Academic Regulations

Program structure & Detailed Syllabus

For

Under Graduate Programme (B.Tech)

CIVIL ENGINEERING

(Applicable For Batches Admitted From 2019 – 2020)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS)

DUVVADA - VISAKHAPATNAM – 530 049

(An Autonomous Institute, Accredited by NAAC, Affiliated to JNTUK, Kakinada, AP)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY

(AUTONOMOUS)

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ACADEMIC REGULATIONS

(VR 19)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS)

VISAKHAPATNAM

ACADEMIC REGULATIONS for B. Tech. (Regular)

(Applicable for the batches admitted from 2019-20)

The Admission of students into B.Tech. Program shall be as per Govt. of Andhra Pradesh rules.

1. **Award of B. Tech. Degree**

   A student will be declared eligible for the award of the B. Tech. degree if he/she fulfils the following academic regulations.

   a. Pursue a program of study for not less than four academic years and not more than eight academic years.
   b. For the award of a degree, regular candidate has to register for 160 credits and shall secure 160 credits.
   c. For lateral entry scheme admission: A program of study for not less than three academic years and not more than six academic years. Candidate has to register for 120 credits and shall secure 120 credits.

2. **Programs of Study**

   The following programs of study are offered at present for specialization in the B. Tech. Program.

Program Code	Program & Abbreviation
01	Civil Engineering (CE)
02	Electrical and Electronics Engineering (EEE)
03	Mechanical Engineering (ME)
04	Electronics and Communication Engineering (ECE)
05	Computer Science and Engineering (CSE)
12	Information Technology (IT)
19	Electronics and Computer Engineering (E.COMP.E)
54	*Artificial Intelligence and Data science (AID)

And any other Course as approved by the authorities of the Institute from time to time.

*code will be assigned later

3. **Registration**

A student shall register for courses in each semester as per the courses offered by the concerned department.

4. **Curricular Program**

The Curriculum of the four-year B. Tech course has been designed to achieve a healthy balance between theory & laboratory hours, industry experience and to develop technical skills required for a career in the industry or a career in research.

5. **Distribution and Weightage of Marks**

i) The performance of a student in each semester shall be evaluated course-wise with a maximum of 100 marks for theory and 50 marks for practical course.

ii) For courses involving laboratory with theory as **integrated course**

Theory and practical will be evaluated for 100 and 50 marks respectively

The credits will be awarded only if a student gets 50% marks independently in theory part as well as practical part

For theory course (including all types of electives), the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Examinations.

5.1. Special Courses:

5.1.1. **Engineering Exploration (EE) course:**

EE course is evaluated for 50 marks.
i) Internal 20 marks shall be awarded based on the day-to-day performance of the activities.

ii) External examination shall be conducted for 30 marks.

5.1.2.Constitution of India course will be totally internal evaluation

5.1.3.Extra-Curricular Activities, sports & games: Though this course has no credits, it is mandatory to satisfy minimum attendance of 80%.

5.2. Mini project–I (Societal relevant project): It is to be carried out during the second year. Students have an option to choose their own area of interest related to problems impacting the society. It is evaluated for 50 marks.

     i)   Internal assessment for 20 marks   ii)   External assessment for 30 marks

5.3. Mini project-II: It is carried out during the third year. The students have an option to choose their own area of interest which may be related to the course work. Evaluation procedure is same as Mini project-I.

5.4. Main Project/Internship

Main project/Internship shall be carried out in the IV-year and evaluated for 200 marks.

Internship is to create a platform for a job or further research in the chosen area. Eligible students based on merit may opt for a full semester Internship during the fourth year in the industry of same discipline.

5.5. MOOCs: A massive open online course (MOOC) is an online course aimed at large-scale interactive participation and open access via the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for the students, professors, and teaching assistants (TAs). MOOCs are a recent development in distance education. Up to 40% of credits per semester as per recent UGC circular in the curriculum may be taken as MOOC course. It is an online course (Minimum of 12 weeks) to promote advanced knowledge suitable for placement and research.

To award credits, the student should get certificate after they have registered for written exam and successfully passed

(Or)

College will conduct the written examination/Viva-voce and award the credits and grades.

In case a student fails in any online course, he/she may be permitted to register for the same course when offered. If the same course is not available an alternate course decided by department level committee may be registered and successfully passed. The internal marks secured earlier are nullified if the course is changed. The assessment procedure of MOOCs course remains same as general theory course.

Note: The registered course must not be same as any of the courses listed in the program structure of their regulation till final year.

5.6. Technical seminar: Technical seminar is carried out during the Thirdyear. For Technical seminar, the student shall present on an emerging/specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated through presentation by the Departmental Committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

5.7. Audit courses: List of audit courses will be notified from time to time. An indicative list of the courses is as shown below.
i) Environmental science, ii) Constitution of India, iii) Extra-curricular activities, sports & games, iv) Professional ethics & Human values

All audit courses will be "Pass/Fail" courses with no specific credit point allotted. The result of the student in the audit course will be notified in the marks memo. A student must pass all the audit courses registered to be eligible for the award of B.Tech. degree.
Note: Audit course will be totally internal evaluation (paper setting as well as valuation will be done by internal expert). Mid and End semester examinations shall be conducted for all Audit courses. It is mandatory to pass all Audit Courses**.**

6. Attendance Requirements:

Aggregate 75% of the attendance is required for promotion to next semester.

Student will not be permitted to write Mid examination if the attendance percentage is less than 75 % during the stipulated instruction duration. However, Academic Monitoring Committee shall review the situation and take appropriate decision.

Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee based on genuine medical grounds. *This privilege is given only three times for regular student and only two times for lateral entry student during the entire program of study*.

A stipulated fee shall be payable towards condonation of shortage of attendance.

Shortage of attendance may be considered for the students who participate in sports at National/International level, co and extra-curricular activities if their attendance is in the minimum prescribed limit.

Note-1: Special cases for students having extraordinary performance at National and International level will be considered by the Academic monitoring committee.

Note -2: Shortage of Attendance below 65% in aggregate shall not be considered for promotion.

7. Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements.

For all courses**,** student is considered to be passed upon securing minimum 40% marks in the external examination alone and minimum 50% marks from both internal and external examination put together.

Note: For courses where there is no internal evaluation or no external evaluation, pass mark is 50%.

8. Promotion Policy

For Regular Students:

    i.   For promotion to II Year from I Year, a student has to secure minimum 50% of total credits in the I year courses.

   ii.   For promotion to III Year from II Year, a student has to secure minimum 50% of total credits in the II Year courses.

  iii.   For promotion to IV Year from III Year, a student has to secure minimum 50% of total credits in the III Year.

For Lateral Entry Students:

    i.   For promotion to III Year from II Year, a student has to secure minimum 50% of total credits from II Year courses.

   ii.   For promotion to IV Year from III Year, a student has to secure minimum 50% of total credits in the III Year.

9. **Supplementary examinations**: Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even semester and vice versa.

In case of failure in any course, a student may be permitted to register for the same course when offered.

In case of integrated courses, student has to reappear for failed part only (Theory part/Laboratory part), but credits will be awarded only after both parts are successfully completed.

Advance supplementary examination shall be conducted for IV Year, I semester courses during the study of IV Year, II semester.

Note: Instant Supplementary Examination will be conducted for one course from IV B. Tech- II Semester courses at the end of the program after declaration of results.

10. Grading System and award of class

10.1. Grading system

CGPA

Marks Range (in %)	Letter Grade	Level	Grade Point
≥ 90	O	Outstanding	10
≥80 to <90	A	Excellent	9
≥70 to <80	B	Very Good	8
≥60 to <70	C	Good	7
≥50 to <60	D	Satisfactory	6
<50	F	Fail	0
		Absent	-1
		Withheld	-2
		Malpractice	-3

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average. (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA $(S_i) = \Sigma (C_i \times G_i) / \Sigma C_i$

Where C_i is the number of credits of the ith course and G_i is the grade point scored by the student in the ith course.

Computation of CGPA

- The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

CGPA $= \Sigma(C_i \times S_i) / \Sigma C_i$

Where S_i is the SGPA of the ith semester and C_i is the total number of credits in that semester.

- Equivalent Percentage = (CGPA – 0.75) X 10

10.2. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	**From the CGPA secured from 160 Credits.**
First Class with Distinction	≥ 7.75 without course failures during entire duration of study	
First Class	≥ 6.75 to <7.75	
Second Class	≥ 5.75 to < 6.75	

11. General Instructions

  i. Where the words 'he', 'him', 'his', occur, they imply 'she', 'her', 'hers', also.

 ii. The academic regulations should be read as a whole for the purpose of any interpretation.

iii. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council is final.

 iv. The college may change or amend the academic regulations or syllabi from time to time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institution.

12. Transcripts: After successful completion of the entire program of study, a transcript containing performance of all academic years will be issued as a final record. Partial transcript will also be issued up to any point of study to a student on request, after payment of requisite fee

13. **Transitory Regulations:** If a student is detained and has to get Re-admitted and follow the same regulation of year of admission.

Transfer cases:

- Transfer from other institutions is permitted as up to II Yr Second semester.
- A committee will be constituted for mapping the courses and credits.
- Student should not have any backlogs at the time of applying.

14. Minimum Instruction Days

- The minimum instruction days for each semester shall be 16 weeks.
- There shall be no branch transfers after the completion of the admission process.

15. Withholding of Results

If the student has not paid the fee dues, if any, to the Institute or in any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

Note: All other regulations including attendance requirements related to four year B.Tech Regular program will be applicable for B.Tech. Lateral Entry Scheme.

16. Malpractices Rules

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/ Improper conduct	Punishment
1 (a)	If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters

		from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the candidate smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	If the candidate refuses to obey the orders of the Chief Superintendent/Assistant - Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	conduct of the examination.	
7	If the candidate leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the candidate possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and. a police case will be registered against them.
10	If the candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that

		semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic committee of the Institute for further action to award suitable punishment.	

17. UGC RECOMMENDED PUNISHMENT FOR RAGGING

i. Suspension from attending classes and academic privileges

ii. Withholding/withdrawing scholarships/fellowship and other benefits.

iii. Debarring from appearing in any test/examination or other evaluation process

iv. Withholding results

v. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.

vi. Suspension/expulsion from the hostel

vii. Cancellation of admission

viii. Rustication from the institution for period ranging from 1 to 4 semesters.

ix. Expulsion from the institution and consequent debarring from admission to any other institution for a specified period.

x. Fine may extend up to Rs. 2.5 lakh.

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY: VISAKHAPATNAM

DEPARTMENT OF CIVIL ENGINEERING

PROGRAM STRUCTURE (VR-19)

I Year- I Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191100	Mathematics-I	3	1*	0	3
2.	1000191120	Engineering Physics	3	1*	3	4.5
3.	1000191121	Technical English Communication	2	0	3	3.5
4.	1003191100	Engineering Mechanics	3	1*	0	3
5.	1005191120	Problem Solving and Programming using C	3	1*	3	4.5
6.	1000191130	Constitution of India	1	0	0	0
		Total Credits:				**18.5**

I Year – II Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191101	Mathematics-II	3	1*	0	3
2.	1000191200	Transforms and Vector Calculus	3	1*	0	3
3.	1000191220	Engineering Chemistry	3	1*	3	4.5
4.	1002191200	Fundamentals of Electrical and Electronics Engineering	3	0	0	3
5.	1003191101	Engineering Drawing	1	0	4	3
6.	1001191210	Civil Engineering Workshop	1	0	4	3
7.	1000191110	Engineering Exploration	0	0	4	2
8.	1000191131	Extra-curricular Activities, Sports and Games	0	0	4	0
		Total Credits:				**21.5**

Total Credits= 18.5 + 21.5 = 40

II Year- I Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1000192100	Complex Variables and Statistical Methods	3	1*	0	3
2	1001192120	Surveying	3	1*	3	4.5
3	1001192100	Building Materials and Construction	2	0	0	2
4	1001192121	Strength of Materials	3	1*	3	4.5
5	1001192122	Fluid Mechanics	3	1*	3	4.5
6	1001192101	Building Planning & Drawing	2	1*	2	3
Total Credits:						**21.5**

II Year- II Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1001192200	Structural Analysis	3	1*	0	3
2	1001192220	Transportation Engineering	3	1*	3	4.5
3	1001192221	Hydraulics and Hydraulic Machinery	3	1*	3	4.5
4	1001192222	Environmental Engineering	3	1*	3	4.5
5	1020192100-10201921002	Open Elective-1	3	0	0	3
6	1000192130	Environmental Science	2	0	0	0
7	1000192110	Communication Skills Lab	0	0	2	1
8	1001192170	Mini Project-I (EPICS/Societal Relevant Project)	0	0	2	1
Total Credits:						**21.5**

Open Elective-I		
S. No.	**Course Code**	**Course Title**
1	1020192100	Employability Readiness Program-I
2	1020192101	Public Administration
3	1020192102	Foreign Linguistic - French

III Year- I Semester

S.No.	Course Code	Name of the Subject	L	T	P	Credits
1	1099192100	Managerial Economics and Financial Analysis	3	0	0	3
2	1001193120	Concrete Technology	2	1*	3	3.5
3	1001193121	Geotechnical Engineering	3	1*	3	4.5
4	1001193100	Hydrology and Water Resources Engineering	3	1*	0	3
5	1001193101	Design of Reinforced Concrete Structures	3	1*	0	3
6		Open Elective-2	3	0	0	3
7	1001193180	Technical seminar	0	0	0	1
8	1099193130	Professional Ethics and Human Values (Audit Course)	2	0	0	0
		Total Credits				**21**

Program Structure

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Detailed Syllabus

I Year- I Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191100	Mathematics-I	3	1*	0	3
2.	1000191120	Engineering Physics	3	1*	3	4.5
3.	1000191121	Technical English Communication	2	0	3	3.5
4.	1003191100	Engineering Mechanics	3	1*	0	3
5.	1005191120	Problem Solving and Programming using C	3	1*	3	4.5
6.	1000191130	Constitution of India	1	0	0	0
Total Credits:						**18.5**

Course Code	MATHEMATICS – I	L	T	P	Credits
1000191100		3	1	0	3

Course Overview:

This course deals with differential equations and its application with more focus on Engineering Mathematics. This course helps the students to learn relevant mathematical tools which are required in the analysis of problems in engineering and scientific professions. Topics included in this course are functions of two variables, higher order linear differential equations, Laplace Transforms, Inverse Laplace transforms, Partial differential equations of first order.

Course Objectives:

1. Utilize mean value theorems to find the characteristics of the function and acquire the knowledge maxima and minima of functions of two variables.
2. To discuss higher order differential equations.
3. To discuss Laplace Transform and its properties.
4. To apply Inverse Laplace transform to different types of functions and to solving initial value problems.
5. To solve first order partial differential equations by analytical methods.

Course Outcomes: The student will be able

	Course outcome	Level as per Bloom's Taxonomy	PO number mapped
CO1	To understand the mean value theorems and evaluate maxima and minima of functions of two variables without constraints.	L2, L4	PO1 PO2
CO2	To understand different analytical methods to solve higher order linear differential equations.	L2, L3	PO1 PO2
CO3	To understand Laplace transform technique to solve initial and boundary value problems arising in engineering stream.	L2, L3	PO1 PO2
CO4	To understand solution of first order linear partial differential equations.	L2, L3	PO1 PO2

UNIT- I

Mean Value Theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's Mean value Theorem. Functions of several variables – Jacobian – Functional dependence – Maxima and Minima of functions of two variables without constraints.

Outcome: The student is able to find stationary point of a curve and extreme values of a given function.

Activity/Event: Finding Extreme value of functions of two variables.

UNIT II

Linear Differential Equations of Higher Order: Non-homogeneous linear differential equations of second and higher order with constant coefficients with non-homogeneous terms of the type e^{ax}, sin ax, cos ax, x^k, method of variation of parameters.

Outcome: The student will be able to solve higher order linear differential equations with constant coefficients.

Activity/Event: Finding current in LCR circuits.

