*
2. *Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice*

UNIT - I

INTRODUCTION: Introduction-Branches of Geology Useful to Civil Engineering- Scope of Geological Studies in Various Civil Engineering Projects – Physical Geology - Weathering, Erosion and Denudation- Factors Affecting Weathering and Product of Weathering - Weathering of Common Rocklike–Granite

UNIT - II

MINERALOGY: Mineral, Origin and Composition- Study of Various Properties for the Identification of Minerals - Different Methods of Study of Minerals - Advantages of Study of Minerals by Physical Properties- Rock Forming Minerals- Megascopic Identification of Common Primary & Secondary Minerals

UNIT - III

PETROLOGY: OriginandFormationofRocks-ClassificationofRocks-Igneous,Sedimentary and Metamorphic rocks - Their Textures and Structures - Study of Rocks like Granite, Gabbro, Dolerite, Basalt, Breccia, Conglomerate, Sand Stone, Shale, Limestone, Laterite, Quartzite, Schist, Gneiss, Marble, Slate

UNIT - IV

STRUCTURAL GEOLOGY: Strength Behavior of Rocks- Stress and Strain in Rocks - Elements of Structural Geology like Strike, Dip, and Outcrop - Study of Folds, Joints, Faults, Unconformities and Their Importance in Civil Engineering Works

GROUND WATER: Ground Water- Water Table - Common Types of Ground Water - Ground Water Exploration

UNIT - V
EARTH QUAKES & LAND SLIDES: Earth Quakes - Causes and Effects of Earth Quakes – Seismic Waves – Richter scale – Precautions to be taken for Building Construction in Seismic Areas - Landslides - Their Causes and Effect - Measures to be taken to Prevent Their Occurrence
GEOLOGY OF DAMS, RESERVOIRS AND TUNNELS: Geology of Dams - Geological Considerations in the Selection of a Dam and Reservoir – Tunnels Purposes of Tunneling - Effects of Tunneling on the Ground - Role of Geological Considerations in Tunneling Over Break and Lining in Tunnels

TEXT BOOKS
1. Engineering Geology by N. Chennkesavulu, Mc-Millan, India Ltd.
2. Engineering geology by Prabin singh, Katson Publications
3. Engineering geology by vasudev kanthi, Universities press, Hyderabad.
4. Engineering Geology by D. Venkata Reddy, Vikas Publications, New Delhi.

REFERENCES
1. Engineering Geology by Subinoy Gangopadhyay, Oxford University press.
2. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).
3. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications
4. Fundamental of Engineering Geology Butterworths by F.G.Bell Publications, New Delhi.

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(18CE0109) SURVEYING & GEOMATICS

COURSE OBJECTIVES

1. *To describe the function of surveying in civil engineering construction*
2. *To train the students on the basic principles of surveying for the measurement of distances and areas*
3. *To measure bearing of a line with prismatic compass and horizontal angles between the lines and vertical angles of elevated or depressed objects by transit theodolite*
4. *Calculate, design and layout horizontal and vertical curves, Understand, interpret and prepare plan, profile, and cross-section drawings.*
5. *To apply for horizontal and vertical distance computation by tachometry survey*
6. *To set out the different types of curves in the field*

COURSE OUTCOMES (COs)

The course will enable the students to:

1. *Apply the knowledge, techniques, skills and applicable tools of the discipline to engineering and surveying activities*
2. *Translate the knowledge gained for the implementation of civil infra-structure facilities.*
3. *To be in a position to apply the basic principle of surveying and usage of surveying instruments in all civil engineering activities, including the construction of buildings, bridges, roads and high ways, pipe lines, dams, ports and harbours*
4. *To be an expert of demarcation of ownership and / or delimitation of land, property, etc., through surveying process*
5. *Surveying techniques to collect data for planning, designing and execution, able to employ green field*
6. *Use total station and able to assess the electromagnetic distances*

UNIT-I

PRINCIPLES OF SURVEYING: Surveying – Definition; Primary Divisions, Classification- Principles of Surveying – Scales used for Maps and Plans –Duties of a Surveyor - Errors: Accuracy and Precision - Sources and Types of Errors.

ANGLES, AZIMUTHS AND BEARINGS: Units of Angle Measurement - Meridians, Azimuths Bearings – Magnetic Declination, Local Attraction and Corrections to Angles and Bearing of Lines

TYPES OF SURVEYING: Introduction to Chain, Compass and Plane Table Survey.

UNIT-II

LEVELLING: Introduction - Basic definitions - Methods of Leveling - Leveling

Instruments: Dumpy Level, Leveling Staff - Temporary Adjustments of Dumpy Level - Theory of Simple and Differential Leveling- Level Field Book-Classification of Direct Leveling Methods – Reciprocal Leveling – Profile Leveling – Cross Sectioning – Curvature and Refraction – Difficulties in Leveling - Errors in Leveling - Degree of Precision.

CONTOURING: Introduction - Contour Interval - Characteristics of Contours - Methods of Locating Contours - Direct and Indirect Methods - Interpolation and Sketching of Contours - Contour Gradient- Uses of Contour Maps

UNIT-III

THEODOLITE: Vernier Theodolite: Basic Definitions - Fundamental Lines and Desired Relations - Temporary Adjustments - Measurement of a Horizontal Angle - Repetition and ReiterationMethodsofHorizontalAngleMeasurement-MeasurementofVerticalAngle-Sources of Errors in Theodolite Survey – Traversing - Omitted Measurements - Closing Error - Determination of the Level of the Top of an Object, When its base is accessible and inaccessible- Determination of the Height of the Object When the Two Instrument Stations are not in the Same Vertical Plane.

TACHEOMETRIC SURVEYING: Definitions - Advantages of Tachometric Surveying - Basic Systems of Tachometric Measurement – Determination of Constants K and C – Inclined Sight with Staff Vertical - Inclined Sight with Staff Normal to the Line of Sight - Movable Hair Method – Tangential Method.

UNIT-IV

CURVES: Simple Curves – Definitions and Notations - Designation of a Curve - Elements of Simple Curves - Methods of Setting Simple Curves: Rankine's method, Two Theodolite Method – Compound curves – Elements of Compound Curve – Reverse Curve – Elements of Reverse Curve - Relationship between Various Elements.

UNIT-V

ELECTRONIC DISTANCE MEASUREMENTS: Introduction – Basic Concepts- Electromagnetic Waves - Basic Definitions - Phase of the Wave, Units, and Types of waves – Distance from Measurement of Transit Time – Computing the Distance from the Phase Differences - EDM instruments - Electronic Theodolite - Total Station: Models, Fundamental Measurements, Recording, Traversing, and Data Retrieval.

TEXT BOOKS
1. Surveying Vol-I, 16th Edition, Punmia B. C, Laxmi Publications.
2. Surveying Vol-II & III, 15th Edition, Punmia B.C, Laxmi Publications.
3. Surveying and Leveling, 2nd Edition, Basak.N, Tata McGraw Hill Publishing Company Ltd.

REFERENCES
1. Surveying and levelling part I & II, 23rd Edition, Kanetkar.T.P. & S.V. Kulkarni, Puna Vidyarthi Girha, Prakashan
2. FundamentalsofSurveyingandLevelling,1stEdition,R.Subramanian,OxfordUniversity Press, India
3. Surveying Vol-I, 10th Edition, Arora K. R, Rajsons Publications Pvt. Ltd

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(18CE0110) MATERIALS, TESTING & EVALUATION

COURSE OBJECTIVES

1. To introduce traditional and modern construction materials.

2. To import knowledge of building components.

3. To import knowledge of construction practices.

COURSE OUTCOMES (COs)

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

1. Understand properties of various construction materials and their manufacturing process.

2. Access the quality of construction materials.

3. Supervise the construction activities.

4. Introduction to Engineering Materials covering

UNIT - I

STONES: Classification of rocks – Quarrying of stones: tools, methods, precautions – Uses of stones – Characteristics of good building stones.

BRICKS: Classification of bricks – Characteristics of good bricks – Ingredients of good brick earth – Harmful substances in brick earth – Manufacturing of bricks – Defects in bricks

WOOD: Classification of trees – Classification of timber – Structure of timber – Characteristics of good timber – Seasoning of timber – Defects, diseases and decay of timber.

UNIT - II

CEMENT: Properties of cement – Composition of ordinary cement – Manufacturing of ordinary cement - field tests on cement – Laboratory tests on cement – Storage of cement.

PAINTS & DISTEMPERS: Composition of oil paint – Preparation of paint – Painting plastered surfaces – Painting wood surfaces – Painting metal surfaces – Defects – Distemper – White wash and color wash – Varnish.

MISCELLANEOUS MATERIALS: Pig iron – Cast iron – Steel – Glass – Asbestos – Gypsum – Rubber.

UNIT - III

BITUMEN: Bitumen and asphaltic materials - Tests & testing of bitumen & bituminous mixes. **AGGREGATES:** Classification of Aggregate, M-Sand, Tests & testing of sand-Mechanical Properties of Coarse Aggregate.

UNIT - IV

CONCRETE: Workability – Factors Affecting Workability – Measurement of Workability by Different Tests – Setting Times of Concrete - Segregation & Bleeding – Mixing and

Vibration of Concrete.

SPECIAL CONCRETE: Plain, Reinforced and steel fibre / Glass fibre – reinforced Concrete, light - weight concrete, High Performance Concrete, Polymer Concrete- Ceramics, and Refractories, Tests & testing of concrete.

UNIT - V
MECHANICAL BEHAVIOR AND MECHANICAL CHARACTERISTICS:

Elasticity – principle and characteristics; Plastic deformation of metals; tensile test – Standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain Interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep
- fundaments and characteristics; Brittle fracture of steel – Temperature transition approach

TEXT BOOKS
1. Building Materials, 4th Edition, Duggal, S.K., New Age International
2. Building Construction, 11th Edition, Dr. B.C. Punmia, Dr. Ashok Kumar Jain, Dr.Arun Kumar Jain, Laxmi Publications.
3. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004.

REFERENCES
1. Engineering Materials [Material Science], 42nd Edition, Rangwala, Charotar Publishing House Pvt. Ltd.
2. A Textbook on Building Construction, Dr. S.K. Sharma, S. Chand Publishers

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(18CE0111) MECHANICS OF SOLIDS

COURSE OBJECTIVES

1. To understand the applications of thin cylinders and thick cylinders
2. To understand the direct and bending stress in beams.
3. To learn application of Castiglione's theorems 1&2 for beams and trusses.
4. To learn and analyze fixed beam
5. To learn and analyze continuous beams by Clapeyron's theorem of three moments
6. To learn and analyze continuous beams and frames by slope deflection method, and Moment distribution

COURSE OUTCOMES (COs)

The course will enable the students to:
1. Determine different stresses developed in thin and thick cylinders
2. Determine the behaviour of direct and bending stress in beams
3. Have knowledge in structural engineering
4. Understand the application of Castiglione's theorem.
5. Analyse continuous beams and portal frames by slope deflection method and moment distribution method.

UNIT-I

THIN CYLINDERS & THICK CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – Hoop, longitudinal and volumetric strains – Changes in dia, and volume of thin cylinders – Thin spherical shells – Introduction to Lame's theory for thick cylinders – Derivation of lame'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.

UNIT-II

DIRECT AND BENDING STRESS: Stresses under the combined action of direct loading and bending moment-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 bending moment about both axes.

UNSYMETRICAL 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 III
INTRODUCTION: Introduction to the Analysis of Structural Systems - Determinate and Indeterminate Structures - Concepts of Energy Principles, Strain Energy Due to Axial Load, Bending Moment and Shear Forces - Maxwell's, Betti's Theorems - Castigliano's First and Second Theorem and Unit Load Method - Deflection of Simple Beams and Pin-Jointed Trusses.

UNIT - IV
ANALYSIS OF FIXED BEAMS: Fixed Beams with UDL, Point Loads, Uniformly Varying Load, Couple - Shear Force and Bending Moment Diagrams - Deflections - Effect of Sinking of Support.

ANALYSIS OF CONTINUOUS BEAMS: Clapeyron's Theorem of Three Moments – Derivation of Theorem – Application to Continuous Beams with Point Load, Eccentric Load, Uniformly Distributed Load and Couple – Sinking of Supports – Shear Force and Bending Moment Diagrams.

UNIT - V
SLOPE DEFLECTION METHOD: Slope Deflection Equation - Application to Continuous Beams with Degree of Indeterminacy Not Exceeding Three, Effect of Sinking.-Analysis of Single Bay and Single Storey Portal Frames with and without Sway.

MOMENT DISTRIBUTION METHOD: Stiffness and Carry Over Factors - Distribution Factors – Analysis of Continuous Beams Degree of Indeterminacy Not Exceeding Three, Effect of Sinking - Analysis of Single Bay and Single Storey Portal Frames with and without Sway

TEXT BOOKS
1. Strength of Materials (Mechanics of Solids), 6th Edition, Dr. R.K. Rajput, S.Chand Publishing
2. A Textbook of Strength of Materials, 6thEdition, Dr. R. K. Bansal, Laxmi Publications.
3. An Introduction to the Mechanics of Solids. 2nd Edition, New York, NY: McGraw Hill, 1979.
4. Theory of structures by Ramamuratam, Jain book depot, New Delhi.
5. Analysis of structures by Vazrani & Ratwani, Khanna Publications.
6. Strength of Materials, fundamentals and applications, Dr.TD Gunneswara Rao, Cambridge University Press.

REFERENCES
1. Mechanics of Materials, Revised, 2016 Edition, Dr. B.C.Punmia, Dr. Ashok Dr.Jain, Dr. Arun Kumar Jain, Laxmi Publications
2. Strength of Materials, 3rd Edition, R. Subramanian, Oxford University Press
3. Strength of Materials, 24th Edition, R. S. Khurmi, S. Chand Publishing
4. Strength of Materials, 11th Edition, Sadhu Singh, Khanna Publishers

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(18CE0112) ENGINEERING GEOLOGY LAB

COURSE OBJECTIVES

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
4. Simple Structural Geology problems.

COURSE OUTCOMES (COs)

After completion of this lab the student:
1. Can conduct macroscopic tests on rack forming minerals to identify
2. Can conduct macroscopic tests on rocks to identify
3. Can be in position to interpret geological models
4. Can perform strike and dip problems

LAB EXAMINATION PATTERN:

1. Description and Identification of SIX Minerals
2. Description and Identification of Six
3. (Including Igneous, Sedimentary and Metamorphic Rocks)
4. Interpretation of a Geological Map of a Geological Section
5. Simple Strike and Dip Problems

TEXT BOOKS

1. Elementary Exercises in Geology by CVRK Prasad, Universities press.

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(18CE0113) SURVEYING LAB – I

COURSE OBJECTIVES

1. To train the students in plotting of land by chain and tape plan table surveys
2. To train the students in determine distance between two inaccessible points by prismatic compass and plane table and theodolite methods
3. To train the students in plotting of contour maps by conducting leveling survey and total station and tachometric methods

COURSE OUTCOMES (COs)

After completion of the course the student will be able to:

1. Gain knowledge and expertise in operation of various survey instruments for computation of area of a land.
2. Successfully carry out survey work in all civil Engineering projects, including the construction of buildings, roads and highways, rail track laying with curves, pipe lines, dams, ports and harbor as well as delimitation of land and property, etc.

LIST OF EXPERIMENTS

*Cycle 1:

1. Survey of an area by chain survey (Closed traverse) & Plotting.
2. Chaining across obstacles.
3. Determination of distance between two inaccessible points with compass.
4. Surveying of a given area by prismatic compass (Closed traverse) and plotting after adjustment.
5. Radiation method, intersection methods by plane Table survey.

