मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी مولانا آزاد نیشنل اُردو یونیورسٹی

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University Established by an Act of Parliament in 1998)

(Accredited "A" Grade by NAAC)

Gachibowli, Hyderabad – 500032, Telangana, INDIA

AICTE Model Curriculum with effect from 2020-21 for MANUU Polytechnics

General Course Structure

&

Credit Distribution

Diploma in Civil Engineering

MANUU POLYTECHNICS

Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical (P) per week	1 credit

A. **Program Credits:**

The total number of credits proposed for the three-year Diploma program in Engineering & Technology is 120.

B. **Structure of Diploma Engineering Program:**

The structure of Diploma Engineering program shall have essentially the following categories of courses with the breakup of credits as given:

Sr. No.	Category	Suggested Breakup of Credits
1.	Humanities & Social Sciences courses	7
2.	Basic Science courses	18
3.	Engineering Science courses	16
4.	Program Core courses (Branch specific)	46
5.	Program Elective courses (Branch specific)	12
6.	Open Elective courses (from other technical and/or emerging subjects)	9
7.	Project work, seminar and internship in industry or elsewhere	12
8.	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge etc.]	(non-credit)
	Total	**120**

C. **Course code and definition:**

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
HS	Humanities & Social Sciences Courses
BS	Basic Science Courses
ES	Engineering Science Courses
PC	Program Core Courses
PE	Program Elective Courses
OE	Open Elective Courses
AU	Audit Courses
SI	Summer Internship
PR	Project
SE	Seminar

D. **Course level coding scheme:**

As per the CBCS Rules and Regulations of Examination Branch of MANUU.

E. **Category-wise Courses**

HUMANITIES & SOCIAL SCIENCES COURSES [HS]

Note:
(i) Number of Humanities & Social Sciences Courses:4
(ii) Credits:7

Sl. No	Code No.	Course Title	Hours per week			Semes-ter	Credits
			L	T	P		
1.		Communication Skills in English	2	0	0	I	2
2.		Sports and Yoga	0	0	2	I	1
3.		Communication Skills in English Lab	0	0	2	I	1
4.		Entrepreneurship and Start-ups	3	0	0	VI	3
Total Credits							**7**

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BASIC SCIENCES COURSE [BS]

Note:
(i) Number of Basic Sciences Courses:8
(ii) Credits:18

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1.		Mathematics-I	2	1	0	I	3
2.		Applied Physics-I	2	1	0	I	3
3.		Applied Chemistry	2	1	0	I	3
4.		Applied Physics-I Lab	0	0	2	I	1
5.		Applied Chemistry Lab	0	0	2	I	1
6.		Mathematics-II	3	0	0	II	3
7.		Applied Physics-II	2	1	0	II	3
8.		Applied Physics-II Lab	0	0	2	II	1
Total Credits							**18**

ENGINEERING SCIENCE COURSES [ES]

Note:

(i) Number of Engineering Sciences Courses:8

(ii) Credits:16

Sl. No	Code No.	Course Title	Hours per week			Semes-ter	Credits
			L	T	P		
1.		Engineering Graphics	0	0	3	I	1.5
2.		Engineering Workshop Practice	0	0	3	I	1.5
3.		Introduction to IT Systems	2	1	0	II	3
4.		Fundamentals of Electrical &Electronics Engineering	2	1	0	II	3
5.		Engineering Mechanics	2	1	0	II	3
6.		Introduction to IT Systems Lab	0	0	4	II	2
7.		Fundamentals of Electrical &Electronics Engineering Lab	0	0	2	II	1
8.		Engineering Mechanics Lab	0	0	2	II	1
Total Credits							**16**

PROGRAM CORE COURSES [PC]

Note:

(i) Number of Program Core Courses: 20 to 30 (including lab courses)

(ii) Credits:**46**

(iii) Number of contact hours per week of a subject may vary as per subject contents without affecting the subject credits.

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1							
.							
.							
n							
Total Credits							**46**

PROGRAM ELECTIVE COURSES [PE]

      Note:

(i)   Number of Program Elective Courses: 4 to 6
(Minimum ten Branch Specific courses to be specified for the students to choose from)

(ii)   Credits:**12**

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1							
.							
.							
n							
Total Credits							**12**

OPEN ELECTIVE COURSES [OE]

Note:

(i)   Number of Open Elective Courses: 3 to 4 (minimum ten courses to be specified out of the suggestive list of open elective courses given as Appendix III)

(ii)   Credits:**9**

(iii)   The Open Elective Courses to be offered preferably in III year (one course may be offered in V Semester and two courses in VI Semester)

(iv)   The students can opt only for those open elective courses that are offered by other than their respective departments

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1							
.							
.							
n							
Total Credits							**9**

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

Sl. No	Code No.	Course Title	Hours per week			Semes-ter	Credits
			L	T	P		
1.		Summer Internship – I (3-4 weeks) after IInd Sem					2
2.		Summer Internship – II (4-6 weeks) after IVth Sem					3
3.		Minor Project	0	0	4	IV	2
4.		Major Project	0	0	2	V	4
5.			0	0	6	VI	
6.		Seminar	1	0	0	VI	1
Total Credits							**12**

Note:

- Summer Internship–I should be undertaken in an industry/ Govt .or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres /Institutes/Schemes.

- Summer Internship–II should be undertaken in an industry only

- Seminar should be based on real/ live problems of the Industry/Govt./NGO/MSME/Rural Sector or an innovative idea having the potential of a Startup

AUDIT COURSES [AU]
Note: These are mandatory non-credit courses.

Sl. No	Code No.	Course Title	Hours per week			Semes-ter	Credits
			L	T	P		
1.		Environmental Science	2	0	0	II	0
2.		Essence of Indian Knowledge and Tradition	2	0	0	IV	0
3.		Indian Constitution	2	0	0	VI	0
Total Credits							**0**

DESCRIPTION OF BRANCH CODES

Sr. No.	Branch	Code
1.	Civil Engineering	CE
2.	Computer Engineering	CO
3.	Electronics and Communication Engineering	EC
4.	Electrical Engineering	EE
5.	Mechanical Engineering	ME
6.	Production Engineering	PE
7.	Information Technology	IT
8.	Chemical Engineering	CH

INDUCTION PROGRAM

Please refer Appendix IV for guidelines.
The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program ',as available on AICTE Portal, although that is for UG students of Engineering & Technology (Link:https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf).

Induction program (mandatory)	Two-week duration
Induction program for students to be offered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

F. Mandatory Visits/Workshop/Expert Lectures:

a. It is mandatory to arrange one industrial visit every semester for the students of each branch.

b. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/industry/entrepreneurial orientation.

c. It is mandatory to organize atleast one expert lecture per semester for each branch by inviting resource persons from domain specific industry

G. Evaluation Scheme:

a. For Theory Courses:
(The weightage of Internal assessment is 40% and for End Semester Exam is 60%)
The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

b. For Practical Courses:
(The weightage of Internal assessment is 60% and for End Semester Exam is 40%)
The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

c. For Summer Internship / Projects / Seminar etc.
Evaluation is based on work done, quality of report, performance in viva-voce, presentation by the student in front of Internship & project review committees consist of HoD, Principal Nominated Member and Concerned Faculty.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.

FR (Fail due to shortage of attendance and therefore, to repeat the course)

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Semester I–Pool: 1
(Common to CIVIL, MECH, ECE Branches)
Curriculum Structure

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/week	Scheme of Evaluation		Credits
				L	T	P		CIE	SEE	
1	Basic Science	DPCC113BST	Mathematics-I	2	1	0	3	40	60	3
2	Basic Science	DPCC111BST	Applied Physics-I	2	1	0	3	40	60	3
3	Basic Science	DPCC112BST	Applied Chemistry	2	1	0	3	40	60	3
4	Engineering Science	DPCE111PCP	Engineering Graphics	0	0	2	2	60	40	1
5	Basic Science	DPCC112BSP	Applied Chemistry Lab	0	0	2	2	60	40	1
6	Engineering Science	DPIT111PCT	Introduction to IT Systems	2	1	0	3	40	60	3
7	Engineering Science	DPIT111PCP	Introduction to IT Systems Lab	0	0	4	4	60	40	2
8	Basic Science	DPCC111BSP	Applied Physics-I Lab	0	0	2	2	60	40	1
9	Humanities& Social Science	CCPE055NCP	Sports and Yoga	0	0	2	2	50	-	1
Total Credits										**18**

Semester I- Pool: 2
(Common to CSE, IT, EEE Branches)
Curriculum Structure

Sl. No	Category of Course	Code No.	Course Title	Hours Per week			Total contact hrs/ week	Scheme of Evaluation		Credits
				L	T	P		CIE	SEE	
1	Basic Science	DPCC113BST	Mathematics-I	2	1	0	3	**40**	**60**	**3**
2	Basic Science	DPCC111BST	Applied Physics-I	2	1	0	3	**40**	**60**	**3**
3	Engineering Science	DPCE101EST	Engineering Mechanics	2	1	0	3	**40**	**60**	**3**
4	Humanities & Social Science	DPCC111HST	Communication Skills In English	2	0	0	2	**20**	**30**	**2**
5	Engineering Science	DPEE111PCT	Fundamentals of Electrical & Electronics Engineering	2	1	0	3	**40**	**60**	**3**
6	Humanities &Social Science	DPCC111HSP	Communication Skills in English Lab	0	0	2	2	**60**	**40**	**1**
7	Engineering Science	DPCE112PCP	Engineering Workshop Practice	0	0	4	4	**60**	**40**	**2**
8	Basic Science	DPCC111BSP	Applied Physics-I Lab	0	0	2	2	**60**	**40**	**1**
9	Engineering Science	DPCE111ESP	Engineering Mechanics Lab	0	0	2	2	**60**	**40**	**1**
10	Engine ring Science	DPEE111PCP	Fundamentals of Electrical& Electronics Engineering Lab	0	0	4	4	**60**	**40**	**2**
11	Audit	DPCC116NCT	Environmental Science	2	0	0	2	**20**	**30**	**0**
Total Credits										**21**

Semester II–Pool: 1
(Common to CIVIL, MECH, ECE Branches)
Curriculum Structure

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/week	Scheme of Evaluation		Credits
				L	T	P		CIE	SEE	
1	Basic Science	DPCC213BST	Mathematics-II	2	1	0	3	**40**	**60**	**3**
2	Basic Science	DPCC211BST	Applied Physics-II	2	1	0	3	**40**	**60**	**3**
3	Humanities & Social Science	DPCC111HST	Communication Skills in English	2	0	0	2	**20**	**30**	**2**
4	Engineering Science	DPEE111PCT	Fundamentals of Electrical & Electronics Engineering	2	1	0	3	**40**	**60**	**3**
5	Engineering Science	DPCE101EST	Engineering Mechanics	2	1	0	3	**40**	**60**	**3**
6	Basic Science	DPCC211BSP	Applied Physics-II Lab	0	0	2	2	**60**	**40**	**1**
7	Engineering Science	DPCE112PCP	Engineering Workshop Practice	0	0	4	4	**60**	**40**	**2**
8	Engineering Science	DPEE111PCP	Fundamentals of Electrical & Electronics Engineering Lab	0	0	4	4	**60**	**40**	**2**
9	Engineering Science	DPCE111ESP	Engineering Mechanics Lab	0	0	2	2	**60**	**40**	**1**
10	Humanities& Social Science	DPCC111HSP	Communication Skills In English Lab	0	0	2	2	**60**	**40**	**1**
11	Audit	DPCC116NCT	Environmental Science	2	0	0	2	**20**	**30**	**0**
Total Credits										**21**

Semester II – Pool: 2
(Common to CSE, IT, EEE Branches)
Curriculum Structure

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/week	Scheme of Evaluation		Credits
				L	T	P		CIE	SEE	
1	Basic Science	DPCC213BST	Mathematics-II	2	1	0	3	**40**	**60**	**3**
2	Basic Science	DPCC211BST	Applied Physics-II	2	1	0	3	**40**	**60**	**3**
3	Engineering Science	DPIT111PCT	Introduction to IT Systems	2	1	0	3	**40**	**60**	**3**
4	Engineering Science	DPCE111PCP	Engineering Graphics	0	0	2	2	**60**	**40**	**1**
5	Basic Science	DPCC112BST	Applied Chemistry	2	1	0	3	**40**	**60**	**3**
6	Basic Science	DPCC211BSP	Applied Physics-II Lab	0	0	2	2	**60**	**40**	**1**
7	Engineering Science	DPIT111PCP	Introduction to IT Systems Lab	0	0	4	4	**60**	**40**	**2**
8	Basic Science	DPCC112BSP	Applied Chemistry Lab	0	0	2	2	**60**	**40**	**1**
9	Humanities &Social Science	CCPE055NCP	Sports and Yoga	0	0	2	2	**50**	**-**	**1**
Total Credits										**18**

Semester III
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No.	Course Title	L	T	P	Total Contact hrs/ week	CIE	SEE	Credits
1	Program Core Course	DPCE305PCT	Construction Materials	3	0	0	3	**40**	**60**	2
2	Program Core Course	DPCE306PCT	Basic Surveying	3	0	0	3	**40**	**60**	3
3	Program Core Course	DPCE307PCT	Mechanics of Materials	3	0	0	3	**40**	**60**	3
4	Program Core Course	DPCE308PCT	Hydraulics	3	0	0	3	**40**	**60**	3
5	Program Core Course	DPCE309PCT	Building Construction & Concrete Technology	3	0	0	3	**40**	**60**	3
6	Program Core Course	DPCE307PCP	Mechanics of Materials Lab	0	0	3	3	**60**	**40**	1
7	Program Core Course	DPCE306PCP	Basic Surveying Lab	0	0	3	3	**60**	**40**	1
8	Program Core Course	DPCE308PCP	Hydraulics Lab	0	0	3	3	**60**	**40**	2
9	Program Core Course	DPCE309PCP	Building Planning and Drawing Lab	0	0	3	3	**60**	**40**	1
10	Summer Internship – I (4 weeks) after II Sem	DPCC301SEP	Summer Internship – I				-	-	50	2
Total Credits										**21**

Semester IV
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total Contact hrs/ week	Scheme of Evaluation		Credits
				L	T	P		CIE	SEE	
1	Program Core Course	DPCE406PCT	Advanced Surveying	3	0	0	3	**40**	**60**	2
2	Program Core Course	DPCE407PCT	Theory of Structures	3	0	0	3	**40**	**60**	3
3	Program Core Course	DPCE408PCT	Design of RCC Structures	3	0	0	3	**40**	**60**	3
4	Program Core Course	DPCE409CCT	Public Health Engineering	3	0	0	3	**40**	**60**	3
5	Program Core Course	DPCE406PCP	Advanced Surveying Lab	0	0	3	3	**60**	**40**	1
6	Program Core Course	DPCE409PCP	Public Health Engineering Lab	0	0	3	3	**60**	**40**	1
7	Program Core Course	DPCE410PCP	Hydraulics and Machinery Lab	0	0	3	3	**60**	**40**	1
8	Program Core Course	DPCE407PCP	Construction Material and Concrete Technology Lab	0	0	3	3	**60**	**40**	2
9	Program Elective Course – I	DPCE411PET DPCE412PET DPCE413PET	1. Precast and Prestressed Concrete 2. Construction Management 3. Rural Construction Technology	3	0	0	3	**40**	**60**	3
10	Mandatory Course	DPCC401PET	Essence of Indian Knowledge and Tradition	2	0	0	2	**20**	**30**	0
11	Project Work	DPCC402SEP	Minor Project	0	0	4	4	**60**	**40**	2
Total Credits										**21**

Semester V
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No.	Course Title	L	T	P	Total Contact hrs/ week	CIE	SEE	Credits
1	Program Core Course		Water Resource Engineering	3	0	0	3	**40**	**60**	2
2	Program Core Course		Design of Steel Structures	3	0	0	3	**40**	**60**	2
3	Program Core Course		Estimating and Costing	3	0	0	3	**40**	**60**	2
4	Program Core Course		Design of Steel and RCC structures Lab	0	0	3	3	**60**	**40**	1
5	Program Core Course		Estimating and Costing Lab	0	0	3	3	**60**	**40**	1
6	Summer Internship – II (6 weeks) after IV Sem		Summer Internship – II					-	**100**	3
7	Program Elective Course – II		1. Transportation Engineering 2. Solid Waste Management 3. Advanced Construction Technology	3	0	0	3	**40**	**60**	3
8	Program Elective Course – III		1. Pavement Design & Maintenance 2. Green Building and Energy Conservation 3. Building Services and Maintenance	3	0	0	3	**40**	**60**	3
9	Program Open Elective – I		1. Air pollution and its Control Measures 2. Watershed Management 3. Internet of Things (IoT)	3	0	0	3	**40**	**60**	3
10	Project Work		Major Project	-	-	2	2			^
Total Credits										**20**

Semester VI
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No	Course Title	L	T	P	Total Contact hrs/ week	CIE	SEE	Credits
1	Program Core Course		Geotechnical Engineering	3	0	0	3	**40**	**60**	2
2	Program Core Course		Geotechnical & Transportation Engineering Lab	0	0	3	3	**60**	**40**	1
3	Program Elective Course -IV		1. Traffic Engineering. 2. Repairs and maintenance of Structures. 3. Tendering and Accounts	3	0	0	3	**40**	**60**	3
4	Program Open Elective – II		1. Disaster Management 2. Environmental Impact Assessment 3. Non-destructive Testing Methods	3	0	0	3	**40**	**60**	3
5	Program Open Elective – III		1. Low-Cost Housing 2. Remote Sensing and GIS 3. Renewable Energy Technologies 4. Artificial Intelligence (AI)	3	0	0	3	**40**	**60**	3
6	Humanities and Social Science course		Entrepreneurship and starts-up	3	0	0	3	**40**	**60**	3
7	Mandatory Course		Indian Constitution	2	0	0	2	**20**	**30**	0
8	Project Work		Major Project	-	-	6	6	**120**	**80**	4
9	Seminar		Seminar	1	0	0	1	**50**	-	1
Total Credits										**20**

Mathematics-I

Course Objectives:
This course is designed to give a comprehensive coverage at an introductory level to the subject of Trigonometry, Differential Calculus and Basic elements of algebra.

Course Content:

UNIT - I: Trigonometry
Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of sin x, cos x, tan x and e^x.

Differential Calculus

Definition of function; Concept of limits. Four standard limits $\lim_{x \to a} \dfrac{x^n - a^n}{x - a}$, $\lim_{x \to 0} \dfrac{\sin x}{x}$, $\lim_{x \to a} \left(\dfrac{a^x - 1}{x} \right)$ and $\lim_{x \to a} (1+x)^{1/x}$.

Differentiation by definition of x^n, $\sin x,\ \cos x, \tan x, e^x\ and\ \log_a x$. Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Exponential functions.

UNIT - III: Algebra
Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-movier's theorem, its application.
Partial fractions: Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction.

Permutations and Combinations: Value of $n\mathrm{P_r}\ and\ nC_r$.

Binomial theorem: Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems

References:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. A Text book of Engineering Mathematics for I,II semester by Dr. M.V.S.S N. Prasad by Radiant Publishing House.
4. A Text Book of Intermediate, Mathematics I , II year by Telugu Akademi , Telangana
5. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)
6. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vi-kas Publishing House.
7. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

APPLIED PHYSICS-I

Course Objectives:

Applied Physics includes the study of a large number of diverse topics all related to materials/things that exist in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which such objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content. The course will help the diploma engineers to apply the basic concepts and principles to solve broad- based engineering problems and to understand different technology based applications.

Learning Outcome:

  After undergoing this subject, the student will be able to:

- Identify physical quantities, select their units for use in engineering solutions, and make measurements with accuracy by minimizing different types of errors.
- Represent physical quantities as scalar and vectors and solve real life relevant problems.
- Analyse type of motions and apply the formulation to understand banking of roads/railway tracks and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.
- Define scientific work, energy and power and their units. Drive relationships for work, energy and power and solve related problems.
- Describe forms of friction and methods to minimize friction between different surfaces.