UNIT -III

Laplace Transforms: Introduction - Laplace transforms of standard functions – Shifting Theorems - Transforms of derivatives and integrals - multiplication by t^n - division by t – Unit step function, Unit impulse function.

Outcome: The student will be able to Understand Laplace transform of standard functions.

Activity/Event: Seminar by student.

UNIT -IV

Inverse Laplace Transforms: Introduction - Properties – Inverse Laplace by using partial fractions and Convolution theorem (without proof)-solving initial and boundary value problems by using Laplace Transform.

Outcome: The student is able to apply Inverse Laplace transform of standard functions.

Activity/Event: The student will be able to apply Inverse Laplace transform technique to solve differential equations with given initial conditions.

UNIT-V:

Partial Differential Equations of first order: Solutions of first order linear (Lagrange) equation and nonlinear (standard type $f(p, q) = 0, f(z, p, q) = 0, f(x, p) = g(y, q) \& claurits$) equations.

Outcome: Student is able to solve first order partial differential equation by different analytical methods.

Activity/Event: Modeling the linear first order PDE and solving.

Text Books:

1. Higher Engineering Mathematics by H.K. Dass, S.Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.

Reference Books:

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications (P) Ltd.
4. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

Course Code	ENGINEERING PHYSICS	L	T	P	Credits
1000191120		3	1	3	4.5

Course Overview:

The course covers the topics of crystal structures, crystal systems, X-ray diffraction and their applications. Further, deals with the concepts of Oscillations, Acoustics, Ultrasonics, lasers, optical fibers and nanomaterials.

Course Objectives:

To introduce the basic concepts of crystallography, X-ray diffraction, Oscillations, Acoustics and Ultrasonic's. Further, to enhance the knowledge related to lasers, optical fibers and its different components to make it suitable for various purposes. Also, provide an insight into latest research topics of nanomaterials synthesis and characterization.

	Course outcome	Level as per Bloom's Taxonomy	PO number mapped
CO1	Apply the knowledge of crystal systemsand X-ray diffraction techniques.to identify thecrystal structure of materials.	L2 L3	PO-1, PO-2 PO-9, PO-12
CO2	Apply the knowledge of acoustics and ultrasonics for characterization of acoustics design and non-destructive testing.	L2 L3	PO-1, PO-2, PO-9, PO-12
CO3	Describe the wave phenomena and apply these concepts for construction of Lasers and optical fibers.	L2 L3	PO-1, PO-2, PO-12
CO4	Discussthe properties and synthesis techniques of nanomaterials.	L2 L3	PO-1, PO-2, PO-9, PO-12

UNIT-I

CRYSTAL STRUCTURES:

Introduction to solids -Fundamental terms of crystal structures - Unit cell- coordination number- Lattice parameters – seven crystal systems - Bravais' lattices - Packing factor for Simple cubic, Body centered cubic and Face centered cubic.

Outcome: Student will able to understand the basic concepts of crystal structures and crystal systems.

Activity:

(Virtual lab experiment): To study various crystals structures

UNIT II

CRYSTAL PLANES AND X-RAY DIFFRACTION:

Introduction— Important features and significance of Miller indices - Crystal planes – Separation between successive (h k l) planes in a cubic crystal - Bragg's law - Experimental technique for X-ray diffraction: Laue method (single crystal).

Outcome: Student will be able to identify various planes in a crystal and understand the structural determination of crystals using X-ray diffraction.

Activity:
- ➢ Building models of simple cubic (SC), face centered cubic (FCC) and body centered cubic (BCC) using commercially available wooden sticks

Experiments:
- ➢ Determination of lattice constant of cubic crystal material by powder XRD pattern

Unit-III

OSCILLATIONS AND VIBRATIONS:
Introduction - Simple Harmonic Motion- Damped Harmonic Oscillator - Forced oscillations.

ACOUSTICS AND ULTRASONICS:

ACOUSTICS: Introduction **-** Reverberation time - Sabine's formula – Acoustics of concert-hall,

ULTRASONICS: Ultrasonics production (Magnetostriction and piezoelectric method) – Applications of Ultrasonics

Outcome: Student will be able to understand the knowledge of Ultrasonics to understand non-destructive testing and also understand the nature and characterization of acoustic design.

Activity:
- ➢ To find the velocity of sound waves in a given rod with Kundt's tube apparatus.
- ➢ To find the Young's modulus of the material of the rod.

Experiments:

- ➢ Determination of Rigidity modulus of a material – Torsional pendulum
- ➢ Determination of 'g' from Compound pendulum
- ➢ Melde's Experiment – Transverse and Longitudinal Modes
- ➢ Determination of Velocity of Ultrasonic waves in a given liquid using Ultrasonic Interferometer
- ➢ Sonometer – verification of transverse laws
- ➢ LCR series and parallel resonance

Unit-IV:

LASERS AND FIBER OPTICS:

LASERS: Characteristics of laser light – stimulated absorption, spontaneous and stimulated emission of radiation – population inversion (2-level, 3-level and 4–level schemes) - Einstein coefficients – Basic components of laser - Ruby laser – He - Ne laser and applications of lasers.

FIBRE OPTICS: Principle of optical fiber – acceptance angle, numerical aperture and Applications of optical fibers.

Outcome: Students will be able to understand the basic concepts of optical fiber and laser. Also working principle of Ruby, He-Ne and optical fibers. Further, their applications in day-to-day life.

Activity:

➢ To calculate the beam divergence and spot size of the given laser beam.

Experiments:

➢ Determination of particle size of lycopodium powder using semiconductor laser.
➢ Evaluation of Numerical Aperture of a given fiber
➢ To determine the bending losses of Optical fibers.

Unit-V:

NANOMATERIALS:
Introduction- Zero, one and two dimensional nanomaterials, Synthesis of nanomaterials: top-down and bottom- up approaches; - Ball milling & Sol-gel, Applications of nanomaterials.

Outcome: Student will able to understand the properties of nanomaterials and their synthesis and apply the knowledge to produce nanomaterials for different applications.

Activity: Identification of nanomaterials.

Experiments:

➢ Determination of nanoparticle size of a lycopodium powder using semiconductor laser
➢ Preparation of nanoparticles of silver

Text Books:

1. Solid State Physics, A. J. Dekker, Macmillan India Pvt. Ltd., (2011)
2. Introduction to Solid State Physics, C. Kittel, Wiley india Pvt. Ltd, (2012)
3. R. N. Chaudhury, waves and oscillations, 2nd edition, new age publications,2001, ISBN (13): 978-81-224-2842-1
4. Solid State Physics: Structure and Properties of Materials, M. A. Wahab, Narosa Publishing House Pvt. Ltd. (2005)

Reference Books:

1. University Physics by Young and Freedman, Pearson Education (2012)
2. A Text Book of Engineering Physics by Dr. M. N. Avadhanulu and Dr. P. G. KshiraSagar, S.Chand& Company Ltd., (2014).
3. Fundamentals and Applications of Ultrasonic Waves by J. David N. Cheeke, CRC Press LLC (2002).
4. Elements of X-Ray Diffraction, B. D. Cullity Pearson Education India; 3 editions (2014)
5. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004)
6. NANO: The Essentials: Understanding Nanoscience and Nanotechnology, T. Pradeep, McGraw Hill, 2017
7. Physics Vol 1& 2 (5ed), Resnick , Halliday, Krane, Wiley; Fifth edition (2007)

Course Code	TECHNICAL ENGLISH	L	T	P	Credits
1000191121	COMMUNICATION	2	0	3	3.5

Course Overview:

In this course students will read, analyze, and interpret material from general and technical fields, and will practice reading, writing, listening and speaking skills on a variety of contemporary topics.

Course Objectives:

- To introduce students to the specific use of English for Technical Communication.
- To develop the overall English proficiency of students and enable them to function effectively in different professional contexts.
- To strengthen student skills in the areas of reading, writing, listening and speaking and enable them to function effectively in their professional sphere

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	The students will be able to read, understand and interpret material on Environment, Science and Technology, tourism, Energy Sources, Social Awareness	Understanding (L2) and Applying (L3)	PO7, PO10, PO6, PO12
CO2	The students will be able to analyze the functions of language and grammar in spoken and written forms.	Applying (L3) and Analyzing (L4)	PO10, PO12, PO5
CO3	The students will be able to write effectively on various domains.	Applying (L3) and Creating (L5)	PO10, PO12
CO4	The students will be able to prepare and exhibit oral presentation skills by using ICT.(Individual/Team)	Applying (L3) and Creating (L5)	PO10, PO12, PO9, PO5

UNIT- I

Reading:1) How to Regain Green Cover 2) Solution to Plastic Pollution

Writing: Functional grammar [articles, prepositions of time, place, direction and movement, verb-tense, subject-verb agreement]

Listening: TED Talk on Water Harvesting (LC) –Answering comprehension based Qs ~ Listening to improve pronunciation

Speaking: Functional English(LC) ~ Introducing oneself

Outcomes: The student will be able to :

read, understand and interpret material on Environment.

speak about himself/herself.

listen to an audio and take notes from the audio clip.

Activities: Reading Comprehension- Note making while reading 1&2

   Letter Writing

Experiments:

     1**.** Just A Minute –Tell about oneself

     2. Note taking while listening to the TED talk

     3. Interactions

UNIT-II

Reading Texts: 1) The Hubble Telescope 2) Genesis of ISRO

Writing: Writing formal letters ~ Functional grammar ~Modals - Paraphrasing

Listening: Listening to a debate on " Colonizing the Moon" (LC) ~ Note Taking

Speaking: (LC) Making mini presentations on general topics

Outcomes: The student will be able to:

         read, understand and interpret material on Space Technology

     analyze the functions of language and grammar in spoken and written forms

write formal letters and paraphrase the text.

       prepare and exhibit oral presentation skills by using ICT(Individual/team)

Activities:
- Reading Comprehension
- Letter Writing-Formal

Experiments:

1. Making a mini presentation

Unit-III:

Reading Texts: 1) Southern Splendour 2) Tourism in India: Role in Conflict and Peace

Writing: Paragraph writing ~ Functional grammar [relative pronouns, comparative adjectives, adverbs]

Listening: (LC) Listening comprehension ~ Listening for global meaning ~ Listening for getting at the nuances and the mood of the speaker

Speaking: (LC) Telephonic Skills ~ participating in an interactive video and teleconferencing

Outcome: The students will be able to :

read, understand and interpret material on Travel.

write Paragraph and Essays with proper coherence.

pronounce the words with apt pronunciation

maintain proper telephonic etiquette.

Activities:

Reading Comprehension

Paragraph writing

Essay writing

Experiments:

1. Letters and Sounds- Some pronouncing Patterns
2. Telephonic Skills

Unit-IV:

Reading Texts: 1) Wind Energy 2) How pertinent is the nuclear option

Writing: Writing a formal E-mail

Speaking: Group Discussion (LC)

Listening: Listening to an Interview (LC) related to the text ~ listening critically for understanding the attitude/tone of the speaker

Outcome: The students will be able to:

read, understand and interpret material on Energy Sources.

write formal Email.

participate in Group Discussion without hesitation.

Activities:

Reading Comprehension

Email Writing

Experiments:

1. Group Discussion
2. Mock-Interview

Unit-V:

Reading Texts: 1) The Evolution of Media

2) The Top Ten Developments in Journalism in the 2000s

Writing: Interpret graphic tools [tables, pie & bar charts ~ writing an abstract ~ Leveraging ICT for communication ~ Preparing a PPT(LC)

Speaking: Making short presentations [individual/team] with the aid of PPT

Listening: Listening to Situation/Scene ~ Sub skills: Listening to understand one's viewpoint ~Listening to understand speaker's intention ~Listening for local understanding.

Outcome: The students will be able to:

read, understand and interpret material on Media.

interpret graphical data

present PPT without hesitation.

listen to a situation and respond

Activity:
Information Transfer

Experiment:
Oral Presentation

Suggested Books:
- Elango, K et.al 2014. Mindscapes: English for Technologists and Engineers, Orient Blackswan, Hyderabad.

Reference Books:
- Balasubrmanyam M. 1985. Business Communication. Vani Educational Books, New Delhi
- Balasubramanian T. 1989. A Text book of Phonetics for Indian Students. Orient Longman, New Delhi.
- Krishnaswamy, N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.
- Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd.New Delhi.
- Narayanaswamy V R. 1979. Strengthen your Writing. Orient Longman, New Delhi.
- Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge

Course Code	ENGINEERING MECHANICS	L	T	P	Credits
1003191100		3	1*	0	3

Course Overview:
This course introduces the principles required to solve engineering mechanics problems. It addresses the modeling and analysis of static equilibrium problems with an emphasis on real-world engineering applications and problem solving.

Course Objectives:
Learn how to resolve forces and understand the conditions of equilibrium.
To Understand and Analyze the Concept of Friction.
To identify the concepts of Centroid and Centre of Gravity and evaluate moment of inertia.
To understand the dynamics where the bodies subjected to motion are analyzed.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Analyze the force systems for equilibrium conditions and able to draw free body diagram.	Analyzing	PO1,PO2,PO3
CO2	Evaluate the frictional forces between contact surfaces.	Applying	PO1,PO2,PO3
CO3	Able to differentiate between centroid and centre of gravity and determine Centroid, centre of gravity and second moment of area for composite sections.	Applying	PO1,PO2,PO3
CO4	Analyse the motion and calculate trajectory characteristics.	Analyzing	PO1,PO2,PO3

Unit-I:

Introduction to Engg. Mechanics – Basic Concepts. **Systems of Forces :** Coplanar Concurrent Forces – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems, Graphical method for the equilibrium of coplanar forces. Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Lami's Theorem.

Outcome :
Able to draw Free Body Diagram and analyze the force systems for equilibrium   conditions.

Activity/Event :

Demonstration of Lami's theorem and Free Body Diagrams can be done by the students.

Unit-II:

Introduction to Friction- limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction. Applications – Ladder friction and wedge friction

Outcome:

Identify the areas of friction and find the frictional forces between contact points and surfaces.

Activity/Event :

Calculating the coefficient of friction for different materials

UNIT III :

Centroid : Centroids of simple figures (from basic principles) – Centroids of   Composite Figures
Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, pappus theorem.

Outcome:

Able to differentiate between centroid and centre of gravity and determine Centroid and CG for composite sections.

Activity/Event :

Different plane areas and solids will be given to students to identify centroid and centre of gravity.

Unit-IV:

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.
Mass Moment of Inertia: Moment of Inertia of Masses, mass moment of inertia of composite bodies.

Outcome:

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

Find MI of various composite sections based on related theorems.

Activity/Event :

Different plane areas and solids will be given to students to calculate area and mass moment of inertia

Unit-V:

Kinematics: Rectilinear motion – Velocity and Acceleration – Motion of Rigid Body **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation.

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System. Impulse momentum method.

Outcome:
At the end of the unit, the student should be able to solve problems related to kinematics and kinetics applying laws of motion, Apply the work energy concept to solve the kinetic problems.

Activity/Event :
Demonstration of the concepts of Kinematics through videos.

Text Books:

1. Engineering Mechanics - S. Timoshenko & D. H. Young., 4th Edn , Mc Graw Hill publications.
2. Engineering Mechanics: Statics and Dynamics,N H Dubey,Mc Graw Hill publications.

Reference Books:

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

Course Code	PROBLEM SOLVING AND PROGRAMMING USING C	L	T	P	Credits
1005191120		3	1*	3	4.5

Course Overview:

C is a basic building block for every language. It is a general Purpose Language. To develop the programming skills 'C' is the only platform to develop programming techniques for any type languages.

Programming is an increasingly important skill, whether you aspire to a career in software development, or in other fields. This is because programming is fundamentally about figuring out how to solve a class of problems and writing the algorithm, a clear set of steps to solve any problem in its class. This course will introduce you to a powerful problem-solving process. In this course, you will learn how to develop an algorithm, and then progress to reading code and understanding how programming concepts relate to algorithms.