*Cycle 2:

6. Two point and three point problems in plane table survey.
7. Traversing by plane table survey.
8. Compound leveling (differential leveling).
9. An exercise of L.S. and C.S. and plotting.
10. Contour survey of reservoir.
11. Contour survey of a highway.

LIST OF EQUIPMENT

1. Chains, tapes, ranging rods, cross staff, arrows.
2. Compasses and Tripods, Optical square.
3. Plane tables, Alidade, Plumbing fork, trough compasses.
4. Leveling instruments and leveling staves.

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(18HS0817) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

COURSE OBJECTIVES

The course aims at imparting basic principles of thought process, reasoning and inference. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

COURSE CONTENTS

1. *Basic structure of Indian Knowledge System: Astadash Vidya- 4ved*
2. *4 Upaved (Ayurved, Dhanurved, Gandharva Ved & SthapthyaAdi.,)*
3. *6 Vedanga (Shisha, Kalppa, Nirukha, VYkaran, Jyothish &Chand)*
4. *4 Upanga (Dharma Shastra, Meemamsa, Purana & Tharka Shastra)*
5. *Modern Science and Indian Knowledge System*
6. *Yoga and Holistic Healthcare*
7. *Case studies*
8. *Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain & Boudh*
9. *Indian Linguistic Tradition –(Phonology, morphology, syntax and semantics)*
10. *Indian Artistic Tradition - Chitra kala, Moorthi kala, Vasthu kala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya*
11. *Case studies*

REFERENCES

1. V. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition,2014
2. Swami Jitatmanand, *Modern Physics and Vedant*, Bharatiya VidyaBhavan
3. Swami Jitatmanand, *Holistic Science and Vedant*, Bharatiya VidyaBhavan
4. Fritz of Capra, *Tao of Physics*
5. Fritz of Capra, *The Wave of life*
6. VN Jha (Eng. Trans.), *Tarkasangraha of Annam Bhatta*, International Chinmay
7. Foundation, Velliarnad, Arnakulam
8. *Yoga Sutra of Patanjali*, Ramakrishna Mission,Kolkata
9. GN Jha (Eng. Trans.), Ed. RN Jha, *Yoga-darshanam with Vyasa Bhashya*, Vidyanidhi Prakashan, Delhi2016
10. RNJha, *Science of Consciousness Psychotherapy and Yoga Practices*, Vidyanidhi Prakashan, Delhi, 2016

11. PB Sharma (English translation), *Shodashang Hridayan* V.Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition,2014

12. S.C. Chaterjee & D.M. Datta, *An Introduction to Indian Philosophy*, University of Calcutta, 1984

13. K.S. Subrahmanialyer, *Vakyapadiya of Bhartrihari, (Brahma Kanda)*, Deccan College Pune 1965

14. *Panini Shiksha,* Motilal Banarasidas V.N. Jha, *Language, Thought and   Reality,* Vasudevasharan AGRAWAL Kala yevam Samskruthi, Shithya Bhavan Elahabad, 1952

15. Pramod Chandra, *India Arts,* Howard Univ. Press,1983

16. Krishna Chaitanya, *Arts of India*, Abhinav Publications,1987

17. R. Nagaswamy, *Foundations of Indian Art*, Tamil Arts Academy,2002

Pedagogy: Problem based learning, group discussions, collaborative mini projects.

Outcome: Ability to understand, connect up and explain basics of Indian traditional Knowledge in modern scientific perspective.

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(18CE0114) HYDRAULIC ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *To relate the theory and practice of problems in hydraulic engineering*
2. *To learn the behavior of types of flows, types of channels*
3. *To learn the different hydraulic models*
4. *To learn the basics of turbo machinery, hydraulic turbines and performance of turbines*

COURSE OUTCOMES (COs)

On completion of the course, the students will able to

1. *Discuss uniform and non-uniform open channel flows and Design economic channel section*
2. *Explain gradually varied flow and rapid varied flow*
3. *Analyze impact of jets on vanes and develop velocity triangle*
4. *Classify turbines and study the principal of various turbines*
5. *Study the principals of different pumps*
6. *Classify methods of dimensional analysis and Apply Buckingham Pi theorem*

UNIT-I

Uniform Flow: Classification of flows -Differences between pipe flow and open channel flow -Flow analysis: The Chezy's equation, Empirical formulae for the Chezy's constant - Hydraulically economical sections

Non-Uniform Flow: Concept of specific energy -Specific energy curves-Critical flow – Critical depth- Computation of critical depth – Critical, sub critical and super critical flows - Channel transitions - Specific force - Specific force curve

UNIT-II

Gradually Varied Flow: Dynamic equation for GVF in wide rectangular channel - Classification of channel bottom slopes - Back water curves and Draw down curves - Surface profiles - various types of water surface profiles - Characteristics of surface profiles Computation of surface profiles by step method

Rapidly Varied Flow: Hydraulic jump - Elements and characteristics of hydraulic jump - Hydraulic jump in rectangular channels Height and length of the jump - Types of hydraulic jump Applications of hydraulic jump

UNIT III

Impact of Jets: 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-IV

Pumps: Centrifugal Pumps **-** Component parts and working of a centrifugal pump - Work done by the impeller-heads, losses and efficiencies, minimum starting speed, priming - Specific speed, Multistage centrifugal pumps - Troubles and remedies

Dimensional Analysis and Similitude: Dimensional homogeneity - Methods of dimensional analysis- Rayleigh's method - Buckingham - Pi theorem - Similitude - Types of similarities - Model laws

UNIT-V

Hydraulic Turbines-I: Layout of Hydro-electric power plant - Head and efficiencies of hydraulic turbines-Classification of turbines - Pelton wheel –Francis turbine-Working, Working proportions, Velocity triangles, work done and efficiency ,hydraulic design

Hydraulic Turbines-II: Kaplan turbine: main components and working - Working proportions - Draft tube: theory and efficiency - Specific speed – NPSH - Cavitation: causes, effects

TEXT BOOKS

1. Dr. P.N. Modi & Dr. S.M. Seth, *Hydraulics and Fluid Mechanics including Hydraulics Machines (A-4-Size)*, Standard Book House, 21th Edition, 2018
2. *Er.R.K.Rajput, A Textbook of Fluid Mechanics and Hydraulic Machines,* S.Chand Publications, 3rd Rev. Edition, 2006

REFERENCES

1. Dr. R. K. Bansal, *A Textbook of Fluid Mechanics and Hydraulic Machines,* Laxmi Publications, 9th Edition, 2005
2. K.Subramanya, *Fluid Mechanics and Machinery (Problems and Solution)*,Tata McGraw Hill Education, 2005
3. E. Benjamin Wylie, K.W. Bedford, *Fluid Mechanics*, Victor Streeter, Tata McGraw Hill Education, 9th Edition, 2017
4. C.S.P. Ojha, P.N. Chandamouli & R. Berndtsson, *Fluid Mechanics and Machinery*, Oxford University Press, 1st Edition, 2010
5. Rama Durgaiah D, *Fluid Mechanics and Machinery*, New Age International,1st Edition, 2002

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(18CE0115) STRUCTURAL DESIGN

COURSE OBJECTIVES
The objectives of this course
1. *To learn the design methodologies for different RCC and steel structural members*
2. *To impart knowledge on the behaviour and design on various reinforced concrete structural elements*
3. *To make the student conversant with the design principles of steel structural elements as per IS Codal provisions*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to
1. *Explain the Limit State of Collage and Serviceability and describe various design parameters*
2. *Design and Analysis of RCC singly, doubly and flanged beams*
3. *Design of RCC flexural members such as beams and slabs for various considerations*
4. *Design RCC columns and isolated footings*
5. *Describe and design various connections used in steel design*
6. *Design of steel compression, tension and flexural members*

UNIT – I
RCC structures: Concepts of Reinforced Concrete Design–Limit State Method–Material–Stress Vs Strain Curves for Concrete & Steel–Safety Factors–Characteristic Values–Stress Block Parameters – IS: 456 –2000
Beams: Limit State Analysis–Design of Singly Reinforced–Doubly Reinforced and Flanged Sections
Limit State of Serviceability: Limit State Design for Serviceability in Case of Deflection, Cracking and Codal Provision

UNIT – II
Design for Shear, Torsion & Bond: Limit State Analysis and Design of Section for Shear and Torsion– Concept of Bond
Design of RC Slabs: One way slab – Two way slab – Types of Staircases – Design of dog legged Staircase

UNIT – III
Design of RC Compression Members: Types of columns – Axially Loaded columns –Design of Uniaxial and biaxial bending
Design of RC Foundation: Design of isolated footing – Square footing

UNIT – IV
Steel Structures: Types of structural steel – Mechanical properties of steel – Concepts of plasticity – Yield strength - Loads and combinations of loading – Behaviour of steel, local buckling - Different Limit States as per IS 800-2007 – Design strengths – Serviceability
Connections: Bolted connections –Welded connections – Design Strength
Tension Members: Design strength of members - Design of tension members

UNIT – V
Design of Compression Members: Buckling class – Slenderness ratio – Strength design – Column Base - Slab base
Design of Beams: Simple and built-up beams – Laterally supported beams

TEXT BOOKS
1. Ashok K. Jain, *Reinforced Concrete (Limit State Design)* 7e, New Chand & Bros Publishers, 2012
2. Duggal,S.K, *Limit State Design of Steel Structures*, McGraw-Hill Education, 2019

REFERENCES
1. Subramanian. N, *Design of Reinforced Concrete Structures,* Oxford University Press, 2014
2. Krishna Raju N, *Reinforced Concrete Design: IS: 456-2000 Principles and Practice,* New Age International Pvt Ltd Publishers, 2018
3. Devadoss Menon and Pillai S, *Reinforced Concrete Design,* McGraw Hill Education India Private Limited, 3rd edition, 2017
4. S.S. Bhavikatti, *Design of Steel Structures,* IK International Publication House, New Delhi, 2017
5. Subramanian, N, *Steel Structures - Design and Practice,* Oxford University Press, 2015

Codes/Tables
1. IS 456: 2000 Plain and Reinforced Concrete - Code of Practice
2. IS 800: 2007 General Constructions in Steel - Code of Practice
3. Steel table

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(18CE0116) GEOTECHNICAL ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *To explain how three phase system is used in soil and how are soil properties estimated using three phase system, carry out soil classification*
2. *To explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated*
3. *Ability to apply the principle of shear strength and settlement analysis for foundation system*
4. *To explain Earth slopes and its stability Analysis*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Describe volumetric ratios, weight/mass relationships, index properties of soils, establish interrelationships and classify soils*
2. *Discuss Soil permeability, effective stress principal and seepage though soils*
3. *Classify compaction and consolidation and predict consolidation settlements*
4. *Determine vertical stress due to various loads and comprehend shear strength of soil*
5. *Can use various methods to analyze stability of finite and infinite earth slopes*
6. *Describe various means to conduct soil exploration and can interpret soil exploration report*

UNIT – I

Introduction: Soil formation - Structure of soils –Volumetric ratios – Phase diagram of Soils –Mass-Volume relationships -Weight-Volume relationships– Interrelationships – Relative Density - Index properties - Sieve analysis - Consistency limits - Indian Standard Classification System – Clay Mineralogy

Permeability: Soil Permeability – Darcy's law -Constant Head Permeability Test-Falling Head Permeability Test-Factors affecting Permeability -Permeability of Layered soils

Effective Stress: Principle of Effective Stress–Quick Sand condition – Seepage through soils – Flow Net for Two-dimensional flow–Applications of Flow Net

UNIT-II

Compaction: Compaction phenomenon– Factors affecting compaction - Effects of compaction on soil properties –Standard and Modified Proctor's test - Field Compaction methods

Consolidation: Types of Consolidation -Consolidation test -Terzaghi's One Dimensional Consolidation Theory - e-p and e-log p curves

UNIT – III
Stress Distribution in Soils: Boussinesq's equation for point load - Line Load – Strip load – Rectangle load – Circular load -Westergaard's equation- Pressure Bulbs– Newmark's Influence Chart
Shear Strength of Soils: Stress at a point - Mohr's Circle of stress- Mohr's-Coulomb Failure Theory - Methods of determining the shear strength parameters - Types of shear tests based on drainage conditions

UNIT – IV
Earth Slope Stability: Types of Slope Failures -Factor of safety- Stability analysis of Infinite slopes of Cohesionless and Cohesive soils -Friction Circle Method - Method of Slices - Bishop's Simplified-Taylor's Stability Number

UNIT – V
Soil Exploration: Stages in Sub-surface explorations - Open excavation methods of soil exploration - Boring for exploration - Sampling in soils -Standard Penetration Tests - Cone Penetration Test -Field Plate Load Test- Execution of soil exploration program and report

TEXTBOOKS
1. K.R.Arora, *Soil Mechanics and Foundation Engineering,* Standard Publishers and Distributors, Delhi, 7th edition, 2019
2. C.Venkataramaiah, *Geotechnical Engineering,* New Age Publications, 6th edition, 2018

REFERENCES
1. V.N.S. Murthy, *Soil Mechanics and Foundation Engineering,* CBS Publishers and Distributor's, 2016
2. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundation,* Laxmi publications Pvt. Ltd., New Delhi, 2017
3. Manoj Dutta & Gulati S.K, *Geotechnical Engineering*, McGraw-Hill Publishers, New Delhi,2010
4. Gopal Rajan and A.S.R. Rao, *Basic and Applied Soil Mechanics,* New Age Publications, 2nd revised edition, 2014

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(18CE0117) HYDROLOGY & WATER RESOURCES ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *Understand the concept of hydrology and components of hydrologic cycle such as precipitation, infiltration, evaporation and transpiration*
2. *Quantify runoff and use concept of unit hydrograph*
3. *Demonstrate different methods of irrigation, methods of application of water and irrigation procedure*
4. *The fundamental idea behind this course is to make student aware of canal regulation works and cross drainage works*
5. *The course also targeted to teach students the concepts of major irrigation structures such as gravity dams, earthen dams and its prerequisites namely reservoir planning*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Explain importance of hydrology, hydrological cycle and estimate precipitation, runoff, evaporation, evapotranspiration and infiltration. Classify different type of geological formation of ground water and estimate yield*
2. *Classify various types of irrigation and describe principals of irrigation*
3. *Explain the principals of crop water requirements and determine the irrigation crop water requirements*
4. *Describe canal regulation works and design various elements in canal regulation works*
5. *Classify different types of cross drainage works and explain the concepts of reservoir planning*
6. *Classify various types of dams and estimate the stability of gravity of dam*

UNIT – I

Introduction to Hydrology: Engineering Hydrology and its applications; Hydrologic Cycle; Precipitation- Types and Forms; Evaporation- Factors affecting & measurement of Evaporation; Infiltration - Factors affecting & measurement of infiltration - Infiltration Indices; Run-off- Factors affecting Run-off - Computation of Run-off

Hydrograph Analysis: Hydrograph-Unit Hydrograph- Construction and limitations of Unit Hydrograph - Application of Unit Hydrograph - S-Hydrograph

UNIT – II

Ground Water: Aquifer – Aquiclude – Aquifuge - Aquifer parameters; Porosity - Specific yield - Specific retention; Types of aquifers - Well Hydraulics - Darcy's Law - Steady radial flow to a well; Dupuit's theory for confined and unconfined aquifers

Irrigation: Introduction - Necessity and importance of Irrigation - Advantages and effects of Irrigation - Types of Irrigation - Methods of Application of Irrigation water -Duty and Delta - Relation between Duty and Delta - Factors affecting Duty - Methods of improving Duty

UNIT – III

Water Requirement of Crops: Types of Soils; Gross Command Area - Culturable Command Area - Culturable Cultivated and Uncultivated Area; Kor Depth and Kor Period - Crop seasons and Crop rotation; Irrigation efficiencies; Determination of irrigation requirements of crops; Consumptive use of water - Factors affecting consumptive use

Canal Regulation Works: Canal falls- Necessity and location of falls- Types and classification of falls; Roughening devices; Design of sarada type fall; Canal regulators- Off take alignment- Head regulators and cross-regulators- Design of cross-regulator and distributary head regulator

UNIT – IV

Cross Drainage Works: Introduction- Types of cross drainage works- Selection of suitable type of cross drainage work- Classification of aqueducts and siphon aqueducts.