Course Content:

Unit 1: Physical world, Units, Dimensions and Vectors

Physics – scope and nature– physics in relation to technology, Physical quantities, Fundamental physical quantities, Derived physical quantities with units, examples. S.I. Units of various physical quantities with symbols, Rules for writing SI units. Dimensions of physical quantity, dimensional formulae, principle of Homogeneity of Dimensions, applications of Dimensional Analysis. Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Resolution of a Vector, Triangle and Parallelogram law of vectors, Scalar and Vector Product, properties with examples, problems solving

Unit 2: Dynamics

Recapitulation of equations of motion in a straight line, acceleration due to gravity, expressions for Maximum Height, Time of ascent, Time of descent and time of flight. Work, energy, power and their SI units, potential Energy and Kinetic Energy examples and their expression. The law of conservation of Energy, verify in the case of freely falling body. simple harmonic motion with examples, conditions of S.H.M, Explanation of simple Harmonic Motion by Reference circle, Expressions for Displacement, Velocity, Acceleration, Time Period and Frequency in S.H.M, simple pendulum and expression for time period of a simple pendulum, second's pendulum, problems solving

Unit 3: Properties of Matter

 Introduction to Elasticity, stress and strain, types of stress and strain, Hooke's law moduli of elasticity, young's modulus, Bulk Modulus, Rigidity Modulus. Surface tension: concept, units, cohesive and adhesive forces, angle of contact, applications of surface tension, effect of temperature and impurity on surface tension. Capillarity and its applications in daily life, Experimental determination of surface tension based on capillary rise method. Viscosity and coefficient of viscosity and effect of temperature on viscosity, problems solving

Unit 4: Heat and Thermodynamics

Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), scales of temperature and their relationship, Expansion of solids, coefficient of linear, Areal and cubical expansions and relation amongst them. Expansion of gases, volume coefficient of a gas and pressure coefficient of a gas, Boyles law, Charles laws, ideal gas Equation, laws of thermodynamics, specific heats and molar specific heats, $C_P - C_V = R$, problems solving.

Text Books and References
1. Concepts of physics by HC VERMA, Surya publication, Ghaziabad, india
2. Physics- Resnik and Halliday- Wiley Toppan Publishers- England
3. Physics- intermediate-I &II year- Telugu Academy, Telangana
4. P.k palaniswamy: Atext book of Engineering Physics
5. C.Kittel(Wiley Eastern) : introduction to solid state physics.

Applied Physics-I Lab

Course Objectives

Study of Applied Physics aims to give an understanding of physical world by observations and predictions. Concrete use of physical principles and analysis in various fields of engineering and technology is very prominence. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

Learning Outcome:

After undergoing this lab work, the student will be able to:

* Select right kind of measuring tools (Meter scale, Vernier caliper, Screw gauge, Spherometer etc.) for determining dimensions of physical quantities and make measurements with accuracy and precision.
* Differentiate various shapes and determine dimensions of plane, curved and regular surfaces/bodies.
* Apply and Verify laws of forces and determine resultant force acting on a body.
* Appreciate role of friction and measure co-efficient of friction between different surfaces.
* Describe and verify Hook‟s law and determine force constant of spring body.
* Identify various forms of energy, energy transformations and verify law of conservation of energy.
* Understand viscosity of liquids and determine viscosity of a given liquid.
* Understand use of thermometers to measure temperature under different conditions and different scales of temperature measurements.

List of Practical's

1. Determination of volume of solid cylinder and sphere, using a Vernier caliper
2. Determination of diameter of a wire, thickness of thin glass plate using a screw gauge.
3. Determination of radius of curvature of a convex and a concave mirror/surface using a spherometer.
4. To verify triangle and parallelogram law of forces.(Concurrent forces)
6. Determination of the acceleration due to gravity at a place using simple pendulum.
7. Determination of force constant of a spring using Hooke's Law.
8. Determination of the surface Tension of a given liquid by capillary Rise Method.
9. Determination of the viscosity of a given liquid by Stoke‟s law
10. Determination of atmospheric pressure at a place using Quill Tube Method
11. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.

Applied Chemistry

Course Objectives:

There are numerous number materials are used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyse and properties of natural raw materials require for producing economical and eco- friendly finished products.

- Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.
- Use relevant water treatment method to solve domestic and industrial problems.
- Solve the engineering problems using knowledge of engineering materials and properties.
- Use relevant fuel and lubricants for domestic and industrial applications
- Solve the engineering problems using concept of Electrochemistry and corrosion.

Learning Outcomes

At the end of the course student will be able to

1. Understand the classification and general properties of engineering materials such as metal, alloys, glasses, cement, refractory and composite materials using knowledge of chemical bonding.
2. Understand and assess the suitability of water source for domestic and industrial application, effluents and minimize water pollution.
3. Qualitatively analyze the engineering materials and understand their properties and applications.
4. Choose fuel and lubricants suitable for economical industrial processing to obtain eco- friendly finished products.
5. a) Ascertain construction, mechanism efficiency of electrochemical cells, solar cell fuel cells

   b) Understand corrosion and develop economical prevention techniques.

Course Content:

Unit 1: Atomic Structure, Chemical Bonding and Solutions
Bohr"s theory (expression of energy and radius to be omitted), Quantum numbers orbital concept. Shapes of s, p and d orbitals, Pauli"s exclusion principle, Hund"s rule of maximum multiplicity Aufbau rule, electronic configuration.
Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond, co-ordination bond in NH_4^+.
Solution–idea of solute, solvent and solution, methods to express the concentration of solution-molarity (M=mole per liter), ppm.

Unit 2: Water, Chemistry of Fuels and Lubricants
Graphical presentation of water distribution on Earth(pie or bar diagram).Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.
Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc). Water softening techniques – soda lime process, zeolite process and ion exchange process.

Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

Chemistry of Fuels and Lubricants:

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong"s formula.

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication – function and characteristic properties of good lubricant, classification with ex- amples. Physical properties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke number, total acid number saponification value)of lubricants.

Unit 3: Engineering Materials

Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (ma-

trix), flux, slag, metallurgy – brief account of general principles of metallurgy.

Extraction of iron from haematite ore using blast furnace. Alloys –

definition, purposes of alloying, ferrous alloys and non-ferrous with

suitable examples, properties and applications.

Portland cement and hardening, Glasses Refractory and Composite materials.

Polymers – monomer, homo and co polymers, simple reactions involved in

preparation and their application of thermoplastics and thermosetting

plastics(using PVC, PS, PTFE, nylon – 6, nylon – 66, Bakelite only), rubber and vulcanization of rubber.

Unit 4: Electro Chemistry

Electronic concept of oxidation, reduction and redox reactions.

Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems. Industrial Application of Electrolysis –
- Electrometallurgy
- Electroplating
- Electrolytic refining.

Application of redox reactions in electrochemical cells –
- Primary cells – dry cell,
- Secondary cell-commercially used lead storage battery, fuel and Solar cells. Introduction to Corrosion of metals–
- definition, types of corrosion (chemical and electrochemical), H_2 liberation and O_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.

Internal corrosion preventive measures –
- Purification, alloying and heat treatment and

External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.

Suggested Learning Resources:
1) Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2) Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi,2015.

Applied Chemistry Lab

Course Objectives:

There are numerous number of materials used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. The course aims to supplement the factual knowledge gained in the lectures by first hand manipulation of processes and apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering problems.

Learning Outcomes:

At the end of the course student will be able to

- To express quantitative measurements accurately.
- To practice and adapt good measuring techniques.
- To use various apparatus for precise measurements.
- To understand and differentiate different methods of quantitative analysis.
- To know and understand principles of quantitative analysis using instruments.

LIST OF PRACTICALS:

Perform any 12 (twelve) Laboratory Practicals.

Volumetric and Gravimetric analysis:

1. Preparation of standard solution of oxalic acid or potassium permanganate.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. Standardization of $KmnO_4$ solution using standard oxalic acid and Determine the percentage of Iron present in given Hematite ore by $KmnO_4$ solution.
4. Iodometric estimation of copper in the copper pyrite ore.
5. Volumetric estimation of total acid number (TAN) of given oil.
6. Volumetric estimation of
   a) Total hardness of given water sample using standard EDTA solution.
   b) Alkalinity of given water sample using 0.01M sulphuric acid
7. Proximate analysis of coal
   a) Gravimetric estimation moisture in given coal sample
   b) Gravimetric estimation ash in given coal sample

Instrumental analysis

8. Determine the conductivity of given water sample.
9. Determination of the Iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.
12. DeterminationofflashandfirepointoflubricatingoilusingAble"sflash point apparatus.
13. To verify the first law of electrolysis of copper sulfate using copper electrode.
14. Construction and measurement of emf of elector chemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

Text Book:

1. Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi,2017- 18.

Communication Skills in English

Course Objectives:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course

To develop confidence in speaking English with correct pronunciation.

To develop communication skills of the students i.e. listening, speaking, reading and writing skills. To introduce the need for personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

Course Outcomes:

At the end of this course, the participants will:

- Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.

- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.

- Also develop skills of group presentation and communication in team. Develop non-verbal communication such as proper use of body language and gestures.

Course Content

Unit-1 Communication: Theory and Practice

- Basics of communication: Introduction, meaning and definition, process of communication etc.

- Types of communication: formal and informal, verbal, non-verbal and written Barriers to effective communication.

- **7** Cs for effective communication (considerate, concrete, concise, clear, complete, correct courteous).

- Art of Effective communication,

    o   Choosing words
    o   Voice
    o   Modulation
    o   Clarity
    o   Time
    o   Simplification of words
- Technical Communication.

Unit-2 Soft Skills for Professional Excellence
- Introduction: Soft Skills and Hard Skills.
- Importance of soft skills.
- Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy etc.
- Applying soft skills across cultures.
- Case Studies.

Unit-3: Reading Comprehension

Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:

Section-1

Malgudi Days: R.K. Narayan

The Room on Roof: Ruskin Bond "The Gift of the Magi" by O. Henry

"Uncle Podger Hangs a Picture" Jerome K. Jerome

Section-2

Night of the Scorpion by Nissim Ezekiel, Stopping by Woods on a Snowy, Evening by Robert Frost, Where the Mind is Without Fear by Rabindranath Tagore, Ode to Tomatoes by Pablo Neruda,

Unit-4: Professional Writing

The art of précis writing, Letters: business and personnel, Drafting e-mail, notices, minutes of a meeting etc   Filling-up different forms such as banks and on-line forms for placement etc. Vocabulary and Grammar Vocabulary of commonly used words Glossary of administrative terms (English and Hindi) One-word substitution, Idioms and phrases etc. Parts of speech, active and passive voice, tenses etc., Punctuation

References:

1. M. Ashraf Rizvi. *Effective Technical Communication*. Mc-Graw Hill: Delhi,2002.

Communication Skills in English – Lab

Course Objectives:

Communication skills play an important role in career development. This lab course aims at actively involving students in various activities to improve their communication skills with an emphasis on developing personality of the students. Thus, the objectives of this course are:

1. To develop listening skills for enhancing communication.

2. To develop speaking skills with a focus on correct pronunciation and fluency.

3. To introduce the need for Personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc. for that purpose group discussion, extempore and other activities should be conducted during lab classes.

Learning Outcome:

- Attheendofthiscoursethestudentswillbeabletocommunicateeffectively with an increase in their confidence to read, write and speak English fluently.

- They will also demonstrate a significant increase in word power.

- The variety of exercises and activities that will be conducted in the Language Lab will develop their skills needed to participate in a conversation like listening carefully and respectfully to others" viewpoints; articulating their own ideas and questions clearly and overall students will be able to prepare, organize, and deliver an engaging oral presentation.

- They will also develop non-verbal communication such as proper use of body language and gestures.

Course Content:

Unit 1 Listening Skills

Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests.

Unit II Introduction to Phonetics

Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), weak forms, syllable division, word stress, intonation, voice etc.

Unit III Speaking Skills

Standard and formal speech: Group discussion, oral presentations, public speaking, business presentations etc. Conversation practice and role playing, mock interviews etc.

Unit IV Building vocabulary

Etymological study of words and construction of words, phrasal verbs, foreign phrases, idioms and phrases. Jargon/ Register related to organizational set up, word exercises and word games to enhance self-expression and vocabulary of participants.

Recommended Readings:

1. Daniel Jones. *The Pronunciation of English.* Cambridge: Cambridge University Press, 1956.

Engineering Graphics

Course Objectives:

Following are the objectives of this course:
- To understand the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs.
- To develop drafting and sketching skills, to know the applications of drawing equipments, and get familiarize with Indian Standards related to engineering drawings.
- To develop skills to visualize actual object or a part of it, on the basis of drawings.
- To develop skills to translate ideas into sketches and to draw and read various engineering curves, projections and dimensioning styles.
- To understand the basic commands and develop basic skills related to computer aided drafting, of how to draw, modify, and edit basic shapes (2D), using AUTOCAD.

Course Outcomes

Following outcomes will be achieved:
- Select and construct appropriate drawing scales, use drawing equipments, and understand Indian Standards of engineering drawing
- Draw views of given object and components 3) Sketch orthographic projections into isometric projections and vice-versa.
- Apply computer aided drafting tools to create 2D engineering drawings

Course Content

Unit – I Basic elements of Drawing
- Drawing Instruments and supporting materials: method to use them with applications. Convention of lines and their applications.
- Representative Fractions – reduced, enlarged and full-size scales; Engineering Scales such as plain and diagonal scale.
- Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning.
- Geometrical and Tangency constructions. (Redraw the figure)

Unit – II Orthographic projections
- Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications (No question to be asked in examination).
- Introduction to orthographic projection, First angle and Third angle method, their symbols.
- Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)
- Isometric Projections
- Introduction to isometric projections. Isometric scale and Natural scale. Isometric view and isometric projection.
- Illustrative problems related to objects containing lines, circles and arcs shape only. Conversion of orthographic views into isometric view/projection.

Unit – III Free Hand Sketches of engineering elements
- Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)
- Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)

Unit – IV Computer Aided Drafting Interface & Drafting: concept.

- Hardware and various CAD software available. System requirements and Understanding the interface.
- Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon.
- File features: New file, Saving the file, opening an existing drawing file, creating templates, Quit.
- Setting up new drawing: Units, Limits, Grid, Snap. Undoing and redoing action.

Computer aided drafting

- Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, PolyLine. Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates. Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers.
- Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions.
- Dim scale variable. Editing dimensions.
- Text: Single line Text, Multiline text.
- Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, drawing orientation, plot scale, plot offset, plot area, print preview.

Suggested Learning Resources:

1. Bureau of Indian Standards. Engineering Drawing Practice for Schools and Colleges IS: Sp-46. BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. Engineering Drawing. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8.
3. Jain & Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)
4. Jolhe, D. A. Engineering Drawing. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07-064837-1
5. Dhawan, R. K. Engineering Drawing. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
6. Shah, P. J. Engineering Drawing. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. Engineering Graphics with AutoCAD. PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapoovan, T. Essentials of Engineering Drawing and Graphics using AutoCAD. Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. AutoCAD User Guide. Autodesk Press, USA, 2015.
10. Sham, Tickoo. AutoCAD 2016 for Engineers and Designers. Dream tech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

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Course Objectives:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

- Solve various engineering problems applying ecosystem to produce eco – friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- To recognize relevant energy sources required for domestic and industrial applications.
- Solve local solid and e-waste problems.

Course Outcomes:

At the end of the course student will be able to

- Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products.
- Understand the suitable air, extent of noise pollution, and control measures and acts.
- Understand the water and soil pollution, and control measures and acts.
- Understand different renewable energy resources and efficient process of harvesting.
- Understand solid Waste Management, ISO 14000 & Environmental Management.

Course Content:

Pre requisite: - High School Chemistry

Unit-1 Ecosystem

- Structure of ecosystem, Biotic & Abiotic components
- Food chain and food web
- Global warming -Causes, effects, process, Green House Effect, Ozone depletion

Unit– 2 Air and Noise Pollution

- Definition of pollution and pollutant, Natural and manmade sources of air pollution
- Air Pollutants: Types, Particulate Pollutants: Effects and control of air pollution
- Noise pollution: sources of pollution, Effects and control of Noise pollution

Unit- 3 Water and Soil Pollution

- Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition
- Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.
- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste.

Unit– 4 Renewable sources of Energy

- Solar Energy: Basics of Solar energy. Solar pond. Solar water heater, solar dryer.

- Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas.
- Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.
- New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy
- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste.

References:

Suggested Learning Resources:

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi

2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.

Introduction to IT Systems

Course Objectives:

This course is intended to make new students comfortable with computing environment – Learning basic computer skills, Learning basic application software tools, Understanding Computer Hard- ware, Cyber security awareness

Course Outcomes:

At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/ attacks.

Course Content:

UNIT 1:

Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals.

General understanding of various computer hardware components – CPU, Memory, Display, Key- board, Mouse, HDD and other Peripheral Devices.

UNIT 2:

OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.

UNIT 3: HTML4, CSS, making basic personal webpage.

UNIT 4: Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

Information security best practices.

Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place in the Lab by practicing regularly.

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. This course is all about some theory and a lot of practice.

References:

1. R.S. Salaria, Computer Fundamentals, Khanna Publishing House
2. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
3. Online Resources, Linux man pages, Wikipedia
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

Introduction to IT Systems Lab

Course Objectives:

This Lab course is intended to practice whatever is taught in theory class of „Introduction of IT Systems" and become proficient in using computing environment – basic computer skills, basic application software tools, Computer Hardware, cyber security features, etc.

Course Outcomes:

At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basicabuses/attacks.

Course Content:

S.No.	Topics for Practice
1	Browser features, browsing, using various search engines, writing search queries
2	Visit various e-governance/Digital India portals, understand their features, services offered
3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, 31hosal31ze various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML commands, try them with various values, make your own Webpage
7	Explore features of Open Office tools, create documents using these features, do it multiple times
8	Explore security features of Operating Systems and Tools, try using them and see what happens.

This is a skill course. More you practice, better it will be.

References:

1. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
2. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.

Applied Physics –II

Course Objectives

Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content. The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology-based applications.

Learning Outcome:

After undergoing this subject, the student will be able to;

a) Describe waves and wave motion, periodic and simple harmonic motions and solve simple problems. Establish wave parameters: frequency, amplitude, wavelength, and velocity and able to explain diffraction, interference, polarization of waves.

b) Explain ultrasonic waves and engineering, medical and industrial applications of Ultrasonics. Apply acoustics principles to various types of buildings for best sound effect.

c) State basic optical laws, establish the location of the images formed by mirrors and thin con- verging lens, design and assemble microscope using lenses combination.

d) Describe refractive index of a liquid or a solid and will be able to explain conditions for total internal reflection.

e) Define capacitance and its unit, explain the function of capacitors in simple circuits, and solve simple problems.

f) Differentiate between insulators, conductors and semiconductors, and define the terms: potential, potential difference, electromotive force.

Course Content
UNIT – 1: Wave motion and Optics

Wave motion, transverse and longitudinal waves with examples, progressive and it's characteristics,Sound waves and their properties, principle of superposition of waves and beat formation. Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications. Light waves and their properties, reflection and refraction, refractive index (snell's law), Critical angle, Total internal reflection and conditions for total internal reflection, applications of total internal reflection in optical fiber,. Image formation by thin lenses, lens formula, power of lens, magnification, problems solving

UNIT -2: Electrostatics and Current Electricity

Charges, Coulombs inverse square law, Electric field, Electric lines of force and their properties, Electric potential and potential difference. Capacitance and its units Capacitor and its principle, Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors.

Electric Current and its units, Ohm's law, Resistance and its units, Conductance, Specific resistance, conductivity, Series and parallel combination of resistances. Kirchhoff's laws, Wheatstone bridge and its applications, Meter Bridge Experiment for determination of specific resistance with neat circuit diagram, problems solving.

UNIT – 3: Electromagnetism

Introduction to magnetism, coulomb inverse square law in magnetism, Magnetic field and its units, , magnetic lines of force, Magnetic induction, magnetic moment and units,

Force on moving charge in magnetic field. Force on current carrying conductor, force on rectangular coil placed in magnetic field. Moving coil galvanometer; principle, construction

and working, Conversion of a galvanometer into ammeter and voltmeter, problems solving.

UNIT – 4: Modern Physics

Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and V-I characteristics Photo- Electric effect, Einstein's photoelectric equation, laws of photoelectric effect, working of photo cell

Nanoscience and Nanotechnology Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology and applications, problems solving.