Course Objectives:

✓ To understand computer programming and its roles in problem solving
✓ To understand and develop well-structured programs using C language

Course Outcomes:

	Course outcome	Skill	PO
CO1	Write compile and debug Programs in C language	Understand	PO1,PO2, PO3
CO2	Use operators, data types and write programs	Understand	PO1,PO2
CO3	Select the best loop construct for a given problem	Analyzing	PO3,PO5
CO4	Design and implement C programs	Analyzing	PO1,PO2 PO3,PO4, PO12

Unit-I:

Introduction to computers: Computer systems, computer Languages, computer number systems.

Introduction to C programming: Background and characteristics of C, Flow Charts, algorithms and pseudo code. Structure of a C Program, Input/output Statements in C, writing C programs, compiling and executing C programs.

Outcome:
✓ Illustrate flowchart and algorithm to the given Problem.
✓ Outline the Basic Structure of Computer.
✓ Explain the Structure of C Program

Activity/Event:
Design a flow chart and develop an algorithm for a real time application.

Unit-II:

Programming Style: Tokens of C, Keywords, Variables, Constants and rules to form variables and constants, Data Types, Declaration of Variables and initialization, Operators, Operator precedence and associativity. Type conversions

Flow of Control: Selection: Two way selection, multi-way selection

Repetition and Unconditional Control Statements: concept of loop ,pre test and post test loops, initialization and updating loops ,while statement, do-while statement, for statements, nested loops, break ,continue, goto.

Outcome:
- ✓ Explain basic Structure of the C-PROGRAMMING, declaration and usage of variables.
- ✓ Build C programs using operators and control structures.

Activity/Event:
- ✓ Build a C Program which has Linear Solution.

Unit-III:

Arrays and Strings:

Arrays: One-Dimensional Arrays, Declaration, Array Initialization, Input and Output of Array Values, Two-Dimensional Arrays.

Strings: String Fundamentals, String Input and Output, String manipulation functions.

Outcome:
- ✓ Build C programs to access arrays, strings and functions.
- ✓ Compare Array and Strings.
- ✓ Understand & Applying Various Library Functions

Activity/Event:
- ✓ Build a preprocessor directive for strings

Unit-IV:

Modular Programming:
Function and Parameter Declarations: Function definition, types of functions, declaration and definition of user defined functions, its prototypes and parameters, calling a function. Arrays as Function Arguments, Variable Scope, storage class, recursive functions.

Outcome:
- ✓ Explain modular Programming
- ✓ Identify Categories of Functions.

Activity/Event:
Simulate how function calls are handled in turbo c with a suitable example using structure chart

Unit-V

Pointers, Structures, Unions and files:

Pointers: Concept of a Pointer, Initialization of pointer variables, pointers as function arguments, address arithmetic, pointers to pointers, Pointers and arrays, Array of Pointers, parameter passing techniques. Dynamic memory allocation.

Structures and Unions: Structures declaration, Initialization of structures, accessing structures, unions.

Files: Declaring, Opening and closing file streams, Reading from and writing to text files.

Outcome:
- ✓ Explain the Concept of Dynamic memory allocation
- ✓ Develop C programs using pointers
- ✓ Outline basic concepts on files

Activity/Event :

Create array of structure dynamically for real-time application

Text Books:
- ➢ Programming in C, ReemaThareja, and Oxford.
- ➢ The C programming Language, Brain W.kernighan, Dennis Ritchie,2e,pearson
- ➢ C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage. Pub.

  Programming with C, Bichkar, Universities Press.

Reference Books:
- ➢ ANSIC Programming gary J.Bronson. Cengage learning.
- ➢ Let us 'C' by yashwant kanethkar, BPB Publications, 16 edition.

PROBLEM SOLVING AND PROGRAMMING USING C LAB

1. a) Write a C program to compute perimeter and area of rectangle

    b) Write a C program to calculate distance between points

    c) Write a C Program to Simulate 3 Laws of Motion

2. a) Write a C Program to convert Celsius to Fahrenheit and vice versa

    b) Write a C program to find maximum of three numbers using conditional operator.

3. a) Write a C Program to find Whether the Given Year is a Leap Year or not.

    b) Write a C Program to find grade of student.

    c) Write a menu driven program to compute area of different geometrical shapes

4. a) Write a C Program to Find Whether the Given Number is

    i)Strong number ii)perfect number

    b) Write a C Program to print the following between 1 to n

    i)Prime Number   ii) Armstrong Number

5. Demonstration of arrays& Strings

    a) Write a C program to perform Linear Search

    b) Write a C program to perform transpose of two matrices

    c) Write a C program to perform multiplication of two matrices

    d) Implementation of string manipulation operations with and **without** libraryfunction.

    i)copy   ii) concatenate iii)length   iv)compare

6. a) Write a C program to find cube of any number using function.

    b) Write a c program to find area and volume of geometric shapes using functions.

    c) Write a C program to check whether a number is even or odd using functions.

7. a) Write a C Program illustrating Fibonacci, Factorial using recursion

    b) Write a C program to find power of any number using recursion.

    c) Write a C program to find GCD and LCM using recursion

8. a) Write a C Program to Access Elements of an Array UsingPointer

    b) Write a C Program to find the sum of numbers with arrays andpointers.

    c)Write a c program to illustrate parameter passing techniques

9. a)Write a C Program to Store Information of a student UsingStructures

    b) Write a C program to create memory for int, char and float variable at run time.

10. a)Write a program in C to copy a file in another name

    b)Write a C program to append multiple lines at the end of file

Course code	**CONSTITUTION OF INDIA**	L	T	P	Credits
1000191130		3	0	0	0

Course Overview: This course introduces students to the Constitution of India. It begins by providing an overview of the history of the making of Indian Constitution. It then discusses the preamble and the basic structures of the Constitution. The fundamental rights, duties and the directive principles of state policy will be discussed thoroughly, followed by a discussion of the legislature, the executive and the judiciary. Some of the important sections of the Constitution that have influenced the history of India since independence will also be taken up for study. These include emergency powers and special provisions.

Course Objectives:
1. To Enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative

	Course outcome	**Bloom's cognitive level**	**PO**
CO1	Have general knowledge and legal literacy and thereby to take up competitive examinations.	Understanding	PO-6 PO-8 PO-9
CO2	Understand state and central policies, fundamental duties.	Understanding	PO-6 PO-8 PO-9
CO3	Understand Electoral Process, special provisions.	Understanding	PO-6 PO-8 PO-9
CO4	Understand powers and functions of Municipalities, Panchayats and Cooperative Societies	Understanding	PO-6 PO-8 PO-9

Unit-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties

Outcome: After completion of this unit student will
● Understand the concept of Indian constitution
● Apply the knowledge on directive principle of state policy
● Analyze the History, features of Indian constitution
● Evaluate Preamble Fundamental Rights and Duties

UNIT II:

Union Government and its Administration Structure of the Indian Union. President: Role, power and position, PM and Council of ministers, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions

Outcome: After completion of this unit student will
● Understand the structure of Indian government
● Differentiate between the state and central government
● Explain the role of President and Prime Minister
● Know the Structure of supreme court and High court

Activity: role play of model parliament

Unit-III:

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Outcome: After completion of this unit student will
● Understand the structure of state government
● Analyze the role Governor and Chief Minister
● Explain the role of state Secretariat
● Differentiate between structure and functions of state secrateriate

Activity: Quiz role play of model assembly.

Unit-IV:

A Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role - CEO of Municipal Corporation PachayatiRaj: Functions ZilaPanchayat, CEO ZilaPanchayat

Outcome: After completion of this unit student will
● Understand the local Administration
● Compare and contrast district administration role and importance
● Analyze the role of Myer and elected representatives of Municipalities
● Evaluate Zillapanchayat block level organisation

Activity: Debate on pros and cons of local governance

Unit-V:

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:,

Outcome: After completion of this unit student will
● Know the role of Election Commission apply knowledge
● Contrast   and   compare   the   role   of   Chief   Election   commissioner   and Commissiononerate
● Analyze role of state election commission
● Evaluate various commissions of viz SC/ST/OBC and women

Activity: Debate on election system in India

Text Books:

1. Civics, Telugu Academy

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPolitics Hans
7. J. Raj IndianGovernment and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

I Year – II Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191101	Mathematics-II	3	1*	0	3
2.	1000191200	Transforms and Vector Calculus	3	1*	0	3
3.	1000191220	Engineering Chemistry	3	1*	3	4.5
4.	1002191200	Fundamentals of Electrical and Electronics Engineering	3	0	0	3
5.	1003191101	Engineering Drawing	1	0	4	3
6.	1001191210	Civil Engineering Workshop	1	0	4	3
7.	1000191110	Engineering Exploration	0	0	4	2
8.	1000191131	Extra-curricular Activities, Sports and Games	0	0	4	0
		Total Credits:				**21.5**

Course Code	MATHEMATICS – II	L	T	P	Credits
1000191101		3	1	0	3

Course Overview:

This course focuses on basic theoretical concepts and Engineering Mathematics. This course helps the students to understand mathematical tools required in the analysis of problems in Engineering and Scientific Professions. Topics included in this course are iteration methods, finite difference operators, interpolation, Numerical differentiation and integration, system of linear equations, Eigen values and Eigen vectors and quadratic forms.

Course Objectives:

1. To familiarize the students with numerical methods of solving the non-linear equations, Interpolation, Numerical differentiation and integration.
2. Course will illuminate the student in the standard concepts of Linear algebra.
3. Methods to solving system of linear equations and compute Eigen values & Eigen vectors of a real matrix.
4. To apply mathematical statements, ideas and results, with the correct use of mathematical definitions.

Course Outcomes: The student will be able

	Course outcome	Level as per Bloom's Taxonomy	PO number mapped
CO1	To understand to solve approximate rootsof an equation by using different numerical methods.	L2, L3	PO1 PO2
CO2	To understand different operators and find the relation among operators and apply forward and backward formulas for compute interpolating polynomial.	L2, L3	PO1 PO2
CO3	To understand different numerical methods to solve integrations and ordinary differentialequations.	L2, L3	PO1 PO2
CO4	To understand to solve the system of Linear equations by direct and iteration methods, and compute Eigen values and Eigen vectors of a matrix and study the nature ofQuadratic form.	L2, L3	PO1 PO2

UNIT- I

Solution of Algebraic and Transcendental Equations: Introduction: The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Outcome: The student will be able to understand numerical linear methods to solve non-Linear equation

Activity/Event: Solving zero of the polynomials by using different numerical methods (Ex. Spherical storage tank & floating ball problems).

UNIT II

Interpolation: Introduction– Forward Difference, Backward difference, Central difference operators –Newton's formulae for interpolation – Gauss' Central Difference Formulae – Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

Outcome: The student will be able to understand different numerical methods to compute the polynomial for the given data.

Activity/Event: Interpolating of an approximate curve for collecting data.

UNIT-III

Numerical Integration:: Trapezoidal rule – Simpson's $1/3^{rd}$ Rule –Simpson's $3/8^{th}$ Rule.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series- Euler's - Runge-Kutta 4th order.

Outcome: The student will be able to understand numerical techniques to solve definite integrals and first order IVPs

Activity/Event: Solving an approximate solution of first order IVP and numerical integrations.

UNIT-IV
Linear system of equations: Introduction-Rank-Echelon Form-Normal Form - Solution of Linear systems - Gauss elimination - Gauss Seidel method.

Outcome: Student will be able to understand to solve the system of Linear equations by analytical &numerical methods.

Activity/Event: Real-world problems can be formulated in terms of systems of linear equations and solving by using analytical and iterative methods.

UNIT-V:

Eigen values, Eigen vectors: Introduction - Eigen values - Eigen vectors - Properties (without proofs) - Cayley Hamilton theorem (without proof) - Inverse and power of a matrix by using Cayley Hamilton theorem, Reduction of Quadratic form to canonical form by using orthogonal reduction – Rank, index, signature.

Outcome: The student will able to find the Eigen values and Eigen vectors of a matrix.

Activity/Event: Finding inverse and powers of a matrix using Cayley Hamilton theorem. Study the nature of the Quadratic forms.

Text Books:

1. Higher Engineering Mathematics by H.K. Dass, S.Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.

Reference Books:

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications (P) Ltd.
4. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

Course Code	TRANSFORMS AND VECTOR	L	T	P	Credits
1000191200	CALCULUS	3	1	0	3

Course Overview:

The entire course is divided into 5 modules covering duly recognized areas and the main aim of this course is to provide a platform to the students to think, design, formulate and derive any problem encountered in real life situation. Topics included in this course are Fourier series, Fourier transform, multiple integrals and vector differentiation and integration.

Course Objectives:

- To enlighten the learners in the concept of multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

	Course outcome	Level as per Bloom's Taxonomy	PO number mapped
CO1	Formulate any period function in terms of sine and cosine	L6	PO1,PO2
CO2	Simplify a non periodic function as integral representation	L4	PO1,PO2
CO3	Apply multiple integration techniques in evaluating areas and volume bounded by region.	L3	PO1,PO2
CO4	Explain Gradient, divergence and curl operations in vector and scalar fields.	L2	PO1,PO2
CO5	Apply Green's, Gauss and Stokes theorem as the generalisation of fundamental theorem of integral calculus.	L3	PO1,PO2

UNIT- I

Fourier series: Determination of Fourier coefficients in interval $(0, 2l), (-l, l)$ – Even and odd functions

$(-l, l)$ - Half- range Fourier sine and cosine expansion in the interval $(0, l)$

Outcome: The student will be able to understand to construct Fourier series expansion for different periodic functions.

Activity/Event: Fourier series representation of piecewise continuous functions.

UNIT II

Fourier transforms: Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties (without proofs).

Outcome: The student will be able to find Fourier Integral and Transform of a function.

Activity/Event: Finding Fourier Transforms and Finite Fourier Transforms.

UNIT-III

Multiple integrals: Double and triple integrals – change of order of integration - Areas and Volumes (Cartesian coordinates).

Outcome: The student will able to evaluate areas by double integrations and volume by double and Triple integration.

Activity/Event: Finding areas and volumes in Cartesian systems.

UNIT-IV

Vector Differentiation: Scalar point function – vector point function – Vector differential operator – Gradient – directional derivative, angle between two surfaces- Divergence- Curl - scalar potential.

Outcome: The student will be able to understand the physical interpretation of Gradient, Divergent and Curl.

Activity/Event: Find the angle between the surfaces and work done by the force.

UNIT-V:

Vector Integration - Line integral – surface and volume integrals, Green's, Stoke's and Gauss Divergence theorems (without proofs).

Outcome: The student can able to apply Green's, Stoke's and Divergence theorem in evaluation of double and triple integrals.

Activity/Event: Find the work done by the force on a particle and flux through a surface.

Text Books:

1. Higher Engineering Mathematics by H.K. Dass, S.Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.

Reference Books:

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications (P) Ltd.
4. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

Course Code	ENGINEERING CHEMISTRY	L	T	P	Credits
1000191220		3	1	3	4.5

Course Overview:

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- To provide a basic understanding of various softening methods of hard water and municipal water treatment
- To build up knowledge in the concepts of refining of petroleum, knocking and to develop various alternate fuels.
- To train the students on the principles and applications of Polymers
- To acquire knowledge on setting and hardening of binding materials like cement and various properties of lubricants.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO number mapped**
CO1	Measure water quality parameters, corrosive environment and protection of precious metal	L-3	PO1,PO2,PO9
CO2	Analyze the different forms of energy sources	L-2	PO1, PO2
CO3	Identify different polymers and their functionalities	L-3	PO1,PO2,PO10
CO4	Acquire the knowledge on advanced materials	L-4	PO1,PO2

UNIT- I

Water Technology

Introduction –Soft water and hard water, Estimation of hardness by EDTA Method - Boiler troubles **-** scales and sludges, Boiler corrosion; potable water – specifications, water treatment - ion-exchange process, desalination of brackish water, reverse osmosis (RO) and electro dialysis.

Learning Outcomes:
After the completion of Unit I, the student will be able to

- List the differences between temporary and permanent hardness of water
- Explain the principles of reverse osmosisandelectro dialysis.

- Illustrate problems associated with hard water - scaleandsludge.
Explain the working principle of water treatment process.