Reservoir Planning: Introduction- Investigations for reservoir planning- Selection of site or a reservoir- Zones of storage in a reservoir; Storage capacity and yield- Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Life of reservoir; Flood routing- Methods of flood routing Graphical Method (Inflow storage discharge curves method)

UNIT – V

Dams: General: Introduction- Classification according to use- Classification according to material- Gravity dams- Arch dams- Buttress dams- Steel dams- Timber dams- Earth dams and rock fill dams- Advantages and disadvantages- Physical factors governing selection of type of dam- Selection of site for a dam

Gravity Dams: Introduction- Forces acting on a gravity dam- Combination of loading for design- Modes of failure- Stability requirements- Principal and shear stresses- Stability analysis- Elementary profile of a gravity dam- Practical profile of a gravity dam- Limiting height of a gravity dam- High and low gravity dams- Design of gravity dams– Single step method- Galleries- Stability analysis of non-overflow section of Gravity dam

TEXT BOOKS
1. K Subramanya, *Engineering Hydrology*, McGraw Hill Publication, 4th Edition
2. Dr. B.C. Punmia, Dr. Pande Brij Basi Lal, Ashok Kumar Jain, Dr. Arun Kumar Jain, *Irrigation and Water Power Engineering*, Laxmi Publications,16th Edition

REFERENCES
1. Dr. P.N. Modi, *Irrigation Water Resources and Power Engineering*, Standard Book House, 9th Edition
2. Dr. P. Jaya Rami Reddy, *A Textbook of Hydrology*, Laxmi Publications, 3rd Edition

3. Santhosh Kumar Garg, *Water Resource Engineering Vol.I & Vol. II*, Khanna Publishers, 23rd Edition

4. Arora, K.R., Irrigation, Water Power and Water Resources Engineering, Standard Publishers Distributors, New Delhi, 2009

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(18CE0118) ESTIMATION, COSTING AND VALUATION

COURSE OBJECTIVES

The objectives of this course

1. *To learn the main items of work in building and different types of estimates.*
2. *To understand the quantity calculations of various items of building works, roads and canal*
3. *To learn various specifications and the rate analysis of various items of building works*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Apply different methods of estimates for calculating the quantities of building works*
2. *Calculate the quantity of earthwork in roads and canals*
3. *Estimate the quantities of the reinforcement in the beams, slabs, columns with foundation and staircase*
4. *Work out the rate analysis of various items of building works*
5. *Explain specifications of various items of building works*
6. *Assess valuation of assets*

UNIT – I

Estimating and Estimate of buildings: Estimate – Types of estimates – Main items of work – Units of measurements – Methods of building estimates – Detailed estimates of buildings using individual wall method and centre line method

UNIT – II

Road estimating and Earth work for canals: Estimate of earthwork by Mid-section, Trapezoidal and Prismoidal formula – Estimate of pitching of slopes – Estimate of earthwork from L-sections – Estimate of earthwork in hill road – Estimate of metalled road – Estimate of C.C. Track way – Earthwork in canals

UNIT – III

R.C.C works: Percentage steel reinforcement – Standard hooks and cranks of reinforcement bars – Estimate of R.C.C. slab – Estimate of R.C.C. beam – Estimate of R.C.C. T-beam slab – Estimate of R.C.C. column with foundation – Estimate of R.C.C. staircase – Estimate of R.C.C. staircase

UNIT – IV

Analysis of rates: Analysis of rates of building works – Earth work – Cement concrete in foundation – Reinforced cement concrete – Damp proof course – Brickwork – Stone masonry – Flooring – Roofing – Plastering – Finishing

UNIT – V

Specifications: Detailed specifications of building works – Earthwork – Cement concrete – Reinforced cement concrete – Damp proof course – Brickwork – Plastering – Pointing– Cement concrete floor – Mosaic floor – White and colour washing – Painting – Varnishing – Woodwork – Doors and Windows

Valuation: Valuation – Purpose of valuation – Gross income – Net income – Outgoings – Scrap value – Salvage value – Capital cost – Year's purchase – Sinking fund – Depreciation – Methods of valuation – Valuation of Freehold & Leasehold properties – Fixation of rent

TEXTBOOKS

1. B.N. Dutta, *Estimating and Costing in Civil Engineering*, UBS publishers,27th Revised Edition, 2017
2. M. Chakraborthi, *Estimation, Costing, Specifications and Valuation in Civil Engineering*, Chakraborthi publisher, 24th Edition, 2010

REFERENCES

1. B.S. Patil, *Civil Engineering Contracts and Estimations*, Universities Press, 4th Edition, 2015
2. G.S. Birdie, *Estimating and Costing*, Dhanpat Rai Publisher, 2014
3. D.D.Kohli and Ar. R.C.Kohli, *Estimation and Costing(Civil),* S.Chand & Company Pvt.Ltd,2013

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(18CE0119) GEOTECHNICAL ENGINEERING LAB

COURSE OBJECTIVES

The objectives of this course

1. *Find index properties such as specific gravity, field density, Atterberg's limits and sieve analysis on soils to classify soils*
2. *Find the engineering properties such as permeability, maximum dry density and corresponding optimum moisture content, shear strength and CBR values of soils*

COURSE OUTCOMES (COs)

On successful the completion of this course, the student will be able to

1. *Conduct tests on fine grained soils to determine Atterberg's limits*
2. *Conduct fields test to find out field density of cohesive and cohesion less soils*
3. *Perform sieve analysis and sedimentation analysis to classify the soil*
4. *Conduct field tests on soil to estimate soil permeability*
5. *Conduct compaction test and draw compaction curve to find out optimum moisture content and maximum dry density*
6. *Conduct shear tests to predict shear strength of the soil*

LIST OF EXPERIMENTS

1. Specific gravity of soil solids (Density bottle)
2. Atterberg's limits (Liquid limit and Plastic limit)
3. Field density test (Core cutter and Sand replacement methods)
4. Grain size distribution (Sieve analysis)
5. Permeability of soil (Constant and Variable head method)
6. Compaction test (Standard or Modified Proctor method)
7. California Bearing Ratio test
8. Consolidation test (Demo)
9. Unconfined compression test
10. Direct shear test
11. Vane shear test
12. Triaxial shear test
13. Free swelling index test

Any eight experiments may be conducted

TEXT BOOKS

1. K.V.S. Appa Rao & V.C.S. Rao, *Soil Testing Lab Manual*, University Science Press, Laxmi Publications, 2016
2. S.Mittal and J.P. Shukla, *Soil Testing for Engineers*, Khanna Publishers, Sixth Edition

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(18CE0120) CONSTRUCTION MATERIALS LAB

COURSE OBJECTIVES

This course enables the students to

1. *Know the concept and procedure of different type of test conducted on cement, aggregate and finished concrete*
2. *Test the basic properties of fresh and hardened concrete*
3. *Students can design the mix, make the specimens and test the same for their respective strengths*

COURSE OUTCOMES (COs)

After the completion of this course, students will be able to

1. *Outline the importance of testing of cement and conduct various tests on cement*
2. *Assess the different properties of aggregate*
3. *Summarize the concept of workability and testing of concrete*
4. *Determine the specific gravity and water absorption on fine aggregate.*
5. *Conduct tests on hardened concrete and describe the its properties*
6. *Perform non-destructive test on concrete*

LIST OF EXPERIMENTS

1. Specific gravity and fineness of cement
2. Soundness of cement
3. Normal consistency of cement
4. Initial and final setting of cement
5. Compression strength of cement
6. Specific gravity and water absorption of coarse aggregate
7. Specific gravity and water absorption of fine aggregate
8. Bulking of sand
9. Fineness modulus of coarse aggregate by sieve analysis
10. Fineness modulus of fine aggregate by sieve analysis
11. Compression strength of concrete
12. Workability of concrete by slump cone test
13. Workability of concrete by compaction factor
14. Workability of concrete by Vee Bee Consistometer
15. Non-destructive testing of concrete

Any ten experiments may be conducted

TEXT BOOKS

1. M.L. Gambhir*, Concrete Manual,* Dhanpat Rai & co., Fourth edition
2. Gambhir, *Building Construction and Materials (Lab Manual),* TMH publishers

REFERENCES

1. IS 10262-2007, IS 456-2000, ACI 211.1-91

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(18CE0121) SURVEYING LAB-II

COURSE OBJECTIVES
This course enables the students

1. *To introduce in curriculum. Drawing of Plans and Maps and determining the area are pre-requisites before taking up any Civil Engineering works*
2. *To set out simple curves for high ways and railways and to determine height of remote objective, horizontal distance and coordinates of points using total station*
3. *Develop skills to set out Curves in the field using both Total Station and Theodolite*

COURSE OUTCOMES (COs)
Students undergoing this course are able to

1. *Measure horizontal and vertical angles using transit theodolite and determine the tachometric constant*
2. *Determine horizontal distances between accessible and inaccessible point using the principals of trigonometry with the help of theodolite and tachometry*
3. *Find the heights of objects using the theodolite and tachometry*
4. *Set simple curves by different methods using theodolite*
5. *Carry out setting of works for building and pipe lines*
6. *Use total stations to carryout various surveying jobs*

LIST OF EXPERIMENTS

1. Study of theodolite in detail – practice for measurement of horizontal and vertical angles
2. Measurement of horizontal angles by repetition method
3. Measurement of horizontal angles by reiteration method
4. Determination of height of building by trigonometric survey
5. Determination of horizontal between accessible points
6. Determination of horizontal between inaccessible points
7. Determination of Constants K and C using tacheometer
8. Heights and distance using principles of tacheometric surveying
9. Curve setting by offsets from long chord
10. Curve setting by deflection angle method
11. Setting out works for buildings
12. Setting out works for pipeline
13. Determination of area using total station
14. Traversing using total station

15. Distance, difference in height between two inaccessible points using total station
16. Measurement of area using digital Planimeter

Any ten experiments may be conducted

REFERENCES
1. Roy S.K., *Fundamentals of Surveying,* Prentice Hall of India, 2nd Edition, 2004
2. Arora K.R., *Surveying, Vol I & II*, Standard Book house, 10th Edition, 2008

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(18HS0842) APTITUDE PRACTICES

COURSE OBJECTIVES

The objectives of this course

1. To evaluate various real life situations by resorting to Analysis of key issues and factors

2. To read between the lines and understand various language structures

3. To demonstrate various principles involved in solving Mathematical problems and thereby reducing the time taken for performing job functions

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. Develop the subtle way of approaching in the candidate

2. Acquired the decision making with in no time

3. Implement logical thinking during professional tenure

4. Improve knowledge on problem solving

5. Understand problems on coding and decoding

6. Apply the knowledge on the concept of reasoning in real life

UNIT – I

Percentages, Partnership, Ratio and Proportion**,** Time and Distance, Time and Work

UNIT – II

Clocks, Calendars, Blood relations, Profit and Loss**,** Simple Interest, Compound Interest

UNIT – III

Permutations and Combinations, Probability
Menstruation: Areas, Volumes of different solids, Problems on Areas, Volumes and Surface Areas, Cubes

UNIT – IV

Number and letter series: Difference series, Product series, Squares series, Cubes series, Alternate series, Combination series, miscellaneous series, Place values of letters
Number and Letter Analogies: Definition of Analogy, Problems on number analogy
Odd Man Out: Problems on number Odd man out, Problems on letter Odd man out, Problems on verbal Odd man out

UNIT – V

Coding and decoding, Directions

Critical Reasoning:

Problems on assumption, Problems on conclusions, Problems on inferences, Problems on strengthening and weakening of arguments, Problems on principle, Problems on paradox

TEXTBOOKS

1. Barrons GL, *Thorpe's Verbal Reasoning*, McGraw Hills, LSAT Materials, 2010
2. Agarwal R S, *A Modern Approach to Logical Reasoning*, S.Chand, 2017

REFERENCES

1. Agarwal R S, *Quantitative Aptitude*, S. Chand, 2017
2. BARRONS G L, *Quantitative Aptitude*, 2010
3. Abhijit Guha, *Quantitative Aptitude*, *PHI Learning PVT. LTD, 2019*
4. Tyra, *Magical Book on Quicker Maths*, BSC Publishing Company, 2018

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(18CE0122) CONSTRUCTION PROJECT MANAGEMENT

COURSE OBJECTIVES

The objectives of this course

1. *To make the student understand various functionaries of the construction project management*
2. *To make the student work with construction project management tools such as bar charts, CMP & PERT*
3. *To gain the knowledge of material management, quality management, safety management and contracts in construction practice*

COURSE OUTCOMES (COs)

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

1. *Describe importance, types, phases, participants of construction projects and summarize functions of construction management*
2. *Develop bar chart, mile stone charts and can explain the basic principles of network techniques*
3. *Analyze PERT & CPM networks to find various time estimates and identify critical activities and path*
4. *Optimize the cost and can update CPM network*
5. *Discuss significance of material management and quality management of construction projects*
6. *Recognize various issues related to construction safety and can describe fundamentals of construction contracts*

UNIT – I

Construction Project: Importance of Construction – Indian Construction Industry – Types of Construction - Construction Project – Phases of Construction Project – Construction Project Management and its relevance – Participants of construction project – Functions of construction management

Construction Planning: Types of project plans – Work breakdown structure – Bar charts – Milestone Charts – Elements of Network – Development of Network – Difference between AoA and AoN diagram – Common errors in drawing the network

UNIT-II

PERT Network Analysis: Uncertainties – Time estimates – Frequency distribution – Earliest expected time – Latest allowable occurrence time – Slack – Critical Path

CPM Network Analysis: CPM process – CPM network – Activity time estimate – Earliest event time – Latest allowable occurrence time – Float – Critical activities and critical path

UNIT – III

CPM Cost Model: Project cost – Indirect project cost – Direct project cost – Slope of direct cost curve – Total project cost and optimum duration – Contracting the network for cost optimization – Steps in time cost optimization

CPM Updating: Updating Process – Data required for updating – Steps in the process of updating – When to update

Resources Allocation: Resources usage profiles – Resources smoothing – Resources levelling

UNIT – IV

Tenders: Tender form – Tender notice – Time limits for tender notice – Submission of tender

Contracts: Types of contract – Contract document – Condition of contract

UNIT-V

Quality Management: Construction quality – Inspection – Quality control – quality assurance in projects – Total quality management – Cost of quality – Audit

Safety Management: Construction accidents – Causes – Prevention of accidents – Safety measures – Cost of accidents – Safety and health management systems

TEXT BOOKS

1. Kumar Neeraj Jha, *Construction Project Management – Theory and Practice*, Pearson Education India, 2011
2. Dr. B. C. Punmia & K. K. Khandelwal, *Project Planning and Control with PERT and CPM,* Lakshmi Publications New Delhi

REFERENCES

1. B Sengupta & H Guha, *Construction Management and Planning*, McGraw Hill Education (India) Private Limited, 1st edition, 2015
2. Saurabha Kumar Soni, *Construction Management and Equipment*, SK Kataria & Sons, 2014
3. Robert L. Peurifoy, William B. Ledbetter and Clifford J. Schexnayder, *Construction Planning, Equipment and Methods*, McGraw-Hill Higher Education, 6th Edition, 2001

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(18CE0123) ENVIRONMENTAL ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *To equip the students with the principles and design of water treatment units and distribution system*
2. *The objectives of this course is to help students to develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants*
3. *To develop a student's skill in evaluating the performance of water and wastewater treatment plants*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Forecast population, Estimate the water demand for a town or city during design period*
2. *Describe water quality criteria and standards, and their relation to public health*
3. *An ability to Design the various functional units in water treatment and distribution system*
4. *Estimate sewage generation and Design of sewer system*
5. *Recognize characteristics and composition of wastewater*
6. *Design of the unit operations and processes that are used in sewage treatment and sludge disposal*

UNIT – I

Introduction to Water Supply: Importance and Necessity of protected water supply system - Objectives of protected water supply system- Flow chart of public water supply system

Water Demand and Quantity Studies: Estimation of water demand for a town or city-Types of water demands- Percapita demand- Factors affecting the percapita demand-Variations in the Demand-Design period-Factors affecting the design period- Population studies-Methods of population forecasting - Sources of water - Surface and subsurface sources-Factors governing the selection of source of water

UNIT – II

Quality and Analysis of Water: Characteristics of water – Physical, Chemical and Biological - Analysis of water – Physical, Chemical and Biological- Water borne diseases- Drinking water quality standards.