Text Books and References

1. Concepts of physics by HC VERMA, Surya publication, Ghaziabad, India
2. Physics- Resnik and Halliday- Wiley Toppan Publishers- England
3. Physics- intermediate-I &II year- Telugu Academy, Telangana
4. P. K Palani swamy: A text book of Engineering Physics
5. C. Kittel (Wiley Eastern): Introduction to solid state physics.

Course Objectives:

Concrete use of physical principles and analysis in various fields of engineering and technology is very prominence. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

Learning Outcome:

After undergoing this subject, the student will be able to;
a) Apply concept of vibrations and determine the time period of vibrating objects.
b) Use of equipment for determining velocity of ultrasonics in different liquids.
c) Verify optical laws; reflection, refraction from plane interfaces and surfaces.
d) Apply knowledge of optics to determine focal length and magnifying power of optical lenses.
e) Understand uses of electrical components and meters and verify Ohm's law for flow of current.
f) Quantify resistances and verify laws of series and parallel combination of resistances.
g) Measure resistance of a galvanometer and how it is converted into an ammeter and volt-meter.
h) Handle optical fibers and determine numerical aperture of given optical fiber.

List of Practicals/Activities:

1. Determine the Velocity of sound in air using resonance column Apparatus at room temperature and at 0o C.
2. Determine focal length and magnifying power of a convex lens.
3. Determine focal length and magnifying power of a concave lens
4. To verify Ohm's law by plotting graph between current and potential difference
5. Determine the resistance and specific resistance of the wire using Meter Bridge
6. To verify laws of resistances in series and parallel combination using meter bridge.
7. Draw the lines of force of combined magnetic field due to bar magnet in earth's magnetic field by locating the null points when North pole of the bar magnet pointing towards Geographical North of the Earth.
8. Draw the lines of force of combined magnetic field due to bar magnet in earth's magnetic field by locating the null points when North pole of the bar magnet pointing towards Geographical North of the Earth
9. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.
10. To measure numerical aperture (NA) of an optical fiber.

Engineering Mechanics

Course Objectives:

Following are the objectives of this course:

- To obtain resultant of various forces
- To calculate support reactions through conditions of equilibrium for various structures
- To understand role of friction in equilibrium problems

Course Outcomes:

After completing this course, student will be able to:

- Identify the force systems for given conditions by applying the basics of mechanics.
- Determine unknown force(s) of different engineering systems.
- Apply the principles of friction in various conditions for useful purposes.
- Find the centroid and centre of gravity of various components in engineering systems.

Course Contents:

Unit – I Basics of mechanics and force system
- Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body.
- Scalar and vector quantity, Units of measurement (SI units) – Fundamental units and derived units.
- Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.
- Resolution of a force – Orthogonal components of a force, moment of a force, Varignon's Theorem.
- Composition of forces – Resultant, analytical method for determination of resultant for concur- rent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II Equilibrium
- Equilibrium and Equilibrant, Free body diagram, Analytical method of analysing equilibrium.
- Lamis Theorem – statement and explanation, Application for various engineering problems.
- Types of beams, supports (hinge, roller and fixed) and loads (vertical, inclined point load & uniformly distributed load) acting on the beam.
- Beam reaction for cantilever, simply supported beam with or without overhang – subjected to Point load, uniformly distributed load and combination of loads.

Unit– III Friction
- Introduction – Theory of Friction – Angle of friction – Laws of Friction – Static and Dynamic Frictions- Wedge Friction, Screw-jack and Differential Screw- jack
- Equilibrium of bodies on level surface subjected to force parallel and inclined to plane.

Unit– IV Centroid
- Introduction to Centroid, Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle). Centroid of T, L, I, Channel section, Z section, Unsymmetrical I section and Built-up sections.

Text Book:

1. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.

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Engineering Mechanics Lab

Course Objectives:

Following are the objectives of this course:
1) To obtain resultant of various forces
2) To calculate support reactions through conditions of equilibrium for various structures
3) To understand role of friction in equilibrium problems
4) To know fundamental laws of machines and their applications to various engineering problems

Course Outcomes:

After completing this course, student will be able to
1. Identify the force systems for given conditions by applying the basics of mechanics.
2. Determine unknown force(s) of different engineering systems.
3. Apply the principles of friction in various conditions for useful purposes.
4. Find the centroid and centre of gravity of various components in engineering systems.
5. Select the relevant simple lifting machine(s) for given purposes.

List of Practical to be performed:

1. To study various equipments related to Engineering Mechanics.
2. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
3. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
4. Determine resultant of concurrent force system graphically.
5. Determine resultant of parallel force system graphically.
6. Verify Lami's theorem.
7. Study forces in various members of Jib crane.
8. Determine support reactions for simply supported beam.
9. Obtain support reactions of beam using graphical method.
10. Determine coefficient of friction for motion on horizontal and inclined plane.
11. Determine centroid of geometrical plane figures.

Text Book:

1. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.

Fundamentals of Electrical and Electronics Engineering

Course Objectives:

To provide basic knowledge of the different elements and concepts of electrical engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, Digital Electronics and their applications to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.

Outcomes:

1. Understand the basics of analog and digital electronics
2. Analyze eclectic and magnetic circuits
3. Understand the working of transformers and machines.

Course Contents:

UNIT I Overview of Electronic Components & Signals:
Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications. Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values.

UNIT II Overview of Analog and Digital Circuits:
Operational Amplifiers-Ideal Op-Amp, Practical op amp, Application of Op-Amp as amplifier, adder, differentiator and integrator.

Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach.

Unit III Electric and Magnetic Circuits:
EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, Electromagnetic induction, Faraday"s laws of electromagneticinduction,Lenz"slaw;Dynamicallyinducedemf;Staticallyinducedemf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.

Unit IV A.C. Circuits, Transformers and Machines
Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; General construction and principle of transformer; Emf equation and transformation ratio of transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.

Text Book:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House

Fundamentals of Electrical and Electronics Engineering Lab

Course Objectives:

To provide basic knowledge of the different elements and concepts of electrical engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, Digital Electronics and their applications to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.

Course Outcomes:

At the end of the course student will be able to:

1. Understand basic principle and operation of electric circuits and machines.
2. Solve basic problems related to electrical circuits and machines. Explain the operation of different electrical technologies.
3. Demonstrate an understanding of the control systems.
4. Understand the basic circuit elements
5. Understand different types of signal waveforms.
6. Understand logic gates and apply them in various electronic circuits.
7. Understand the basic concepts of op-amps, and their applications.
8. Use relevant electric/electronic protective devices safely.

S. No.	List of Experiments	Approx. Hrs.
1.	Determine the value of given resistor using digital multimeter to confirm with colour code.	02
2	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.	02
3	Use LCR-Q tester to measure the value of given capacitor and inductor.	02
4	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.	02
5	Measure voltage, current and power in 1-phase circuit with resistive load.	02
6	Measure voltage, current and power in R-L series circuit.	02
7	Test the performance of PN-junction diode.	02
8	Test the performance of Zener diode.	02
9	Determine the current gain of CE transistor configuration.	03
10	Determine the transformation ratio (K) of 1-phase transformer.	03

Text Book:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House,2018

Mathematics-II

Course Objectives:
- This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, Integral Calculus coordinate geometry, Basic elements of vector algebra and First Order Differential Equations.

Course Content:

UNIT – I: Determinants and Matrices
Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

UNIT – II: Integral Calculus
Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Use of formulas $\int_0^{\pi/2} \sin^n x\, dx$, $\int_0^{\pi/2} \cos^n x\, dx$ and $\int_0^{\pi/2} \sin^m x \cos^n x\, dx$ for solving problems Where m and n are positive integers.
Applications of integration for (i). Simple problem on evaluation of area bounded by a curve and axes. (ii). Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT – III: Co-Ordinate Geometry
Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula. General equation of a circle and its characteristics. To find the equation of a circle, given:

   i. Centre and radius,
   ii. Three points lying on it and
   iii. Coordinates of end points of a diameter;
      Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directories or vertices are given.

UNIT – IV: Vector Algebra
Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.

UNIT-V: Differential Equations
Solution of first order and first-degree differential equation by variable separation method (simple problems). MATLAB – Simple Introduction.

References:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. A Text book of Engineering Mathematics for I, II, III semester by Dr. M.V.S.S N. Prasad by Radiant Publishing House.

4. A Text Book of Intermediate Mathematics I, II year by Telugu Akademi, Telangana
5. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
6. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
7. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Course Code	:	
Course Title	:	**Engineering Workshop Practice**
Number of Credits	:	2 (L: 0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- Tounderstandbasicengineeringprocessesformanufacturingandassembly.
- To understand, identify, select and use various marking, measuring, and holding, striking and cutting tools and equipment's
- To understand and interpret job drawings, produce jobs, and inspect the job for specified Dimensions
- Tounderstandthevarioustypesofwiringsystemsandacquireskillsinhouse wiring
- To understand, operate, control different machines and equipment's adopting safety practice

Course Outcomes:

After competing this course, student will be able to:

- Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools &equipment's and machines
- Understandjobdrawingandcompletejobsasperspecificationsinallottedtime
- Inspect the job for the desired dimensions and shape
- Operate, control different machines and equipments adopting safety practices

List of Practicals to be performed (Minimum 8 practicals should be conducted):

S.No.	Details of Practical Content
I	**Carpentry:** i) Demonstration of different wood working processes, like plaining, marking, chiseling, turning of wood etc. ii) One simple job involving any one joint like mortise and tendon dovetail, bridle, half lap etc. **Fitting:** i) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. ii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.
II	**Welding:** i) Demonstration of different welding tool. Ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. iii) One simple job involving butt and lap joint **Sheet Metal Working:** i) Demonstration of different sheet metal operations like sheet cutting, bending, edging, lancing, soldering, and riveting. Ii) One simple job involving sheet metal operations and soldering and riveting
III	**Electrical House Wiring:** Practice on simple lamp circuits (i) one lamp controlled by one switch by surface conduit wiring, (ii) Lamp circuits- connection of lamp and socket by separate switches
IV	**Demonstration:** i) Demonstration of measurement of Current, Voltage, Power and Energy. ii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. Iii) Tools for Cutting and drilling

Suggested Learning Resources:

1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi,2015

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Semester III
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total Contact hrs/ week	Scheme of Evaluation		Credits
				L	T	P		CIE	SEE	
1	Program Core Course	DPCE305PCT	Construction Materials	3	0	0	3	**40**	**60**	2
2	Program Core Course	DPCE306PCT	Basic Surveying	3	0	0	3	**40**	**60**	3
3	Program Core Course	DPCE307PCT	Mechanics of Materials	3	0	0	3	**40**	**60**	3
4	Program Core Course	DPCE308PCT	Hydraulics	3	0	0	3	**40**	**60**	3
5	Program Core Course	DPCE309PCT	Building Construction & Concrete Technology	3	0	0	3	**40**	**60**	3
6	Program Core Course	DPCE307PCP	Mechanics of Materials Lab	0	0	2	3	**60**	**40**	1
7	Program Core Course	DPCE306PCP	Basic Surveying Lab	0	0	3	3	**60**	**40**	1
8	Program Core Course	DPCE308PCP	Hydraulics Lab	0	0	3	3	**60**	**40**	2
9	Program Core Course	DPCE309PCP	Building Planning and Drawing Lab	0	0	3	3	**60**	**40**	1
10	Summer Internship – I (4 weeks) after II Sem	DPCC301SEP	Summer Internship – I				-	-	**100**	2
Total Credits										**21**

Semester IV
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No.	Course Title	L	T	P	Total Contact hrs/ week	CIE	SEE	Credits
1	Program Core Course	DPCE406PCT	Advanced Surveying	3	0	0	3	**40**	**60**	2
2	Program Core Course	DPCE407PCT	Theory of Structures	3	0	0	3	**40**	**60**	3
3	Program Core Course	DPCE408PCT	Design of RCC Structures	3	0	0	3	**40**	**60**	3
4	Program Core Course	DPCE409CCT	Public Health Engineering	3	0	0	3	**40**	**60**	3
5	Program Core Course	DPCE406PCP	Advanced Surveying Lab	0	0	3	3	**60**	**40**	1
6	Program Core Course	DPCE409PCP	Public Health Engineering Lab	0	0	3	3	**60**	**40**	1
7	Program Core Course	DPCE410PCP	Hydraulics and Machinery Lab	0	0	3	3	**60**	**40**	1
8	Program Core Course	DPCE407PCP	Construction Material and Concrete Technology Lab	0	0	3	3	**60**	**40**	2
9	Program Elective Course – I	DPCE411PET DPCE412PET DPCE413PET	1. Precast and Prestressed Concrete 2. Construction Management 3. Rural Construction Technology	3	0	0	3	**40**	**60**	3
10	Mandatory Course	DPCC401PET	Essence of Indian Knowledge and Tradition	2	0	0	2	**20**	**30**	0
11	Project Work	DPCC402SEP	Minor Project	0	0	4	4	**60**	**40**	2
Total Credits										**21**

Course Code	:	**DPCE305PCT**
Course Title	:	**Construction Materials**
Number of Credits	:	2 (L:3, T:0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn about various construction materials, and understand their relevant characteristics.
- To be able to identify suitability of various materials for different construction purposes.
- To know about natural, artificial, and processed materials available for various purposes of construction activities.

Course Outcomes:

After competing this course, student will be able to:

- Identify relevant construction materials.
- Identify relevant natural construction materials.
- Select relevant artificial construction materials.
- Select relevant special type of construction materials.
- Identify and use of processed construction materials

Course Content:

Unit – I: Introduction to Construction Materials

- Scope and important of construction materials in civil engineering.
- Selectionofmaterialsfordifferentcivilengineeringstructuresonthebasisofstrength, durability, Eco friendly and economy.
- classification of materials –Natural, Artificial, special, finishing and recycled.

Unit – II: Natural Construction Materials

- Requirements of good building stone, general characteristics of stone, quarrying and dressing methods and tools for stone.
- Types of sand – River, Pit and Sea Sand. Characteristics of good sand, function of sand, bulking of sand.
- Classification of aggregate according to size.
- Properties of lime, its types and uses.
- Asphalt, bitumen and tar used in construction, properties and its benefits.
- Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction

Unit- III: Artificial Construction Materials

- Introduction- Classification – Physical Properties of Clay.
- Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks –fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process

of burnt clay brick, fly ash bricks, Aerated concrete blocks.

- Chemical composition of cement. Manufacturing process of Cement dry and wet (only flowchart), types of cement and its uses. Field tests on cement.
- Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses
- Flooring Tiles – Types and their uses.
- Types of glass: soda lime glass, lead glass and borosilicate glass and their uses.

Unit– IV: Special Construction Materials and Processed Construction Materials

- Mortar: Introduction to cement mortar and lime mortar
- Types of material and suitability in construction works of following materials: Water proofing, Termite proofing, Thermal and sound insulating materials.
- Fibers – Types –Jute, Glass, Plastic Asbestos Fibers, (only uses).
- Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses.
- Paints- whitewash, paint, Distempers, Oil Paints and Varnishes with their uses. (Situations where used).
- Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses.
- Agro waste materials – Rice husk, Bagasse, coir fibres and their uses.

Suggested Learning Resources:

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
3. Varghese, P.C., Building Materials, PHI learning, New Delhi.
4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahmedabad.
5. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
6. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
7. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
8. Sharma C. P., Engineering Materials, PHI Learning, New Delhi.

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Course Code	:	**DPCE306PCT**
Course Title	:	**Basic Surveying**
Number of Credits	:	3 (L: 3, T: 1, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To understand the types of surveying works required.
- To know the types of methods and equipment's to be used for different surveys.
- To know the use and operational details of various surveying equipment's.

Course Outcomes:

After completing this course, the student will be able to:
- Select the type of survey required for a given situation.
- Compute area of open field using chain, tape and cross-staff.
- Conduct traversing in the field using chain and compass.
- Use levelling instruments to determine the reduced level for preparation of contour maps
- Use a digital planimeter to calculate the areas.

Course Content:

Unit – I Concept of Surveying
- Definition of Surveying- Purpose and Use of Surveying.
- Principles of Surveying.
- Basic Classification of Surveying, Plane Surveying and Geodetic Surveying.
- Types of surveying- Detailed Classification
- Scales: Engineer's scale and Representative Fraction (RF)
- Conventional Signs, Recording of measurements in a field book.

Unit – II Chain Surveying
- Study of various Instruments used in chain surveying
- Principle of Chain Surveying
- Chain survey Station, Base line, Check line, Tie line, Offset, Tie station.
- Ranging: Methods of Direct and Indirect Ranging.
- Methods of Chaining, obstacles in chaining. Chaining in Sloping Ground.
- Types of offsets: Perpendicular and Oblique.
- Types of Errors in Chain Surveying, Errors in length: Problems on errors.

Unit– III Compass Survey
- Compass Traversing- Over View, Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings.
- Meridian- Types of Meridian, Bearings- Types of Bearing, Whole Circle Bearing system and Reduced Bearing system and examples on the conversion of the given bearing from one form to another-Problems, Fore Bearing and Back Bearing, Calculation of internal and external angles from bearings at a station-Problems, Dip of Magnetic needle, Magnetic Declination-Problems.

- Local attraction, Methods of correction of observed bearings-Problems – Correction at station and correction to included angles-Problems.
- Methods of plotting a traverse and closing error, Graphical adjustment.

Unit– IV Levelling and Contouring

- Types of levels: Dumpy, Tilting, Auto level, Digital level, Component parts of Dumpy Level and its Fundamental axes, Temporary adjustments of Level.
- Types of Levelling Staff: Self-reading staff and Target staff.
- Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks-GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments.
- Levelling Types: Simple, Differential, levelling with Inverted Staff, Fly, Profile and Reciprocal Levelling.
- Reduction of level by Line of collimation and Rise and Fall Method- Problems. Missing Data Problems.
- Contour, contour intervals, horizontal equivalent, Characteristics of contours, Methods of Contouring: Direct and indirect methods.
- Uses of contour maps, Measurement of volume of the reservoir from a contour map
- Study of Digital planimeter. Measurement of the area by Digital Planimeter.

Suggested Learning Resources:

1. Punmia, B.C, Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and levelling volume I, Pune Vidyarthi GruhPrakashan.
4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.
8. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
9. Arora K R, Surveying Vol. I, Standard Book House.

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Course Code	:	**DPCE307PCT**
Course Title	:	**Mechanics of Materials**
Number of Credits	:	3 (L: 3, T: 1, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To learn properties of area and structural material properties.
- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
- To understand the concept of buckling loads for short and long columns.

Course Outcomes:

After competing this course, student will be able to:
- Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structural sections.
- Analyze structural behavior of materials under various loading conditions.
- Interpretshearforceandbendingmomentdiagramsforvarioustypesofbeamsandloading conditions.
- Determine the bending and shear stresses in beams under different loading conditions.
- Analyse the column for various loading and end conditions.

Course Content:

Unit – I Moment of Inertia
- Moment of inertia (M.I.): Definition, M.I. of plane lamina, Radius of gyration, section modulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations).
- M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections and built-up sections about centroidal axes and any other reference axis.
- Polar Moment of Inertia of solid circular sections.

Unit– II Simple Stresses and Strains
- Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity.
- Type of Stresses- Normal, Direct, Bending and Shear and nature of stresses i.e., Tensile and Compressive stresses.
- Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety.
- Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading.
- Concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section)
- Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial
- stresses, volumetric strain, change in volume, Bulk modulus (Introduction only).
- Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).

Unit– III Shear Force, Bending Moment, Bending and Shear Stresses in beams
- Concept and definition of shear force and bending moment, Relation between load, shear
- force and bending moment (without derivation).
- Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed load two types of loading), point of contraflexure.
- Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram.
- Concept of moment of resistance and simple numerical problems using flexural equation.
- Shear stress equation (without derivation), relation between maximum and average
- shear stress for rectangular and circular section, shear stress distribution diagram.
- Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, I-section, T section. Simple numerical problems based on shear equation.

Unit– IV Columns
- Concept of compression member, short and long column, Effective length, Radius of gyration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns.
- Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load.
- Rankine' s formula and its application to calculate crippling load.
- Concept of working load/safe load, design load and factor of safety.

Suggested Learning Resources:
1. Bedi D.S., Strength of Materials, Khanna Publishing House, Delhi, Ed.2018
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

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Course Code	:	**DPCE308PCT**
Course Title	:	**Hydraulics**
Number of Credits	:	3 (L: 3, T: 1, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To understand the properties and parameters associated with fluid flow and hydrostatic pressure.
- To understand the concept of pipe flow.
- To understand the basic concept of open channel flow.