Activity:
➢ Collection and analysis of hardness of different water samples

Experiments:

1. Determination of alkalinity of Water.
2. Determination of Hardness of a groundwater sample by using EDTA.
3. Estimation of amount of Copper by using Standard EDTA solution.

UNIT II:Fuel Chemistry

Introduction of Fuels – Types of fuels, calorific value and Bomb Calorimeter; Solid fuels - Analysis of coal (proximate & ultimate analysis) Liquid fuels - refining of petroleum; Cracking – knocking; anti - knocking agents. Bio diesel preparation

Learning Outcomes:
After the completion of Unit II, the student will be able to
- Select suitable fuels for IC engines
- Analyze the composition of coal sample and its significance.
- Develop the concept of anti-knocking agents used in IC engines.

Experiments:

1. Determination of percentage of Moisture content in a coal sample.
2. Preparation of Biodiesel.

Activity:

1. Determination of nitrogen by using kjeldahls method(Virtual lab)

Unit-III: Corrosion
Introduction to corrosion, dry corrosion with mechanism, electrochemical theory of corrosion with mechanism, Types of wet corrosion(differential aeration corrosion, galvanic corrosion, pitting corrosion & stress corrosion), protection – cathodic protection, corrosion inhibitors, Cathodic & Anodic coatings, Galvanizing and Tinning.

Outcome:

After the completion of Unit III, the student will be able to
- Discuss different types of protecting methods of metals.
- Demonstrate the corrosion prevention methods.

Activity:

➢ Identification of corrosion formation in different metals

Experiments:

1. Determination of Iron (II) by using standard $K_2Cr_2O_7$ solution.
2. Determination of Iron (II) by using standard $KMnO_4$ solution.

Unit-IV: Polymer Chemistry

Introduction to polymers, Classification of polymers, Types of polymerization (Addition, Condensation & copolymerization) with examples, properties of polymers (physical and mechanical).
Plastics - Thermoplastics & Thermosetting plastics, compounding of plastics, Moulding Techniques (Compression & Blow moulding) - Preparation, properties and applications of – PVC, and Bakelite.

Outcome:
After the completion of Unit IV, the student will be able to
- Explain the different types of polymers and their applications.
- Explain the preparation, properties and applications of Bakelite, & PVC

Activity: Identification and collection of various thermo and thermosetting plastics.
Experiments:
1. Preparation of a polymer (phenol-formaldehyde resin)

Unit-V: Cement and Lubricants (8)

Cement: Introduction to building materials – Portland cement, constituents, manufacturing process of Portland cement (wet process), setting & hardening of cement with chemical equations, decay of cement concrete.
Lubricants: Classification, Mechanism and Properties (Viscosity, Flash and Fire points)

Outcome: After the completion of Unit V, the student will be able to
- Identify the constituents of port-land cement.
- Explain the manufacturing of port-land cement.
- Demonstrate the scheme of concrete formation.
- Determine the flash and fire points of various fuels.

Activity:

➢ Collection and determination of properties of various lubricant oils.

Experiments:
1. Determination of viscosity of lubricant oil by using survismeter/redwood viscometer
2. Determination of percentage of Iron in Cement sample by colorimetry
3. Estimation of Calcium in port land Cement.
4. Determination of Flash and Fire points of any fuel

Text Books:

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

Reference Books:

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

Engineering Chemistry - Laboratory

Course objectives:

The student with the knowledge of the basic chemistry will understand and explain scientifically the various chemistry related problems in the industry/engineering and develop experimental skills for building technical competence. The student will be able to understand the new developments and breakthroughs efficiently in engineering and technology. The introduction of the latest (R&D oriented) topics will make the engineering student upgraded with new technologies.

List of Experiments:

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of alkalinity of Water.
2. Determination of Hardness of a groundwater sample by using EDTA.
3. Determination of Iron (II) by using potassium dichromate.
4. Determination of Iron (II) by using potassium permanganate.
5. Preparation of Biodiesel
6. Preparation of a Polymer (Phenol- Formaldehyde resin)
7. Determination of viscosity of lubricant oil by using survismeter/redwood viscometer
8. Determination of percentage of Iron in Cement sample by colorimetry
9. Estimation of Calcium in port land Cement
10. Determination of percentage Moisture content in a coal sample
11. Determination of Flash and Fire points of any Fuel.
12. Estimation of amount of Copper by using Standard EDTA solution

*Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Course outcomes:

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

CO1: Analyze & generate experimental skills.
CO2: Enhance the thinking capabilities in the modern trends of engineering & technology.
CO3: learn and apply basic techniques used in chemistry laboratory for preparation of Organic compounds.
CO4: Learn safety rules in the practice of laboratory investigation.

Course Code	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	Credits
1002191200		3	0	0	3

Course Overview:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

Course Objectives:

i. To memorize the basic electrical laws and analysis of circuits.
ii. To discuss the principle of operation and construction details of DC machines.
iii. To relate the principle of operation and construction details of transformer and AC rotating Machines.
iv. To classify the measuring instruments and study the principle of operation.
v. To study the operation of PN junction diode, BJT, Thyristor, (half wave, full wave rectifiers).

Course Outcomes:

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

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Apply Ohms Law and Kirchhoff's Laws and solve electrical circuits	Evaluate	PO1, PO2, PO3, PO4, PO9
CO2	Describe the constructional features of DC machines, select suitable starters for DC motors estimate losses and efficiency of DC motor.	Apply	PO1, PO2, PO3
CO3	Outline the constructional details and operating principles of AC machines and calculate the efficiency identify the characteristics, losses and efficiency of a three-phase induction motor.	Analyze	PO1, PO3
CO4	Identify the structure, operation and characteristics and applications of measuringinstruments and semiconductordevices.	Evaluate	PO1, PO2, PO3, PO4

UNIT – I: ELECTRICAL CIRCUITS

Basic definitions (charge, current, voltage, power, energy, **real power, reactive power, apparent power, power factor**) - Classification of network elements-Ohm's Law-Kirchhoff's Laws-series & parallel circuits (**R, L, C, RL, RC**) - **Representation of sinusoidal waveforms-peak and rms values- phasor representation** - star-delta transformations.

Outcome: Apply Ohms and Kirchhoff's Laws to solve various electrical circuits.

Activity/Event: Students will construct three circuits with more than one battery and bulb in series and parallel.

UNIT – II: DC MACHINES

Construction and Principle of operation of DC generator – EMF equation - Types of DC generators – Types of DC motors, –-Torque equation – Swinburne's Test - Speed control of DC shunt motor using Field control and Armature control methods. (Simple Numerical Problems only).

Experiments: Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator)- . Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method- Brake test on D.C. Shunt Motor.

Outcome: To understand the operation of DC generators and DC motors.

Activity/Event: Develop a mechanical moving arm using DC motors, battery and extra connections to control its speed.

UNIT – III: AC MACHINES

Transformers: construction and operation (core and shell type) – e.m.f equation – losses-OC and SC Test –efficiency and regulation.

Experiment: OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).

Three phase induction motor - Construction and operation - slip- torque equation- slip Torque characteristics- losses & efficiency (Simple numerical problems only).

Experiment: Brake test on 3-phase Induction motor (Determination of performance characteristics).

Synchronous machine: Construction and operation of alternator – Construction and principle of synchronous motor.

Experiment: Regulation of alternator by Synchronous impedance method.

Outcome: Outline the constructional details and principle of AC machines and calculate their losses and efficiency.

Activity/Event: Demo of cut view section of AC machines.

UNIT– IV: ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS

Classification of measuring instruments- deflecting, control and damping torques- Construction and operation of -Moving coil instruments- Moving Iron instruments, Wattmeter, Energy meter - Electronic Voltmeters (AC & DC) (Only Basic Theoretical Concepts).

Outcome: To measure various AC and DC electrical quantities like voltage, power, current, energy etc.

Activity/Event: To demonstrate the working of Measuring Instruments.

UNIT – V: SEMICONDUCTOR DEVICES AND APPLICATIONS

PN Junction Diode, VI Characteristics-Diode applications (Half wave & bridge rectifiers)-Bipolar Junction transistor - NPN and PNP- construction, operation, characteristics (CB, CE & CC configurations) – Single stage CE amplifier.

Experiments: PN junction Diode characteristics A. Forward bias, B. Reverse bias. (Cut in voltage & Resistance calculations)-Transistor CE Characteristics (Input and Output)- Half Wave & Full wave Rectifier- CE amplifiers.

Outcome: Identify structure ,construction, operation and applications of semiconductor devices

Activity/Event: Design a DC-DC step down converter.
Text Books:

1. Basic Electrical Engineering by S.K.BHATTACHARYA, Pearson Publications

2. Fundamentals of Electrical Engineering and Electronics by B.L. Theraja S.Chand Publications Volume I

3. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications.

4. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition

Reference Books:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 200Electrical Technology by Surinder Pal Bali, Pearson Publications.

2. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group.

3. Industrial Electronics by G.K. Mittal, PHI.

4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.

Course Code	**ENGINEERING DRAWING**	**L**	**T**	**P**	**Credits**
1003191101		1	0	4	3

Course Overview:
This course deals with the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Course Objectives:
To introduce the use and the application of drawing instruments and to make the students construct the polygons and curves.
To introduce orthographic projections and to project the points and lines parallel to one plane and Inclined to other.
To make the students draw the projections of the plane and solids inclined to one planes
To make the students draw isometric views of simple objects

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Understand the use of drawing instruments to construct the polygons and curves	Understanding	PO1,PO2,PO3
CO2	Learn the principle of orthographic projections. Draw Orthographic projections of points, lines.	Analyzing	PO1,PO2,PO3,PO12
CO3	Draw the various types of planes and solids its views in different Positions	Analyzing	PO1,PO2,PO3,PO12
CO4	Draw isometric views of simple objects	Analyzing	PO1,PO2,PO3,PO12

Unit-I:
Introduction to Engineering Drawing, Polygons: Construction of regular polygons, Curves use in Engineering Practice: Ellipse (General method and oblong Method only), Parabola & Hyperbol (General method only), Introduction to Scales: Vernier & Diagonal Scales.

Outcome :
The students able to learn the use of drawing instruments to construct the polygons, curves an various types of scales.
To enlarge or reduce the size of objects in representing them.
Activity/Event :
Demonstration of Ellipse ,Parabola , Hyperbola & polygons.

Unit-II:

Introduction to orthographic projections: Projections of points - Projections of straight lines: Line parallel to one plane and perpendicular to other plane, parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane. Straight lines inclined to both the planes.

Outcome:

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

The students able to learn the principle of orthographic projections.

Draw the projections of the lines inclined to both the planes H.P & V.P.

Activity/Event :

Demonstration of straight lines and its views.

UNIT III :

Projections of planes: Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

Outcome:

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

Draw the various types of planes and its views in different Positions .

Activity/Event :

Demonstration of Pentagon ,Hexagon, Heptagon& octagon.

Unit-IV:

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the plane only.

Outcome:

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

Draw the various types of solids and its views in different Positions.

Activity/Event :

Demonstration of cylinder, cone, prism & pyramids.

Unit-V:

Conversion of isometric views to orthographic views.

Conversion of orthographic views to isometric views.

Outcome:

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

Draw 3D view through isometric views & 2D view through orthographic views.

Activity/Event :

Demonstration of Isometric objects & views of the Isometric objects.

Demonstration of Auto CAD software & drawing & editing basic figures.

Text Books:

1. Engineering Drawing, N. D. Butt, Chariot Publications.
2. Engineering Drawing, K. L. Narayana & P. Kannaiah, Scitech Publishers.

Reference Books:

1. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers.
2. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age.

Course Code	CIVIL ENGINEERING WORKSHOP	L	T	P	Credits
1001191210		1	0	4	3

Course Overview:

Civil Engineering Workshop offers practical exposure experiments which include Setting out of a building, Wall construction, Computation of C.G and M.I, Installation of plumbing and fixtures, Plastering and Finishing of wall, Application of wall putty. painting a wall, base coat and laying of Tile flooring of one square meter, Preparation of soil cement blocks for masonry and testing for compressive strength, cover blocks for providing cover to reinforcement, Casting and testing of Fly ash Blocks.

Course Objectives:

The students will be explained
1. The setting out of building in the field
2. The construction of wall thickness 1½ bricks using English bond
3. The installation of plumbing and fixtures like Tap, T-Joint, Elbow, Bend, Threading
4. The application of wall putty, painting of wall base coat and laying of tile flooring
5. The casting and testing of fly ash blocks

Course Outcomes:

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

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Set out of building in the field	Applying	PO1, PO 2
CO2	Construct a wall of thickness 1½ bricks using English bond	Applying	PO1, PO2
CO3	Install plumbing the fixtures like Tap, T-Joint, Elbow, Bend, Threading	Applying	PO1, PO2
CO4	Apply wall putty, painting of wall base coat and laying of tile flooring	Applying	PO1, PO2

List of Exercises:

1. Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.
2. Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape and cross staff.
3. Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.
4. Construct a wall of height 50 cm and wall thickness 2 bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.
5. Computation of Centre of gravity and Moment of inertia of a given rolled steel section by actual measurements.
6. Installation of plumbing and fixtures like Tap, T-Joint, Elbow, Bend, Threading etc;
7. Plastering and Finishing of wall
8. Application of wall putty and painting a wall
9. Application of base coat and laying of Tile flooring of one square meter
10. Preparation of soil cement blocks for masonry and testing for compressive strength
11. Casting and testing of Fly ash Blocks
12. Preparation of cover blocks for providing cover to reinforcement

Requirements

1. Chain, Tape and Cross Staff
2. Bricks
3. Rolled steel sections
4. Tap, T-Joint, Elbow, Bend etc.
5. Cement and Paints
6. Fly ash and Reinforcement

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	ENGINEERING	L	T	P	Credits
1000191110	EXPLORATION	0	0	4	2

Course Overview:

This course aims in teaching the Inter disciplinary engineering knowledge to students with the help of activity-based learning. This course teaches "Engineering Design, Mechanisms, Platform based development & Data acquisition and analysis" concepts to cover the basic knowledge & practices of multiple engineering disciplines.

Course Objectives:

To understand the importance of multi-disciplinary Engineering knowledge in the current world, for making any project. To learn Engineering design process for creating any new product/system. To learn the fundamental practical knowledge for starting any inter-disciplinary project.

	Course Outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO number mapped**
CO1	Realize the purpose/Role of Engineer for solving social problems	Understand (Level 1)	PO6, PO7, PO8, PO9, PO12
CO2	Learn to Design a component/system in an engineering way	Apply and Analyze (Level 2 & 3)	PO1, PO3, PO5, PO9
CO3	Learn to use mechanisms, Arduino, sensors,motors.	Understand (Level 1)	PO1, PO3, PO5, PO9
CO4	Integrating different systems (mechanical/Electrical/computer) to work as a unit	Apply and Analyze and Create (Level 3, 4 & 5)	PO2, PO3, PO5, PO9

Unit-I:

Introduction to Engineering and Engineering Study: Introduction to Engineering, Difference between science and engineering, scientist and engineer, needs and wants various disciplines of engineering, some misconceptions of engineering, Role of engineers in solving social problems, Graduate Attributes.

Outcome: Student will learn about Engineering & it's evolution in solving social problems. Will also learn about Variety of engineering branches and their contributions to society.

Activity theme: Activities aimed to understand Engineering

Activities: (only for integrated theory and lab course)

1**.** Identifying Various Engineering disciplines involved in a project/system

2. Listing down various social problems in the world & Finding how engineering can solve the social problems.

Unit-II:
Engineering Design: Engineering Design Process, Multidisciplinary facet of design, Generation of multiple solution, Introduction to Mechatronics systems, Motor and Battery Sizing concepts, Introduction to PCB design.

Outcome: Student will be able to understand the Engineering Design procedure & applying the same knowledge for making / creating a new product/model.

Activity theme: Activities based on the designing & making of models

Activities: (only for integrated theory and lab course)

1. Converting 230V of AC to 5V of DC power.
2. Making of a Bridge Structure.
3. Preparing a Full Adder circuit using IC's
4. Creating a mobile App using MIT app inventor

Unit-III:

Mechanisms: Basic Components of a Mechanism, Degrees of Freedom (Mobility of a Mechanism), 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism.