Water Treatment: Layout and general outline of water treatment units –Screening-Types of screens – Sedimentation - Principles – Design factors – Coagulation-Methods of feeding coagulation – Flocculation - Filtration – Theory – Classification of filters –Comparison -

Design of filters – Disinfection – Methods – Chlorination – Forms - Break point chlorination - Water Softening – Hardness – Types - Methods of removal of hardness

UNIT – III
Water Distribution: Distribution systems – Requirements-Methods of distribution- Layout of Water distribution systems - Waste detection and prevention – House service connection
Introduction to Sanitation: Sources of waste water generation- System of sanitation – Relative merits & demerits – Collection and conveyance of wastewater – Sewerage – Classification of sewerage systems
Estimation of Sewage Flow: Estimation of sewage flow and storm water drainage –DWF- Factors affecting DWF- Hydraulics of sewers and storm drains– Design of sewers – Materials for sewers- Appurtenances in sewerage – Cleaning and ventilation of sewers

UNIT – IV
Wastewater Characteristics: Characteristics of sewage – Physical, Chemical and Biological - Decomposition of sewage- Examination of sewage – Biological Oxygen Demand-Chemical Oxygen Demand
Wastewater Treatment: Layout and general outline of various units in a wastewater treatment plant–Primary treatment-Screens–Grit Chamber– Skimming tanks – Sedimentation tanks – Principles & design – Secondary treatment – Activated sludge process - Trickling filters – Standard and high rate trickling filters – Comparison

UNIT – V
Disposal of Sewage and Sludge Treatment: Methods of waste water disposal-Self-purification–Oxygen sag curve - Sludge treatment processes-Flow chart-Sludge thickening and digestion – Factors – Design of digestion tank
Disposal of Sludge: Sludge dewatering- Disposal of sludge – Methods - Septic tanks and Imhoff Tanks - Working principles and design – Soak pits and Dispersion trench

TEXT BOOKS
1. Garg, S.K., *Environmental Engineering Vol. I & II*, Khanna Publishers, New Delhi, 2015
2. Modi, P.N., *Water Supply & Waste Water Engineering, Vol. I & II*, Standard Book House, New Delhi, 2010

REFERENCES
1. Punmia, B.C., Jain, A.K., and Jain.A.K, *Water Supply & Waste Water Engineering, Vol. I & II*, Laxmi Publications, 2010
2. Duggal K.N*., Elements of Environmental Engineering,* S.Chand and Co. Ltd., New Delhi, 2014
3. Metcalf and Eddy, *Wastewater Engineering-Treatment and Reu*se, Tata McGraw-Hill Company, New Delhi, 2010
4. *Manual on Water Supply and Treatment*, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999
5. *Manual on Sewerage and Sewage Treatment Systems Part A, B and C*, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013

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(18CE0124) TRANSPORTATION ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. To familiarize with various elements and geometric design of highways

2. To learn the various aspects of pavement design

3. To understand the various aspects of Railway Engineering

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. Recognize significance of highway alignment and can carry out engineering surveys for highway location

2. Design various geometric elements of highway

3. Implement traffic studies, traffic regulations and can design intersection and traffic signals

4. Design flexible and rigid pavements as per IRC

5. Describe different components of permanent way in Railway Track

6. Design various components of Railway Track

UNIT – I

Highway Alignment and Surveys: Highway alignment - Basic requirements - Controlling factors - Engineering surveys for highway location

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 – II

Traffic Engineering: Traffic studies - Flow - Speed - Travel time - Delay and O-D study – PCU - Peak hour factor - Parking study - Accident study - Highway capacity and level of service of rural highways and urban roads. Traffic signs - Types - Traffic signals - Types - Signal design by Webster's method - Design of Intersections

UNIT – III

Pavement Design: Types of pavement - Components and their functions - Design factors - Flexible pavement design (IRC: 37-2012) - IRC methods based on CBR only - Rigid pavement design (IRC: 58-2011) - Calculation of stresses - Design of Dowel bars and Tie bars

UNIT – IV

Railway Engineering: Permanent way components - Cross section of permanent way - Functions and requirements of Rails, Sleepers and Ballast - Types of gauges - Creep of rails - Theories related to Creep - Coning of wheels - Adzing of sleepers - Rail fastenings

UNIT – V

Geometric Design of Railway Track: Gradients - Grade compensation - Cant and negative super elevation - Cant deficiency - Degree of curves - Safe speed on railway track - Points and Crossings - Layout and functioning of left hand turn out and right hand turn out - Station yards - Signalling and Interlocking

TEXT BOOKS

1. S.K.Khanna & C.E.G.Justo, *Highway Engineering,* New Chand & Bros, 10th edition, 2012
2. S.C.Saxena and S.P.Arora, *A Text Book of Railway Engineering*, Dhanpat Rai Publications, New Delhi, 2011

REFERENCES

1. L.R.Kadiyali and Lal, *Traffic Engineering and Transportation Planning*, Khanna Publications, 9th edition, 1999
2. L.R.Kadiyali and Lal, *Principles and Practice of Highway Engineering Design*, Khanna Publications, 7th edition, 2013
3. Rangwala SC, *Railway Engineering,* Charotar Publishing House Pvt. Ltd., 27th edition, 2017

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(18CE0133) FOUNDATION ENGINEERING

COURSE OBJECTIVES

To make the student understand

1. *Bearing capacity and settlement of shallow foundations*
2. *The concepts involved in computing lateral earth pressures on retaining walls*
3. *The load-carrying capacity of pile foundations and settlement of pile groups*
4. *The well foundation and construction aspects of caisson foundation*
5. *The General Criteria for design of machine foundations and vibration analysis*

COURSE OUTCOMES (COs)

At the end of the course the student will able to

1. *Describe different earth pressures and calculate active and passive earth pressures using Rankine's theory,* Coulomb's theory and graphical techniques
2. *Establish the stability of retaining walls*
3. *Discuss various theories on bearing capacity and field tests and apply them to estimate the bearing capacity of soils and conduct settlement analysis*
4. *Classify various types of pile foundation, analyze the load carrying capacity of pile and pile groups*
5. *Describe the concept of well foundation and explain the design and construction aspects of caisson foundation*
6. *Describe types and principals of machine foundations*

UNIT – I

Earth Pressure Theories: Introduction – Plastic Equilibrium in Soils – Active and Passive States – Earth Pressure at Rest – Rankine's Theory – Coulomb's Wedge Theory – Culmann's and Rebhann's Graphical Methods for Active Earth Pressure

Retaining Walls: Types of retaining walls – Stability Consideration for Gravity Retaining Walls

UNIT – II

Shallow Foundations: Types and choice of foundation – Depth of foundation – Types of shear failures – safe bearing capacity – Terzaghi's analysis – Meyerhof's analysis – Skempton's analysis – IS Method – Bearing Capacity from Standard Penetration Test – Effect of water table on bearing capacity - Plate load test

Settlement: Types of settlement – Tolerable settlements – Allowable soil pressure for both cohesion less and cohesive soils

UNIT – III

Pile Foundations: Necessity – Classification – Load carrying capacity of piles – Static methods – Dynamic formulae – Insitu penetration tests – pile load tests – Negative skin friction – Group action in piles – Settlement of pile groups

UNIT – IV

Well Foundations: Introduction – Types – Different shapes of wells – Forces Acting on Wells - Components of wells – Grip length – Design Criteria – Sinking of wells – Measures for Rectification of Tilts and Shifts

Caisson Foundation: Introduction – Design Aspects of Caissons –Types of caissons – Construction Aspects of Caissons

UNIT- V

Machine Foundations: Introduction – Types of Machine Foundation – Basic Definitions – General Criteria for Design of Machine Foundations – Free and Forced Vibration – Vibration Analysis – Determination of Natural Frequency – Reinforcement and Construction Details – Weight of Foundation – Vibration Isolation and Control

TEXT BOOKS

1. K.R. Arora, *Soil Mechanics and Foundation Engineering,* Standard Publishers
2. C. Venkataramaiah, *Geotechnical Engineering,* New Age International Pvt Ltd

REFERENCES

1. V.N.S. Murthy, *Geotechnical Engineering,* CRC Press, New York, Special Indian Edition
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundation* Laxmi Publications Pvt Ltd., New Delhi, 16th Edition, 2005
3. Joseph E. Bowles, P.E., S.E., *Foundation Analysis and Design,* McGraw-Hill Companies New york, 5th Edition,1997

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(18CE0134) WATER TECHNOLOGY

COURSE OBJECTIVES
The objectives of this course
1. *To develop a student's skill in evaluating the performance of water treatment plants*
2. *Communicate the importance of conserving water*
3. *Outline the strategies for reducing water consumption*
4. *To minimize the risks of floods, droughts and landslides.*
5. *To develop rural areas in the region with clear plans for improving the economy of the regions*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to
1. *Underline the importance of water and Describe the mechanism of hydrological cycle*
2. *Describe various elements associate with public water supply*
3. *Describe water quality criteria and standards, and their relation to public health*
4. *Recognize the cause of water pollution and Influence of climatic changes on water resources*
5. *Summarize various water conservation techniques in practice*
6. *Explain need for watershed management and Implement various plans for watershed management*

UNIT-I
Water Demand and Sources of Water: Water demand -Types of water demands- Percapita Demand- Factors affecting the percapita demand – Water cycle-Sources of water-Surface and subsurface sources - Factors governing the selection of source of water - Water deficiency-Water crisis
Introduction to Water Supply: Importance and Necessity of protected water supply systems - Objectives of protected water supply system- Flow chart of public water supply system

UNIT-II
Water Quality: Requirement of water for domestic use-Impurities in water- Characteristics of water-Water quality standards – Flow chart of basic treatment process- Latest treatment process- Membrane filtration-Reverse process- Desalination process

UNIT-III
Water Pollution: Surface water pollution – Causes - Remedial measures – Ground water pollution – Causes - Remedial measures

Climatic Changes on Water Resources: Impact of climatic changes on water resources-Droughts- Extreme Precipitation- Melting Glaciers and Snow Drought- Greenhouse Gas emissions- Algal blooms

UNIT-IV
Water Conservation: Definition – Rain-water harvesting– Advantages of implementing the rain-water harvesting–Components of roof top rain-Water harvesting-Techniques in rain water harvesting–Catchment harvesting-Check dams-Farm ponds-Percolation tank-Ground water recharge- Ground water recharge structures

UNIT-V
Watershed Management: Definition – Concept of Watershed Management-Need for watershed management- Objectives of watershed management-Characteristics of watershed – Planning of watershed management

TEXT BOOKS
1. Modi, P.N., *Water Supply & Waste Water Engineering, Vol. I & II*, Standard Book House, New Delhi, 2010
2. J.V.S.Murty.,*Watershed Management*, New Age International Publications, New Delhi,2017

REFERENCES
1. Garg, S.K., *Environmental Engineering, Vol.I & II*, Khanna Publishers, New Delhi, 2015
2. Madan Mohan Das, Mimi Das Saikia, *Watershed Management*, PHI Learning Pvt. Ltd., Delhi, 2012
3. Ghanshyam Das, *Hydrology and Soil Conservation Engineering: Including Watershed Management*, PHI Learning Pvt. Ltd., Delhi
4. https://theberkey.com/pages/a-guide-to-water-conservation

   https://blog.mygov.in/water-conservation-rainwater-harvesting/

   https://theconstructor.org/water-resources/methods-rainwater-harvesting/5420/
5. Links for "Climatic Changes on Water Resources"

   https://ascelibrary.org/doi/10.1061/%28ASCE%29EE.1943-7870.0001394

   https://www.watercalculator.org/footprint/climate-change-water-resources/

   https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-water-resources.html

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(18CE0135) MAINTENANCE & REHABILITATION OF STRUCTURES

COURSE OBJECTIVES

The objectives of this course

1. *Learn the fundamentals of maintenance and repair strategies*
2. *Know the causes of corrosion, Mechanism and prevention*
3. *Study the quality assurance, serviceability and durability of concrete*
4. *Educate the different repair, strengthening, rehabilitation and retrofitting techniques*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Describe the fundamentals of maintenance and repair strategies*
2. *Identify the probable reasons for the deterioration of various structural members*
3. *Explain the causes of corrosion and its prevention*
4. *Know the materials and techniques used for repair of structures*
5. *Assessing damage to structures and various repair techniques*
6. *Carry out inspection and evaluation of damaged structure*

UNIT – I

Maintenance and Repair Strategies: Maintenance – Repair and Rehabilitation – Facets of Maintenance – importance of Maintenance – Various aspects of Inspection – Assessment procedure for evaluating a damaged structure – causes of deterioration

Serviceability and Durability of Structures: Quality Assurance for concrete construction – Fresh concrete properties – Strength – Permeability – Cracking – Effects due to climate – Temperature – chemicals – Wear and erosion – Design and construction errors

UNIT – II

Corrosion of Steel Reinforcement: Corrosion mechanism - Effects of cover thickness and cracking - Methods of corrosion Protection – Inhibitors - Coatings - Cathodic protection

UNIT – III

Diagnosis and Assessment of Distress: Diagnosis and Assessment of Distress - Visual inspection – Non-destructive tests – Ultrasonic pulse velocity method – Rebound hammer technique –Pull out tests – Core test

UNIT – IV

Materials for Repair: Materials for Repair – Special concretes and mortar – Concrete chemicals – Special elements for accelerated strength gain – Expansive cement – Polymer concrete – Ferro cement, Fibre reinforced concrete – Fibre reinforced plastics

UNIT – V

Rehabilitation of Structures: Strengthening of Structural elements–Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques –Engineered demolition methods – Case studies

TEXT BOOKS

1. Bhattacharjee, *Concrete Structures Repair Rehabilitation and Retrofitting,* CBS, First edition, 2019
2. Shetty, M.S., *Concrete Technology Theory and Practice,* S.Chand and company, New Delhi, 2018

REFERENCES

1. B.L. Gupta and Amit Gupta, *Maintenance and Repair of Civil Structures,* Standard Publications, New Delhi, 2010
2. P.C.Varghese, *Maintenance Repair & Rehabilitation & Minor Works of Bridges,* PHI Learning Pvt. Ltd, 2014
3. A.R. Santhakumar, *Concrete Technology*, Oxford University Press, New Delhi, 2018
4. *Handbook on Repair and Rehabilitation of RCC buildings,* CPWD, Government of India, 2002

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(18EE0234) INDUSTRIAL INSTRUMENTATION

COURSE OBJECTIVES

The objectives of this course are

1. *To Analyze the Common errors that occur in measurement systems, and their classification*
2. *To understand the characteristics of signals, their representation, and signal modulation techniques*
3. *To learn the Methods of Data Transmission, Telemetry, and Data acquisition*
4. *To study working principles of different Signal Analyzers and Digital meters*
5. *To learn about several types of transducers and their use for measurement of non-electrical quantities*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Identify and explain the types of errors occurring in measurement system*
2. *Differentiate among the types of data transmission and modulation techniques*
3. *Apply digital techniques to measure voltage, frequency and speed*
4. *Analyse the working principles of different Signal Analyzers and Digitalmeter*
5. *Understand the operation of several types of transducers*
6. *Choose suitable Transducers for the measurement of non-electrical quantities*

UNIT-I

Characteristics of Signals and their Representation: Measuring Systems, Performance Characteristics, Static Characteristics, Dynamic Characteristics; Errors in Measurement Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation.