Course Outcomes:

After competing this course, student will be able to:
- Measure pressure and determine total hydrostatic pressure for different conditions.
- Understand various parameters associated with fluid flow
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.

Course Content

Unit – I Pressure measurement and Hydrostatic pressure
- Technical terms used in Hydraulics –fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics – ideal and real fluid, application of hydraulics.
- Physical properties of fluid–density-specific volume, specific gravity, surface tension,
- capillarity, viscosity-Newton's law of viscosity.
- Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses.
- Measurement of differential Pressure by different methods.
- Variation of pressure with depth, Pressure diagram, hydrostatic pressure, Determination of total pressure and center of pressure on immersed surfaces, curved surface.

Unit– II Fluid Flow Parameters
- Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number.
- Discharge and its unit, continuity equation of flow.
- Energy of flowing liquid: potential, kinetic and pressure energy.
- Bernoulli's theorem: statement, assumptions, equation.

Unit– III Flow through pipes
- Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms.
- Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings.
- Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe.
- Hydraulic gradient line and total energy line.
- Water hammer in pipes: Causes and Remedial measures.

- Discharge measuring device for pipe flow: Venturi meter – construction and working.
- Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.

Unit– IV Flow through Open Channel

- Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section.
- Determination of discharge by Chezy's equation and Manning's equation.
- Conditions for most economical rectangular and trapezoidal channel section.
- Discharge measuring devices: Triangular and rectangular Notches.
- Specific energy diagram, Froude's Number
- Introduction to hydro power plants, Types of turbines &pumps.

Suggested Learning Resources:

1. Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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Course Code	:	**DPCE309PCT**
Course Title	:	**Building Construction and Concrete Technology**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To identify different components of building.
- To understand different types of foundation and their significance.
- To know different types of masonry and their construction.
- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

Course Outcomes:

After completing this course, student will be able to:
- Identify components of building structures.
- Propose suitable type of foundation for building structures.
- Select suitable type of masonry for building structures.
- Propose relevant means of communications for different types of buildings.
- Use different types of cement and aggregates in concrete
- Prepare concrete of desired compressive strength.
- Prepare concrete of required specification.
- Maintain quality of concrete under different conditions.
- Apply relevant admixtures for concreting.

Course Content:

Unit – I: Overview of Building Component
- Classification of Buildings as per National Building Code Group A to I, As per Types of Constructions-Load Bearing Structure, Framed Structure and Composite Structure.
- Building Components – Functions of Building Components, Substructure Foundation and Plinth.
- Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors Windows, Floor, Roof, Columns, Beams and Parapet.

Unit-II: Construction of Substructure, Superstructure, Building Communication and Ventilation
- **Job Layout:** Site Clearance, Layout for Load Bearing Structure and Framed Structure. Earthwork: Excavation for Foundation.
- **Foundation:** Functions of foundation, Types of foundation – Shallow Foundation-Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation, Deep Foundation – Pile Foundation.
- **Stone Masonry:** Introduction, types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Selection of Stone Masonry.
- **Brick masonry:** Introduction, Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry.

- **Horizontal Communication:** Doors –Components of Doors, Full Panelled Doors, Partly Panelled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors and Glazed Doors.
- **Windows:** Component of Windows, Types of Windows – Full Panelled, Partly Panelled, Glazed, Wooden, Steel, Aluminum Windows, Sliding Windows, UPVC Windows.

Unit – III Cement, Aggregates and Water

- Physical properties and Chemical composition of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength. Different grades of OPC and relevant BIS codes
- Aggregates: Requirements of good aggregate, Classification according to size and shape.
- Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383.
- Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications.
- Concrete: Different grades of concrete, provisions of IS 456.
- Water Cement (w/c) ratio, Workability, Factors affecting workability of concrete. Workability of concrete by slump cone, compaction factor. Segregation and bleeding, Ready Mix Concrete (RMC) introduction and its advantages
- Properties of Hardened concrete: Mechanical Properties of concrete Strength, Durability-Creep, Shrinkage.

Unit IV Quality Control of Concrete and Admixture

- Concreting Operations: Batching, Mixing, Compaction and Curing of concrete.
- Forms for concreting: Introduction to form works and types of form work for beams, slabs, columns, materials used for form work, requirement of good form work. Stripping time for removal of form works per IS 456.
- Admixtures in concrete: Purpose, properties and application of different types of admixtures-accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers.

Suggested Learning Resources:

1. S. P. Arora and Bindra., Building Construction, Dhanpat Rai Publication, Delhi.
2. Sushil Kumar., Building Construction, Standard Publication.
3. Punmia B. C., and Jain A. K., Building Construction, Firewall Media.
4. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
5. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
6. Santha kumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
7. Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.

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Course Code	:	**DPCE307PCP**
Course Title	:	**Mechanics of Materials Lab**
Number of Credits	:	1 (L: 0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To know the procedure for the conduct of tensile and compressive strength.
- To understand the concept of stress and strain through testing of different materials.
- To calculate shear force, bending moment and their corresponding stresses.

Course Outcomes:

After competing this course, student will be able to:

- Test different Civil engineering materials on Universal Testing Machine.
- Analyse structural behaviour of materials under various loading conditions.

List of Practicals to be performed (Minimum 8 practicals should be conducted):

1. Study and understand the use and components of Universal Testing Machine (UTM).
2. Perform Tension test on mild steel as perIS:432(1).
3. Perform tension test on Tor steel as per IS:1608, IS:1139.
4. Conduct compression test on sample test piece using Compression Testing Machine.
5. Conduct Izod Impact test on three metals. E.g., mild steel/ brass/aluminum/ copper /cast iron etc. as per IS:1598.
6. Determine Water Absorption on bricks per IS:3495 (part II), IS:1077 or tileIS:1237.
7. Determine Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077.
8. Perform Single Shear and double shear test on any two metals e.g., Mild steel/ brass/ aluminum/ copper / cast iron etc. as perIS:5242.
9. Conduct Compression test on timber section along the grain and across the grain as per IS:2408.
10. Conduct Flexural test on timber beam on rectangular section in both orientations.

Suggested Learning Resources:

1. Bedi D.S., Strength of Materials, Khanna Publishing House, New Delhi (Edition2018)
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

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Course Code	:	**DPCE306PCP**
Course Title	:	**Basic Surveying Lab**
Number of Credits	:	1 (L: 0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand types of surveying works required
- To know the type of method and equipments to be used for different surveys
- To know the use and operational details of various surveying equipments.

Course Outcomes:

After completing this course, student will be able to:

- Select the type of survey required for given situation.
- Compute area of open field using chain, tape and cross staff.
- Conduct traversing in the field using chain and compass.
- Use levelling instruments to determine reduced level to prepare contour maps
- Use digital planimeter to calculate the areas.

List of Practicals to be completed (Minimum 8 practicals should be conducted):

	Cycle – I
1.	Measure distance between two survey stations using chain, tape and ranging rods when two stations are intervisible.
2.	Undertake reciprocal ranging and measure the distance between two stations.
3.	Determine area of open field using chain and cross staff survey.
4.	Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.
5.	Measure Fore Bearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.
6.	Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building.
7.	PlotthetraverseonA1sizeimperialdrawingsheetfordatacollectedinSurveyProjectmentioned at practicalNo.6.
	Cycle – II
8.	Undertake simple levelling using dumpy level/ Auto level and levelling staff.
9.	UndertakedifferentiallevelinganddetermineReducedLevelsbyHeightofinstrumentmethod and Rise/fall method using dumpy level/Auto Level and levelling staff.
10.	Undertake fly levelling with double check using dumpy level/ Auto level and levelling staff.
11.	Undertake Survey Project with Levelling instrument for Profile levelling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.
12.	Plot the L-section with minimum 3 cross-sections on A1 size imperial sheet for data collected in Survey Project mentioned at practical**No.11.**

13.	Undertake Survey Project for plotting contour map using block contouring method I block of 150m x 150m with grid of 10m x 10m or size as available at the site.
14.	Plot the contours on A1 size imperial drawing sheet for data collected in Survey Project mentioned at practical**No.13.**
15.	Measure area of irregular figure using Digital planimeter.

Suggested Learning Resources:

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications., New Delhi.

2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.

3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi GruhPrakashan.

4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.

5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.

6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.

7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning

8. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.

9. Arora K R, Surveying Vol. I, Standard Book House

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Course Code	:	**DPCE308PCP**
Course Title	:	**Hydraulics Lab**
Number of Credits	:	2 (L: 0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn calculation of flow rate.

Course Outcomes:

After competing this course, student will be able to:

- Measure pressure and determine total hydrostatic pressure for different conditions.
- Understand various parameters associated with fluid flow
- Determine head loss of fluid flow through pipes.

List of Practicals to be performed (Minimum 8 practicals should be conducted):

1.	Use piezometer to measure pressure at a given point.
2.	Use of measurement of actual discharge using Bernoulli's apparatus
3.	Use Reynold's apparatus to determine type of flow.
4.	Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
5.	Use Friction factor Apparatus to determine friction factor for a given pipe.
6.	Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
7.	Determine minor losses in pipe fitting due to Bend and Elbow.
8.	Calibrate Venturi meter to find out the discharge in a pipe.
9.	Calibrate the Orifice to find out the discharge through a tank
10.	Use Pitot tube to measure the velocity of flow of water.

Suggested Learning Resources:

1. Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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Course Code	:	**DPCE309PCP**
Course Title	:	**Building Planning and Drawing Lab**
Number of Credits	:	1 (L:0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn the basic principles of building planning and drawing.
- To make a graphical representation of various components of buildings.
- To draw a complete plan and elevation of a building.
- To learn the basics of perspective drawings and Computer-Aided Drawings.

Course Outcomes:

After completing this course, the student will be able to:

- Interpret the symbols, signs and conventions from the given drawing.
- Prepare line plans of residential and public buildings using principles of planning.
- Prepare a working drawing for the given requirement of Load Bearing Structure.
- Prepare working drawing using CAD for the given requirement of Framed Structure.

List of Practicals /Drawings to be completed (Minimum 8 practicals should be conducted):

	Cycle – I
On Sketch Book / Drawing Sheet:	
1.	Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962.
2.	Cross-section of a load-bearing wall, showing all the components, below and above the ground level
3.	Plan of one brick wall meeting at a corner, showing Odd and even courses in English bond.
4.	Plan & Cross-section of a Fully panelled door, Plan & Cross-section of a Fully panelled window, glazed window
5.	Draw line plan to suitable scale (Load-bearing residential building) a) 1BHK with Staircase, WC and Bathroom b) 2BHK with Staircase, WC and Bathroom
6.	Draw plans to suitable scale for the following Public & Industrial Buildings (School Building, Hospital Building, Hostel, Industrial Building).
	Cycle – II
Using CAD Software:	
7.	Draw submission drawing, of (G+1) load-bearing residential building (2BHK) with flat roof and staircase, showing: a) Developed plan. b) Elevation and Section c) Site plan
8.	Draw submission drawing, of (G+1) Framed structure residential building (1BHK) with flat roof and staircase showing: a) Developed plan.

	b) Elevation and Section c) Site plan
9.	Draw submission drawing, of (G+1) Framed structure residential building (2BHK) with flat roof and staircase showing: a) Developed plan. b) Elevation and Section c) Site plan
10.	Draw working drawings for electrical layout, plumbing, for a given residential building (Two-bedroom building – Ground floor only).
11.	Draw a floor plan of an apartment building
12.	Lift for a Multi-storeyed building

Suggested Learning Resources:

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, McGraw Hill Publishing

2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd

3. Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.

4. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.

5. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.

6. Singh, Ajit, Working with Auto CAD 2000, McGraw Hill Publishing company Ltd.

7. Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

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Course Code	:	**DPCE406PCT**
Course Title	:	**Advanced Surveying**
Number of Credits	:	2 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:
Following are the objectives of this course:
- To know methods of Theodolite surveying and their uses
- To learn tachometric surveying and curve setting
- To understand the principles of Electronic Distance Measurement equipment and Total station and their use.
- To know the concept of remote sensing, GPS and GIS

Course Outcomes:
After completing this course, student will be able to:
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Prepare plans using Total Station instrument.

Course Content:
Unit– I Theodolite Surveying
- Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the transit Theodolite.
- Technical terms- Swinging, Transiting, Face left, Face right.
- Fundamental axes of transit Theodolite and their relationship
- Temporary adjustment of transit Theodolite.
- Measurement of horizontal angle- Reiteration Method and Repetition method, Errors eliminated by method of repetition.
- Measurement of magnetic bearing of a line, Prolonging and ranging a line, deflection angle.
- Measurement of vertical Angle.
- Theodolite traversing by Included angle method and Deflection angle method.
- Checks for open and closed traverse, Calculations of bearing from angles-Problems.
- Traverse computation-Latitude, Departure – Problems, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's Rule – Problems, and Transit rule, Gale's Traverse table computation.

Unit– II Tachometric surveying
- Principles of Tacheometry,
- Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.
- Field method for determining constants of tacheometer.
- Determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical and Inclined.

Unit– III Curve setting
- Study of Simple Circular Curve, Designation of curves.
- Study of various Properties of a Curve.
- Types of curves used in roads and railway alignments.

- Setting of simple circular curve by different methods.

Unit– IV Advanced surveying

- Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM.
- Study of Electronic Digital Theodolite.
- Use of Total Station, Use of function keys.
- Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.
- Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use / Land cover, mapping, disaster management.
- Use of Global Positioning System (G.P.S.) instruments.
- Geographic Information System (GIS): Over view, Components, Applications, Software for GIS.
- Introduction to Drone Surveying.

Suggested Learning Resources:

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
2. Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, MD.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol.II,
7. Laxmi Publications Pvt. Ltd., New Delhi.
8. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
9. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
10. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
11. De, Alak, Plane Surveying, S. Chand Publications, New Delhi.

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Course Code	:	**DPCE407PCT**
Course Title	:	**Theory of Structures**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:
Following are the objectives of this course:
- To learn the concept of slope and deflection and its applications.
- To analyse fixed beams.
- To analyse continuous beams by using slope deflection and moment distribution method.
- To understand different methods of finding axial forces in trusses.

Course Outcomes:
After competing this course, student will be able to perform:
- To evaluate slope and deflection in cantilever and simply supported beams.
- To analyse fixed beams.
- To analyse continuous beams by slope deflection and moment distribution method.
- To evaluate internal forces of members of trusses by method of joints and awareness of method of sections.

Course Content:
Unit– I Slope and Deflection
- Introduction to slope and deflection, Necessity for determination of slope and deflection, Deflection equation, Relation among bending moment, slope, deflection and radius of curvature.
- Computation of slopes and deflection using Double integration and Macaulay's method for cantilever and simply supported beams subjected to single and multiple concentrated loads and uniformly distributed load over partial span and entire span of the beam.
- Moment area method for determining slope and deflection in a cantilever beam for concentrated load and uniformly distributed load over entire span.

Unit– II Fixed beams
- Statically indeterminate beams, degrees of freedom, degrees of restraints, degrees of indeterminacy in beams.
- **Fixed Beams: -** Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam – Principle of superposition, fixed end moments form first principle for beam subjected to concentrated load, uniformly distributed load over the entire span – Application of standard formulae for determining end moments, support reactions and drawing shear force and bending moment diagrams along with point of contraflexure (without sinking of supports).

Unit– III Slope Deflection method
- Introduction to slope deflection method, Necessity of slope – Deflection equation.
- Application to continuous beams (without sinking of supports) with maximum two spans acted upon with concentrated loads and uniformly distributed loads – Shear force and bending moments diagrams and elastic curve.

Unit– IV Moment Distribution method & Analysis of trusses

- Introduction to moment distribution method, sign convention, carry over factor, stiffness factor, distribution factor.
- Application of moment distribution method to continuous beams (with various supports) subjected to concentrated loads and uniformly distributed load over entire span with supports at the same level –Shear force and bending moment diagrams.
- **Trusses: -** Types of trusses, calculation of support reactions for trusses subjected to concentrated loads at joints.
- Determination of internal forces in members of truss by method of joints. Introduction to method of sections (no numerical problems).

Suggested Learning Resources:

1. Ramamrutham. S, Theory of structures, Dhanpatrai & Sons.
2. Khurmi, R. S., Theory of Structures   S. Chand and Co., New Delhi.
3. Bhavikatti, S S, Structural Analysis Vol-1, Vikas Publishing House Pvt Ltd. New Delhi.
4. Junnarkar, S. B., Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5. Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

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Course Code	:	**DPCE408PCT**
Course Title	:	**Design of RCC Structures**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:
Following are the objectives of this course:
- To learn the concept of limit state design for RCC members.
- To understand design of RCC rectangular beams.
- To understand the concept one-way, two-way slabs & design of two-way slabs.
- To identify short and long columns and design provisions for short column
- To understand the concept of design of footing.

Course Outcomes:
After competing this course, student will be able to perform:
- Concept of single reinforced beam &Design of doubly reinforced beam section.
- Design of RCC beam for shear and development length.
- Concept of T-beams
- Design of axially loaded short RCC columns.
- Design of square footings.

Course Content:
Unit– I Design of Reinforced Concrete Beams
- Concept of Working stress method (an overview only), Limit state method – Stress strain diagram.
- **Beams:** Introduction to singly reinforced beams – Types of sections (under reinforced, balanced & over reinforced sections).
- Analysis and design of doubly reinforced beams – Determination of ultimate moment of resistance & design of the beam section.

Unit– II Shear, Bond and Development length & T-beams
- Need for shear reinforcement, bond and development length in the design of RCC beam – Nominal shear stress in RCC section, Design shear strength of concrete – Design of shear reinforcement, Minimum Shear Reinforcement, Forms of shear reinforcement.
- Bond stress, check for bond stress, Determination of Development and check as per codal provisions, Simple numericals on: Design of Shear reinforcement, Adequacy of section for shear.
- Introduction to serviceability limit state check.
- **T-beams: -** Necessity of T-beams – Effective flange width, Depth of neutral axis –ultimate moment of resistance of T-beam section.

Unit– III Design of Slabs
- Slabs as structural and functional members – Codal provisions
- One-way slabs: - Definition, Necessity.
- Two-way slabs: - Definition, Necessity and design with various end conditions, Torsion reinforcement (Corners held down and not held down) along with necessary codal checks.

Unit– IV Design of Axially loaded RCC Column & Footing

- Definition and classification of columns, effective length of column – Codal provisions for minimum and maximum steel, spacing of lateral ties, cover etc.
- Load carrying capacity, Design of axially loaded short column – Square, Rectangular, and Circular (with only lateral ties) sections.
- **Footings: -** Definition, Necessity, Types, Codal provisions and design of isolated square footing in flexure, check for one-way shear and two-way shear (punching shear).

Suggested Learning Resources:

1. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
2. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
3. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
4. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
5. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

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Course Code	:	**DPCE409PCT**
Course Title	:	**Public Health Engineering**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To learn the principles for identification of sources of surface and subsurface water
- To learn calculation of population and requirement of drinking water
- To understand the plotting of water supply scheme highlighting different features
- To know evaluation of characteristics and treatment of sewage.

Course Outcomes:

After competing this course, student will be able to:
- Know the procedure to identify the sources of surface and subsurface water
- Estimate the quantity of drinking water required for a population
- Draw labelled layout for water supply scheme.
- Device suitable water treatment technique.
- Evaluate the characteristics and suggest treatment of sewage.

Unit – I Sources, Demand and Quality of Water
- Sources of water- Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure.
- Water demand: Factors affecting per capita demand, Variations of water demands, population forecasting, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, estimating of quantity of water supply required for city or town.
- **Quality of water** – Need for analysis of water quality, water quality parameter-Physical, Chemical and Biological, testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, Ecoli, Bcoli index, MPN, Sampling of water, Water quality standards as per IS10500.

Unit II Treatment of water and Distribution System
- Treatment of Water – Objectives of water treatment, Flow diagram of different treatment units in a treatment plant. Aeration, Plain sedimentation, Sedimentation with coagulation objectives and methods. Principles of coagulation, types of coagulants, Jar Test, process of coagulation.
- Filtration –Process of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, merits and demerits of slow sand and rapid sand filters. Disinfection: Objectives, methods of disinfection, Chlorination-methods of chlorination – Break point chlorination, residual chlorine and its importance.
- Distribution of water- Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs – functions and types, Layouts of distribution system – Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.