Outcome: Student will be able to understand the importance & working of mechanisms.

Activity theme: Creating a model which illustrate any mechanism

Activities: (only for integrated theory and lab course)

1. Determining the Degree of Freedom for a given structure
2. Assembling of Scissor jack mechanism

Unit-IV:

Platform based development: Introduction to platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino.

Outcome: Student will be able to gain knowledge about the various sensors, transducers, actuators & Arduino device. To Program Arduino for any inter-disciplinary project.

Activity theme: To Program to control lights, Motors, Sensors etc., on Arduino platform.

Activities: (only for integrated theory and lab course)

1. Obstacle detection using IR sensor on Arduino Platform
2. Measuring distance using Ultrasonic sensor on the Arduino Platform
3. Measuring Temperature and Humidity using DHT sensor on Arduino Platform

Unit-V:

Data Acquisition and Analysis: Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition using Sensors interfaced with Arduino, exporting acquired data to Microsoft Excel and analysis using visual representation.

Outcome: Student will be able to understand the importance of data collection & analysis. Able to use various sensors with Arduino, acquires data from sensors and analyzing the data through a computer
Activity Theme: Acquiring data from sensors using Arduino

Activities: (only for integrated theory and lab course)

1. Data Analysis through Arduino programming for multiple sensors

Course Code	Extra-Curricular Activities, Sports And Games (Audit Course)	L	T	P	Credits
1000191131		0	0	4	0

Extra-Curricular Activities, sports & games: Though this course has no credits, it is mandatory to satisfy minimum attendance of 80%.

II Year- I Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1000192100	Complex Variables and Statistical Methods	3	1*	0	3
2	1001192120	Surveying	3	1*	3	4.5
3	1001192100	Building Materials and Construction	2	0	0	2
4	1001192121	Strength of Materials	3	1*	3	4.5
5	1001192122	Fluid Mechanics	3	1*	3	4.5
6	1001192101	Building Planning & Drawing	2	1*	2	3
Total Credits:						**21.5**

Course Code	COMPLEX VARIABLES & STATISTICAL METHODS	L	T	P	Credits
1000192100		3	1	0	3

Course Description and Objectives:

This course develops the theory of functions of a complex variable, emphasizing their geometric properties and indicating some applications. This course deals with more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. To equip the students to solve application problems in their disciplines. Also, to impart knowledge in basic concepts and few techniques in probability and statistics in relation to the engineering applications.

Course Objectives:

1. To understand Differentiation and integration of complex valued functions.
2. Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
3. Expansion of complex functions using Taylor's and Laurent's series and to explain the fundamental concepts of probability and random variables.
4. To impact statistical methods in various applications of engineering.
5. The basic ideas of statistical methods of studying data samples, correlation and regression.

Course Outcomes:

	Course Outcome	Levelasper Bloom's Taxonomy	POnumber mapped
CO1	Analyze the complex functions with reference to their analyticity.	L1 L4	PO1 PO2
CO2	Analyze the complex integration by using Cauchy's integral formula and find Taylor's, Maclaurin's series and Laurent series expansion of complex function.	L1 L4	PO1 PO2
CO3	Evaluate contour integrals by using Residue theorem and Explain the notation of random variables and Evaluate the expected value and probability of random variables.	L5 L2	PO1 PO2
CO4	Evaluate the confidence levels and maximum errors for large and small samplings and Apply the concept of hypothesis testing for large and small samples in real life situations.	L5 L3	PO1PO2
CO5	Examine correlation for bi-variate data and Predict the regression analysis.	L5	PO1 PO2

UNIT – 1

Functions of a complex variable: Introduction to complex variable function - Limit – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates- Harmonic and conjugate harmonic functions – Milne – Thomson method to find analytical function.

UNIT-II

Complex Integration: Line integral – evaluation along a path and by indefinite integration – Cauchy's integral theorem (without proof) – Cauchy's integral formula – Generalized integral formula.
Complex Power Series: Radius of convergence – Expansion of a function as Taylor's series -Maclaurin's series and Laurent series (without proof) - types of singularities –Isolated singular point – Pole of order m – Essential singularity.

UNIT-III

Residue – Evaluation of residue by formula and by Laurent series - Residue theorem (without proof)- Evaluation of contour integrals by residue theorem.
Random Variables: Introduction-Definition of a Random Variable-Discrete and Continuous Distributions- Binomial, Poisson and Normal distributions.

UNIT-IV

Sampling Distributions and Test of Hypothesis: Introduction to sampling distributions, level of significances and confidence limits. - Tests of hypothesis using Z-test -Student's t-test-F-test and χ^2-test

UNIT-V

Correlation and Regression: Determination of correlation coefficients, types, Pearson's coefficient of correlation, Spearman's rank correlation, Regression, Regression lines- Multiple Regression.

TEXT BOOKS

1. Advanced Engineering Mathematics by H.K. Dass, S. Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.

REFERENCE BOOKS

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Text book of Engineering Mathematics, N.P. Bali, Laxmi Publications (P) Ltd.
Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition

Course Code	SURVEYING	L	T	P	Credits
1001192120	**(CIVIL ENGINEERING)**	**3**	**1**	**3**	**4.5**

Course Description and Objectives:

In this course student gets knowledge and can perform the operation of chain surveying, compass surveying, plane table surveying, leveling, theodolite survey, tacheomatric surveying, curve setting, areas from filed notes and total station survey.

Course Objectives:

1. The basic concepts of surveying along with chain and plane table surveying include chaining, ranging, linear and angular measurements
2. Methods of levelling and contouring, with usage of surveying instruments to extract elevationsthere by contours mapping.
3. Computation of areas and volumes of embankments, cuttings, reservoir etc.
4. Theodolite surveying concepts include traversing, trigonometric leveling, distance and elevations measurements in tachometric surveying.
5. Setting of simple and compound curves using various methods, basic concepts of total station, GPS and GIS

Course Outcomes:

	Course Outcome	Level as per Bloom's Taxonomy	PO number mapped
CO1	Describe and use various types of surveying instruments along with understanding of basic concepts of surveying	L2 L3	PO1 PO3
CO2	Describe the methods of levelling and contouring, finding elevations followed by contour mapping	L2 L3	PO1 PO3
CO3	Compute areas and volumes of embankments, cuttings, reservoir etc. by various methods	L2 L3	PO1 PO3
CO4	Describe concepts of theodolite surveying, traversing and trigonometric levelling with tracheomatric surveying include distance & elevation measurements.	L2 L3	PO1 PO3
CO5	Describe concepts of setting out of a simple and compound curve with various methods, basic concepts of total station along with introduction of GPS	L2 L3	PO1 PO3 PO5

Unit-I:

INTRODUCTION: Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications

Distances and Direction**:** Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements, Meridians, Azimuths and Bearings, declination, Linear and Angular measurements, Errors in surveying measurements.

Experiments:

1.Chain surveying

- ➢ Surveying in an area by chain surveying (Closed circuit)
- ➢ Chaining across obstacles

2.Compass surveying

- ➢ Determination of distance between two inaccessible points by using compass
- ➢ Finding the area of the given boundary using compass (Closed Traverse)

3.Plane table surveying

- ➢ Finding the area of a given boundary by the method of radiation & method of intersection.

Unit-II:

LEVELING AND CONTOURING: Concept and Terminology, Temporary and permanent adjustments- method of leveling.

Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

Experiments:

1.Fly levelling

- ➢ Height of the instrument method (differential levelling)
- ➢ Rise and fall method
- ➢ Closed / Open Circuit

Unit-III:

COMPUTATION OF AREAS AND VOLUMES: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two-level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

Unit-IV:

THEODOLITE: Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling, Traversing.

Tacheometric Surveying: Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position

Experiments:

1.Measurements of horizontal angles by repetition and reiteration method

2.Measurements of vertical angles

3.Trigonometric leveling- heights and distance problem

Unit-V:

Curves: Types of curves, design and setting out – simple and compound curves.

Introduction to geodetic surveying, Total Station- working principle and Global positioning system, Introduction to Geographic information system (GIS).

Experiments:

1.Setting out a simple curve by means of offsets from long chord

2.Determine distance and area using total station

TEXT BOOKS:

1. "Surveying (Vol – 1, 2 & 3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi

2. Duggal S K, "Surveying (Vol – 1, 2 & 3), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Reference Books:

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi

2. Arora, K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004

3. Chandra A M, "Higher Surveying", New Age International Pvt. Ltd., New Delhi.

Course Code	BUILDING MATERIALS AND	L	T	P	Credits
1001192100	CONSTRUCTION	2	1	0	2

Course Overview:

In this course student gets knowledge of various building materials such as stones, Bricks, wood, Lime, Tile, Cement, concrete, Masonry and Building components, Finishing and other materials. Thus this subject becomes necessary for civil engineers to learn about basic constructions materials.

Course Objectives

Students will be taught
1. The properties, characteristics, uses and classification of stones, bricks and wood.
2. The properties, uses, classification and methods of manufacturing of Lime and tile.
3. The ingredients, constituents, properties, types, methods of manufacturing of cement andconcrete
4. The types of masonry and the building components include lintels, staircases, floors, roofs along with trusses
5. The Finishing's include proofing, plastering, pointing, washing, paints along with formwork

and scaffolding, other materials.

Course Outcomes: At the end of the course, the student will be able to

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Understand the properties, characteristics, uses and classification of stones, bricks , wood, lime and tile	Understanding	L2	PO-1 PO-6 PO-7
CO2	Describe the ingredients, constituents, properties, types, methods of manufacturing of cement and concrete	Understanding	L2	PO-1 PO-7 PO-8
CO3	Describe the types of masonry and Explain the building components include lintels, staircases, floors, roofs along with trusses	Understanding	L2	PO-1 PO-2
CO4	Explain the Finishing's include proofing, plastering, pointing, washing, paints along with formwork and scaffolding, other materials	Understanding	L2	PO-1 PO-2 PO-7

Unit-I   **L: 12**

STONES-BRICKS-WOOD

Stone: Stone as building material – Criteria for selection – Classification of stones-Tests on stones – Stone quarrying-Precautions in blasting- Dressing of stone.

Bricks: Composition of good brick earth-Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence.

Wood: Structure, Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber.

Outcome: Able to test the stones, Bricks and woods to find the strengths

Activity: Collect the different types of stones, bricks and wood for testing their corresponding strengths in the laboratory. Then analyze their strengths to choose their suitability for various constructions.

UNIT IIL: 10

LIME-TILE

Lime: Various ingredients of lime, Constituents of lime stone, classification of lime, various methods of manufacturing of lime.

Tile: Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminum, Gypsum, Glass and Bituminous materials.

Outcome: Able to test the lime and tile to find the strengths

Activity: Collect the different types of limes and tiles for testing their corresponding strengths in the laboratory. Then analyze their strengths to choose their suitability for various constructions

UNIT- III   **L: 10**

CEMENT-CONCRETE

Cement: Portland cement- Chemical Composition, Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance, various tests for concrete

Concrete:

Concrete – Ingredients – Manufacturing Process – Batching plants –mixing – transporting – placing – compaction of concrete –curing and finishing – Ready mix Concrete – Mix specification.

Outcome: Able to perform various laboratory tests on cement and concrete

Activity:

Collect various types of cement and prepare the test specimens for determining the compressive strength in the laboratory. Then analyze their strengths to choose their suitability for various constructions.

Unit-IV L: 08

MASONRY-BUILDING COMPONENTS

Masonry: Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls.

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

Outcome:

Able to draw English & Flemish bonds of brick walls

Able to identify and distinguish the various types of buildings components like lintels, arches, vaults, stair cases and so on

Activity:

Collect the bricks and build the English and Flemish bond models wall and test them for different loads in the laboratory. A seminar on advanced topics related to building components of multi storey buildings.

Unit-V L: 10

FINISHING AND OTHER MATERIALS

Damp Proofing and water proofing materials and uses, Plastering, Pointing, white washing and distempering. Paints: Constituents of a paint, Types of paints, Painting of new/old wood-Varnish. Form Works and Scaffoldings, Distempers – Bitumen's.Glass – Ceramics – Sealants for joints, Fibre glass reinforced plastic – Clay products – Composite materials – Types – Applications of laminar composites

Outcome:

- Able to distinguish the finishing's include proofing, plastering, pointing, washing, paints
- Able to guide installation procedure of the frameworks and scaffoldings

Activity:

Collect the wood or steel bars to make model scaffoldings for various structures and test their strengths for various loadings in the laboratory field.

Text Books:

1. Engineering Materials byS.C Rangwala ,Charotar publishing House private ltd.
2. Building Materials by B.C. Punmia, Laxmi Publications private ltd.
3. Building Construction by Sushil Kumar, Standard Publishers Distributors New Delhi
4. Building Constructions by Dr.B.C.Punmia , Er.Ashok K.Jain , Dr.Arjun K Jain
5. Building Construction by Rangawala

Reference Books:

1. Building Materials by S.K.Duggal, New Age International Publications.
2. Building Materials by P.C.Verghese, PHI learning (P) ltd.
3. Building Materials by M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building Construction by P.C.Verghese, PHI Learning (P) Ltd
5. Building Construction by S.S. Bhavikatti, Vices publications House private ltd.

Course Code		L	T	P	Credits
1001192121	**STRENGTH OF MATERIALS**	3	1	3	4.5

Course Overview:

The course deals with various engineering properties of solid materials such as simple stresses and strains,thin cylindrical shells, shear force and bending moment of beams, flexural stresses, shear stresses, deflection in beams and springs, torsion , columns and struts.

Course Objectives

The students will be taught
1. The internal stresses and strains produced in the material and thin cylindrical shells
2. The shear force and bending moment in beams
3. The flexural stresses and shear stresses in beams
4. Deflections in beams and springs
5. The torsion of circular shafts and the columns and struts subjected to axial loading for different end conditions

Course Outcomes: At the end of the course, the student will be able to

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Calculate internal stresses and strains to know mechanical behavior of solid material under the externally applied loads and forces	Applying	L3	PO-1 PO-2 PO-4 PO-7
CO2	Calculate the shear forces and bending moments for beams	Understanding	L2	PO-1 PO-2
CO3	Determine Flexural and shear stresses in beams and deflections in beams and springs.	Applying	L3	PO-1 PO-2
CO4	Calculate torsional forces developed in components with circular cross sections and analyses columns and struts subjected to axial loading under various end conditions	Applying	L3	PO-1 PO-2 PO-4

UNIT- I L: 10+8

SIMPLE STRESSES AND STRAINS AND THIN CYLINDRICAL SHELLS:

Simple Stresses And Strains: Elasticity and plasticity, Types of stresses and strains, Hooke's law, Stress, Strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic constants(E, C , K) and the relationship among them, Bars of varying section, Composite bars, Temperature stresses.

Thin Cylindrical Shells: Introduction, Hoop and Longitudinal stresses and strains, Change in diameter and volume of thin cylinders, Thin spherical shell stresses.

Outcome:
- Able to differentiate Elasticity and plasticity, stresses and strains, Young's Modulus, Modulus of rigidity and bulk modulus
- Able to compute the simple stresses and strains of steel bars in uniform and varying cross sections
- Able to compute the hoop and longitudinal stresses and strains in thin cylindrical

Activity/Event:
The test specimen with different sizes and materials are to be prepared to test those in UTM testing machine to find their tensile strengths. Analyze the stress strain relationships for each specimen. Seminar on advanced topics related to thin cylinders.

Experiments:
- ➢ To determine the ultimate tensile strength of a metal
- ➢ To determine the ultimate crushing strength (Compression test) of wood or concrete
- ➢ To determine the impact strength of the specimen by conducting charpy Impact test
- ➢ To determine the hardness value for the given metal specimen using Brinell and Rockwell hardness test

UNIT II   **L: 10+2**

SHEAR FORCE AND BENDING MOMENT:

Definition of beam, Types of beams, Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, Simply supported and overhanging beams subjected to point loads, Uniformly distributed load, Uniformly varying loadsand combination of these loads, Point of contra flexure, Relation between S.F, B.M and rate of loading at a section of a beam.