UNIT-II

Data Transmission, Telemetry and Das: Methods of Data Transmission–General Telemetry System .Frequency Modulation (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM)Telemetry. Comparison of FM, PM, PAM and PCM - Analog and Digital Data Acquisition Systems –Components of Analog DAS–Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing – Digital DAS–Block Diagram—Modern Digital DAS (Block Diagram)

UNIT-III

Signal Analyzers, Digital Meters: Wave Analysers- Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers-Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, QMeter. Peak Reading and RMS Voltmeters, Digital Voltmeters-

Successive Approximation, Ramp and Integrating Type- Digital Frequency Meter- Digital Multimeter- Digital Tachometer

UNIT-IV
Transducers: Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Synchros, Piezo electric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes

UNIT-V
Measurement of Non-Electrical Quantities: Measurement of strain, Gauge Sensitivity, Measurement of Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level

TEXTBOOKS
1. A.K.Sawhney, *A course in Electrical and Electronic Measurements and Instrumentation,* Dhanpat Rai & Co., 2012
2. D.V.S. Murty, *Transducers and Instrumentation*, Prentice Hall of India, 2nd Edition, 2004

REFERENCES
1. A.Dhelfrick and W.D.Cooper, *Modern Electronic Instrumentation and Measurement Technique*, Pearson/Prentice Hall of India., 1990
2. H.S. Kalsi, *Electronic Instrumentation*, Tata McGraw-Hill Edition, 2010
3. T.R.Padmanabhan, *Industrial Instrumentation–Principles and Design,* Springer

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(18ME0307) NON-CONVENTIONAL ENERGY RESOURCES

COURSE OBJECTIVES

The objective of the course is to

1. *Know the importance of energy, resources of renewable energy, their usage and impact on environment.*
2. *Recognize the significance of Solar energy, its harnessing technologies & its applications*
3. *Identify the method of exploiting energy from wind and parameters to be considered for the selection of site for wind turbine installation*
4. *Explain the concept of bio energy and its conversion devices*
5. *Differentiate various renewable energies such as tidal energy, geothermal energy, fuel cells etc.*

COURSE OUTCOMES (COs)

On successful completion of the course, the student will be able to

1. *State various sources of Energies, its availability and explain the importance of them by observing the global energy scenario.*
2. *Distinguish the types of solar energy tapping devices and describe the method of harnessing the solar energy.*
3. *Summarize the Wind energy systems and elucidate the impact of it in environmental aspects.*
4. *Describe the Biomass conversion process and list out various bioenergy applications.*
5. *Interpret the knowledge of renewable energies such as tidal energy, OTEC, Fuel cell, etc. for effective construction of Hybrid systems.*
6. *Identify numerous applications renewable energy resources and illustrate its harnessing technologies*

UNIT-I
INTRODUCTION: World energy use – classification of energy's-reserves of energy resources– environmental aspects of energy utilization – need of renewable energy– renewable Energy scenario in Andhra Pradesh, India and around the world

UNIT-II
SOLAR THERMAL CONVERSION: Flat Plate and Concentrating Collectors – Solar direct Thermal Applications– Solar thermal Power Generation - Photo voltaic Conversion: Fundamentals of Solar Photo Voltaic Conversion – Solar Cells –Solar PV Power Generation – Solar PV Applications, Solar Radiation Measurements

UNIT-III

WIND ENERGY: Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine–Wind Energy Measurements-Safety and Environmental Aspects

UNIT-IV

BIO ENERGY; Biomass direct combustion – Biomass gasifiers – Biogas plants–Ethanol production – Biodiesel – Cogeneration - Biomass Applications

UNIT-V

OTHER SOURCES OF ENERGY: Tidal energy – Wave Energy – Open and Closed OTEC Cycles –Geothermal Energy – Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.

TEXT BOOKS

1. R.K. Rajput, *Non-conventional Energy Sources and Utilization,* S. Chand Publishers, 2nd Edition, 2014
2. G. D Rai, *Non-Conventional Energy Sources,* Khanna Publishers, 1st Edition, 2010
3. Nicholas Jenkins & Janaka Ekanayake*, Renewable Energy Engineering*, Cambridge University Press; 1st Edition, 2017

REFERENCES

1. Dr. R K Singal*, Non-Conventional Energy Resources*, S.K Kataria & Sons, 4th Edition, 2014
2. John Twidell & Tony Weir, *Renewable Energy Sources,* Rutledge publisher, 3rd Edition, 2015
3. Sukhatme. S.P*, Solar Energy, Principles of Thermal Collection and Storage,* Tata McGraw Hill Publishing Company Limited, 6th Edition, 1990

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(18EC0449) INTRODUCTION TO IOT

COURSE OBJECTIVES

1. *To provide an overview on the ICT ecosystem and enabling environment to foster Internet of Things (including technology, standards, system management and applications) deployments*
2. *Define the infrastructure for supporting IoT deployments*
3. *To provide an understanding of the technologies and the standards relating to the Internet of Things*
4. *Understand various case studies related to IoT domain*

COURSE OUTCOMES (COs)

On successful completion of this course, student will be able to

1. *Understand the technology and standards relating to IoTs*
2. *Understand where the IoT concept fits within the broader ICT industry and possible future trends*
3. *Understand the key components that make up an IoT system*
4. *Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack*
5. *Configure Raspberry Pi, Understand Sensors, and Actuators & get started with python on Raspberry Pi*
6. *Apply the knowledge and skills acquired during the course to design, build and test a complete, working IoT system involving prototyping, programming and data analysis*

UNIT – I

IoT Introduction & Concepts: Introduction to Internet of Things - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - IoT Levels & Deployment Templates

UNIT – II

Domain Specific IoTs: Home Automation – Cities – Environment – Energy – Retail – Logistics - Agriculture – Industry - Health & Lifestyle

UNIT – III

IoT and M2M: Introduction – M2M – Difference between IoT an M2M - Software Defined Networking - Network Function Virtualization for IoT
Developing Internet of Things: IoT Design Methodology – Motivation for using Python

UNIT – IV

IoT Physical Devices & Endpoints: IoT Device – Raspberry Pi Board - Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming raspberry Pi with Python – Other IoT devices

UNIT – V

Case Studies Illustrating IoT Design: Home Automation – Cities – Environment – Agriculture – Productivity applications

TEXT BOOKS

1. Vijay Madisetti – Arshdeep Bahga, Arshdeep Bahga & Vijay Madisetti, *Internet of Things A Hands-on Approach*, 1st Edition, 2014

2. Pethuru Raj and Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, CRC Press, 1stEdition, 2014

REFERENCES

1. Raj Kamal, *Embedded Systems*, Tata McGraw-Hill Education, 2nd Edition, 2011
2. Adrian McEwen & Hakim Cassimally, *Designing of Internet of Things*, John Wiley and sons Ltd, 1st Edition, 2014
3. Daniel Kellmereit - Daniel Obodovski, *The Silent Intelligence: The Internet of Things*, DnD Ventures, 1st Edition, 2013

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(18CS0517) PYTHON PROGRAMMING

COURSE OBJECTIVES
The objectives of this course
1. Introduce Scripting Language

2. Exposure to various problem solving approaches of computer science

3. Introduce function-oriented programming paradigm

4. Exposure to solve the problems using object oriented concepts, exceptional handling

5 Exposure to solve the problems using Files, Regular Expressions and, Standard Libraries

COURSE OUTCOMES (COs)
 On successful completion of this course, the student will be able to
1. Solve the problems using control structures, input and output statements

2. Summarize the features of lists, tuples, dictionaries, strings and files
3. Experience the usage of standard libraries, objects, and modules
4. Solve the problems using Object Oriented Programming Concepts
5. Build the software for real time applications using python
6. Install various Python packages

UNIT – I
Introduction: History of Python- Python features- Applications - Programming using the REPL- Running Python Scripts - Variables – Assignment – Keywords – Input – Output - Indentation
Data Types: Single-Value data types - int, float, complex and boolean
Multi-Valued Data types - Lists, Tuples, Sets, Dictionaries, Strings- indexing and slicing

UNIT – II
Operators and Expressions: Operators-Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators- Expressions and order of evaluations
Control Flow: Branching- simple if, if-else, if-elif-else, nested if, looping-while and for- jumping – break- continue and pass

UNIT – III
Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions-Nested functions, Recursive functions- Scope of the Variables in a Function
Object Oriented Programming in Python: Classes and Objects- self-variable- Methods – Constructor- Inheritance-polymorphism- Method Overloading- Method Overriding

UNIT – IV

Modules: Creating modules, import statement, from...import statement and name spacing.

Python packages: Introduction to PIP- Installing Packages via PIP (Numpy, Pandas, MatPlotlib etc.,) - Using Python Packages

Exception Handling: Introduction to Errors and Exceptions, Handing Exceptions, Raising Exceptions, User Defined Exceptions, Regular Expressions-Searching and Matching

UNIT – V

Functional Programming: Iterators and Generators - Maps and Filters

Files: Text files- Reading and Writing files- Command line arguments

Brief Tour of the Standard Library: Dates and Times- Data Compression- Python Runtime Services- Data Management and Object Persistence

GUI Programming - Turtle Graphics

TEXT BOOKS

1. Reema Thareja, *Python Programming: Using Problem Solving Approach,* Oxford University Press, First Edition
2. Vamsi Kurama, *Python Programming: A Modern Approach,* Pearson

REFERENCES

1. Mark Lutz , *Learning Python*, O Reily, 4th Edition, 2009.
2. Mark Lutz , *Programming Python* , O Reily, 4th Edition, 2010.
3. Tim Hall and J-P Stacey , *Python 3 for Absolute Beginners*, 2009.
4. Magnus Lie Hetland , *Beginning Python: From Novice to Professional*, 2nd Edition, 2009.
5. Michael T. Goodrich , Roberto Tamassia, Michael H. Goldwasser, *Data Structures and Algorithms in Python,* 1st Edition , Kindle.

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(18HS0814) INTELLECTUAL PROPERTY RIGHTS

COURSE OBJECTIVES

1. *To provide an understanding of the concept and significance of intellectual property rights*
2. *To understand the concept of trademarks, copy rights, patents and the need for their protection*
3. *To comprehend the concept of competition, unfair competition and the latest developments in the laws pertaining to intellectual property rights*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Become aware of intellectual property rights, concepts, treaties, agencies and international organizations involved in sanctioning IP rights*
2. *Identify different types of intellectual properties, ownership rights and the scope of the protection*
3. *Get an adequate knowledge on patents, trademarks, copy rights and to get property rights for their intellectual work*
4. *Able to identify, apply, and assess ownership rights, registration processes for IP rights*
5. *To discern the approaches for intellectual property management and intellectual property audits*
6. *Demonstrate knowledge and understanding on unfair competition and latest developments in IP rights at international level*

UNIT – I
Introduction to Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights

UNIT – II
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes

UNIT – III
Law of Copy Rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law
Law of Patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV
Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secret elitigation
Unfair Competition: Misappropriation right of publicity, False advertising

UNIT – V
New Development of Intellectual Property: New developments in trade mark law; copy right law, patent law, intellectual property audits
International overview on intellectual property, international - trade mark law, copy right law, international patent law, international development in trade secrets law

TEXT BOOKS
1. Deborah, E. Bouchoux, *Intellectual Property Right,* Cengage Learning India Private Limited
2. Nityananda KV, *Intellectual property rights: Protection and Management India,* Cengage Learning India Private Limited

REFERENCES
1. Prabuddha Ganguli*, Intellectual Property Right - Unleashing the Knowledge Economy*, Tata McGraw Hill Publishing Company Ltd.
2. Ahuja VK, *Law relating to Intellectual Property Rights,* Lexis Nexis, India
3. Neeraj P & Khushdeep D, *Intellectual Property Rights,* PHI learning Pvt limited, India

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(18CE0125) TRANSPORTATION ENGINEERING LAB

COURSE OBJECTIVES

Objective of this course is

1. *To learn the various aspects of aggregate and its engineering behaviour*
2. *To introduce bitumen & its engineering behaviour*
3. *To understand the concept of traffic behaviour*

COURSE OUTCOMES (COs)

After completion of this course, the students will be able to

1. *Conduct test on road aggregates to estimate their mechanical properties*
2. *Perform shape tests on aggregates and decide their suitability as road aggregates*
3. *Conduct tests on bitumen to find its properties and purity*
4. *Conduct tests on bitumen to identify its grade*
5. *Perform traffic volume studies*
6. *Perform vehicle speed studies*

LIST OF EXPERIMENTS

1. Aggregate crushing value test
2. Aggregate impact test
3. Specific gravity and Water absorption test of coarse aggregate
4. Los Angeles abrasion test
5. Shape test (Flakiness index & Elongation index)
6. Penetration test on bitumen
7. Bitumen ductility test
8. Bitumen softening point test
9. Bitumen flash and fire point tests
10. Stripping value test
11. Traffic volume studies at mid-block and data analysis
12. Traffic volume studies at intersection and data analysis

Any eight experiments may be conducted

REFERENCES

1. S.K.Khanna and C.E.G Justo, *Highway Materials Testing Laboratory Manual*, New Chand Bros, Roorkee
2. Ajay.K.Duggal & Vijay.P.Puri, Lab *Manual on Highway Engineering*, New Age Publications, New Delhi
3. Relevant IS Code

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(18CE0126) ENVIRONMENTAL ENGINEERING LAB

COURSE OBJECTIVES
The objectives of this course
1. *The laboratory provides knowledge of estimating various parameters like pH, Chlorides, Hardness and Alkalinity in water*
2. *For effective water treatment, the determination of optimum dosage of coagulant and chloride demand is also included*
3. *The estimation status of Industrial effluents will also be taught in the laboratory by estimating BOD of effluent*

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to
1. *Describe and use the water and wastewater sampling procedures and sample preservations*
2. *Conduct the physical tests on drinking water and compare the result with standards*
3. *Perform the test on drinking water to estimate various chemical constituents*
4. *Conduct test on drinking water to access biological contamination*
5. *Perform the Total solids test to estimate the level of contamination of water*
6. *Decide the optimal coagulant dose required to treat water*

LIST OF EXPERIMENTS
1. Determination of pH
2. Determination of Conductivity
3. Determination of Acidity of Water
4. Determination of Alkalinity of Water
5. Determination of Chlorides
6. Determination of Hardness of Water
7. Determination of Residual Chlorine
8. Determination of Dissolved Oxygen
9. Determination of Biochemical Oxygen Demand
10. Conducting Jar test for determining optimum dosage of coagulant
11. Determination of Total Solids, Total Dissolved Solids & Settle able Solids

Any eight experiments may be conducted

TEXT BOOKS
1. Sawyer, C.N., McCarty, P.L. & Parkin, G.F., *Chemistry for Environmental Engineering,* McGraw Hill India, Fifth Edition,2017
2. Mathur, R.P, *Water & Wastewater Testing Lab Manual*, Roorkee

REFERENCES

1. *Standard Methods for the Examination of Water and Wastewater*, A.P.H.A., American Public Health Association
2. Lab Manual, *ISO 14001 Environmental Management,* Regulatory Standards for Drinking Water and Sewage disposal
3. Dr.G. Kotaiah and Dr.N. Kumara Swamy, *Environmental Engineering Lab Manual*, Charotar Publishers, Anand

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(18HS0859) ENGLISH FOR CORPORATE COMMUNICATION SKILLS LAB

COURSE OBJECTIVES

The objectives of this course

1. To improve the students' fluency in English through a well-developed vocabulary.

2. To enable them communication skills at normal conversational speed by the peer learners.

3. To respond accurately in different social-cultural and professional contexts.

4. To evolve the drafting skills among the students.

5. To improve students' inter and intra-personal skills.

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. Flair in Writing by using cohesion and coherence.