Unit III   Building Sanitation and Wastewater Treatment

- Building Sanitation – Necessity of sanitation, Necessity to treat domestic sewage Definitions. - Sewage, sullage, types of sewage. Building Sanitary Fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types, qualities of good trap. Plumbing system (one pipe and two pipe).
- Wastewater Characteristics – Physical, Chemical and biological Characteristics, Characteristics of sewage, B.O.D., C.O.D .and its significance, Wastewater effluent standards.
- Wastewater treatment flow sheet, Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation Pond, Oxidation ditch. Septic tank, Recycling and Reuse of domestic waste.

Unit IV Solid Waste Management

- Introduction to Solid Waste, Classification of solid wastes, Sources and characteristics, methods of disposal of solid wastes, Waste Management Waste Generation, Collection, Processing and Disposal Methods, Resource Recovery in Waste Management, Biological and Thermal Conversion Processes.

Suggested Learning Resources:

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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Course Code	:	**DPCE406PCP**
Course Title	:	**Advanced Surveying Lab**
Number of Credits	:	1 (L: 0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To know methods of Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting.
- To understand the principles of total station and its uses.
- To know the concept of Remote Sensing, GPS and GIS.

Course Outcomes:

After completing this course, student will be able to:
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Setting of Curve using Theodolite.
- Use of Electronic Theodolite for different Measurements.
- Make measurements using Total Station.
- Locate coordinates of survey stations using GPS

List of Practicals to be completed (Minimum 8 practicals should be conducted):

	Cycle – I
1	Use transit theodolite to measure Horizontal Angle.
2	Measurement of Vertical angle by Direct Method.
3	Use of Theodolite to perform a closed traverse of at least five sides and Plot the traverse on A1 size imperial drawing sheet for the collected data Theodolite Survey Project.
4	Use Theodolite as a Tacheometer to compute reduced levels
5	Use Theodolite as a Tacheometer to compute horizontal distances.
6	Set out a circular curve by Rankine's Method of Deflection Angle
	Cycle – II
7	Use Electronic Theodolite to Measure Horizontal angle by Direct Method.
8	Use Electronic Theodolite to Measure Vertical angle by Direct Method.
9	Parts and functions of Total Station and its Adjustments.
10	Use Total station instrument to measure horizontal distances, Slope Distance and Difference of Height between Two Points.
11	Use Total station instrument to measure vertical angle.
12	Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.
13	Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
14	Demonstration of GPS and uses to locate the coordinates of a station.

Suggested Learning Resources:

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi GruhPrakashan, Pune.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C, ; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S. Chand Publications, New Delhi.

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Course Code	:	**DPCE409PCP**
Course Title	:	**Public Health Engineering Lab**
Number of Credits	:	1 (L: 0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To learn the tests for measuring quality of drinking water.
- To learn determination of BOD and COD requirement in sewage.
- To understand the plotting of water supply scheme highlighting different features.

Course Outcomes:

After competing this course, student will be able to:
- Perform various tests to assess quality of water.
- Estimate dissolved solids as per BIS codes.
- Measure BOD and COD of sewage sample.

List of Practicals to be performed (Minimum 8 practicals should be conducted):

	Cycle I
1	Determine pH value of given sample of water.
2	Determine the turbidity of the given sample of water.
3	Determine residual chlorine in a given sample of water.
4	Determine suspended, dissolved solids and total solids of given sample of water.
5	Determine the dissolved oxygen in a sample of water.
6	Determine the optimum dose of coagulant in a given raw water sample by Jar Test.
7	Undertake a field visit to water treatment plant and prepare a report.
	Cycle II
8	Determine pH value of given sample of sewage.
9	Determine suspended solids dissolved and total solids for sample of sewage.
10	Determine the dissolved oxygen in the given sample of sewage.
11	Determine B.O.D. of given sample of sewage
12	Determine C.O.D. of given sample of sewage.
13	Undertake a field visit to sewage treatment plant and prepare a report.

Suggested Learning Resources:

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi.
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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Course Code	: **DPCE410PCP**
Course Title	: **Hydraulics & Machinery Lab**
Number of Credits	: 1 (L: 0, T: 0, P:3)
Prerequisites	: Nil
Course Category	: PC

Course Objectives:

Following are the objectives of this course:

- To calibrate the given flow measuring device.
- To apply the knowledge acquired in theory subject.
- To analyse the performance of turbines and pumps.

Course Outcomes:

After competing this course, student will be able to:

- Measure pressure and determine total hydrostatic pressure for different conditions.
- Understand various parameters associated with fluid flow
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.

List of Practicals to be performed (Minimum 8 practicals should be conducted):

	Cycle I
1	Use triangular notch to measure the discharge through open channel.
2	Use Rectangular notch to measure the discharge through open channel.
3	Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of Orifice meter.
4	Determination of Coefficient of Discharge of weir.
5	Demonstration on submersible pump.
	Cycle II
6	Demonstration on reciprocating pump.
7	Demonstration on centrifugal pump.
8	Demonstration on Francis turbine
9	Demonstration on Pelton turbine
10	Demonstration on Kaplan turbine.

Suggested Learning Resources:

1. Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi.
3. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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Course Code	:	**DPCE407PCP**
Course Title	:	**Construction Material and Concrete Technology Lab**
Number of Credits	:	2 (L: 0, T: 0, P:3)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:
- To learn about various Construction Material and Concrete Technology, and understand their relevant characteristics.
- To be able to identify suitability of various materials for different construction purposes.
- To know about natural, artificial, and processed materials available for various purposes of construction activities.
- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.

Course outcomes

After competing this course, student will be able to:
- Identify relevant construction materials.
- Identify relevant natural and artificial construction materials.
- Select relevant special type of construction materials.
- Identify and use of processed construction materials.
- Identify different types of cement by performing laboratory tests.
- Know the physical properties of fine and coarse aggregates.
- Prepare concrete of required specification.
- Maintain the quality of concrete applying scientific principles.

List of Practicals to be performed (Minimum 8 practicals should be conducted)

	Cycle I
1	Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10mm)
2	Identify the available construction materials in the laboratory on the basis of their sources.
3	Select first class, second class and third-class bricks from the stake of bricks and prepare report on the basis of its properties.
4	Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests dropping, striking and scratching by nail and correlate the results obtained
5	Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a special processed construction material.
6	Prepare mortar using cement and Fly ash or Granite/marble polishing waste in the proportion 1:6 or1:3.
	Cycle II
7	Determine fineness of cement by Blaine's air permeability apparatus by sieving.
8	Determine specific gravity, standard consistency, initial and final setting times of cement.
9	Determine compressive strength of cement.
10	Determine bulking of sand and silt content.

11	Determine Fineness modulus of fine aggregate by sieve analysis.
12	Determine impact value of aggregate.
13	Determine elongation and flakiness index of coarse aggregates
14	Determine workability of concrete by slump cone test.
15	Determine workability of concrete by compaction factor test.
16	To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.

Suggested Learning Resources:
1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, New Delhi
3. Varghese, P.C. Building Materials, PHI learning, New Delhi.
4. Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
5. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
6. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
7. Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.

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Course Code	:	**DPCE411PET**
Course Title	:	**Precast and Prestressed Concrete**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:
Following are the objectives of this course:
- To introduce various types of precast and prefabricated concrete elements.
- To know advantages and disadvantages of precast and prefabricated concrete elements.
- To understand prestressing methods, systems for Reinforced Concrete members.
- To learn issues involved in loss of prestressing.

Course Outcomes:
After competing this course, student will be able to perform:
- Select the relevant precast concrete element for a given type of construction.
- Use relevant components for prefabricated structures.
- Justify the relevance of prestressed element in a given situation.
- Select relevant methods / systems for given construction work.
- Propose suitable cable profile for the given prestressed concrete members

Course Content:
Unit – I Precast concrete Elements
- Introduction to precast concrete members – Advantages and disadvantages of precast concrete members – various materials used such as plain cement concrete, reinforced cement concrete, prestressed concrete, self-compacting concrete, ferro-cement, aerated and foam concrete.
- Non-structural Precast elements – Fencing Poles, Man- hole Covers, Hollow and Solid Blocks, Transmission Poles, etc.
- Structural Precast elements – Canal lining, Box culvert, Bridge panels.
- Fabricating systems, storage, transportation and equipment's used.

Unit– II Prefabricated building
- Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements.
- Material characteristics, Plans & Standard specifications
- Prefabricated building using precast load bearing and non-load bearing wall panels, floor systems – Manufacturing, storage, curing, transportation and erection of precast elements.
- Ecological aspect of use of prefabricated building.

Unit– III Introduction to Prestressed Concrete
- Basic terminology, Principles of pre-stressed concrete and basic terminology.
- Applications, advantages and disadvantages of prestressed concrete.
- Materials used and their properties, Necessity of high-grade materials
- Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications.

Unit– IV Methods, Systems of Prestressing and Losses of Prestress

- Methods of prestressing – Internal and External pre-stressing, Pre tensioning and Post tensioning- applications, merits and demerits.
- Systems for pre-tensioning – process, applications, merits and demerits – Hoyer system.
- Systems for post-tensioning-process, applications, merits and demerits – Freyssinet system.
- Understanding of loss of prestress, prestressing force in cable – Loss of prestress during the tensioning process due to friction, length effect and curvature effect (Simple numerical problems to determine loss of prestress) – Loss of prestress at the anchorage stage.

Suggested Learning Resources:

1. Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, New Delhi.
2. Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, New Delhi
3. Marzuki, Nor Ashikin, Pre-Cast and Pre-Stress Technology: Process, Method and Future Technology, Create space Independent Publication.
4. Indian Concrete Institute., Handbook on Precast Concrete buildings.
5. Elliott, Kim S., Precast Concrete Structures, CRC Press, New York.
6. Lin, T.Y., Design of Pre-Stressed Concrete Structures, John Wiley and Sons, New York Nagarajan, Pravin., Pre-stressed Concrete Structures, Pearson Education India
7. BIS, New Delhi. IS 12592 Precast Concrete Manhole Cover and Frame, BIS, New Delhi
8. BIS, New Delhi. IS 15658 Precast concrete blocks for paving – Code of Practice, BIS, New Delhi
9. BIS, New Delhi. IS 15916 Building Design and Erection Using Prefabricated Concrete – Code of Practice, BIS, New Delhi
10. BIS, New Delhi. IS 15917 Building Design and Erection Using Mixed/Composite Construction – Code of Practice, BIS, New Delhi
11. BIS, New Delhi. IS 458 Precast Concrete Pipes (with and without reinforcement) – Specification, BIS, New Delhi.

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Course Code	:	**DPCE412PET**
Course Title	:	**Construction Management**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To understand the contract management and associated labor laws.
- To prepare and understand the principals involved in site layout.
- To know the procedure for scheduling of various activates in construction project.
- To understand the labour laws, procedure for arbitration, settlements.
- To know different safety measures in construction projects.

Course Outcomes:

After competing this course, student will be able to:

- Understand the contract management and associated labour laws.
- Prepare and understand the nuances of executing the site layout.
- Prepare networks and bar charts for the given construction project.
- Understand the intricacies of disputes, related arbitration and settlement laws.
- Apply safety measures at construction projects.

Course Content:

Unit – I Construction management, Preliminary Planning& Organisational aspects

- Introduction to construction management. States the need for construction management. Lists the factors involved in construction management.
- Explains the importance of preliminary planning. Explains the difference between feasibility report and project report. Explains the data to be collected and aspects to be considered in project report. Lists the aspects to be considered during preliminary planning in respect of Minor & irrigation project, Road project, Rural water supply project. Housing colony, Rural hospital.
- Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.
- Organization-objectives, principles of organization, types of organization: government/ public and private construction industry, Role of various personnel in construction organization

Unit – II Site Layout

- Principles governing site layout.
- Factors affecting site layout.
- Preparation of site layout.
- Land acquisition procedures and providing compensation.

Unit- III Constructional Planning

- Understands Constructional Planning, Distinguishes between construction stages and construction Operations.

- Development of bar charts, Merits & limitations of bar chart.
- Prepares network diagram based on C.P.M for construction works, Event, activity, dummy activities. CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and total floats, critical activities and critical path,

Unit IV Construction Contracts, scheduling and Safety in Construction

- Defines terms; Contract and Contractor Explain the various contract systems available for construction works. Lists the merits and limitations of each of the contract systems.
- Explains the concept and use of construction schedules. States the need for material schedule and labour schedule.
- Contract Management, procedures involved in arbitration and settlement (Introduction only).
- Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures.
- Labour Laws and Acts pertaining to Civil construction activities (Introduction only)

Suggested Learning Resources:

1. Sharma SC and Deodhar SV, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Gahlot, P.S. and Dhir, B.M Construction planning and management New Age International (P) Ltd. Publishers, New Delhi.
3. Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt., Ltd. New Delhi
4. Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan, New Delhi
5. Khanna, O.P. Industrial Engineering and management, Dhanpat Rai New Delhi
6. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT and CPM,
Laxmi Publications (P)Ltd.
7. Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw-Hill.
8. Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
9. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

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Course Code	:	**DPCE413PET**
Course Title	:	**Rural Construction Technology**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:
Following are the objectives of this course:

- To learn development and planning of low-cost housing infrastructure.
- To know about different government schemes for rural development.
- To understand techniques for rural road construction as per IRC stipulations.
- To learn rural irrigation techniques and watershed management.

Course Outcomes:
After competing this course, student will be able to:

- Plan low-cost housing using rural materials.
- Make use of relevant government schemes for construction of roads and housing.
- Use guidelines for rural road construction.
- Implement different irrigation systems for rural areas.
- Identify the need of watershed management in rural areas.

Course Contents:
Unit I – Rural Development and Planning

- Scope; development plans; various approaches to rural development planning.
- Significance of Rural Development Plans.
- Rural development programme/projects.

Unit II -Rural Housing

- Low-cost construction material for Rural Housing.
- Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricks and soil stabilized un-burnt bricks.
- Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, Panels for roof, ferro-cement flooring/roofing units.
- Biomass – types of fuels such as firewood, agricultural residues, dung cakes.
- Working of Gobar Gas and Bio-Gas plants.
- Renewable energy and its sources.

Unit III Water Supply and Sanitation for Rural Areas

- Sources of water: BIS & WHO Water Quality Standards.
- Storage and distribution for Rural Water Supply System.
- Conservation of water – rainwater harvesting, drainage in rural areas.
- Construction of low-cost latrines: Two pit pour flush water seal, septic tank etc.
- Low-cost community and individual Garbage disposal systems.

Unit IV – Low-Cost Rural Roads

- Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases.

- Guidelines for Surfacing of Rural Road as per relevant IRC codes.
- Pradhan Mantri Gram SadakYojna (PMGSY)- Highlights of Scheme.

Low-Cost Irrigation:
- Introduction to tube-well, drip & sprinkler irrigation systems.
- Watershed Management, Catchment area development and its features.

Suggested Learning Resources:
1. Madhov Rao AG, and Ramachandra Murthy, DS, Appropriate Technologies for low-cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.
2. CBRI, Roorkee, Advances in Building Materials and Constriction.
3. Desai, Vasant, Rural Development in India: Past, Present and Future: A Challenge in the Crisis, Himalaya Publishing House, Delhi.
4. Rastogi, A.K. Rural Development Strategy, Wide Vision, Jaipur.

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Course Code	:	**DPCC401PET**
Course Title	:	**Essence of Indian Knowledge and Tradition**
Number of Credits	:	0 (L: 2, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	AU

Learning Outcomes:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the important roots of knowledge system.

- To make the students understand the traditional knowledge and analyse it and apply it in their day to day life

Course Outcomes:

At the end of the Course, Student will be able to:

- Identify the concept of Traditional knowledge and its importance.

- Understand the need and importance of protecting traditional knowledge.

- Illustrate the various enactments related to the protection of traditional knowledge.

- Explain the importance of Traditional knowledge in Agriculture and Medicine.

Course Contents:

UNIT I:
Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK)

UNIT II:
Protection of traditional knowledge: The need for protecting traditional knowledge, Significance of traditional knowledge Protection, value of traditional knowledge in global economy, Role of Government to harness traditional knowledge

UNIT III:
Traditional Knowledge in different Sectors: Traditional knowledge and engineering, Traditional medicine system, traditional knowledge in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of traditional knowledge

Suggested Learning Resources:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link: Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

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Course Code	:	**DPCC402SEP**
Course Title	:	**Minor Project**
Number of Credits	:	2 (L: 0, T: 0, P:4)
Prerequisites	:	Nil
Course Category	:	Project Work

Course Objectives:

1. To enable students learn by doing.
2. To develop capability to analyse and solve real world problems
3. To develop innovative ideas among the students

Course Outcomes: Students should be able to do the following:

1. To provide innovative solutions
2. To work in a team
3. To manage time and resources in the best possible manner

Students are required to choose a topic for minor project related to the courses of this semester. Student has to implement and present the project as per the given schedule. During the implementation of the project, student has to follow the schedule given below. Report of the project work has to be submitted for evaluation.

Schedule:

S.No	Description	Duration
1.	Problem Identification / Selection	4 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation & Testing of the Project	5 weeks
4.	Documentation & Project Presentation	2 weeks

Guidelines for the Award of marks:

S.No.	Description	CIE Max. Marks 60	SEE Max. Marks 40
1.	Weekly Assessment	20	--
2.	Design/ Implementation	20	10
3.	Presentation	10	10
4.	Viva Voce	10	10
5.	Report	-	10

Final Minor Project demonstration and PPT presentation is to be evaluated for the entire class together by the entire faculty handling Minor project for that class.

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Semester V
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No.	Course Title	L	T	P	Total Contact hrs/ week	CIE	SEE	Credits
1	Program Core Course		Water Resource Engineering	3	0	0	3	**40**	**60**	2
2	Program Core Course		Design of Steel Structures	3	0	0	3	**40**	**60**	2
3	Program Core Course		Estimating and Costing	3	0	0	3	**40**	**60**	2
4	Program Core Course		Design of Steel and RCC structures Lab	0	0	3	3	**60**	**40**	1
5	Program Core Course		Estimating and Costing Lab	0	0	3	3	**60**	**40**	1
6	Summer Internship – II (6 weeks) after IV Sem		Summer Internship – II					-	**150**	3
7	Program Elective Course – II		1.Transportation Engineering 2. Solid Waste Management 3. Advanced Construction Technology	3	0	0	3	**40**	**60**	3
8	Program Elective Course – III		1. Pavement Design & Maintenance 2. Green Building and Energy Conservation 3.Building Services and Maintenance	3	0	0	3	**40**	**60**	3
9	Program Open Elective – I		1.Air pollution and its Control Measures 2.Watershed Management 3.Internet of Things (IoT)	3	0	0	3	**40**	**60**	3
10	Project Work		Major Project	-	-	2	2			^
Total Credits										**20**

Semester VI
Curriculum Structure
Diploma in Civil Engineering

Sl. No	Category of Course	Code No	Course Title	L	T	P	Total Contact hrs/ week	CIE	SEE	Credits
1	Program Core Course		Geotechnical Engineering	3	0	0	3	**40**	**60**	2
2	Program Core Course		Geotechnical & Transportation Engineering Lab	0	0	3	3	**60**	**40**	1
3	Program Elective Course -IV		1.Traffic Engineering. 2.Repairs and maintenance of Structures 3.Tendering and Accounts	3	0	0	3	**40**	**60**	3
4	Program Open Elective – II		1.Disaster Management 2.Environmental Impact Assessment 3.Non-destructive Testing Methods	3	0	0	3	**40**	**60**	3
5	Program Open Elective – III		1.Low-Cost Housing 2.Remote Sensing and GIS 3.Renewable Energy Technologies 4.Artificial Intelligence (AI)	3	0	0	3	**40**	**60**	3
6	Humanities and Social Science course		Entrepreneurship and starts-up	3	0	0	3	**40**	**60**	3
7	Mandatory Course		Indian Constitution	2	0	0	2	**20**	**30**	0
8	Project Work		Major Project	-	-	6	6	**120**	**80**	4
9	Seminar		Seminar	1	0	0	1	**50**	-	1
Total Credits										**20**

Course Code	:	
Course Title	:	**Water Resources Engineering**
Number of Credits	:	2 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

Course Outcomes:

After completing this course, student will be able to:

- Estimate hydrological parameters.
- Estimate crop water requirements of a command area.
- Execute Minor and Micro Irrigation Schemes.
- Select the relevant Cross Drainage works for the specific site conditions.