Outcome: Able to compute the shear force and bending moment for different beams with different loadings

Activity/Event:
Seminar on Advanced topics related to various inclined loads on various beam in finding shear force and bending moment followed by their drawings.

Experiment:
- ➢ To measure the stress & strain using strain gauges mounted on cantilever beam

Unit-III   **L: 12+2**

FLEXURAL AND SHEAR STRESSES:
Flexural stresses: Theory of simple bending, Derivation of bending equation: $M/I = f/y = E/R$, Determination bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections.
Shear Stresses: Derivation of formula, Shear stress distribution across various beam sections like rectangular, Circular, I, T, angle sections.

Outcome:
- Able to derive bending equation i.e, $M/I = f/y = E/R$ and compute the flexural stresses in beam of various cross sections
- Able to compute the shear stresses in beam of various cross sections

Activity/Event:
The test specimen with different sizes and materials are to be prepared to test those in UTM testing machine to find their bending.

Experiment:
➢ To find the shear strength of given specimen

Unit-IV   **L: 12+10**

DEFLECTION OF BEAMS AND SPRINGS:

Deflections of Beams: Determination of slope and Deflection of (i) Cantilever (ii) Simply Supportedsubjected to point loads, uniformly distributed load and UVL using (a) Double Integration and (b) Macaulay's Method (c) Moment Area Method, (d) Conjugate Beam Method

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple (only final expression) – springs in series and parallel – Basic Concept of Carriage or leaf springs.

Outcome:

- Able to compute the deflection of various beams by Double Integration, Macaulay's Method, Moment area method and conjugate beam method
- Able to compute deflections in various types of springs under axial pull and axial couple

Activity/Event:
The cantilever, simply supported are to be made to find the deflection at various locations for different loading conditions and followed by determination of slopes from the deflection values. Collect or make various types of springs to test deflection in spring testing machine.

Experiments:
➢ To determine the Bending test on Cantilever beam.
➢ To determined young's modulus of elasticity of material of beam simply supported at ends.
➢ To find the young's modulus of the given structural material by measuring deflection of Continuous beam
➢ To find young's modulus of the given beam material by conducting bending test on simply supported beam using Maxwell's law of reciprocal deflections.

➢ To determine the stiffness and modulus of rigidity of the spring wire

Unit-V   **L: 12+2**

TORSION AND COLUMN AND STRUCTS:

Torsion: Theory of pure torsion, Derivation of Torsion equations, Assumptions made in the theory of pure torsion, Torsional moment of resistance, Polar section modulus, Power transmitted by shafts.

Columns and Struts: Types of columns, Axially loaded compression members,Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory.

Outcome:
- Able to compute the torsion and power transmitted in circular shafts
- Able to identify short, medium and long columns
- Able to analyse columns and struts subjected to axial loading under various end conditions

Activity:
Make different specimens to test their torque in torsion testing machine followed by computing power transmitted and torsional rigidity.

Experiment:
➢ To conduct torsion test on mild steel or cast iron specimen to determine modulus of rigidity

Text Books:

1. Introduction to text book of Strength of materials by R.K.Bansal – Laxmi publications Pvt. Ltd., New Delhi
2. Strength of Materials byS.Ramamrutam, DhanpatRai Publishing Company, New Delhi
3. "Mechanics of Materials", by Gere and Timoshenko, 4th Edition, PWS Publishing Company, May 1997
4. Mechanics of Materials by Dr. B. C. Punmia, Firewall Media, New Delhi
   Mechanics of Materials by Egor P Popov , Pearson Publications

Reference Books:

1. Mechanics of Solid, by Ferdinandp Beer and others – Tata Mc.Grawhill Publications 2000.
2. Strength of Materials by Schaum'sout line series – Mc. Grawhill International Editions.
3. Strength of Materials by S. Ramakrishna and R.Narayan – DhanpatRai publications.
4. "Mechanics of Materials", by Ferdinand BeerJr., E. Russell Johnston, John DeWolf, David Mazurek, , 6th edition, McGraw Hill Publishers, 2012.
5. "Fundamentals of Solid Mechanics", by M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.

Course Code		L	T	P	Credits
	FLUID MECHANICS				
1001192122		**3**	**1**	**3**	**4.5**

Course Overview:

The subject Fluid Mechanics has a wide scope and is of prime importance in several fields of engineering and science. Present course emphasizes the fundamental underlying fluid mechanical principles and application of those principles to solve real life problems. Special attention is given towards deriving all the governing equations starting from the fundamental principle. There is a well-balanced coverage of physical concepts, mathematical operations along with examples and exercise problems of practical importance. After completion of the course, the students will have a strong fundamental understanding of the basic principles of Fluid Mechanics and will be able to apply the basic principles to analyze fluid mechanical systems.

The Fluid Mechanics Laboratory is designed to examine the properties of fluids. The laboratory is equipped to conduct experiments like flow measuring equipment's like flow in orifices, mouth pieces, notches, orifice meters, Venturimeter, verification of Bernoulli's, Friction factor in different diameters of pipes

Course Objectives

The students will be taught

1. The Fundamental properties of fluids and its applications.
2. Principles of Kinematics and Hydro-Dynamics for practical applications
3. The boundary layer,laminar and turbulent flows
4. Basic design of pipes and pipe networks considering flow, pressure and its losses.

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

	Course outcome	**Bloom's taxonomy**	**Bloom's Taxonomy Level**	**PO**
CO1	**Understand**the physical properties of fluids & their influences on fluid motion. **Apply** the knowledge to determine the Coefficient of discharge of a small orifice and external mouth piece.	Understanding Applying	L2 L3	PO1 PO2 PO4
CO2	**Understand** the concepts of kinematics and dynamics of fluid flow and the concepts of boundary layer,**apply** knowledge to prove the Bernoulli's equation.	Understanding Applying	L2 L3	PO1 PO2 PO4

		Understanding	L2	PO1
CO3	**Understand** the concepts laminar and turbulent flows. Describe and analyze the closed conduit flow. **Apply** knowledge to determination of the coefficient of loss of head in a sudden contraction and also friction factor	Applying	L3	PO2 PO4
CO4	**Compute the measurement** of flow by pitot tube, venture meter, orifice meter, notches and weirs. Compute hydro static forces on various sub merged Surfaces **Apply** knowledge to determination the Coefficient of discharge of Venturimeter. Orifice meter, Rectangular Notch & Triangular Notch,	Understanding Applying	L2 L3	PO1 PO2 PO4

UNIT- I   **L: 10+6**

Introduction: Dimensions and units – Physical properties of fluids -specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure - measurement of pressure. Pressure gauges, Manometers: Differential and Inverted differential monometers. Classification of orifices and Mouth pieces, Hydraulic coefficients and discharge formals

Outcome: Able to compute the pressure of fluids in various pressure gauges and manometers
Able to compute the hydrostatic forces on submerged surfaces include vertical, inclined and horizontal

Activity/Event: Collect or make manometers by which measure the pressure heads in pipes at various sections for varying velocities or discharges. Finally validate them theoretical value

Experiments:

- ➢ Determination of Coefficient of discharge for a small orifice by a constant and variable head method.
- ➢ Determination of Coefficient of discharge for an external mouth piece by constant and variable head method.

UNIT IIL: 10+6

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

Fluid Dynamics: Euler's and Bernoulli's equations for flow along a stream line for 3-D flow. Momentum equation

Outcome:
- Able to explain through figures about the various types of flows
- Able to derive Euler's and Bernoulli's equations for flow along a stream line for 3-D flow
- Able to analyze surface and body forces on pipe flow.

Experiments:
- Identification of laminar and turbulent
- Verification of Bernoulli's equation.
- Verification of continuity equation

Unit-III L: 10

Boundary Layer flow: Boundary layer theory – Concepts, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation for laminar and turbulent Boundary layers. Boundary layer separation.

Laminar and Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows. Flow between parallel plates.

Outcome:
- Able to deriveVonkarmen momentum integral equation
- Able to perform the Reynold's experiment to know the characteristics of Laminar & Turbulent flows
- Able to analyze the flow between parallel plates

Activity/Event:

- Make model of transparent pipe line to identify laminar and turbulent flows for various velocities. Find also Reynold's number to validate with theoretical values

Unit-IV L: 10+6

Closed Conduit Flow: Types of flows – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Variation of friction factor with Reynolds number. Water hammer theory and Estimation of Increased pressure due to water hammer valve closed suddenly and gradually only on rigid pipes.

Outcome:
- Able to identify the variations of friction factor with Reynold's number and Moody's Chart
- Able to compute the discharge of flow in pipes by considering friction and minor losses
- Able to compute the pipe network problems using different concepts.

Experiments:
- Determination of Coefficient of loss of head in a sudden contraction and friction factor
- Identification of total energy line and hydraulic gradient line

Unit-V   **L: 10+6**

Measurement of Flow: Pitot-tube, Venturi meter and orifice meter, Flow over rectangular, triangular and trapezoidal and stepped notches - Broad crested weir.

Hydro Static Forces on Surfaces: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems. Definition of Buoyancy forces.

Outcome:
Able to explain through figures about the various instruments include pitot tube, venturi meter and orifice meter, orifices and notches
Able to compute measurement of flow by pitot tube, venturi meter and orifice meter, orifices, notches and weirs.
Activity/Event: Collect or make instruments like pitot tube, Venturi meter and orifice meter to find the discharge in various pipes. Make models of rectangular, triangular and trapezoidal and stepped notches to find discharge in channels.

Experiments:
- Calibration of Venturimeter
- Calibration of Orifice meter
- Calibration of contracted Rectangular Notch and /or Triangular Notc

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som&G.Biswas ,Tata McGraw-Hill publishers Pvt. Ltd.
3. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi
4. Fluid Mechanics inclosing Hydraulic machines by Dr. A. K. Jain, Khanna Publishers, New Delhi

Reference Books:
1. Fluid Mechanics by J.F.Douglas, J.M. Gaserek and J.A.Swaffirld (Longman)
2. Fluid Mechanics by Frank.M. White (Tata Mc.Grawhill Pvt. Ltd.)
3. Fluid Mehanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi
4. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi

Course Code		L	T	P	Credits
	BUILDING PLANNING AND DRAWING				
1001192101		**2**	**1***	**0**	**3**

Course Overview:

This course will give the student knowledge about building byelaws and its regulations, give the sign conventions for different building materials, and how to prepare the planning and designs for residential and public buildings.

Course Objectives

The student will be taught

1. The building byelaws and regulations
2. The orientation, standards, requirements, types and planning of various residential and public buildings
3. The drawing of sign conventions of various types of building materials and bonds
4. The drawing of various types doors, windows, ventilators and roofs
5. The planning and design of various residential and public buildings

Course Outcomes: At the end of the course, the student will be able to

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Understand the building byelaws and regulations	Understanding	L2	PO-1 PO-8
CO2	Describe the orientation, standards, requirements, types and planning of various residential and public buildings	Understanding	L2	PO-1 PO-6 PO-8
CO3	Draw the sign conventions of various types of building materials and bonds and also various types doors, windows, ventilators and roofs	Understanding	L2	PO-1 PO-5
CO4	Plan and draw of various residential and public buildings	Applying	L3	PO-1 PO-3, PO-5,PO-8

Unit-I L: 10

BUILDING BYELAWS AND REGULATIONS:
Introduction- terminology-objectives of building bye laws- floor area ratio- floor space index-principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of building – wall thickness – lightening and ventilation requirements.

Outcome: Able to identify the Building Byelaws and Regulations

Activity: Seminar on advanced topics related to the National Building Code (NBC) 2016 which was released by the Bureau of Indian Standards (BIS) in March, 2017.

UNIT IIL: 10

RESIDENTIAL AND PUBLIC BUILDINGS:
Orientation of building and its different elements, Minimum standards for various parts of buildings – requirements of different rooms and their grouping – characteristics of various types of residential buildings - Selection of site for building construction. Planning of educational institutions, hospitals, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation

Outcome:
- Able to identify the various parts of building with minimum standards and requirements of different rooms
- Able to distinguish the educational institutions, hospitals, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation
- Able to perform selection of sites for various building constructions

Activity: Make a model of residential/ public building by scaling measurements with the standards of the buildings

UNIT- III L: 10

SIGN CONVENTIONS AND BONDS:

Sign conventions for brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminums alloys, lead, zinc, earth, rock, timber and marbles, English bond and Flemish bond – odd and even courses for one, one and half and two walls in thickness at the junction of a corner.

Outcome:
- Able to draw the sign conventions include brick, stone, plaster, sand filling, concrete, glass, steel and so on
- Able to draw English bond and Flemish bond with odd/even courses for one, one and

half and two walls

Activity:

Construct the brick wall by using English bond and Flemish bond with different sizes.

Unit-IV   **L: 10**

DOORS, WINDOWS, VENTILATORS AND ROOFS:
Panelled door panelled and glazed door, panelled window, glazed window, fixed ventilator, coupled roof, collar roofs, king post truss, queen post truss. Sloped and flat roof of buildings: drawing plans, elevations and cross sections of given sloped and flat roof buildings.

Outcome: Able to draw the various types of doors, windows, ventilators and roofs

Activity: Draw various types of doors, windows, ventilators and roofs using AutoCAD Software

Unit-V   **L: 10**

Planning and Designing of Buildings: Draw the plan, elevation and sections of residential and public buildings from the given line diagram.

Outcome:
- Able to study plan, elevation and sections of residential and public buildings
- Able to draw plan, elevation and sections of residential and public buildings from the given line diagram.

Activity:

Draw plan, elevation and sections of residential and public buildings from the given line diagram using AutoCAD Software

Text Books:

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

Reference Books:

1. Building drawing by M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.
2. Principles of Building Drawing by M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning by B. P. Verma, Khanna publishers, New Delhi

II Year- II Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1000192100	Complex Variables and Statistical Methods	3	1*	0	3
2	1001192120	Surveying	3	1*	3	4.5
3	1001192100	Building Materials and Construction	2	0	0	2
4	1001192121	Strength of Materials	3	1*	3	4.5
5	1001192122	Fluid Mechanics	3	1*	3	4.5
6	1001192101	Building Planning & Drawing	2	1*	2	3
Total Credits:						**21.5**

Course Code			L	T	P	Credits
1001192200	**STRUCTURAL ANALYSIS-I**		3	1	0	3

Course Overview:

This is an elementary course on Structural Analysis. Various methods and their underlying mechanics in determining response of structures when subjected to external loading will be discussed in this course. This course is comprehensive at the basic level. Journey through this course will help students to build the foundation for more advanced courses related to structural engineering.

Course Objectives

The students will be taught

1. Fundamental concepts to analyses the structures classification and the S.F, B.M and deflection of propped cantilevers
2. The S.F, B.M and deflection of fixed beams and continuous beams
3. The deflection of beams and frames by strain energy method
4. The analysis of structures by using slope deflection and Moment distribution method
5. The S.F and B.M of simply supported beams for moving loads

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

	Course outcome	**Bloom's taxonomy**	**Bloom's Taxonomy Level**	**PO**
CO1	Identify the Classification of structures and analyze the S.F, B.M and deflection of propped cantilever, fixed and continuous beams	Understanding	L2	1,2,4,12
CO2	Analyze the deflection of beams and frames by strain energy method	Analyzing	L4	1,2,4
CO3	Analyze structures using slope deflection and Moment Distribution method	Analyzing	L4	1,2,4
CO4	Analyze S.F and B.M of simply supported beams for moving loads	Analyzing	L4	1,2,4

UNIT- I   **L: 10**

Introduction to structural analysis: Introduction, Definition and Classification of structures, elements/members and joint/support, Degree of static and kinematic indeterminacy.

Propped Cantilever:Analysis of propped cantilever subjected to point load, UDL, UVL-Shear Force and Bending Moment diagrams and calculate deflection.