2. Prepare effective job application.

3. Present Effective Speaking Abilities.

4. Apply various communicative techniques in their professional lives.

5. Cope with the employability skills.

6. Use effective communicative approaches by preparing job application, report and other kinds of spoken and written correspondences.

UNIT I
COMMUNICATIVE COMPETENCY

1. Reading Comprehension
2. Listening Comprehension
3. Vocabulary for competitive purpose
4. Spotting Errors

UNIT II
TECHNICAL WRITING

1. Report writing
2. Curriculum vitae
3. Cover Letter
4. E-mail writing

UNIT III
PRESENTATIONAL SKILLS

1. Oral presentation
2. Power point presentation
3. Poster presentation

4. Stage Dynamics

UNIT IV
CORPORATE SKILLS

1. Dress code
2. Telephonic skills
3. Net-etiquettes

UNIT V
GETTING READY FOR JOB

1. Group Discussion
2. Interview skills
3. Psychometric test

Minimum requirements for English for Corporate Communication Skills Lab

1. Computer Assisted Language Learning (CALL) Lab: The Computer Assisted Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.
2. English for Corporate Communication Skills Lab with movable chairs and audio visual aids with a P. A. system, Projector, a Digital stereo audio & video system and Camcorder etc.

System Requirement (Hardware component):
Computer network, LAN with minimum 60 multimedia systems with the following:
Specifications
i)   a) Intel (R) core (TM) i3
      b) Speed 3.10 GHZ
      c) RAM – 4 GB
      d) Hard Disk – 320 GB
ii) Headphones with High quality

 SOFTWARE
 Walden Info Tech Software

REFERENCES
1. Effective Tech Communication, Rizvi, Tata McGraw – Hill Education, 2007
2. Communication skills, Sanjay Kumar & Pushpalatha, Oxford University Press, 2012
3. Writing Tutor. Advanced English Learners' Dictionary, 9th Edition, Oxford University Press, 2015
4. Powerful Vocabulary Builder, Anjana Agarwal, New Age International Publishers, 2011
5. Listening Extra, Miles Craven, Cambridge University Press, 2008

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(18HS0812) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

COURSE OBJECTIVES

1. To familiarize the students with the concepts of microeconomics and make them understand the concept of demand and supply analysis in business applications
2. To understand the pricing and output decisions under different market structures
3. To understand the basic financial statements and techniques of financial statement analysis

COURSE OUTCOMES (COs)

After the completion of the course student would be able to:

1. Understand the nature of managerial economics and the role of it in business firms
2. Identify the determinants of demand and apply cost analysis under different market conditions
3. Integrate the concepts of price and output decisions of business firms
4. Appreciate the importance of market structures and implement appropriate price and output decisions
5. Assess the financial statements of a firm and the financial performance of the firm through the financial statements
6. Measure operating, investing and financial performance of a firm

UNIT-I

Introduction to Managerial Economics - Managerial Economics - Definition, nature and scope – contemporary importance of Managerial Economics - Demand Analysis: Determinants- Law of Demand - Elasticity of Demand. Significance –Types – measurement of elasticity of demand - Demand forecasting- factors governing demand Forecasting- methods of demand forecasting –Relationship of Managerial Economics with Financial Accounting and Management.

UNIT-II

Theory of Production and Cost Analysis -Production Function – Short-run and long- run production - Isoquants and Isocosts, MRTS, least cost Combination of inputs - Cobb-Douglas production function - laws of returns - Internal and External Economies of scale .
Cost Analysis: Cost concepts - Break-Even Analysis (BEA) – Managerial Significance and limitations of BEA - Determination of Break Even Point (Simple Problems).

UNIT-III

Introduction to Markets and New Economic Environment - Market structures: Types of Markets - Perfect and Imperfect Competition - Features, Oligopoly -Monopolistic competition. Price-Output determination - Pricing Methods and Strategies - New Economic Environment-

Economic systems – Economic Liberalization – Privatization and Globalization

UNIT-IV

Capital and Capital Budgeting - Concept of Capital - Over and under capitalization – Remedial measures - Sources of Short term and Long term capital - Estimating Working Capital requirement – Capital budgeting – Features of Capital Budgeting proposals – Methods and Evaluation of Capital budgeting – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

UNIT-V

Introduction to Financial Accounting and Analysis - Financial Accounting – Concept - emerging need and importance - Double-Entry Book Keeping-Journal - Ledger – Trial Balance - Financial Statements - - Trading Account – Profit & Loss Account –Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Techniques – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

TEXT BOOKS
1. Aryasri, *Managerial Economics and Financial Analysis,* TMH, 4th edition, 2009
2. Varshney & Maheswari, *Managerial Economics,* Sultan Chand, 2009

REFERENCES
1. Premchand Babu, Madan Mohan, *Financial Accounting and Analysis*, Himalaya, 2009
2. S.A. Siddiqui and A.S. Siddiqui, *Managerial Economics and Financial Analysis*, New Age International, 2009
3. Pearson Joseph G. Nellis and David Parker, *Principles of Business Economics,* 2nd edition, New Delhi
4. Domnick Salvatore, *Managerial Economics in a Global Economy*, Cengage, 2009
5. H.L.Ahuja, *Managerial Economics*, S.Chand, 3rd edition, 2009

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(18CE0136) CONCRETE TECHNOLOGY

COURSE OBJECTIVES

1. *To know the physical and chemical properties of cement and admixtures.*
2. *To understand the basic behaviour of concrete, its application in varied environment, help them to handle the material on site*
3. *To give basic and essential knowledge to graduate students about concrete as well as latest developments in concrete technology*
4. *Enrich the practical knowledge on mix design principles, concepts and methods.*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Describe various constituents for preparing cement concrete*
2. *Conduct tests on different ingredient of concrete namely cement, sand and coarse aggregate*
3. *Conduct tests on both green and hardened concrete*
4. *Discuss various properties of both green and hardened concrete*
5. *Point out the causes affecting the durability of concrete*
6. *Design concrete mixes based on various stands*

UNIT – I

Cements & Admixtures: Portland Cement – Chemical Composition – Hydration, Setting of Cement – Structure of Hydrated Cement –Different Grades of Cement – Admixtures – Mineral and Chemical Admixtures–accelerators, retarders, air-entrainers, plasticizers, super plasticizers, fly ash and silica fume.

Aggregates:-Physical, Strength & Other Mechanical Properties of Aggregate – Specific Gravity, Bulk Density, Porosity, Adsorption & Moisture Content of Aggregate–Soundness of Aggregate–Deleterious Substance in Aggregate -Alkali Aggregate Reaction – Thermal Properties – Sieve Analysis – Fineness Modulus –Grading Curves – Grading of Fine & Coarse Aggregates – Gap Graded Aggregate - Bulking of Sand

UNIT – II

Hardened Concrete: Water / Cement Ratio – Abram's Law – Gel Space Ratio –Strength of Concrete–MaturityConcept–StrengthinTension&Compression–Compression Tests – Tension Tests — Flexure Tests – Splitting Tests – Relation Between Compressive &Tensile Strength-Factors Affecting Strength-Curing

UNIT – III

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

Non-Destructive Testing Methods: Introduction to Non-Destructive Testing Methods – Rebound Hammer – Ultra Pulse Velocity Method – Pullout - Profometer - Codal Provisions for NDT

UNIT – IV
Permeability and Durability: Permeability – Sulphate attack – Methods of controlling Sulphate attack– Attack of sea water – Acid attack – Chloride attack – Corrosion of steel – Corrosion control – Deterioration of concrete by Abrasion, Erosion and Cavitation – Effects of some Materials on Durability – Surface treatment of Concrete

UNIT – V
Mix Design: Durability of Concrete – Quality Control of Concrete – Factors Considered in Mix Proportions – Statistical Methods of Mix Design – Acceptance Criteria – Proportioning of Concrete Mixes by Various Methods– ACI Method & IS10262 Method

TEXTBOOKS
1. M.L.Gambhir, *Concrete Technology,* Tata McGraw-Hill Publishers, New Delhi
2. M.S. Shetty, *Concrete Technology,* S. Chand & Co

REFERENCES
1. A.M. Neville, *Properties of Concrete,* Pearson Publication, 4th edition
2. P.K.Mehta and J.M.Monteiro, *Concrete: Microstructure, Properties and Materials*, McGraw Hill Publishers
3. Krishna Raju*, Design of Concrete Mix*, CBS Publishers
4. J.Prasad & C.G.K.Nair, *Non Destructive Test and Evaluation of Materials,* McGraw-Hill Publishers, New Delhi

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(18CE0137) FINITE ELEMENTS METHODS

COURSE OBJECTIVES

1. *To equip the fundamental concepts of finite element methods.*
2. *To learn the theory and characteristics of finite elements that represent engineering structure.*
3. *To ascertain and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analysis.*

COURSE OUTCOMES (COs)

Students undergoing this course are able to

1. *Exemplifies the fundaments needed for carrying FEM analysis*
2. *Develop finite element formulations of 1D & 2D problems*
3. *Compute the shape functions for different elements*
4. *Solve the complex problems using plane stress and plane strain analysis*
5. *Formulate Isoparametric elements with different irregular boundaries*
6. *Comprehend the concept behind Axi-symmetric analysis*

UNIT –I
Introduction: Concepts of FEM – Steps Involved – Merits & Demerits – Energy Principles – Discretization – Rayleigh-Ritz Method of Functional Approximation
Principles of Elasticity: Equilibrium Equations – Strain Displacement - Relationships in Matrix Form – Constitutive Relationships for Plane Stress, Plane Strain and Axi-Symmetric Bodies of Revolution with Axi-Symmetric Loading

UNIT –II
One Dimensional & Two Dimensional Elements: Stiffness matrix for bar element – shape functions – 1D and 2D elements – types of elements for plane stress and plane strain analysis – Displacement models – Generalized coordinates — Natural coordinate system – area and volume coordinates.

UNIT - III
Shape Functions: Introduction - Polynomial Shape Functions – Convergence Requirements; Compatibility Requirement of Shape Functions – Shape Function for Different Elements - Derivation of Shape Functions Using Polynomials - Finding Shape Functions Using Lagrange Polynomials - Shape Functions for Serendipity Family Elements

UNIT - IV
Bars and Trusses: Introduction – Generation of Element Stiffness Matrix - Tension Bars/Columns - Two Dimensional Trusses – Numerical Problems

Plane-Stress and Plane-Strain Analysis: Introduction – Generation of Element Stiffness Matrix - Solving Plane Stress and Plane-Strain Problems Using Constant Strain Triangle Page

UNIT – V
Isoparametric Formulation: Concepts of Isoparametric Elements for 2D Analysis – Formulation of CST Element, 4–Noded and 8-Noded Iso-Parametric Quadrilateral Elements – Lagrangian and Serendipity Elements
Axi-Symmetric Analysis: Basic principles - Formulation of 4-noded Iso-parametric Axi - Symmetric Element.

TEXT BOOKS
1. S.S. Bhavakatti, *Finite Element A*nalysis, New Age International Publishers
2. T R Chandrupatla and A D, *Introduction to Finite Element in Engineering,* Belegundu University Press, India.

REFERENCES
1. Dr.S.Senthil and R. Panneerdhass, *Finite Element Analysis,* Lakshmi Publications, Chennai
2. Robert D. Cook, *Concepts and Applications of Finite Element Analysis*, Malkus and Michael E. Plesha. John Wiley & Sons
3. Krishnamurthy, *Finite Element Analysis (Theory and Programming),* Tata McGraw Hill Co. Ltd. New Delhi.
4. David V Hutton, *Finite Element Analysis*, Tata McGraw Hill, New Delhi.

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(18CE0138)   FUNDAMENTALS OF URBAN PLANNING

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the concept of town planning by ensuring that new and existing facilities are complimentary to each other*
2. *To understand about bye-laws implemented in towns and cities.*
3. *To create awareness about the traffic management within the town.*

COURSE OUTCOMES (COs)

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

1. *Recognize issues related to town planning and discuss the objectives, necessity and stages of town planning*
2. *Summarize importance of zoning, can classify various town planning practices and can conduct surveys for town planning*
3. *Classify the residential building, list the agencies involved in improving house and review the problems associated with residential housing*
4. *Discuss the issues associated with slums and recognize the methods to improve condition of slums*
5. *Interpret norms laid down for public and industrial building and can summarize building bye-laws*
6. *List and discuss various urban roads and the concepts of traffic management in a town*

UNIT – I

Introduction to Town Planning: Objects of town planning – Necessity of town planning – Principles of town planning – Origin and growth of towns – Stages in Town Development – Development of towns – Town Planning in Ancient India – Planning of Modern towns & Military towns – Selection of site for an ideal town – Cost of town planning – Introduction to smart cities

UNIT – II

Surveys & Planning: Necessity of surveys – Various types of surveys to be conducted for town planning project – Data to be collected in different types of town planning survey – Uses of surveys –Drawing & Reports from surveys – Forms of Planning.

Zoning: Definition – Objects and principles of zoning – Importance of zoning – Classification of various zones – Transition zone – Advantages of zoning – A brief note on Special Economic Zone (SEZ).

UNIT – III

Housing: Importance of housing – Requirements & Classification of residential building – National Housing policy – Various housing agencies involved in housing – Investment in Housing – Housing Problems in India

Slums: Causes of slums – Characteristics – Effects – Slum clearance and re-housing – Works of improvement – Open Plot Scheme – Prevention of slum formation.

UNIT – IV

Public Buildings & Industries: Classification – Location – Design Principles of public building – Grouping of public buildings – Classification of industries – Requirements of an industry – Regulation of their location – Treatment of Industrial wastages.

Building Bye-Laws: Importance of bye-laws – Function of local authority – Applicability of bye-laws – Principles underlying building bye-laws – Setbacks – Floor Space Index

UNIT – V

Urban Roads: Objects & Requirements – Classification – Types of street systems – Through and bypass roads – Outer and inner ring roads – Expressways – Freeways.