Course Content:
Unit – I Introduction to Hydrology

- Hydrology: Definition and Hydrological cycle
- Rain Gauge: Symons rain gauge, automatic rain gauge,
- Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method.
- Runoff, Factors affecting Run off, Computation of run–off.
- Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems.
- Yield and Dependable yield of a catchment, determination of dependable yield.

Unit– II Crop water requirement and Reservoir Planning

- Irrigation and its classification.
- Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and capacity of canal.
- Methods of application of irrigation water and its assessment.
- Surveys for irrigation project, data collection for irrigation project.
- Silting of reservoir, Rate of silting, factors affecting silting and control measures, Control levels in reservoir

Unit– III Dams and Spillways

- Dams and its classification: Earthen dams and Gravity dams (masonry and concrete).
- Earthen Dams– Components with function, typical cross section, seepage through embankment and foundation and its control.

- Methods of construction of earthen dam, types of failure of earthen dam and preventive measures.
- Gravity Dams, Theoretical and practical profile, typical cross-section, drainage gallery, joints in gravity dam, concept of high dam and low dam.
- Spillways-Definition, function, location, types and components, Energy dissipaters.

Unit– IV Diversion Head Works & Canals
- Weirs – components, parts, types, K.T. weir – components and construction
- Diversion head works – Layout, components and their function.
- Barrages – components and their functions. Difference between weir and Barrage.
- Canals – Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Design of most economical canal section.
- Canal lining – Purpose, material used and its properties, advantages.
- Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing.
- Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets
- Lift irrigation Scheme-Components and their functions, Layout.

Suggested Learning Resources:
1. Subramanayan, Engineering Hydrology, McGraw Hill.
2. Asawa, G.L., Irrigation and water resource Engineering, New Age
3. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.

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Course Code	:	
Course Title	:	**Design of Steel Structures**
Number of Credits	:	2 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:
Following are the objectives of this course:

- To understand IS 800-2007 and Latest codes of practice of IS 875 for the design of Compression, Tension, Flexural members.
- To understand the concepts involved in the design of welded connections.
- To learn the concept of limit state design of steel beams.
- To study the design of slab base along with a cement concrete pedestal.
- Awareness about Gantry girder, welded plate girder, stiffeners and bolted connections.

Course Outcomes:
After completing this course, student will be able to:

- Develop skill of using IS 800-2007 and Latest codes of practice of IS 875 codes of practice for the design of steel structural elements subjected to Bending, Compression and Tension.

- Design of I, T, L, C and built-up sections.

- Develop skill to analyze the behaviour and design of welded connections.

- Develop skill to visualise and to draw the various Steel Connections.

Course Contents:
Unit – I Properties of Sections and Loads on Steel Structures: Merits and demerits of steel structures, Properties of structural steel sections -I, T, angle and channel sections, flats and tubular section, Permissible stresses in bending, shear, bearing, tension and compression, use of steel tables and IS: 800 – 2007, Loads on steel structures –Dead loads, Live loads, wind loads as per IS: 875, Seismic loads etc.
Design of Connections in Steel Structures: Different types of joints, Types of rivets, Riveted connections, Strength of riveted joints, Design of riveted joints for axially loaded members.
Types of weld, Differentiate welded joints with riveted joints, Different forms of welded joints (Butt / Fillet / Slot / Plug), Specifications of fillet welds – Size, effective throat thickness, effective length, Allowable stresses in welds – Strength of a weld, Design of fillet weld for axial load.

Unit – II Design of Simple Beams: Introduction, Classification of beams, Flexural behaviour of beams-Elastic & Plastic behaviour, Shape factor(No Numericals), Shear centre and its significance, Limit state of serviceability-Deflection, Web Buckling and Web Crippling, Classification of cross sections, Permissible bending stresses for laterally supported and laterally unsupported beams, Load carrying capacity of laterally supported (Simple and Built-up) and laterally unsupported beams (Simple sections only)Design of laterally supported beams & Check for bending, shear, deflection and web crippling. Component parts of plate girder with sketches-brief description of different types of stiffeners.

Unit – III Design of Tension Members: Various sections of tension members -Single & double angle members, Single Tee section- Effective area -Allowable stresses – Determine the

Strength of tension member by yielding of section, rupture of net cross-section and block shear. Design of tension members connected on same or both sides of gusset plate and its welded end connections.

Roof Trusses: Types – Suitability of truss for different spans – Definitions and Basics of different Components involved in Roof Truss. Calculation live load on truss.

Unit – IV Design of Compression members: Introduction to columns and struts, Columns – End conditions, effective length, slenderness ratio, Use of steel tables and IS:800-2007 for permissible stress in compression, Determine the strength of columns (I section, I section with cover plates, single & double angle struts) – Design of axially loaded columns (I section, I section with cover plates, single & double angle struts connected by welded connections with gusset plate). Design of slab base along with cement concrete pedestal for axially loaded columns only.

Design specifications of single lacing / double lacing and battening for built-up columns (No numerical problems).

Suggested Learning Resources:
1. Limit State Design of Steel Structures by S.K. Duggal
2. Design of Steel Structures by S.S. Bhavikatti
3. IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi.

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Course Code	:	
Course Title	:	**Estimating and Costing**
Number of Credits	:	2 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives:
Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

Course Outcomes:
After completing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

Course Contents:

Unit – I Fundamental of Estimating and Costing: Estimating and Costing-Meaning, purpose, Roles and responsibility of quantity surveyor, Administrative Approval and Technical Sanction.

Measurement of Materials and works: Rules of measurements, Units of measurement of various items of Civil Engineering works as per I.S:1200. General specification of items of building work.

Types of Estimates-Approximate and Detailed estimate, Standard formats of Measurement sheet, Abstract sheet and face sheet.

Approximate Estimates: Approximate Estimate-Definition, Purpose. Methods of approximate estimate-Service unit method, Plinth area rate method, Cubical content method, Approximate quantity method (simple numerical).

Unit – II Detailed Estimate: Definition, Purpose and Data required for detailed estimate-Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting. Detailed estimate for Compound wall, Single storey – Load Bearing Type, RCC Framed building using Long wall and Short wall method, Centre line method (with simple numericals).

Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements. Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc.

Unit– III Estimate for Civil Engineering Works: Earthwork – Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method. Capacity of Reservoirs. Detailed estimate for septic tank, Community well. Use of computer /software's / programmes for detailed estimate Preparation of Civil Engineering Works.

Unit– IV Rate Analysis: Definition, purpose and importance. Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit. Procedure for rate analysis. Task work-Definition, types. Task work of different skilled labour for different items. Categories of labours, their daily wages, types and number of labours for different items of work. Transportation charges of materials – Lead and Lift, Hire charges of machineries and equipments. Preparing rate analysis of different items of work pertaining to buildings.

Suggested Learning Resources:
1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGraw-Hill Education, New Delhi.
3. Rangwala, S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
4. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
5. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
7. PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Sched- ule of Rates.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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Course Code	:
Course Title	: **Design of Steel and RCC Structures Lab**
Number of Credits	: 1 (L:0, T: 0, P:3)
Prerequisites	: Nil
Course Category	: PC

Course Objectives:

Following are the objectives of this course:

- To learn the concept of limit state design RCC & Steel members.
- Interpreting the actual RCC Structural Drawings.
- Interpreting the actual Steel Structural Drawings.
- To prepare a check list for reinforcement.

Course Outcomes:

After completing this course, the student will be able to understand:

- Codal provisions (IS 456:2000) & design of RCC members.
- Codal provisions (IS 800:2007) of Steel members.
- The process of preparing check lists of reinforcement.
- The method of preparing reports of site visits.

List of Practicals/ Drawings to be completed (Minimum 8 practicals should be conducted):

	Cycle – I
1	Draw sections of Singly and Doubly reinforced beam in flexure, shear and development length (Using CAD Software).
2	Types of Staircase, Summarize the codal provisions (IS 456:2000) required for the design of Dog legged staircase (In Excel form or Report of the numerical design)
3	Draw the reinforcement details of One-way slab (Using CAD Software).
4	Draw the reinforcement details of Two-way slab (Using CAD Software).
5	Summarize the codal provisions (IS 456:2000) required for the design of Rectangular footing (In Excel form or Report of the numerical design).
	Cycle – II
6	Draw sketches of different types of RCC column footings (On Sketch book / Drawing sheet).
7	Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements.
8	Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.
9	Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.
10	Draw the sketches of welded plate girder (On Sketch book / Drawing sheet).
11	Enlist codal provisions for the design of laced & battened columns with sketches.
12	Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.

Suggested Learning Resources:

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.

2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, Delhi.

3. Subramanian N., Design of Steel Structures, Oxford University Press.

4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

5. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.

6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.

7. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.

8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.

9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

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Course Code	:
Course Title	: **Estimating and Costing Lab**
Number of Credits	: 1 (L:0, T: 0, P:3)
Prerequisites	: Nil
Course Category	: PC

Course Objectives:

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.

- To perform rate analysis for different items associated with construction projects.

- To use Software/MS-Excel for detailed estimate related to civil infrastructural projects.

Course Outcomes:

After completing this course, the student will be able to:

- Select modes of measurements for different items of works.

- Prepare approximate estimate of a civil engineering works.

- Prepare detailed estimate of a civil engineering works.

- Use relevant software for estimating the quantities and cost of items of works.

- Justify rate for given items of work using rate analysis techniques.

List of Practicals to be completed (Minimum 8 practicals should be conducted):

Cycle – I	
1	Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2	Recording in Measurement Book (MB) for any four items
3	Prepare approximate estimate for the given civil engineering works. (In MS-Excel)
4	Calculate the quantity of items of work for 1BHK load bearing residential Building with staircase using description of item from DSR. (In MS-Excel)
5	Prepare detailed estimate for RCC framed G+1 Building using "standard measurement and abstract format" using description of item from DSR. (In MS-Excel)
6	Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule for columns and footings. (In MS-Excel)
Cycle – II	
7	Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule for lintel with chajja, beam, slab. (In MS-Excel)
8	Prepare detailed estimate of Embankment of one kilometre length from the given drawing. (In MS-Excel)
9	Prepare detailed estimate of road of one kilometre length from the given drawing. (In MS-Excel)

10	Prepare detailed estimate of canal of one kilometre length from the given drawing. (In MS-Excel)
11	Prepare rate analysis for the given items of works. (In MS-Excel)
12	Prepare detailed estimate of small Septic tank from the given set of drawings. (In MS-Excel)
13	Prepare detailed estimate of well from the given set of drawing. (In MS-Excel)

Suggested Learning Resources:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors

2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGraw-Hill Education, New Delhi.

3. Rangwala, S.C., Estimating and Costing, Charotar Publishing House, Anand.

4. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. Delhi.

5. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.

6. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.

7. PWD Schedule of Rates.

8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.

9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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Course Code	:	
Course Title	:	**Transportation Engineering**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:
- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks.

Course Outcomes:

After completing this course, student will be able to:
- Identify the types of roads as per IRC recommendations.
- Implement the geometrical design features of different highways.
- Perform different tests on road materials.
- Identify the components of railway tracks.
- Identify the defects in railway tracks.

Course Content:

Unit – I Introduction to Highway Engineering
- Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics.
- Different modes of transportation – land way, waterway, airway. Merits and demerits of roadway and railway;
- General classification of roads.
- Selection and factors affecting road alignment.

Unit– II Geometric Design of Highway
- Camber: Definition, purpose, types as per IRC –recommendations.
- Kerbs: Road margin, road formation, right of way.
- Design speed and various factors affecting design speed as per IRC –recommendations.
- Gradient: Definition, types as per IRC –Recommendations.
- Curves: Necessity, types: Horizontal, vertical curves.
- Extra widening of roads: numerical examples.
- Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation.
- Standards cross-sections of national highway in embankment and cutting.

Unit– III Construction of Road Pavements

- Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.
- Pavement – Definition, Types, Structural Components of pavement and their functions
- Construction of WBM road. Merits and demerits of WBM road.
- Construction of Flexible pavement / Bituminous Road, Types of Bitumen and its proper- ties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, seal coat, Merits and Demerits of BR.
- Cement concrete road/Rigid pavement -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads/ rigid pavement, Types of joints.

Unit– IV Railway Engineering
- Classification of Indian Railways, zones of Indian Railways
- Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge.
- Rail, Rail Joints – requirements, types.
- Creep of rail: causes and prevention.
- Sleepers – functions and Requirement, types – concrete sleepers and their density
- Ballast – function and types, suitability.
- Rail fixtures and fastenings–fishplate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers.

Suggested Learning Resources:
1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN:978-93- 82609-858) Edition2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg, Standard Book House, New Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand Publication, New Delhi.
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, SciTech Publications, Hyderabad.

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Course Code	:	
Course Title	:	**Solid Waste Management**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:
- To know various sources of solid.
- To learn techniques of collection and transportation of solid waste.
- To know various methods of disposal of solid waste.
- To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

Course Outcomes:

After competing this course, student will be able to:
- Identify the sources of solid waste.
- Select the relevant method of collection and transportation of solid waste.
- Suggest an action plan for composting of solid waste.
- Devise suitable disposal technique for solid waste
- Use the relevant method for disposal of Bio-medical and E-waste.

Course Content:
Unit – I Introduction
- Definition of solid waste, different types of solid waste – domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc.
- Sources of solid waste, Classification of solid waste – hazardous and non- hazardous waste.
- Physical and chemical characteristics of municipal solid waste (MSW).

Unit– II Storage, Collection and Transportation of Municipal Solid Waste
- Collection, segregation, storage and transportation of solid waste.
- Tools and Equipment- Bin, Broom, Shovels, Handcarts, Mechanical road sweepers.
- Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles.
- Role of rag pickers and their utility for society.

Unit III Composting of Solid Waste and Techniques for Disposal.
- Concept of composting of waste, Principles of composting process. Factors affecting the composting process.
- Methods of composting–Manual Composting–Bangalore method, Indore Method, Vermicomposting.
- Solid waste management techniques–solid waste management hierarchy, waste prevention and waste reduction techniques
- Land filling technique, Factors to be considered for site selection, Land filling methods, Advantages and disadvantages of land fill method, Recycling of municipal solid waste

- Incineration of waste: Introduction of incineration process, Types of incinerators – Flash, Multiple chamber Incinerators.

Unit– IV Biomedical and E-waste management
- Definition of Bio Medical Waste.
- Sources and generation of Biomedical Waste and its classification
- Bio medical waste Management technologies.
- Definition, varieties and ill effects of E-waste,
- Recycling and disposal of E-waste.

Suggested Learning Resources:
1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed.2018
2. Bhide, A.D., Solid Waste Management, Indian National Scientific Documentation Centre, New Delhi.
3. George Tchobanoglous, Kreith, Frank., Solid Waste, McGraw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

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Course Code	:	
Course Title	:	**Advanced Construction Technology**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:
Following are the objectives of this course:
- To gain knowledge on different materials in advanced construction
- To know different methods in concreting.
- To know the relevance of advanced construction methods for particular site condition.
- To identify the requisite hoisting and conveying machinery for the given situation.

Course Outcomes:
After completing this course, student will be able to perform:
- Use relevant materials in advanced construction of structures.
- Use relevant method of concreting and equipment according to type of construction.
- Apply advanced construction methods for given site condition.
- Select suitable hoisting and conveying equipment for a given situation.
- Identify advanced equipment required for a particular site condition.

Course Content:
Unit – I Advanced Construction Materials
- Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
- Plastics: Use and properties of PVC, RPVC, HDPE, FRP, GRP.
- Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plasterboards, micro-silica, waterproofing materials, adhesives.

Unit– II Advanced Concreting Methods and Equipments
- Ready Mix Concrete: Necessity and use of ready-mix concrete. Products and equipments for ready mix concrete plant. Conveying of ready-mix concrete, transit mixers.
- Vibrators for concrete consolidation: Internal, needle, surface, platform and form vibrators.
- Underwater Concreting: Procedure and equipments required for Tremie method, Drop bucket method.
- Special concrete: procedure and uses of special concretes: Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, shotcreting.

Unit– III Advanced Technology in Constructions
- Construction of multi-storeyed Building: Equipments and machinery required for construction of multi-storeyed building such as use of lifts, belt conveyers, pumping of concrete.
- Prefabricated construction: Methods of prefabrication, Plant fabrication and site fabrication, All prefabricated building elements such as wall panels, slab panels, beams, columns, door and window frames etc. Equipments and machineries used for placing and Jointing of prefabricated elements.

Unit– IV Hoisting, Conveying and Excavation Equipments
- Hoisting Equipments: Principles and working of Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Tower crane, Lattice Girder, Winches, Elevators, ladders. Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes.
- Conveying Equipments: Working of belt conveyers, types of belts and conveying mechanism. Use of dumpers, tractors and trucks.
- Excavation Equipments: Use, working and output of following machinery – bull dozers, scrapers, graders, trenching equipment, Wheel mounted belt loaders, power shovels, JCB, and drag lines.

Suggested Learning Resources:

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi.
2. Chudley, R., Construction Technology Vol. I to II, ELBS-Longman Group.
3. Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. New York.
4. Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
5. Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
6. Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
7. Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.
8. Rangwala, S. C., Construction of Structures and Management of works, Charotar Publication, Anand.
9. Ghose, D. N., Materials of Construction, McGraw Hill Publishing Co, New Delhi.

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Course Code	:	
Course Title	:	**Pavement Design and Maintenance**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:
- To know types of pavements and their uses.
- To learn issues in design of flexible and rigid pavements.
- To understand methods of pavement evaluation.
- To learn pavement maintenance methods.

Course Outcomes:

After competing this course, student will be able to:
- Identify the components of the given type of pavement.
- Suggest the type of pavement for the given situation.
- Design the flexible pavement using the provisions of IRC
- Design the concrete pavement using the provisions of IRC
- Decide type of maintenance required under different damaged conditions

Course Content:
Unit – I Basics of pavement Design
- Types of pavements– Flexible and Rigid
- Comparison of Rigid pavement and flexible pavement according to Design precision, life maintenance, initial cost, stages of construction, availability of materials.
- Functions and characteristics of pavement.
- Factors affecting selection of type of pavement.

Unit – II Fundamentals of pavement design
- Factors affecting pavement design-design wheel load, Traffic factors, Environmental factors, Road geometry and material, Characteristics of soil and Drainage situation.
- IRC37 guidelines for design of flexible pavement (overview only).
- IRC58 guidelines for design of concrete pavement (overview only).
- Joints-Need, Types, requirements, spacing of joints.

Unit – III Pavement evaluation
- Definition and purpose of pavement evaluation
- Methods of Pavement evaluation –Visual rating, Pavement serviceability index, Roughness measurements, Benkelman Beam deflection method

Unit – IV Pavement Maintenance
- Types of pavement maintenance – routine, periodic, and special. Need for inspection and maintenance schedule. Causes of pavement failure and remedial measures.
- Types and causes of damages in flexible pavement, surface defects, cracks. Deformations - Rutting, fatigue, settlement and upheaval. Disintegration- loss of aggregate, stripping, pothole.

- Types of damages to rigid pavement-cracking, spalling, slab rocking, settlement, joint seal- ant failure. Methods of repair – repair of spalled joints, full depth reconstruction, replacement of dowel bars.

Suggested Learning Resources:

1. Kadiyali, L.R., Highway Engineering, Khanna Book Publishing House, New Delhi (ISBN: 978-93-86173-133)
2. Chakroborty, Partha Das, Animesh., Principles of Transportation engineering, Prentice-Hall of India Pvt. Ltd
3. Vazirani, VN, Chandola, SP., Transportation Engineering Vol . I& II, Khanna Publishers. Delhi
4. Yoder, E J, Principles of Pavement Design, Wiley India Pvt Ltd.
5. Bindra, S P., Highway Engineering, Dhanpat Rai Publications (P)Ltd
6. Kumar RS, Pavement Evaluation and Maintenance Management system, University Press (India), Pvt. Ltd.
7. Sharma S K, Principles, Practice and Design of Highway Engineering, S Chand, New Delhi.