Outcome: Able to compute shear force, bending moment and deflections of propped cantilever beams with various types loadings

Activity/Event:A seminar on advanced topics related to analysis of propped cantilever by Finite Element Analysis

UNIT II   **L: 10**
Fixed Beams: Introduction, Analysis of fixed beams, subjected to single and multiple point loads, UDL and UVL.Draw SFD, BMD and deflection – Effect of support sinking and support rotation.
Continuous Beams: Introduction- Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia for different spans and different moment of inertia for different spans– Effects of sinking supports-SF and BM diagrams

Outcome:
  • Able to compute shear force, bending moment and deflections of fixed beams with various types loadings
  • Able to compute shear force and bending moment of continuous beams with various types loadings
Activity/Event:
A seminar on advanced topics related to analysis of fixed beam by force method and continuous beam by moment distribution method.

Unit-III   **L: 10**

Energy Theorems:
Part-1: Strain Energy-Resilience-Toughness- Gradual, Sudden, Impact and Shock Loadings-Simple Applications – Strain energy in linear elastic system, expression of Strain Energy due to axial load, flexure, and shear force.
Part-2: Statement ofMaxwell's reciprocal theorem, Maxwell-Betti's generalized reciprocal theorem, Castigliano's first theorems, Application of Castigliano's first theorem for calculating deflection of simple beams, and simple Frames.

Outcome:
  • Able to derive expression for strain energy due to axial load
  • Able to solve the deflections of beams and frames

Activity/Event:

A seminar on advanced topics related to expression of strain energy due to Torsional loading

Unit-IV   L: 10+6

Slope deflection method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

Moment Distribution Method: Stiffness and carry over factors – Distribution factors –Analysis of continuous beams with and without sinking of supports – Portal frames –including Sway.

Outcome:

Able to Analyze structures using slope deflection method and Moment Distribution method.

Activity/Event on Unit-IV:

Analyze any innovative beam using slope deflection method and frame structure with suitable loading using Moment Distribution method

Unit-V   L: 10

Influence Lines: Definition of Influence line for reactions, SF and BM at a given position of loading, number of point loads, UDL

Moving Loads: Introduction, maximum S.F and B.M at a given section due to concentrated load and udl and absolute maximum S.F. and B.M due to multiple concentrated loads, UDL longer than the span, UDL shorter than the span.

Outcome:

Able to draw Influence Line Diagrams for Shear force and Bending moment of Simply supported beams

Activity/Event: A seminar on advanced topics related to Influence diagrams for overhanging beams.

Text Books:

Analysis of Structures (Vol I & II) by V.N. Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.

2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi

3. Comprehensive Structural Analysis (Vol I & II) by Dr. R. Vaidyanathan & Dr. P.Perumal, Laxmi Publications Pvt. Ltd., New Delhi.

4. Basic structural Analysis by C.S. Reddy, Tata Mc Graw hill, New Delhi

 Reference Books:

1. Devdas Menon, Structural Analysis, Narosa Publishing House, 2008. (ISBN: 9781842653371)

2. Hibbeler, R. C. (2002). Structural Analysis, 6/e, Pearson Education

3. Norris, C.H., Wilbur, J.B., and Utku, S., Elementary Structural Analysis, McGraw Hill

4. Wang, C.K., Intermediate Structural Analysis, McGraw Hill, 1983

Course Code	**TRANSPORTATION ENGINEERING**	L	T	P	Credits
1001192220		3	1*	3	4.5

Course Overview:

Transport Engineering introduces you to the role of engineers in planning, and designing the transport system and infrastructure. These aspects represent integral components of civil and transport infrastructure. The course comprises both theoretical components and application of theoretical knowledge into design practice.

Course Objectives:

The students will be taught
1. The basic concepts of highway planning and alignment
2. The geometric design of highway elements includes cross section, sight distance, alignment both vertical and horizontal, curves etc.
3. The traffic engineering studies includes traffic studies like traffic volume, parking, signaling, accident etc.
4. The highway materials includes soil, aggregates, concrete, bitumen which are used for base, sub base, sub grade etc.
5. the requirement of Ideal Railway Alignment and able to identify suitable site for airport construction

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

	Course outcome	**Bloom's taxonomy**	**Bloom's Taxonomy Level**	**PO**
CO1	Finalize suitable highway alignment and Design of geometric elements for different terrains.	Analyzing	L4	1,2,3,7
CO2	Describe traffic engineering studies include traffic studies like volume parking, signaling, accident etc.	Applying	L3	1,2,3, 4, 5, 6, 7
CO3	Distinguish the highway materials and its suitability for different types pavement	Applying	L3	1, 2,6, 7
CO4	understand the requirement of Ideal Railway Alignment and able to identify suitable site for airport construction	Understanding	L2	1,2,6,7

Unit-I:
Highway Planning and Alignment:Highway development in India; Classification of Roads; Road Network Patterns; road development vision in India; Necessity for Highway Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

Unit-I Outcome:
- Able to draw a highway network plan for a given area.
- Able to trace out the final Highway alignment from different alternative alignments.

Activity/Event on Unit-1:
Delineate the different possible alignments from a topo sheet between specified two locations and finally trace one final alignment

UNIT – II: Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- design of Sight Distance, Design of Horizontal Alignment- Vertical alignment at different terrains.

Unit-II Outcome:
- Able to design the elements of horizontal and vertical alignments.
- Able to design and analyze sight distances include SSD, OSD and ISD

Activity/Event on Unit-II:
Design the different types of curves along the traced final alignment on the topo sheet

Unit-III:

Traffic Engineering: Basic Parameters of Traffic engineering and its relationship, Traffic Volume Studies; Speed studies –spot speed and speed & delay studies, PCU Factors, Capacity of Highways, Parking Studies; Road Accidents-Causes, – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections, and design of signals by web-star method.

Unit-III Outcome:
1. Able to prepare traffic management plans
2. Able to identify suitable traffic signs and road marking
3. Able to design traffic signal at different road junctions

Activity/Event on Unit-III:
Design traffic signal at junction by conducting traffic volume studies

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

Unit-IV:

Highway Materials: Sub grade soil: classification –Group Index – Subgrade soil strength characteristics–Desirable properties pavement material and testing: Tests for Road Aggregates and Bituminous Materials: Requirements – Marshall Method of Mix Design.Types of pavements; Functions and requirements of different components of pavements**.**

Unit-IV Outcome:
- Able to conduct various tests on Aggregate.
- Able to conduct various tests on bitumen.
- Able design the bituminous mix.

Activity/Event on Unit-IV:
Conduct California Bearing Ratio test (CBR) in the laboratory for collected specimen from the field and evaluate subgrade strength of roads. The results obtained by these tests are used with the empirical curves to determine the thickness of pavements and its component layers

Experiments:
1. California Bearing Ratio (CBR) value of soil sample
2. Determine the Aggregate Crushing value of aggregate
3. Determine the Aggregate Toughness value of aggregate
4. Determine the Aggregate Hardness of aggregate
5. Determine the Aggregate Specific Gravity and Water Absorption.
6. Determine the flakiness and elongation value of aggregate
7. Determine the Penetration value of bitumen
8. 2 Determine the ductility value of bitumen.
9. Determine the Softening Point C
10. Determine the Viscosity Determine the.

Unit-V:

Introduction of Railway and airport engineering Importance of Indian Railways Construction and Maintenance- Components- Gauges, Types. Ideal Railway Alignment- Standard rail Sections Functions and Requirements of sleepers- Types and Spacing- Methods of fixing rails with prestressed Concrete and Wooden Sleepers. Airport site selection – factors affecting site selection and surveys, Introduction of runway design.

Unit-V Outcome:
- Able to understand the requirement of Ideal Railway Alignment
- Able to identify suitable site for airport construction

Activity/Event on Unit-V:
Delineate the different possible Railway alignments from a topo sheet between specified two locations and finally trace one final Railway alignment

Text Books:
1. Highway Engineering by S.K.Khanna &C.E.G.Justo, Nemchand& Bros., 7th edition (2000).
2. Transportation Engineering (Volume – 1) by C.Venkataramaiah, Universities Press, Hyderabad.
3. Traffic Engineering and Transportation Planning by L.R.Kadiyali and Lal- Khanna Publications.
4. Design of flexible pavements by IRC:37- 2018
5. Transportation Engineering (Volume – 2) by C.Venkataramaiah, Universities Press, Hyderabad

Reference Books:
1. Principles and Practice of Highway Engineering Design by L.R.Kadiyali and Lal, Khanna Publications.
2. Text book of Highway Engineering by R.Srinivasa Kumar, Universities Press, Hyderabad.
3. Highway Engineering by Dr.S.K.Sharma, S.Chand Publishers.
4. A Textbook of Railway Engineering by Saxena S. C. and Arora
5. Airport Planning and Design by S.K. Khanna, M.G Arora and S.S Jain.

Course Code		L	T	P	Credits
1001192221	**HYDRAULICS AND HYDRAULIC MACHINERY**	3	1	3	4.5

Course Overview:

Hydraulics is the section of fluid mechanics which describes production, transmission and conversion of energy during mutual interaction of fluids and mechanisms in motion. This course starts from the deep fundamentals of fluid dynamics accompanied at later stages by an overall description of technical solutions used in machinery. The main objective of the course is to learn basic principles of fluid power generation, transmission and conversion with the use of hydraulic machines and supplementary passive equipment.

Hydraulics And Hydraulics Machinery laboratory is equipped to identify the efficiencies and power generation in various turbines viz., Pelton wheel, Kaplan turbine, Francis turbine, and efficiencies to draw water from various pumps viz., single stage and multistage Centrifugal pumps, Single –stage Reciprocating pump. This laboratory is primarily used as an undergraduate teaching lab, though the experimental apparatus has been used for demonstrations in graduate classes

Course Objectives

The students will be taught

1. The Hydraulic Turbines concepts
2. The Hydraulic Similitude and Basics of Turbo Machinery
3. The uniform flow in open channels
4. The Non-Uniform Flow in Open Channels
5. The Centrifugal-Pumps and Reciprocating-Pumps concepts

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

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	**Understand**the concepts of Basics of Turbo Machinery. **Apply** the concepts of the Hydraulic Turbines and Performance of Peloton turbine.	Understanding Applying	L2 L3	PO1 PO2 PO3 PO4
CO2	**Apply**the knowledge in calculating performance analysis in turbines. **Apply** the knowledgeto perform on Francis turbine and Kaplan turbine	. Applying	L3	PO1 PO2 PO3 PO4 PO7 PO8
CO3	**Apply** the dimensional analysis in solving fluid problems and plan hydraulic similitude studies.	. Applying	L3	PO1 PO2 PO3 PO4

CO4	**Understand** the concepts of Centrifugal-Pumps and Reciprocating. **Apply** the knowledge in calculating the performance analysis in Pumps	Understanding Applying	L2 L3	PO1 PO2 PO3 PO4 PO7 PO8

UNIT- I   **L: 10+6**

Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.

Hydraulic Turbines 1: Layout of a typical Hydropower installation –Heads and efficiencies - classification of turbines. Pelton wheel
Outcome:
- Able to derive the hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes
- Able to draw the layout of a typical Hydropower installation
- Able to perform tests on Peloton wheel, in the laboratory to find generated electricity

Activity/Event: Compute the hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes in the laboratory and validate with theoretical values

Perform the tests on the turbines, in the laboratory on Peloton Turbine, with different kinetic energies to find the electricity generation and validate with theoretical values

Experiments:
- Impact of jet on flat plate
- Impact of jet on curved plate
- Performance test on Peloton wheel turbine

UNIT- II   **L: 10+6**

Hydraulic Turbines 2: Francis turbine – Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity-cavitation.
Outcome:
- Able to Differentiate Peloton wheel, Francis turbine and Kaplan turbine
- Able to perform tests on Francis turbine and Kaplan turbine in the laboratory to find generated electricity

Activity/Event: Perform the tests on the turbines, in the laboratory, on Francis Turbine, Kaplan turbine with different kinetic energies to find the electricity generation and validate with theoretical values

Experiments:
- ➢ Performance test on Francis turbine at Constant speed
- ➢ Performance test on Francis turbine constant head
- ➢ Performance test on Kaplan turbine.

Unit-III   L: 12

Hydraulic Similitude: Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

Uniform Flow in Open Channels: Types of channels –Types of flows - Velocity distribution – Energy and momentum correction factors – Chezy's, and Manning's formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth.

Outcome:
- • Able to derive Rayleigh's method and Buckingham's pi theorem
- • Able to derive Chezy's, and Manning's formulae for uniform flow
- ➢ Able to derive design parameters of Most Economical sections and the specific energy formulae

Activity/Event:

Seminar on advanced topics related to uniform flow in a channel section with composite roughness

Unit-IV   L: 10+6
Non-Uniform Flow in Open Channels: Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles direct step method- Rapidly varied flow, hydraulic jump, energy dissipation
Outcome:

- • Able to derive equations for the Steady Gradually Varied flow along with slopes and surface profilesAble to derive equations for the Rapidly varied flow along with hydraulic jump and energy dissipation

Activity/Event: Seminar on advanced topics related to computation of spatially varied flow using numerical integration

Experiments:
- ➢ Study of Hydraulic jump.
- ➢ Discharge estimation in open channel flow.
- ➢ Efficiency comparison between Rectangular and triangulate channels

Unit-V   **L: 10+6**

Centrifugal-Pumps: Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves-NPSH- Cavitation

Reciprocating-Pumps: Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

Outcome:
- Able to perform tests on Centrifugal pump and Reciprocating pump

Activity/Event: Perform tests on Centrifugal pump and Reciprocating pump in the laboratory to pump the water from the water bodies

Experiments:
- Efficiency test on centrifugal pump on single stage
- Efficiency test on centrifugal pump on multi stage
- Efficiency test on reciprocating pump on single acting
- Efficiency test on reciprocating pump on double acting

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som&G.Biswas ,Tata McGraw-Hill publishers Pvt. Ltd.
3. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi
4. Fluid Mechanics inclosing Hydraulic machines by Dr. A. K. Jain, Khanna Publishers, New Delhi

Reference Books:
1. Fluid mechanics and Fluid Machines by Rajput, S.Chand& Co.
2. Fluid Mechanics & Fluid Machines by Narayana Pillai, Universities press.
3. Fluid Mechanics and Machinery by Kothandaraman, New Age Publishers.
4. Flow in Open channels by K.Subramanya. Tata McGraw-Hill Publishers.
5. Fluid Mechanics and Machinery by CSP Ojha, Oxford Higher Education

Course Code	Environmental Engineering	L	T	P	Credits
1001192222		3	1	3	4.5

Course Overview:

This course will give the student knowledge about various sources and characterization of water, quantity of water required, collection, conveyance, and distribution; various treatment methods water treatment, and water supply arrangements in buildings.

Course Objectives

The objective of this course is to:

1. To impart the basic knowledge on sources, quality, quantity, demand, conveyance, treatment systems, storage, and distribution of water; and water supply arrangements in buildings.
2. To develop skills in analysis, design and problem-solving in water supply engineering issues using appropriate techniques.
3. To inculcate ethics in solving water supply engineering problems ensuring health and safety.

Outcomes:

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Acquire the basic knowledge of sources, quality, quantity, demand, conveyance, treatment systems.	Understanding Applying	L2 L3	PO1, PO4 PO6, PO8 PO10
CO2	Analyze and design water conveyance, storage, and distribution systems.	Understanding Applying	L2 L3	PO1, PO2 PO3, PO4 PO5, PO6 PO7, PO8 PO11, PO12
CO3	Analyze the quality of various sources of water and its treatment problems through proper investigations and interpretation.	Understanding Applying	L2 L3	PO1, PO2 PO3, PO4 PO5, PO6 PO7, PO8 PO11, PO12
CO4	Use appropriate techniques in solving water supply engineering problems to maintain water quality standards ensuring health and safety	Understanding Applying	L2 L3	PO1, PO2 PO3, PO4 PO6, PO7 PO8, PO9 PO11

UNIT- I   **L: 12**

Introduction: Importance of water supply engineering, Need for protected water supply, Objectives of water supply systems, Flow diagram of water supply systems,

Water Sources, Quantity & Demand –Different sources of water quality of sources, Introduction, Design Period, Forecasting of the population – (Short term Forecasting methods, Long term Forecasting methods), suitability. Types and Variation in water demand, Factors affecting water demand.