Traffic Management: Objects – Traffic surveys – Traffic congestion – Parking – Road accidents – Traffic capacity of roads – Road intersections – Traffic islands – Roundabouts – Grade separation – Traffic signals – Road signs – Road markings – Street lighting in a town – Applications of Drones in Smart Cities

TEXT BOOKS

1. Rangwala, *Town Planning*, Charotar Publishing, 30th edition, 2018
2. G K Hiraskar, *Fundamentals of Town Planning*, Dhanpat Rai Publications, New Delhi, 17th edition, 2018

REFERENCES

1. Abir bandyopadhyay, *A Text Book of Town Planning*, Books & Allied (P) Ltd, 2000
2. Peter Hall and Mark Tewdwr-Jones, *Urban and Regional Planning,* Routledge Publications, 5th edition, 2010.
3. Catanese A J*, Urban Planning,* McGraw Hill Publications, 2nd edition, 2014

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(18CE0139) TRAFFIC ENGINEERING AND MANAGEMENT

COURSE OBJECTIVES

The objectives of this course

1. *To give an overview of traffic engineering, various surveys to be conducted, traffic Regulation, management and traffic safety*
2. *To make students understand the concept of traffic regulation and safety.*
3. *To create awareness about the traffic management within the town.*

COURSE OUTCOMES (COs)

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

1. *Determine various characteristics and standards adopted in a traffic system.*
2. *Carry out traffic surveys, highway capacity and level of service analysis*
3. *Design a traffic signals and suitable regulatory measures to meet an efficient traffic system.*
4. *Implement appropriate methods to ensure safety of the road users.*
5. *Recall the environmental issues related to traffic system.*
6. *Explain the concept of traffic management measures in addressing the demand, pricing and its applications.*

UNIT – I

Traffic Characteristics: Road Characteristics – Road user characteristics – PIEV theory – Vehicle & its performance characteristics – Traffic Forecasting – Fundamentals of Traffic Flow – Urban Traffic problems in India – Promotion of public transport – Promotion of non-motorized transport.

UNIT – II

Traffic Surveys and Highway Capacity: Traffic Surveys – Speed, journey time and delay surveys – Vehicle Volume Survey – Methods and interpretation – Origin Destination Survey – Parking Survey – Methods, interpretation and presentation – Statistical applications in traffic studies – Capacity and level of service – Factors affecting Capacity and LOS – Capacity of Rural Highways, Capacity of Urban Roads – HCM and IRC standards.

UNIT – III

Traffic Control: Traffic Signals – Signal Warrants – Signal phasing and Development of phase plans – Fixed and Vehicle activated signals – Webster method – IRC method – Traffic signs including VMS – Types & specifications – Road markings – specifications – Regulations of traffic and their enforcement – Street furniture

UNIT – IV

Traffic Safety and Environment: Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, health effects and abatement measures

UNIT – V

Traffic Management: Traffic Management System – Travel Demand Management (TDM) – One way street system, exclusive traffic lanes, tidal flow operation – Traffic congestion, Traffic restraints & road pricing – Traffic simulation – Introduction to Intelligent Transportation Systems (ITS) – ITS Applications in Traffic Management – Intermediate Public Transport (IPT)

TEXT BOOKS
1. Kadiyali.L.R., *Traffic Engineering and Transport Planning*, Khanna Publishers, Delhi, 2018
2. Garber and Hoel, *Principles of Traffic and Highway Engineering*, CENGAGE Learning India Pvt Ltd, Noida, New Delhi, 2010.

REFERENCES
1. Rogu P. Roess, Elena S. Prassas and William R. Mc Shane, *Traffic Engineering,* Pearson India Education Services Pvt. Ltd.
2. Partha Chakroborty and Animesh Das, *Principles of Transportation Engineering*, PHI Learning Pvt. Ltd., 2011.
3. John E Tyworth, *Traffic Management Planning, Operations and Control*, Addison Wesly Publishing Company, 1996
4. Hobbs.F.D., *Traffic Planning and Engineering*, University of Birmingham, Pergamum Press Ltd, 2005
5. Taylor MAP and Young W, *Traffic Analysis* – New Technology and New Solutions, Hargreen Publishing Company, 1998

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(18CE0140) ADVANCED STRUCTURAL DESIGN

COURSE OBJECTIVES

The objectives of this course

1. *Familiarize Students with different types of Connections and relevant IS codes*
2. *Equip student with concepts of design of Flat slabs, water tanks, retaining walls, plate girder and gantry girder.*

COURSE OUTCOMES (COs)

The successful completion of this course, the students will be able to

1. *Applying principals outlined in code while detailing various structural elements*
2. *Analyse and design flat slabs*
3. *Analyse and design circular and rectangular water tanks resting on the ground*
4. *Analyse and design of retaining walls for horizontal back fill*
5. *Analyse and design plate girder*
6. *Analyse and design gantry girder*

UNIT – I

Analysis and Design of a flat slab (Interior panel only)

UNIT – II

Analysis and Design of circular and rectangular water tank resting on the ground

UNIT – III

Analysis and Design of cantilever and counterfort retaining wall with horizontal back fill

UNIT – IV

Analysis and Design of a Plate girder

UNIT – V

Analysis and Design of a Gantry girder

TEXT BOOKS

1. Krishna Raju, *Structural Design and Drawing (RCC and Steel),* Universities .Press, New Delhi
2. Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *R.C.C Structures*, Laxmi Publications, New Delhi.

REFERENCES

1. Varghese, *Advanced RCC,* PHI Publications, New Delhi.
2. M.L.Gambhir, *Design of RCC structures*, P.H.I. Publications, New Delhi

3. S.S.Bhavikatti, *Design of Steel Structures: By Limit State Method as per IS: 800-2007*, I.K.International Publishing House Pvt Ltd., New Delhi, 3rd Edition
4. S.K.Duggal, *Limit State Design of Steel Structures*, Tata McGraw Hill Publications, 1st Edition

IS Codes
1. IS 456-2000
2. IS 800 – 2007

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(18CE0141) ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT

COURSE OBJECTIVES

The objectives of this course

1. *Can understand various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same*
2. *Can understand the various impacts of development projects on environment and the mitigating measures*
3. *Can understand about of various environmental acts to protect environment*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Perform a critical quality review of an EIA*
2. *Structure the EIA working process considering the need for interdisciplinary*
3. *Perform the screening and scoping of an EIA, based on existing requirements, evaluate the impacts and draw meaningful conclusions from the results of the EIA*
4. *Clarify the concept of EIA and its application in an international context to those involved in or affected by the EIA process*
5. *Interpretate an EIA, present its conclusions and translate its conclusions into actions*
6. *Describe the various environmental protection acts implement in India*

UNIT – I

Introduction: Basic concept of EIA- Salient Features of EIA , EIA Procedure - Defining the Scope of EIA- Identification of Impacts on the Environment by Preliminary Overview Assessment - - Classification and Prediction of Impacts - Impact Evaluation and Analysis - preparation of Environmental Base map -Classification of environmental parameters - Preparation of an EIA Report

UNIT-II

EIA Methodologies: Introduction, Criteria for the selection of EIA Methodology, EIA methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis

UNIT – III

Impact of Developmental Activities and Land Use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures- EIA in surface water: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact

UNIT – IV

Assessment of Impact on Vegetation and Wildlife: Introduction**:** Assessment of Impact of development Activities on Vegetation and wildlife, Impact analysis, Loss of valuable vegetation community types, direct loss of wild life - Mitigation

Environmental Risk Assessment and Management: Introduction: Environmental risk assessment (ERA), Risk assessment and Treatment of Uncertainty-Key steps in performing on ERA - Advantages and Limitations of Environmental risk assessment (ERA)

UNIT – V

Environmental Acts (Protection and Prevention): Post Audit activities, The Environmental protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries

TEXT BOOKS

1. Y. Anjaneyulu, *Environmental Impact Assessment Methodologies*, by, B.S. Publication, Sultan Bazar, Hyderabad, 2nd Edition, 2017
2. J. Glynn and Gary W. Hein Ke, *Environmental Science and Engineering*, Prentice Hall Publishers, 2nd Edition, 1996

REFERENCES

1. Suresh K. Dhaneja, *Environmental Science and Engineering*, S.K., Katari & Sons Publication, New Delhi, 3rd Edition, 2008
2. John G. Rau and David C. Wooten (Ed), *Environmental Impact Analysis Handbook*, McGraw Hill Book Company
3. Dr H.S. Bhatia, *Environmental Pollution and Control,* Galgotia Publication (P) Ltd, Delhi, 2nd Edition. 2003

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(18CE0142) AIRPORT PLANNING AND DESIGN

COURSE OBJECTIVES

The objectives of this course

1. To familiarize with Airport planning issues along with the designing of runways

2. To learn the various aspects of structural design of Airport pavements

3. To understand visual aids and necessary inputs required for Airport grading and drainage

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. Collect vital data required for planning of an airport by conducting various surveys and can prepare various drawings

2. Classify various types of airports

3. Design features and various geometric elements pertaining to runways

4. Design various types of airport pavements

5. Recognize the importance of various visual aids such as airport marking and lighting

6. Design various surface and sub-surface drainage systems for an airport

UNIT – I

Airport Planning: General- Regional Planning- Data Required before Site Selection- Airport Site Selection- Surveys for Site Selection- Drawings to be prepared- Estimation of Future Air Traffic Needs

UNIT – II

Runway Design: Runway Orientation- Basic Runway Length- Corrections for Elevation, Temperature and Gradient- Airport Classification- Runway Geometric Design- Airport Capacity- Runway Configurations- Runway Intersection Design

UNIT – III

Structural Design of Airport Pavements: Introduction- Various Design Factors- Design Methods for Flexible Pavement- Design Methods for Rigid Pavement- LCN System of Pavement Design- Joints in Cement Concrete Pavement- Airport Pavement Overlays- Design of an Overlay

UNIT – IV

Visual Aids: General- Airport Marking- Airport Lighting

UNIT – V

Airport Grading And Drainage: General- Computation of Earthwork- Airport Drainage- Special Characteristics and Requirements of Airport Drainage- Design Data- Surface Drainage Design Subsurface Drainage Design

TEXT BOOKS

1. S.K.Khanna, M.G.Arora and S.S.Jain, *Airport Planning and Design,* Nem Chand & Bros, 6th edition, 2009
2. Dr. L. R. Kadyali, Dr. N. B. Lal, *A Text Book of Principle and practices of Highway Engineering including Expressways and Airport Engineering*, Khanna Publications, 7th edition, 2013.

REFERENCES

1. Rangwala SC, *Airport Engineering,* Charotar Publishing House Pvt. Ltd., 17th edition, 2019
2. Dr. S. K. Sharma, *Highway Engineering including Airport Pavements*
3. Virendra Kumar, *Air Transportation Planning and Design*
4. Subash C Saxena, *Airport Engineering: Planning & Design*

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(18CE0143) PRESTRESSED CONCRETE

COURSE OBJECTIVES

The objective of this course is

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 in the analysis and design of prestressed concrete members under flexure, shear and torsion.

COURSE OUTCOMES (COs)

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

1. Describe principles and methods of prestressing

2. Estimate the loss of prestressing

3. Analyze and design prestressed concrete beams under flexure and shear.

4. Design of prestressed members for torsion

5. Relate the IS Codal provisions for prestressed concrete

6. Describe the concepts related to transfer of prestress in pre-tensioned members

UNIT I

Introduction: Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing Materials- high strength concrete and high tensile steel their characteristics. Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

UNIT II

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 of steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design

UNIT III

Design for Flexural Resistance: Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing- Prediction of short term and long-term deflections

UNIT IV

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 V

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

1. N.Krishna Raju, *Prestressed Concrete,* Tata McGraw Hill Book Education Pvt. Ltd, 5th Edition
2. G.S. Pandit and S.P. Gupta, *Prestressed Concrete,* CBS Publishers and distributors

REFERENCES

1. T.Y.Linand Burn*, Design of Prestress Concrete Structures*, John Wiley, New York
2. S. Ramamrutham, *Prestressed Concrete*, Dhanpat Rai & Sons, Delhi
3. N.Rajagopalan, *Prestressed Concrete*, Narosa Publishing House

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(18CE0144) GROUND IMPROVEMENT TECHNIQUES

COURSE OBJECTIVES

1. *To give an overview of latest ground improvement techniques*
2. *To understand the problems related to soil and select the best method*
3. *Modify the ground by different procedures such as admixtures, grouting and ground freezing.*
4. *Understand the concept of reinforced earth, geo-synthetics and soil reinforcement in ground improvement*

COURSE OUTCOMES (COs)

After completion of this course, the student shall be able to

1. Identify the problems in Expansive soils

2. Implement the stabilization methods

3. Apply grouting and dewatering techniques

4. Interpreting the need of ground improvement for stable engineered structures using various techniques.

5. Application of dewatering methods using well point system and electro-osmotic methods.

6. Design of foundation on swell soils.

UNIT – I

Dewatering: Methods of de-watering- open sumps and ditches- single, multistage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains –Electro-osmosis

Grouting: Objectives of grouting - grouts and their applications - grouting categories- Grouting equipments and machinery - Injection methods - grout monitoring

UNIT – II

Densification Methods in Granular Soils: In – situ densification methods in granular Soils: – Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, and Impact at depth.

Densification Methods in Cohesive Soils: preloading or dewatering, Vertical drains – Sand Drains, Sand wick geo drains – Stone and lime columns – thermal methods

UNIT – III

Stabilization: Methods of stabilization – mechanical – cement – lime – bituminous - chemical stabilization with calcium chloride, sodium silicate and gypsum

UNIT – IV

Reinforced Earth: Concept of soil reinforcement – Types of reinforcement material – Reinforced earth wall -Components and applications of reinforcement

Geo synthetics: Geo textiles- Types, Functions and applications–geo grids and geo membranes – functions and applications

UNIT – V

Expansive Soils: Parameters of expansive soils–tests for identification–methods of determination of swell pressure. Modification of expansive soils –Design of Foundation on swell soils – under reamed piles

TEXT BOOKS

1. Dr.P. Purushotham Raj, *Ground Improvement Techniques*, Laxmi Publications, New Delhi.
2. Haussmann M.R, *Engineering Principles of Ground Modification by* McGraw-Hill International Edition.

REFERENCES

1. Nihar Ranajan Patra, *Ground Improvement Techniques,* Vikas Publications, New Delhi.
2. K.R. Arora, *Soil Mechanics and Foundation Engineering.* Standard Publishers
3. Moseley M.P ,*Ground Improvement,* Blackie Academic and Professional edited, Boca Taton (1993), Florida, USA

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(18CE0145) DESIGN & DRAWING OF IRRIGATION STRUCTURES

COURSE OBJECTIVES

The objectives of this course:

1. *To study the different aspects of design of hydraulic structures.*
2. *To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works.*
3. *To draw the various components of irrigation structures.*

COURSE OUTCOMES (COs)

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

1. *Estimate the flood discharge for various irrigation structures*
2. *Preform hydraulic design of various components of irrigation structures such as abutment, wing walls*
3. *Estimate various forces acting on the different components of hydraulic structures*
4. *Conduct stability analysis on various components of hydraulic structures*
5. *Design protective structures such as apron, talus etc.*
6. *Develop and draw various views of irrigation structures*

UNIT – I

Design and Drawing of Sloping Glacis Weir

UNIT – II

Design and Drawing of Surplus Weir

UNIT – III

Design and Drawing of Tank Sluice with a Tower Head

UNIT – IV

Design and Drawing of Type III Syphon Aqueduct

UNIT – V

Design and Drawing of Canal Regulator

FINAL EXAMINATION PATTERN: Any *Two* questions of the above *Five* designs may be asked out of which the student has to answer *One* question. The duration of examination is three hours

TEXTBOOKS
1. Satya Narayana Murthy Challa, *Water Resources Engineering Principles and Practice*, New Age International Publishers, Revised Second Edition, 2002
2. Santosh Kumar Garg, *Irrigation Engineering and Hydraulic Structures*, Khanna Publishers, Nineteenth Revised Edition, 2005

REFERENCES
1. B.C. Punmia and Pande B.B. Lal, *Irrigation and Water Power Engineering*, Laxmi Publications Pvt. Ltd., New Delhi, 16th Edition, 2009
2. G. L. Asawa, *Irrigation and Water Resources Engineering*, New Age International Publishers, 2006

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(18EE0236) SOLAR PHOTOVOLTAIC SYSTEMS

COURSE OBJECTIVES

The objectives of the course are

1. To develop a comprehensive technological understanding in solar PV system components

2. To provide in-depth understanding of design parameters to help design and simulate the performance of a solar PV power plant

3. To pertain knowledge about planning, project implementation and operation of solar PV power generation

COURSE OUTCOMES (COs)

After the end of the course, a student should be able to

1. Understand of renewable and non-renewable sources of energy

2. Gain knowledge about working principle of various solar energy systems

3. Analyse the solar power PV power generation

4. Applying the knowledge on to installation and integration of PV modules for different applications

5. Understand the operation of different solar collectors in the market

6. Understand the solar thermal energy storage systems

UNIT-I
Introduction: Sources of renewable energy; global potential for solar electrical energy systems - Solar radiation - Extra-terrestrial and terrestrial solar spectrum; clear sky direct-beam radiation; total clear sky insulation on a collecting surface; radiation on the collector in tracking systems; calculation of average monthly insolation from measured data

UNIT-II
PV Cells and Modules: Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters, Efficiency of PV Module, Measuring Module Parameters

UNIT-III
Solar Photovoltaic Module Array: Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power, Selection of PV Module

UNIT-IV
Solar PV System Design and Integration: Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV

Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant.