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Course Code	:	
Course Title	:	**Green Building and Energy Conservation**
Number of Credits	:	3(L: 3, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To know various aspects of green buildings
- To relate the construction of green building with prevailing energy conservation policy and regulations.
- To know and identify different green building construction materials.
- To learn different rating systems and their criteria.

Course Outcomes:

After completing this course, student will be able to:

- Identify various requirements for green building.
- Relate the construction of green building with prevailing energy conservation policy and regulations.
- Supervise the construction of green building construction using green materials.
- Focus on criteria related to particular rating system for assessment of particular Green building.

Course Content:

Unit I: Introduction to Green Building and Design Features

- Definition of Green Building, Benefits of Green building, Components/features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.
- Site selection strategies, Landscaping, building form, orientation, material and construction techniques, roofs, walls, fenestration, advanced passive heating and cooling techniques, waste reduction during construction.

Unit–II Energy Audit and Environmental Impact Assessment (EIA)

- Energy Audit: Meaning, Necessity, Procedures, Types, Energy Management Programs.
- Environmental Impact Assessment (EIA): Introduction, EIA regulations, Steps in environmental impact assessment process, Environmental clearance for the civil engineering projects.

Unit– III Green Building

- Introduction: Definition of Green building, Benefits of Green building.
- Principles: Principles and planning of Green building.
- Features: Salient features of Green Building, Environmental design (ED) strategies for building construction.
- Process: Improvement in environmental quality in civil structure.
- Materials: Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board, Insulated concrete forms. Reuse of waste material-Plastic, rubber, Newspaper wood, Nontoxic paint, Green roofing.

Unit IV Rating System

- Introduction to (LEED) criteria
- Indian Green Building council (IGBC) Green rating
- Green Rating for Integrated Habitat Assessment. (GRIHA) criteria
- Heating Ventilation Air Conditioning (HVAC) unit in green Building
- Functions of Government organization working for Energy conservation and Audit (ECA).
- National Productivity council (NPC)
- Ministry of New and Renewable Energy (MNRE)
- Bureau of Energy efficiency (BEE)

Suggested Learning Resources:

1. Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hobouken, New Jersey.
2. Chauhan, DS Sreevasthava, SK., Non-conventional Energy Resources, New Age International Publishers, New Delhi.
3. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi.
4. Jagadeesh, K S, Reddy Venkatta Rama & Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.
5. Sam Kubba., Handbook of Green Building Design and Construction, Butterworth-Heinemann.
6. Means R S, Green Building – Project Planning and Cost Estimating, John Wiley &Sons.
7. Sharma K V, Venkataseshaiah P., Energy Management and Conservation, IK International.

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Course Code	:	
Course Title	:	**Building Services and Maintenance**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:
Following are the objectives of this course:
- To know the procedure for classifying various types of building services.
- To know the fire safety requirements for multi-storeyed building.
- To devise suitable plumbing system for given type of building.
- To understand the procedure for rain water harvesting and solar water heater.
- To know the system for designing lighting, ventilation and acoustics for any building.

Course Outcomes:
After completing this course, student will be able to:
- Classify various types of building services as per functional requirements.
- Propose the fire safety requirements for multi-storeyed building.
- Devise suitable water supply and sanitation system for given type of building.
- Evaluate the potential of rain water harvesting and solar water heater system for the given type of building.
- Justify the necessity of designing the system of lighting, ventilation and acoustics for the given type of building.

Course Content:
Unit – I Overview of Building Services
- Introduction to building services, Classification of buildings as per National Building code, Necessity of building services, Functional requirements of building, Different types of building services i.e., HVAC (Heat, Ventilation and Air Conditioning), Escalators and lifts, fire safety, protection and control, plumbing services, rainwater harvesting, solar water heating system, lighting, acoustics, sound insulation and electric installation etc.
- Role and responsibility of Building Service Engineer, Introduction to BMS (Building Management Services), Role of BMS, concept of smart building.

Unit– II Modes of vertical communication
- Objectives and modes of vertical communication in building.
- Lifts: Different types of lifts and it uses, Component parts of Lift-Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push etc., Design provisions for basic size calculation of space enclosure to accommodate lift services, Safety measures.
- Escalators: Different Types of Escalators and its Uses, Components of escalators, Design provisions for basic size calculation of space enclosure to accommodate escalator services, Safety measures.
- Ramp: Necessity, design consideration, gradient calculation, layout and Special features required for physically handicapped and elderly.

Unit– III Fire Safety
- Fire protection requirements for multi-storeyed building, causes of fire in building, Fire detecting and various extinguishing systems, Working principles of various fire protection systems.

- Safety against fire in residential and public buildings (multi-storeyed building), National Building Code provision for fire safety, Fire resisting materials and their properties, Fire resistant construction, procedures for carrying out fire safety inspections of existing buildings, Provisions for evacuation.

Unit– IV: Lighting, Ventilation and Plumbing Services

- Concept of SWH (Solar water heating), component parts of SWH, various system of SWH (heat transfer, propulsion, passive direct system, active direct system, Do-it-yourself), installation and maintenance.
- Concept of lighting, types of lighting (natural and artificial), factors influencing the brightness of room, factors affecting selection of artificial lighting, installation of light (direct, half-direct, indirect, half-indirect and direct-indirect), types of light control (manual switch, remote switch, timer switch and photo-electric cell switch), types of
- Lamps (incandescent, tungsten halogen and electric discharge), Lamp selection as per room sizes.
- Concept of ventilation, necessity and Types of ventilation.
- Importance of plumbing, AHJ (Authority Having Jurisdiction) approval, Plumbing Terminology and fixtures: Terms used in plumbing, Different types of plumbing fixtures, shapes/ sizes, capacities, situation and usage, Traps, Interceptors.
- System of plumbing for building water supply: storage of water, hot and cold-water supply system.
- System of plumbing for building drainage: Types of drainage system such as two pipe system, one pipe system, types of Vents and purpose of venting, Concept of grey water and reclaimed water.
- Different pipe materials, and jointing methods, fittings, hanger, supports and valves used in plumbing and their suitability.

Suggested Learning Resources:

1. Patil, S. M., Building Services, Seema Publication, Mumbai.
2. Mantri and Sandeep, The A to Z of Practical Building Construction and its Management, Satya Prakashan, New Delhi.
3. Bag S P, Fire Services in India: History, Detection, Protection, Management, Mittal Publications, New Delhi.
4. Deolalikar, S. G., Plumbing Design and Practice, McGraw-Hill,
5. Akhil Kumar Das., Principles of Fire Safety Engineering: Understanding Fire and Fire Protection, PHI Learning Pvt. Ltd, New Delhi.
6. Shraman N L, Solar panel installation guide & user manual, The Memory Guru of India.
7. Gupta M K, Practical handbook on building maintenance – Civil works, Nabhi Publications.
8. BIS., National Building Code Part1, 4, 8, 9., Bureau of Indian Standard, New Delhi
9. BIS., IS 12183(Part 1):1987 Code of practice for plumbing in multistoried buildings., Bureau of Indian Standard, New Delhi
10. BIS., 2008 Uniform plumbing code – India (UPC-I)., Bureau of Indian Standard

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Course Code	:	
Course Title	:	**Air Pollution and its Control Measures**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	OE

Course Objectives:

Following are the objectives of this course:
- The objective of air pollution control is to prevent adverse responses by all receptor categories exposed to the atmosphere: human, animal, vegetable, and material.
- To take up the basic concepts of air pollution.
- To introduce students to basic concepts of pollution.
- The contents involved the knowledge of causes of air pollution.
- The contents involved the knowledge of health related to air pollution.
- To develop skills relevant to control of air pollution.
- Basic understanding of the ecosystem and its diversity.

Course Outcomes:

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

- Explain and calculate the statistics of a given aerosol size distribution as well as properties of gaseous pollutants (vapor pressure, solubility, ignition temperature, and ideal gas law)
- To determine the motion of aerosols by a given transport mechanism (inertial motion, diffusion, and electrical migration;
- Select the most appropriate aerosol collection device and its properties for a given problem
- Determine which removal mechanisms or destruction mechanisms are most suitable for a given gaseous pollutant (combustion, adsorption, absorption)
- Calculate the removal and/or collection efficiency for a given pollutant and engineering control system and evaluate key parameters that affect the collection efficiency and operating cost;
- Design the most appropriate air pollution control system for a particular industrial air pollution problem;
- Explain air pollution control systems to the professional society and air pollution control concepts general public

Course Content:

Unit-I Air Pollution: Definition of Air Pollution – Sources & Classification of Air Pollutants – Effects of air pollution – Global effects – Air Quality and Emission standards – Sampling of Pollutants in ambient air – Stack sampling. Meteorology and Air Pollution: Factors influencing air pollution, Wind rose, Mixing Depths, Lapse rates and dispersion – Atmospheric stability, Plume rise and dispersion, Prediction of air quality, Box model – Gaussian model – Dispersion coefficient – Application of tall chimney for Pollutant dispersion.

Unit-II Control of Particulate Pollutants: Properties of particulate pollution – Particle size

distribution – Control mechanism – Dust removal equipment – Design and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP.

Unit-III Control of Gaseous Pollutants: Process and equipment for the removal by chemical methods – Design and operation of absorption and adsorption equipment – Combustion and condensation equipment.

Unit-IV Automobile Pollution and Control: Sources, Theoretical Considerations, Operating conditions Vs Emissions, Pollution control Measures, Emission Standards. Control of Air Pollution: Zoning and site selection – Other Management controls, AP Legislation.

Suggested Learning Resources:
1. Rao M.N. (1986), Air Pollution, McGraw Hill.
2. Wark K. & Warner C.F., Air Pollution its origin and Control.
3. Martin Crawford (1980), Air Pollution theory, Tata McGraw Hill Publishers
4. Stern A.C. (1968) Air Pollution, Vol. 1 – 5, Academic Press, New York.

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Course Code	:	
Course Title	:	**Watershed Management**
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	OE

Course Objectives:
Following are the objectives of this course:
- To understand different watershed behaviour.
- To provide a comprehensive treatise on the engineering practices of watershed management for realizing the higher benefits of watershed management.

Course Outcomes:
After completion of the course, the students will have a thorough knowledge on
- Watershed planning,
- Development and management strategies through different soil and water conservation approaches.
- Estimation of costs and benefits

Course Content:
Unit – I:
 Introduction: Watershed – Definition, concept of watershed development, objectives of watershed, importance and advantages of watershed management, classification – priority watersheds –characteristic of water sheds.

Unit – II
 Watershed Planning: Planning principles – collection of data – present land use – Preparation of watershed development plan – Estimation of costs and benefits – Financial plan.

Unit – III:
 Watershed management – Concept need, principles & components of watershed management integrated watershed management. Factors effecting watershed management runoff & soil loss management in a watershed socio-economic concept of watershed.

Unit – IV
 Water Harvesting and Watershed development programme: Principles of water harvesting, methods of rainwater harvesting, design of rainwater harvesting structures.
 River Valley Project (RVP) – Hill Area Development Programme (HADP) – National Watershed Development Programme for Rainfed Agriculture (NWDPRA) – Other similar projects operated in India

Suggested Learning Resources:
1. Murthy, V.V.N. and M.K. Jha Land and Water Management, Kalyani Publishers, 2015
2. Watershed Management by Madan Mohan Das and M.D. Saikia, Prentice Hall of India, 2013
3. Watershed Management Muthy, J. V. S. New Age International Publishers, 1998.
4. Watershed Hydrology by P E Black, Prentice Hall Englewood Cliffs, 1991.
5. Watershed Hydrology by R Suresh, Standard Publishers and Distributors, Delhi, 2007

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Course Code	:	
Course Title	:	**Internet of Things (IoT)**
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	OE

Course Objectives:
On completion of the study of the subject the student should be able to comprehend the following:
- To introduce the terminology, technology and its applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:
- Students will understand the Concept of IoT.
- Students will be able to develop IoT Applications.

Course Content:
Unit – I: Introduction to Internet of Things
- Define the term "Internet of Things"
- State the technological trends which have led to IoT.
- Describe the impact of IoT on society.

Unit – II: Design consideration of IoT
- Enumerate and describe the components of an embedded system.
- Describe the interactions of embedded systems with the physical world.
- Name the core hardware components most commonly used in IoT devices.

Unit – III: Interfacing by IoT devices
- Describe the interaction between software and hardware in an IoT device.
- Explain the use of networking and basic networking hardware.
- Describe the structure of the Internet.

Suggested Learning Resources:
1. Internet of Things Raj Kamal McGraw Hill Education; First edition (10 March 2017) ISBN 978-9352605224
2. Internet of Things: A Hands-On Approach Arsheep Bahge and Vijay Madisetti Orient Blackswan Private Limited - New Delhi; First edition (2015) ISBN: 978-8173719547

Suggested Software/Learning Websites:
1. https://www.raspberrypi.org/blog/getting-started-with-iot/
2. https://www.arduino.cc/en/IoT/HomePage
3. https://www.microchip.com/design-centers/internet-of-things
4. https://learn.adafruit.com/category/internet-of-things-iot
5. http://esp32.net/

MAJOR PROJECT

Course Objectives:

1. To impart team building and management skills among students.
2. To instill writing and presentation skills for completing the project.
3. Plan, Analyse, Design and implement a project.

Course Outcomes: Students should be able to do the following:

1. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
2. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
3. Prepare and submit the Report and deliver presentation before the departmental Committee.

Students are required to choose a topic for major project related to the courses of this semester. Student has to implement and present the project as per the given schedule. During the implementation of the project, student has to follow the schedule given below. Report of the project work has to be submitted for evaluation.

Schedule:

S.No	Description	Duration
1.	Problem Identification / Selection	5 weeks
2.	Preparation of Abstract	2 week
3.	Design, Implementation & Testing of the Project	12 weeks
4.	Documentation & Project Presentation	5 weeks

Guidelines for the Award of marks:

S.No	Description	CIE Max. Marks 120	SEE Max. Marks 80
1.	Weekly Assessment	30	--
2.	Design/ Implementation	50	20
3.	Presentation	20	20
4.	Viva Voce	20	20
5.	Report	-	20

Final Major Project demonstration and PPT presentation is to be evaluated for the entire class together by the entire faculty handling Major Project for that class.

Course Code	:	
Course Title	:	**Geotechnical Engineering**
Number of Credits	:	2(L: 3, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand and determine physical and index properties and classification of soil
- To estimate permeability and shear strength of soil
- To know the load bearing capacity of soil
- To learn various soil stabilization and compaction methods

Course Outcomes:

After completing this course, student will be able to:

- Identify types of rocks and sub soil strata of earth.
- Interpret the physical properties of soil related to given construction activities.
- Use the results of permeability and shear strength test for foundation analysis.
- Interpret soil bearing capacity results.
- Compute optimum values for moisture content for maximum dry density of soil.

Course Content:

Unit – I Overview of Geotechnical Engineering

- Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks.
- Importanceofsoilasconstructionmaterialin Civil engineering structuresandasfoundation bed for structures.
- Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam.

Unit– II Physical and Index Properties of Soil

- Soil as a three-phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.
- Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.
- Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.
- Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, method to determine coefficient of permeability, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure.

Unit– III Bearing Capacity and Shear Strength of Soil
- Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure.
- Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 &IS:2131.
- Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear laboratory methods.

Unit– IV Compaction and stabilization of soil
- Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line.
- Factors affecting compaction, field methods of compaction – rolling, ramming and vibration. Suitability of various compaction equipments -smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.
- Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization.

Suggested Learning Resources:
1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.

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Course Code	:	
Course Title	:	**Geotechnical & Transportation Engineering Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 3)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand and determine physical and index properties of soil.
- To estimate the water content of soil
- To understand Grain Size distribution and Sieve Analysis
- To learn various aggregate Properties related to transportation engineering.

Course Outcomes:

After completing this course, student will be able to:

- Interpret the physical properties of soil.
- Determine water content of soil.
- Interpret the soil grain size distribution.
- Interpret properties of aggregates.

List of Practicals to be performed:
Cycle 1

1. Classification of soil samples.
2. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part- II).
3. Determine specific gravity of soil by pycnometer method as per IS 2720 (Part-III).
4. Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part-XXIX).
5. Determine dry unit weight of soil in field by sand replacement method as per IS 2720 (Part-XXVIII).

Cycle 2

6. Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- V).
7. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part-IV).
8. Abrasion test on Aggregates.
9. Aggregates Crushing value test.
10. Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part-VII).

Suggested Learning Resources:

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication
2. Murthy, V.N.S., A textbook of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Khanna, S. K., & Justo, C. E. G. Highway engineering. Nem Chand & Bros.

Course Code	:	
Course Title	:	**Traffic Engineering**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:
- To understand the issues involved in traffic flow.
- To know and understand the tools for traffic studies.
- To delineate various traffic control measures.
- To understand measures for preventing accidents.

Course Outcomes:

After competing this course, student will be able to:
- Analyze road traffic characteristics.
- Undertake various types of road traffic studies.
- Use relevant road traffic signs, signal and markings.
- Identify the intersection depending on the traffic flow.
- Suggest preventive measures to avoid accidents by analyzing the traffic conditions at site.

Course Content:

Unit – I Fundamentals of Traffic Engineering and Traffic studies
- Traffic Engineering- Introduction, objective and scope
- Relationship between speed, volume and density of traffic
- Road user's characteristics-physical, mental, emotional factors.
- Vehicular characteristics-width, length, height, weight, speed, efficiency of breaks.
- Reaction time – factors affecting reaction time. PIEV Theory.
- Traffic volume count, Origin and Destination study.
- Spot speed studies and parking study

Unit– II Road Signs and Traffic Markings
- Traffic control devices –definition, necessity, types.
- Road signs – definition, objects of road signs.
- Classification as per IRC: 67-Mandatory or Regulatory, Cautionary or warning, informatory signs, Location of cautionary or warning sign in urban and non-urban areas, Points to be considered while designing and erecting road signs.
- Traffic markings- definition, classification, carriage way, kerb, object marking and reflector markers.

Unit– III Traffic Signals and Traffic Islands
- Traffic signals- Definition, Types, Traffic control signals, pedestrian signals.
- Types of traffic control signals – Fixed time, manually operated, traffic actuated signals and location of signals.
- Traffic islands –Definition, advantages and disadvantages of providing islands.

- Road intersections – Definition, Types of road intersection.
- Intersection at grade- Types, basic requirements of good intersection at grade.
- Grade separated intersection – advantages and disadvantages, types-flyovers- partial and full Cloverleaf pattern, Diamond intersection

Unit– IV Road Accident Studies and Arboriculture
- Road Accidents-Definition, types and causes for collision and non-collision accidents.
- Measures to prevent road accidents.
- Collision and condition diagram.
- Street lighting–definition, necessity, types-luminaire, foot candle, lumen, factors affecting their utilization and maintenance.
- Arboriculture- definition, objectives, factors affecting selection of type of trees.
- Maintenance of trees-protection and care of road side trees.

Suggested Learning Resources:
1. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
2. Kadiyali L.R., Transportation Engineering, Khanna Book Publishing Co., Delhi
3. Vazirani, VN, Chandola, SP, Transportation Engineering Vol. I & II, Khanna Publishers. Delhi.
4. Saxena, S C, Traffic planning and design, Dhanpat Rai & Sons Delhi.
5. Kumar R S, Introduction to Traffic Engineering, University Press (India), Pvt. Ltd.

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Course Code	:	
Course Title	:	**Repairs and Maintenance of Structures**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:
Following are the objectives of this course:
- To learn about types of maintenance techniques
- To understand causes of various types of damages.
- To know about relevant materials for repair.
- To learn methods of retrofitting for different structures.

Course Outcomes:
After completing this course, student will be able to perform:
- Decide which type of maintenance is needed for a given damaged structure
- Assess causes of damages various types of structures.
- Select the relevant material for repair of the given structure.
- Apply relevant method of retrofitting for re-strengthening of structures.
- Suggest relevant technique to restore the damages of the given structural elements.

Course Content:
Unit – I Basics of maintenance
- Types of Maintenances – repair, retrofitting, re-strengthening, rehabilitation and restoration.
- Necessity, objectives and importance of maintenance.
- Approach of effective management for maintenance.
- Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance.

Unit– II Causes and detection of damages
- Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement.
- Various aspects of visual observations for detection of damages.
- Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection microscope, digital crack measuring gauge.
- Chemical test – Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).