UNIT-V
Solar Collectors and Solar Energy Storage: Different types of solar collectors, Flat plate and concentrated type collectors, Fundamental Terminologies of thermal storage, Sensible heat storage materials, Latent heat storage materials, Solar thermo-chemical energy storage systems, Advantages and disadvantages of solar thermal storage, application of thermal storage

TEXT BOOKS
1. Chetansingh solanki, *Solar Photovoltai,* PHI, Learning private Ltd., New Delhi, 2018
2. G.D Rai, *Non-conventional Sources of Energy,* Khanna Publishers, Delhi, 2012

REFERENCES
1. Chetan Singh Solanki, *Renewable Energy Technologies; A Practical Guide for Beginners,* PHI School Books (2008)
2. Kothari D.P. and Signal K.C, *Renewable Energy Sources and Emerging Technologies*, New Arrivals –PHI; 2 Edition (2011)

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(18ME0353) COMPUTER AIDED PROCESS PLANNING

COURSE OBJECTIVES

The objectives of this course is to

1. *Provide the student with an understanding of the importance of process planning role in manufacturing.*
2. *Classify the various methods of CAPP*
3. *Understand the importance of product development through CIMS, shop floor control, Computer Integrated Manufacturing and Automation*
4. *Understands about NC, CNC and DNC systems.*
5. *Know about capacity Planning, Adaptive control machining systems, FMS and MRP's*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *Know the importance of process planning role in manufacturing*
2. *Describe the various methods of CAPP*
3. *Recognize the importance of product development through CIMS, shop floor control, Computer Integrated Manufacturing and Automation*
4. *Gain the knowledge about NC, CNC and DNC systems.*
5. *Identify about capacity Planning, Adaptive control machining systems*
6. *Familiar in FMS and MRP I and MRP II*

UNIT- I

Introduction to Process Planning: Role of process planning in the manufacturing cycle- Information requirement for process planning system - Merits of conventional process planning over CAPP - Structure of automated process planning system, features recognition, methods.

UNIT- II

Generative CAPP System: Importance - Generative CAPP system - Automation of logical decisions - Knowledge based systems - Inference Engine, implementation, benefits.

Retrieval CAPP System: Significance - Retrieval CAPP system, structure, relative advantages and disadvantages- implementation and applications.

UNIT- III

Implementation Techniques for CAPP: MIPLAN system - The Bottom-up approach - The Top-Down approach - Computer programming languages for CAPP- Criteria for selecting a CAPP system - Benefits of CAPP - MRP - I, MRP - II and benefits.

UNIT- IV

Computer Integrated Production Planning: Capacity planning- shop floor control- MRP-I,

MRP-II- CIMS benefits.

Computer Integrated Manufacturing System (CIMS): Introduction to CIMS, Automation strategies, Automation and CAD/CAM, Scope of CIM- Computer controls in NC- NC, CNC and DNC systems, components, block diagram, applications- Part programming- Group technology, benefits.

UNIT- V

Flexible Manufacturing systems (FMS): Components of FMS, workstation, Material handling system and computer control system, FMS Layout configurations and benefits of FMS.

Adaptive control machining systems: Introduction to adaptive control machining systems, application- approaches, adaptive control optimization system, adaptive control constraint system, applications to machining processes, computer process monitoring and computer process control.

TEXT BOOKS

1. Mikel P.Groover, *Automation, Production systems and Computer Integrated Manufacturing Systems,* Pearson Higher Education, Inc., 4th Edition, 2015.
2. Dr. Sadhu Singh, *Computer Aided Design and Manufacturing*, Khanna Publishers, 2009.

REFERENCES

1. Gideon Halevi and Roland D. Weill, *Principles of Process Planning,* A logical approach, Chapman & Hall, 1995.
2. Chang T C and Richard A Wysk, An *Introduction to Automated Process Planning Systems*, Prentice Hall, 1985
3. H.P. Wang and J.K. Li*, Computer Aided Process Planning*, Elsevier Science and Technology Publishers, 1st edition, 1991.

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(18EC0450) MATLAB PROGRAMMING

COURSE OBJECTIVES

The objectives of this course:

1. Understand the MATLAB Desktop, Command window and the Graph Window

2. Be able to do simple and complex calculation using MATLAB

3. Understand the mathematical concepts upon which numerical methods

4. Understand the tools that are essential in solving engineering problems

COURSE OUTCOMES (COs)

On successful completion of this course, student will be able to

1. Analyze and visualize data effectively by using MATLAB.

2. Apply numeric techniques and computer simulations to solve engineering-related problems.

3. Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.

4. Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.

5. Demonstrate understanding and use of fundamental data structures (classes).

6. Create and control simple plot and user-interface graphics objects in MATLAB.

UNIT-I

Introduction to MATLAB: MATLAB Interactive Sessions, Menus and the toolbar, computing with MAT LAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MAT LAB

UNIT-II

Arrays: Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

UNIT-III

Functions & Files: Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

UNIT-IV

Programming Techniques: Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, the Switch Structure, Debugging MATLAB Programs

Plotting: XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

UNIT-V

Linear Algebraic Equations: Elementary Solution Methods, Matrix Methods for Linear Equations, Cramer Method, Undetermined Systems, Order Systems.

TEXT BOOKS

1. G. H. Golub and C. F. Van Loan, *Matrix Computations*, 3rd Edition, Johns Hopkins University Press, 1996.
2. B. N. Datta, *Numerical Linear Algebra and Applications*, Brooks/Cole, 1994 (out of print)

REFERENCES

1. William J Palm, *Introduction to MATLAB for Engineers*, 3rd edition, McGraw Hill
2. L.Elden, *Matrix Methods in Data Mining and Pattern Recognition*, SIAM Press, 2007
3. Amos Gilat, *MAT LAB: An Introduction with Applications*, 4thedition, WILEY

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(18CS0544) SOFTWARE DEVELOPMENT & TESTING

COURSE OBJECTIVES

The objectives of this course is to

1. Illustrate the Software Development Models

2. Explain Software Requirements Engineering Process and SRS document

3. Illustrate the importance of modeling and modeling languages

4. Explain various testing methodologies

5. Explain Quality assurance and test cases

COURSE OUTCOMES (COs)

On successful completion of the course, the students will be able to

1. Define and develop as software project from requirement gathering to implementation

2. Ability to code and test the software

3. Ability to plan, estimate and maintain software systems

4. Understand the basic testing procedures

5. Able to generate test cases and test suites.

6. Test the applications manually by applying different testing methods and automation tools.

UNIT-I

Introduction: Introduction to Software Engineering , Software Process, Software Myths, A generic view of process, A layered Technology, A Process Framework, Software Process Models, Unified process

Introduction to Agility: Agility, Agile Process, Agile Process Models

UNIT-II

Requirements Analysis and Specification: Requirements Engineering, Eliciting Requirements, Requirements Analysis, Types of Requirements, Requirement Modeling and Data Modeling concepts.

Architectural Design Concepts: The Design Process, Design Concepts, Design Model, Software Architecture, Architecture Styles.

UNIT-III

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps.

Web App Design: Introduction, Web App Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component-Level Design

UNIT-IV

Software Testing: Introduction, Levels of Software Testing – Unit Testing, Module Testing, Integration Testing, System Testing, Acceptance Testing, Alpha Testing, Beta

Testing

Approach to Software Testing: Types of Software Testing - Black Box Testing, White Box Testing, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Art of Debugging.

UNIT-V

Software Quality: Software Testing Life Cycle, Software Quality, Testing Principles, Test Process – Testing Activities, Quality Assurance.

Software Test Cases: Introduction to Test cases, Test Case Selection – Test Planning and Design – Test Execution – Case Study on Test tools and automation.

TEXT BOOKS

1. Roger S.Pressman, *Software Engineering - A Practitioner's Approach,* McGraw Hill International Edition, Seventh edition, 2001
2. Boris Beizer, Dreamtech*, Software Testing Techniques*, Second Edition

REFERENCES

1. Ian Sommerville, *Software Engineering*, Pearson Education, 8th Edition, 2008
2. Richard Fairley, *Software Engineering Concepts*, McGraw Hill, 2004
3. Dr.K.V.K.K.Prasad, *Software Testing Tools*, Dreamtech

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(18HS0815) ENTREPRENEURSHIP DEVELOPMENT

COURSE OBJECTIVES

1. *To acquire necessary skills and knowledge required for organizing and carrying out entrepreneurial activities,*
2. *To develop the ability of analyzing and understanding business situations in which entrepreneurs act*
3. *To develop the ability of analyzing various aspects of entrepreneurship – especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development*

COURSE OUTCOMES (COs)

1. *The ability to discern distinct entrepreneurial traits and identify the successful elements of successful entrepreneurial ventures*
2. *Consider the legal and financial conditions for starting a venture and to assess the opportunities and constraints for new ventures*
3. *Design strategies for the successful implementation of ideas*
4. *To comprehend the evaluation of business opportunity from the prospective of an investor*
5. *Identify the most suitable sources of finance for start-ups*
6. *To write and execute their own business plan*

UNIT-I

Introduction to Entrepreneurship - Concept of Entrepreneur's, Enterprise and Entrepreneurship; Characteristics, Qualities, Functions of entrepreneur and Advantages of Entrepreneurship; Role of entrepreneurship in Economic development, Challenges faced by entrepreneurs, Entrepreneurial scenario in India and Abroad; Elements of Social Entrepreneurship, Types of Entrepreneurs, Entrepreneurship vs Intrapreneurship

UNIT-II

Small Business and its Importance - Introduction, Need, Classification of Micro, Small and Medium Enterprises (MSMEs), Role of MSMEs, Problems of MSMEs, Steps for Starting MSMEs, The role of government in supporting MSMEs in India.
Forms of Business Organization: Evaluation of Form of Business organization: Sole Proprietorship, Partnership, Joint Hindu Family, Joint Stock Company and Co-operative Society. Special forms of business ownership: Licensing, Franchising and Leasing.

UNIT-III

Innovation and Idea Generation in Entrepreneurship: Concept of Invention and Innovation, types of innovation, Sources of Innovation, Importance of Innovation in Entrepreneurship. Sources of new ideas, Methods of generating ideas and Opportunity recognition and idea generation in entrepreneurship - Intellectual Property Rights (IPRs):

Patents, trademarks, copyrights, and trade secrets. E-commerce and Business Start-ups, Sources of information for Start-up Entrepreneurs in India - Problems of Start-ups without IPRs

UNIT-IV
Entrepreneurial Motivation - Concept of Motivation and Factors influencing the entrepreneurs; Motivational Theories-Maslow's Need Hierarchy Theory, McClelland's Acquired Need Theory. Entrepreneurship Development Programs (EDPs) - Need and Role of EDPs. Opportunities for entrepreneurship in present scenario - Successful entrepreneurs
Financing of Enterprises - Source of financing - Debt capital, seed capital, venture capital, Loans available for starting ventures in India, Role of government agencies in small business financing, Role of consultancy organizations

UNIT-V
Project Planning and Feasibility Study - Meaning of Project, Project Life Cycle, and Stages of Planning Process. Project Planning and Feasibility, Project proposal and report preparation.

TEXT BOOKS
1. Robert D Hisrich, Mathew J.Manimala, Michael Peters, Dean A. Shepherd, *Entrepreneurship*, McGraw Hill Education, , 8th edition
2. Vasanth Desai, *The Dynamics of Entrepreneurial Development and Management*, Himalaya Publishing House, Mumbai.

REFERENCES
1. S.S. Khanka, *Entrepreneurial Development*, S. Chand and Company Limited
2. H. Nandan, *Fundamentals of Entrepreneurship*, PHI
3. Bholanath Dutta, *Entrepreneurship Management* – text and cases, Excel Books
4. *Entrepreneurship* – New venture Creation, Holt, and PHI
5. Ramachandran, *Entrepreneurial Development*, Tata McGraw Hill, New Delhi

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(18CE0128) COMPUTER AIDED DESIGN LAB

COURSE OBJECTIVES

The objectives of this course is

1. To understand software skills regarding analysis and design.

2. To understand the scope of STAAD PRO software

3. To understand to analyze and design frames, trusses and slabs.

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. List and discuss various basic commands of STAAD PRO or Equivalent.

2. Discuss the software skills regarding analysis and design.

3. Analyze and Design any 2-D & 3-D Framed Structures.

4. Analyze and Design of One -Way Slab & Two-Way Slab.

5. Discuss the Retaining Wall and its Analysis & Design.

6. Analyze and Design of Multistoried Building & Overhead Tank.

LIST OF EXPERIMENTS

1. 2-D Frame Analysis and Design
2. 3-D Frame Analysis and Design
3. Steel Tabular Truss Analysis and Design
4. Retaining Wall Analysis and Design
5. One -Way Slab Analysis & Design
6. Two-Way Slab Analysis & Design
7. Column Analysis & Design
8. Design of Overhead Tank
9. Analysis of Multistoried Building
10. Design of Multistoried Building

Any eight experiments may be conducted

SOFTWARE

- STAADPRO or Equivalent

TEXTBOOKS

1. Sesha Prakash, M.N. and C.S. Suresh, *Computer Aided Design Lab Manual*

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(18CE0129) CIVIL ENGINEERING LAB (VIRTUAL LAB)

COURSE OBJECTIVES

1. To introduce student to virtual lab environment

COURSE OUTCOMES (COs)

On successful completion of this course, the student should be able to

1. *Conduct Brinell Hardness Test, Rockwell Hardness Test and Vickers Hardness test on the same metal and report different hardness values.*
2. *Study Fatigue and Creep test in virtual labs and report observations*
3. *Reynold's Experiment and give observations on different types of flows*
4. *Find out bursting pressure of a pipe*
5. *Conduct BOD & COD test in virtual environment on wastewater sample.*
6. *Determine optimum dose of Alum*

LIST OF EXPERIMENTS

Following experiments are conducted in virtual environment:
1. Brinell, Rockwell and Vickers Hardness Tests
2. Fatigue and Creep Tests
3. Reynold's Experiment
4. Bursting of Pipe
5. BOD & COD Tests
6. Optimum Dose of Alum

REFERENCES

1. Virtual Labs - Civil Engineering (vlab.co.in)