Unit– III Materials for maintenance and repairs
- Types of repair material, material selection.
- Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement.
- Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates.

- Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete, emulsions and paints.

Unit– IV Maintenance and repair methods for Masonry and RCC Construction
- Causes of cracks in walls – bulging of wall, shrinkage, bonding, shear, tensile, vegetation.
- Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints.
- Repair methods based on crack type – For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing.
- Remedial measures for dampness & efflorescence in wall.
- Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation.
- Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing.
- Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy injection, grooving and sealing, stitching, grouting and guniting/ shotcreting.

Suggested Learning Resources:
1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi
2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies
3. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth
4. Relevant BIS codes.

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Course Code	:	
Course Title	:	**Tendering and Accounts**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To understand terminologies in contract and tender document and their significance.
- To know different types of contracts and their uses.
- To learn preparation of typical Tender documents for civil engineering work.
- To get acquainted with rent fixation and valuation of civil structures.

Course Outcomes:

After completing this course, student will be able to:

- Understand various types of contracts and when they are used
- Suggest the relevant type of contract for the given civil engineering work.
- Prepare the typical Tender document for the given civil engineering work.
- Decide type of payment for the executed work.
- Justify the rent fixation and valuation of given civil structure.

Course Content:

Unit – I Procedure to execute the work

- Administrative approval, technical sanction, budget provision, expenditure sanction.
- Methods for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing labors on daily wages basis.

Unit– II Contracts

- Definition of contract, objects of contract, requirements of contract, overview of Indian Contract Act.
- Types of engineering contract with advantages, disadvantages and their suitability – Lump sum contract, item rate contract, percentage rate contract, labour contract, demolition contract, target contract,
- Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor.

Unit– III Tender, Tender Documents and Accounts

- Definition of tender, necessity of tender, types of tenders- Local, Global, Limited, E - Tendering System – Online procedure of submission and opening of bids (Technical and Financial).
- Notice to invite tender (NIT)-Points to be included while drafting tender notice.
- Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders

- Terms related to tender documents – contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract. Various account forms and their uses–Measurement Books, E-Measurement book (E-MB), Nominal Muster Roll (NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book.
- Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Retention money, E – payment.

Unit– IV Introduction to Valuation
- Definition and purpose of Valuation, role of valuer. Definition – Cost, Price and Value, Characteristics of Value, Factors Affecting Value.
- Types of Value – Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value.
- Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation–Straight Line Method, Sinking Fund Method, Constant Percentage Method.
- Fixation of rent, Lease–types of leases, lease hold property and free hold property. Mortgage – Mortgage deed, precautions to be taken while making mortgage.

Suggested Learning Resources:
1. Datta, B. N., Estimating and Costing in Civil engineering, UBS Publishers Pvt. Ltd., New Delhi
2. Raina, V. K., Construction Management and Contract Practices, Shroff Publishers & Distributers Pvt. Ltd.
3. Rangwala, S. C., Estimating and Costing, Charotar Publishing House PVT. LTD., Gujrat
4. Birdie, G. S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd., New Delhi
5. Patil, B. S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai
6. Chakraborti, M., Estimating and Costing, Specification and Valuation in Civil Engineering, Monojit Chakraborti, Kolkata.

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Course Code	:	
Course Title	:	**Disaster Management**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	OE

Course Learning Objectives:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organisations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

Course Outcomes:

After competing this course, student will be:

- Acquainted with basic information on various types of disasters
- Knowing the precautions and awareness regarding various disasters
- Decide first action to be taken under various disasters
- Familiarised with organisation in India which are dealing with disasters
- Able to select IT tools to help in disaster management

Course Content:

Unit – I: Understanding Disaster

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Disaster and Development.

Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters).

Climate Change and Urban Disasters, (Earthquakes, Hurricanes, Tornadoes, Floods, Drought, Tsunami, Volcanoes, Cyclones and Storms, Forest Fires, Severe Heat Waves, Landslides and Avalanches, Epidemics and Insect Infestations).

Technological and Social Disasters: Introduction, Types of Technological Hazards, Hazardous Materials, Social Disasters, Political and Crowd Disasters, War and Terrorism,

Disaster Management: Components of Disaster Management, Government's Role in Disaster Management through Control of Information, Actors in Disaster Management, Organizing Relief measures at National and Local Level, Psychological Issues, Carrying Out Rehabilitation Work, Government Response in Disaster.

Unit- III: Disaster Management Cycle and Framework

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development;

Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation.

Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment.

Unit– IV: Disaster Management in India

Disaster Profile of India – Mega Disasters of India and Lessons Learnt (Episodes of Disasters).

Disaster Management Act 2005 – Institutional and Financial Mechanism,

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management;

Applications of Science and Technology for Disaster Management.

Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

Disaster Communication System (Early Warning and Its Dissemination).

Suggested Learning Resources:
1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R.K., An over view on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

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Course Code	:	
Course Title	:	**Environmental Impact Assessment**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category		OE

Course Objectives:

Following are the objectives of this course:
- Identify the need to assess and evaluate the impact on environment.
- Major principles of environmental impact assessment
- Understand the different steps within environmental impact assessment

Course Outcomes:

After competing this course, student will be:
- Overview of assessing risks posing threats to the environment.
- Be able to access different case studies/examples of EIA in practice.
- Able to the importance of stakeholders in the EIA process

Course Content:

Unit I:
- Environmental Impact Assessment (EIA)
- Introduction, EIA regulations, Steps in environmental impact assessment process.
- Benefits of EIA, Limitations of EIA, Environmental clearance for the civil engineering projects.

Unit–II
- Energy Audit and Environmental Impact Assessment (EIA)
- Energy Audit: Meaning, Necessity, Procedures, Types, Energy Management Programs

Unit– III
- Evolution of EIA, EIA at project, Regional and policy levels Strategic EIA.
- EIA process Screening and scoping criteria, Rapid and comprehensive EIA.
- Specialized areas like environmental health impact assessment, Environmental risk analysis Economic valuation methods.
- Cost-benefit analysis Expert system and GIS applications Uncertainties.

Unit IV
- Legislative and environmental clearance procedures in India and other countries, Public participation Resettlement and rehabilitation. Practical applications of EIA.
- EIA methodologies Baseline data collection.
- Prediction and assessment of impacts on physical, biological and socio-economic environment, Environmental management plan.
- Post project monitoring, EIA report and EIS Review process. Case studies on project, regional and sectorial EIA.

Suggested Learning Resources:

1. R. Therirvel, E. Wilson, S. Hompson, D. Heaney, D. Pritchard, *Strategic Environmental Assessment*, Earthscan, London, 1992
2. Paul, A Erickson, *A Practical Guide to Environmental Impact Assessment*, Academic Press, 1994

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Course Code	:	
Course Title	:	**Non-Destructive Testing Methods**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	OE

Course Objectives:
Following are the objectives of this course:
- To introduce the basic principles, techniques, equipment, applications and limitations of NDT methods such as Visual, Electro Magnetic Testing and Ultrasonic Testing.
- To enable selection of appropriate NDT methods.
- To identify advantages and limitations of non-destructive testing methods.
- To make aware the developments and future trends in NDT.
- Exposure to various non-destructive testing methods which is essential in advanced manufacturing applications, the course aims at giving an insight into various Non-Destructive Testing methods used in practice.

Course Outcomes:
After completing this course, student will be able to:
- Differentiate various defect types and select the appropriate NDT methods for the specimen.
- Students will be able to understand significance and suitability of various non-destructive testing methods in industrial applications.

Course Content:
Unit – I Introduction
- Importance and need of non-destructive testing. Basic methods for NDT of concrete structures. Qualification and certification.
- Basic manufacturing processes and defects of concrete structures: Types of concrete structures, Composition of concrete, Process of concrete manufacture, Discontinuities and defects in concrete structures, Situations where NDT is an option to consider for investigation of in-situ concrete.

Unit– II Testing and Visual Inspection
- Testing of concrete: Quality control tests, Partial destructive tests.
- Comparison of NDT methods.
- Introduction, Tools and equipment for visual inspection, General procedure of visual inspection, Applications of visual inspection, Sketches of typical defects found by visual inspection.

Unit– III NDT Methods
- **Schmidt Rebound Hammer Test:** Fundamental principle, Equipment for Schmidt/rebound hammer test, General procedure for Schmidt rebound hammer test, Applications of Schmidt rebound hammer test, Range and limitations of Schmidt rebound hammer test.
- **Electromagnetic Methods of Testing Concrete:** Fundamental principles, Equipment for electromagnetic inspection, General procedure for electromagnetic testing, Applications of electromagnetic testing method, Range and limitations of electromagnetic testing method, Work or site calibration.

- **Ultrasonic Testing -Pulse velocity test:** Fundamental principle, Equipment for pulse velocity test, Applications, Determination of pulse velocity, Factors influencing pulse velocity measurements, Detection of defects, Developments in ultrasonic tomography.

Unit– IV
Other Methods of NDT:
- Acoustic emission, Computer tomography.
- Strain sensing: Mechanical gauges, Electrical resistance gauges, Acoustic gauges, Electrical displacement transducers, Other types of strain measuring devices, Choice of strain measuring method.
- Corrosion rate measurement.

Codes, Standards & Specifications:
- General considerations: The need for standards, Different categories of standards.
- Standardization organizations: American Society for Testing and Materials (ASTM), International Organization for Standardization (ISO), American Concrete Institute.

Suggested Learning Resources:
1. Baldev Raj, Practical Non – Destructive Testing, Narosa Publishing House ,1997.
2. Hull B. and V. John, Non-Destructive Testing, Macmillan,1988.
3. Kraut kramer, Josef and Hebert Kraut kramer, Ultrasonic Testing of Materials, Springer-Verlag, 1990.
4. The Testing Instruction of Engineering Materials – Davis H.E Troxel G.E wiskovil C.T – McGraw hill.
5. Non-Destructive Testing – Mc Gonnagle JJ – Garden a nd reach New York.
6. Non-Destructive Evolution and Quality Control – volume 17 of metals hand book 9 edition Asia internal 1989.

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Course Code	:	
Course Title	:	**Low-Cost Housing**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	OE

Course Objectives:

Following are the objectives of this course:
- To learn development and planning of low-cost housing infrastructure.
- To know significance and needs of low-cost building materials, innovative techniques for cost reduction.
- To understand the low-cost housing services
- To learn rural irrigation techniques and watershed management.

Course Outcomes:

After competing this course, student will be able to:
- Plan low-cost housing using rural materials.
- Make use of relevant government schemes for construction of roads and housing.
- Use guidelines for rural road construction.
- Implement different irrigation systems for rural areas.
- Identify the need of watershed management in rural areas.

Course Content:

Unit – I Introduction to low-cost housing, development and Planning
- Scope; development plans; various approaches to low-cost development planning.
- Significance of low-cost housing development.
- Low-cost housing development programme /projects.

Unit– II Low-cost construction material
- Low-cost construction material and labour for housing
- Choice of material for low-cost housing in relation to prevention of environmental degradation.
- Energy conservation, organic materials and inorganic materials used in low-cost housing

Unit– III Alternative construction material for low-cost building
- Introduction to alternate low-cost construction material.
- Developing new and alternate building material.
- Use of industrial and agricultural wastes – Fly Ash, Rice Husk, Gypsum fiber boards, Asphaltic Roofing sheets etc.

Unit– IV Rural Development and Planning
- Scope; development plans; various approaches to rural development planning.
- Significance of rural development.
- Rural development programme /projects.

Suggested Learning Resources:
1. Madhov Rao AG, and Ramachandra Murthy, DS, Appropriate Technologies for low-cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.

2. CBRI, Roorkee, Advances in Building Materials and Constriction.

3. Desai, Vasant, Rural Development in India: Past, Present and Future: A Challenge in the Crisis, Himalaya Publishing House, Delhi.

4. Rastogi, A.K. Rural Development Strategy, Wide Vision, Jaipur.

5. Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India Pvt., Ltd.

6. Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications, Delhi.

7. Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development.

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Course Code	:	
Course Title	:	**Remote Sensing and GIS**
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	OE

Course Objective:

Following are the objectives of this course:
- To introduce the principles and basic concepts of Remote Sensing and GIS.
- To introduce the remote sensing systems, data products and analysis.
- To study the applications of Remote Sensing and GIS in agriculture.

Course Outcomes:

On completion of the course, the student will be familiar:
- To understand the basic concepts of remote sensing
- To know the applications of Geographic information systems in Civil Engineering
- Identify the basic remote sensing concepts and its characteristics
- Implement the photogrammetry concepts and fundamentals of Air photo interpretation
- Use various analysis and interpretation of GIS results

Course Content:

UNIT – I: Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Historical Components of Remote Sensing Principles & methods of remote sensing – Active and Passive remote sensing.

UNIT – II: Data Product and Image Analysis: Types of Data Products – types of image interpretation – basic elements of image interpretation – visual interpretation keys. Digital image processing – Image enhancement – image classification – Supervised and unsupervised.

UNIT – III: Geographic Information Systems: Introduction, History of GIS, GIS Components, GIS Applications in Real life. The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Coordinate systems, Map projections, Map transformation, Geo-referencing.

Unit – IV: Application of Remote sensing and GIS: - Application of Remote Sensing and GIS in Precision Agriculture – Monitor Crop Health – Management Decision Support Systems. GIS based road network planning.

Suggested Learning Resources:
1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015.
4. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
5. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
6. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

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Course Code	:	
Course Title	:	**Renewable Energy Technologies**
Number of Credits	:	3(L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	OE

Course Objective:

Following are the objectives of this course:
- To understand present and future scenario of world energy use.
- To understand fundamentals of solar energy systems.
- To understand basics of wind energy.
- To understand bio energy and its usage in different ways.
- To identify different available non-conventional energy sources.

Course Outcomes:

On completion of the course, the student will be able:
- Understand the importance of renewable energy.
- Understand the methods of harnessing the solar energy.
- Understand the methods of harnessing the solar energy.
- Understand the biomass energy conversion and other hybrid systems.

Unit I: Introduction:

World Energy Use, Environmental Aspects of Energy Utilisation, Renewable Energy Scenario in India and around the World, Potentials and Economics of renewable energy systems.

Unit II: Solar energy:

Solar Radiation, Measurements of Solar Radiation, Flat Plate and Concentrating Collectors, Fundamentals of Solar Photo Voltaic Conversion, Solar Cells, Solar PV Power applications.

Unit III: Wind Energy:

Wind Data and Energy Estimation, Types of Wind Energy Systems, Performance, Site Selection, Details of Wind Turbine Generator. Safety and environmental aspects.

Unit IV: Bio Energy and Other Renewable Energy Sources:

Biomass direct combustion, Biomass gasifiers, Biogas plants, Bio diesel, Biomass applications Tidal energy; Wave Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

Suggested Learning Resources:

1. Energy Technology, O.P. Gupta, , Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J JKraushaar, Second Edition, John Willey & Sons, New York, 2006. 8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

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Course Code	:	
Course Title	:	**Artificial Intelligence (AI)**
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	OE

Course Objectives:

Following are the objectives of this course:
- To understand foundations and Applications of AI.
- To learn Probabilistic Reasoning and other search algorithms.
- To study different models of evolution and learning of fuzzy techniques, their applications.
- To introduce the concepts of Biological and Artificial neural networks.
- To understand different neural architectures with supervised learning and their learning mechanisms.
- To study different models of evolution and learning of fuzzy techniques, their applications.

Course Outcomes:

After competing this course, student will be able to:
- Understand and analyze working of an AI technique using Heuristic search
- Explain the concept of Fuzzy logic
- To differentiate between Biological Neuron & Artificial Neuron and different Neuron Models
- To analyze activation & synaptic dynamics of Neural Networks

Course Content:

Unit – I
- Introduction to Artificial Intelligence • Artificial Intelligence (AI) definition • Goals of AI • History of AI • Applications of AI.

Unit– II
- Search Algorithms Terminology • Brute Force Search Strategies – Breadth First Search, Depth First Search. • Heuristic Search Strategies, Local Search Algorithms.

Unit– III
- Fuzzy Logic Systems Introduction to Fuzzy Logic and Fuzzy systems, • Membership functions, • Fuzzification/Defuzzification

Unit– IV
- Neural Networks Basic structure of Neural Networks • Perceptron • Back-propagation

Suggested Learning Resources:

1. Artificial Intelligence By Example: Develop machine intelligence from scratch using real artificial intelligence use cases. Denis Rothman. Packt Publishing ISBN – 978-1788990547
2. Artificial Intelligence – A Modern Approach (3rd Edition), Authors Russell, Norvig, ISBN: 9789332543515, 9332543518, Edition: 3rd Edition, 2015, Pages: 1168
3. Artificial Intelligence: The Basics, Author-Kevin Warwick, Publisher- Routledge; 1st edition (18 August 2011), ISBN-10 : 0415564832, ISBN-13 : 978-0415564830

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Course Code	:	
Course Title	:	**Entrepreneurship and start-ups**
Number of Credits	:	0 (L: 2, T: 0, P:0)
Prerequisites	:	Nil
Course Category	:	

Course Objectives:
- Acquiring Entrepreneurial spirit and resourcefulness.
- Familiarization with various uses of human resources for earning dignified means of living.
- Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation
- Acquiring entrepreneurial quality, competency, and motivation.
- Learning the process and skills of creation and management of entrepreneurial venture

Course Outcome:
On completion of the study of the subject the student will be able to
- Understanding the dynamic role of entrepreneurship and small businesses
- Organizing and Managing a Small Business
- Financial Planning and Control
- Forms of Ownership for Small Business
- Strategic Marketing Planning
- New Product or Service Development
  Business Plan Creation

Course contents

Unit -I

Introduction to Entrepreneurship and Start – Ups: Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation, Types of Business Structures, Similarities/differences between entrepreneurs and managers.

Unit -II

Business Ideas and their implementation: Discovering ideas and visualizing the business, Activity map, Business Plan.

Unit -III

Idea to Start-up: Market Analysis – Identifying the target market, Competition evaluation and Strategy, Development. Marketing and accounting, Risk analysis, Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy.

Unit -IV

Management, and Financing & Protecting Ideas

Company's Organization Structure, Recruitment and management of talent, Financial organization and management, Financing methods available for start-ups in India, Communication of Ideas to potential investors – Investor Pitch, Patenting and Licenses.

Text And Reference Books:

1. The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company Steve Blank and Bob Dorf K & S Ranch ISBN – 978-0984999392

2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses Eric Ries Penguin UK ISBN – 978-0670921607
3. Demand: Creating What People Love Before They Know They Want It Adrian J. Slywotzky with Karl Weber Headline Book Publishing ISBN – 978-0755388974
4. The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business Clayton M. Christensen Harvard business ISBN: 978-142219602

Course Code	:	AU302
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 2, T:0; P:0)
Prerequisites (Course code)	:	None
Course Category	:	AU

Course Content

Unit 1 – The Constitution - Introduction

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

Unit 2 – Union Government

- Structure of the Indian Union
- President – Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

Unit 3 – State Government and Local Administration

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat
- District Administration
- Municipal Corporation
- Zila Panchayat

Unit 4 – Election Commission

- Role and Functioning
- Chief Election Commissioner, State Election Commission

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1.	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3.	Introduction to the Constitution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

MAJOR PROJECT

Course Objectives:

4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.
6. Plan, Analyse, Design and implement a project.

Course Outcomes: Students should be able to do the following:

4. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
5. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
6. Prepare and submit the Report and deliver presentation before the departmental Committee.

Students are required to choose a topic for major project related to the courses of this semester. Student has to implement and present the project as per the given schedule. During the implementation of the project, student has to follow the schedule given below. Report of the project work has to be submitted for evaluation.

Schedule:

S.No	Description	Duration
1.	Problem Identification / Selection	5 weeks
2.	Preparation of Abstract	2 week
3.	Design, Implementation & Testing of the Project	12 weeks
4.	Documentation & Project Presentation	5 weeks

Guidelines for the Award of marks:

S.No	Description	CIE Max. Marks 120	SEE Max. Marks 80
1.	Weekly Assessment	30	--
2.	Design/ Implementation	50	20
3.	Presentation	20	20
4.	Viva Voce	20	20
5.	Report	-	20

Final Major Project demonstration and PPT presentation is to be evaluated for the entire class together by the entire faculty handling Major Project for that class.