Outcome:

- ➢ Acquire the basic knowledge of sources of water
- ➢ Able to estimate the quantity of water required; various demands of water.

Activity/Event:

- ➢ Estimation of the quantity of water required

Experiments:

- Sampling, handling, and transportation from various sources

UNIT II   **L: 12**

Collection & Conveyance: Intake works for the collection of surface water

Conveyance of water: gravity and pumping methods conveying conduits and their suitability

Quality of water– quality of sources, physical, chemical, and biological properties, and their testing parameters.

Outcome:

- Acquire the basic knowledge on quality parameters of water.

Activity/Event:

- Difference between I.S. and WHO standards for drinking water.

Experiments:

- ➢ Determination of pH, conductivity, turbidity
- ➢ Determination of hardness (total hardness, ca & mg hardness)
- ➢ Determination of alkalinity and acidity for water and wastewater

Unit-III L: 12

Conventional water treatment processes – Units and their functions; Aeration, Coagulation, Flocculation, Clarification, Determination of optimum dose of alum for coagulation of water, Theory of filtration, Different types of filters and their design, Disinfection – Disinfectants, Mechanism of disinfection, Different methods of disinfection, Breakpoint chlorination, Types of chlorination, Dose of disinfectant.

Outcome:

- Able to solve water supply engineering problems through proper investigations and interpretation.

Activity/Event:

➢ Design of Water Treatment plant

Experiments:

➢ Determination of optimum coagulant dosage
➢ Determination of residual chlorine

Unit-IV L: 10

Advanced Treatment Methods: Removal of fluorides, hardness, iron and manganese, salinity, colour, organic chemical and biological residues; Adsorption with activated carbon, ion–exchange resins; Membrane processes, Chemical oxidation.

Outcome:

➢ Able to use advanced techniques for water treatment.
➢ Analyze problems associated with the water distribution network.

Activity/Event:

➢ List out the effect of heavy metals on human health

Experiments:

➢ Determination of total solids, volatile and fixed solids
➢ Determination of total suspended solids and total dissolved solids

Unit-V L: 12

Distribution: Distribution- Systems of distribution, Distribution reservoirs, Distribution networks, Design of simple networks, Pipe accessories, Valves and their location and suitability.

Water Supply Arrangements in Buildings

Definition of technical terms used in water supply arrangements, House water connection, Water storage, Water piping systems in buildings, Water supply fittings, Principles, and precautions in laying pipelines in the premises of buildings, Detection, and prevention of leakages.

Outcome:

➢ Acquire the basic knowledge of storage and distribution of water; and water supply arrangements in buildings.

Activity/Event:

➢ Prepare a model for water supply network for any residential building.

Experiments:

➢ Determination of D.O
➢ Determination of B.O.D
➢ Determination of C.O.D

Text Books:

1. Environmental Engineering Water Supply Engineering - Vol.1, Santosh Kumar Garg, Khanna Publications
2. H. S. Peavy and D. R. Rowe, Environmental Engineering, McGraw–Hill Publishing Company, 2nd Edition, 1984.

Reference Books:

1. K. N. Duggal, Elements of Environmental Engineering, S. Chand Publishers, 2010.
2. P. N. Modi, Water Supply Engineering, Standard Book House, 3rd edition, 2010.
3. Water Supply & Sanitary Engineering, by Birdie G. S (Author), Birdie J. S (Author), Dhanpat Rai Publication Company, 2010

Course Code	Employability Readiness Program-1 (Open Elective-1)	L	T	P	Credits
1020192100		3	0	0	3

Course Overview

In this course students get knowledge of analytical thinking,standard operation methods, verbal ability, career-oriented skills, numerical ability, mensuration, data interpretation,arithmetical ability, logical ability and reasoning

Course Objectives:
- To encourage the all-round development of students by focusing on verbal ability
- To perform better during Campus Recruitment and variousinterviews they face in their career.
- To enhance the problem solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of competitive examinations.
- Toenhance the problemsolving skills in the area ofQuantitative Aptitude' and 'Reasoning' which will enable the students to achieve in Campus Placements and competitive examinations.

Course Outcomes: After taking the course, students will be able to

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Students have the adequate writing **skills** that are needed in an organization	Understanding	PO9 ,PO10
CO2	Understand the core competencies to succeed in professional and personal life	Understanding	PO9, PO10
CO3	Solve various Basic Mathematics problems by following different methods and to perform well in various competitive exams and placement drives.	Understanding and applying	PO1, PO4
CO4	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems and confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.	Understanding and applying	PO1, PO2

Unit-I:

Verbal:

English Grammar and Vocabulary, Noun &Pronoun,Verbs (Lexical& Auxiliary),Verb Tenses,Adjectives & Adverb Preposition,Conjunction, Phrases and Clause

Aptitude/ Logical Reasoning:

Number System: Speed maths, Numbers, Factors, prime & Co primes, LCM;HCF, Divisibility rules, finding unit place digit and last two digits of an expression.

Blood Relations: Defining the various relations among the members of a family, Solving Blood Relation Puzzles by using symbols and notations. Problems on Coded relations.

Outcome:

1. Demonstrate the knowledge of all parts of speech's

2. Apply shortcut methods to solve mathematical problems

Activity/Event :

1. Quiz on Parts of Speech

2. Brain Teasers (Number System) and Puzzles on Blood Relations

UNIT -II:

Verbal: Sentence Types, Transformations, Word meanings, synonym, Antonym,Root words, one word substitutes, Phrasal Verbs, Idioms,Word games – Vocabulary development

Aptitude/ Logical Reasoning:

Percentages: Converting fractions and decimal into percentages, successive percentage, populations, expenditure and savings

Profit and loss: Relation between Cost price and Selling price, Discount and Marked price, Gain or Loss percentages on selling price

Simple and Compound Interest: Problems on Interest (I), Amount (A), Principal (P) and Rate of

Interest(R),Difference between the simple interest and compound interest for 2 and 3 years.

Outcome:

1.Understand the vocabulary and grammar

2. Follow strategies in minimizing time consumption in problem solving and to perform well in various competitive exams and placement drives.

Activity/Event :

- Stock Market Game

- Class Business

- Budget Tracking

- Role Play on : (Sentence Transformations ;Types of Sentence)

- Semantic Maps (Vocabulary Development).

- Eye Spy

Unit-III:

Verbal:

Reading Comprehension, Comprehension: The Goal of Reading, General strategies for Reading Comprehension, Strategies for Reading Comprehension: Narrative Text, Strategies for Reading Comprehension: Expository Text, Main Idea/Summarization

Aptitude/ Logical Reasoning:

Partnership:Relation between partners, period of investment and shares

Averages and Ages: Average of different groups, change in averages by adding, deleting and replacement of objects, problems on ages.

Allegation and mixtures: Allegation rule, Mean value of the mixture, Replacement of equal amount of quantity.

Outcome:

1. Understand the core competencies to succeed in personal life

2. Utilize these mathematical skills both in their professional as well as personal life

Activity/Event :

Box Plots

Brain Teaser/Puzzle

KWL Chart & Story Map

UNIT- IV:

Verbal:

Sentence Correction/ Improvement/ Completion, Subject-verb agreement, Repetition, Error in modifiers, Parallelism, Error in diction, Wrong comparisons

Aptitude/ Logical Reasoning:

Time and Work: Men and Days, Work and Wages, hours andwork, Alternate days concept,

Time and Distance: Difference between the average and relative speeds, reaching the destination late and early, Stoppage time per hour, time and distance between two moving bodies

Trains, Boats and Streams: Train crossing man, same and opposite directions, Speed of boat and stream

Outcome:

1.Understand the core competencies to succeed in professional and personal life

2.Solve various Basic Mathematics problems by following different methods

Activity/Event :

Brain Teaser/Puzzle

Use sticky notes

Tic-tac-toe

UNIT -V:

Verbal: E-mail,Essay Writing, Tips on Writing an Effective Essay, Cloze Test, Cloze Test – Introduction to the Concept, Tips and Tricks to Solve Cloze Test

Aptitude/ Logical Reasoning:

Series &Progressions: Arithmetic, Geometric and Harmonic Progressions, Arithmetic Mean, Geometric Mean and Harmonic   Mean and their relations.

Permutation and Combination: Fundamental rules, problems on permutations & combinations.

Probability: Definition of probability, notations and formulae, problems on probability

Outcome:

1.Students have the adequate writing **skills** that are needed in an organization

2. Solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.

Activity/Event :

Picture Stories(PPDT Images)

Word Grab

Brain Teaser/Puzzle

TEXT BOOKS

1. Quantitative Aptitude by R S Agarwal, S Chand Publications

2. *Quantitative* Analysis. Third edition (Hall, William Thomas). Norris F. Hall · Cite this: J. Chem. Educ. 1942, 19, 7, 350.

3. *Arun Sharma and Meenakshi Upadhyay for verbal ability*

4. A Modern Approach to Verbal Reasoning by R S Agarwal, S Chand Publications

REFERENCE BOOK

1. Quantitative Aptitude – Abhijit Guha, McGraw Hills. Logical Reasoning, Arun Sharma, McGraw Hill.

2. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications

Course Code	PUBLIC ADMINISTRATION	L	T	P	Credits
1020192101		3	0	-	3

Course Overview:

The course will provide an overview of the field of public administration by focusing on its development and importance in modern government operations at the local, state, and federal levels. It will familiarize the students with the basic principles, concerns, and methods of public administration.

Course Objectives:

Students will be able to:

➢ Understand definition, scope, approach and theories of public administration.
➢ Identify the process and technique of decision making and also understand the concept of administrative behaviour and control.
➢ Will be able to understand the process and technique of personnel and financial administration.
➢ Discuss the tools that modern public administrators use to pursue public goals and public policy, along with the pros and cons of those tools.
➢ Explain the major administrative techniques and values that public administration has and illustrate how those affect the work of government and also understand the process of administrative improvement.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	understand definition, scope, approach and theories of public administration.	Remembering and Understanding(L1 &L2)	PO-2 PO-6 PO-12
CO2	identify the process and technique of decision making and also understand the concept of administrative behaviour and control.	Understanding and Analyzing (L2&L4)	PO-6 PO-12
CO3	understand the process and technique of personnel and financial administration.	Understanding and applying (L2&L3)	PO-06 PO-09 PO-11 PO-12

CO4	Discuss the tools that modern public administrators use to pursue public goals and public policy, along with the pros and cons of those tools.	Understanding, Applying Evaluating (L2, L3&L5)	PO-06 PO-09 PO-12
CO5	understand and explain the major administrative techniques and values that public administration has and illustrate how those affect the work of government and also understand the process of administrative improvement.	Understanding, Applying Evaluating (L2, L3&L5)	PO-06 PO-08 PO-09 PO-12

UNIT I. Introduction:

Meaning, scope and significance of Public Administration; Wilson's vision of Public Administration; Evolution of the discipline and its present status; New Public Administration; Public Choice approach; Challenges of liberalization, Privatization,Globalization; Good Governance: concept and application; New Public Management. Organization Theories

UNIT II Accountability and control & Administrative Behaviour

Process and techniques of decision-making; Communication; Morale; Motivation Theories – content, process and contemporary; Theories of Leadership: Traditional and Modern. Legislative, Executive and Judicial control over administration; Citizen and Administration; Role of media, interest groups, voluntary organizations; Civil society; Citizen's Charters; Right to Information; Social audit.

UNIT-III Personnel and Financial Administration:

Importance of human resource development; Recruitment, training, career advancement, position classification, discipline, performance appraisal, promotion, pay and service conditions; employer- employee relations, grievance redressal mechanism; Code of conduct; Administrative ethics. Monetary and fiscal policies; Public borrowings and public debt Budgets - types and forms; Budgetary process; Financial accountability; Accounts and audit.

UNIT-IV: Public Policy:

Models of policy-making and their critique; Processes of conceptualization, planning, implementation, monitoring, evaluation and review and their limitations; State theories and public policyformulation. Women and development - the self-help group movement.

UNIT-V Techniques of AdministrativeImprovement:

Organization and methods, Work study and work management; e-governance and information technology; Management aid tools like network analysis, MIS, PERT, CPM.

Reference Books

1. The Politics of Public Health in the United States (2004)
2. The Public Administration Theory Primer (2011)
3. Ethics and Integrity in Public Administration (2009)
4. Social Equity and Public Administration (2010)

Course Code	FOREIGN LINGUISTIC - FRENCH	L	T	P	Credits
1020192102		3	0	-	3

Course Overview:

In this course students get knowledge of active communication in beginning French. including listening, speaking, reading, writing, pronunciation, structure, vocabulary and culture.

Course Objectives:

1. Express him/herself effectively and accurately in simple French about him/herself and pronounce French reasonably well.
2. Construct simple sentences in French using accurate rudiments of syntax and grammar, Time, Weather and Structures used in a restaurant
3. Write short paragraphs on simple topics, e.g., (food, past memories, vacations, daily routines, shopping, health, love and hopes, etc.)
4. Demonstrate an elementary knowledge of French sentence structure while expressing themselves in French.
5. Compare and contrast the similarities and differences between his/her own culture and those of various French-speaking cultures

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Students have the adequate reading and speaking skills and will be able to express himself in French.	Understanding(L2)	PO-10 PO-12
CO2	Understand the grammar and use them in their personal and professional life.	Understanding (L2)	PO-10 PO-12
CO3	Students will be able to write proficiently in French.	Understanding and applying (L2&L3)	PO-10 PO-12
CO4	Studentswill be able to compare and contrast world culture and it will expand his knowledge about various culture.	Understanding and applying (L2&L3)	PO-6 PO-10 PO-12

UNIT-1 French Alphabet and Typical Sounds in French – I

Recognize the French letters; Pronounce these letters, Identify the differences and similarities between the English and French alphabet Spell one's name and other names in French;   Discover simple words that begin with these letters; Identify the letter-combinations that are characteristic of the French language; Pronounce these letter-combinations: Recognize the different pronunciations of certain letter-combinations;   Learn the various letter-combinations that produce the same sounds;   Discover simple words that are constructed from these letter-combinations;

UNIT-2 Typical Sounds in French – II,Liaison and Silent Letters

Identify the remaining letter-combinations that are characteristic of the French language; Pronounce these letter-combinations; Combine various letter-combinations to produce a variety of different sounds; Recognize the various accents and diacritical marks used in French; Discover simple words that have these letter-combinations, accents and diacritical marks;   Understand when to pronounce the final consonant;   Recognize when to connect the first and last letters of two adjacently placed words;   Differentiate between a silent 'E' and a pronounced 'E;   Distinguish the difference between a mute 'H' and an aspirated 'H'; Discover simple words that begin with 'H' and those that have silent letters;

UNIT-3 Numbers

Count the numbers from 0 - 100; Write the numbers from 0 – 100 in French; Ask someone his age; Tell one's age and phone number in French;   Distinguish between the formal 'you' and informal 'you';

UNIT-4 Basic Grammar

Pronouns, Verbs, Definite and Indefinite Articles, Adjective, Prepositions, Tenses, ArticlesNegation, Closed Questions

UNIT-5 Time, Weather and Structures used in a restaurant

Say the time in French;Learn how to say the time in numerals; Learn how to say the time in fractions; Learn how to write the time in French; Learn a few prepositions associated with time; Talk about the weather in French; Use different phrases to express different types of weather conditions; Describe a weather condition in different ways; Understand the difference between French and Native cultures;   Learn the various words and phrases related to weather;Learn the different prepositions used with weather and seasons; Structures used in a restaurant; Place an order in a restaurant; Take an order from a client at a restaurant; Identify the different courses of a meal; Identify basic expressions and structures associated with French gastronomy;

  Review partitive articles and expressions of quantity.

BOOKS AND REFERENCES

Alter Ego - Méthode de Français, A1 (2006): Berthet, Hugot et al., Hachette

Alter Ego – Cahier d'activités, A1 (2006): Berthet, Hugot et al., Hachette

Écho - Méthode de Français, A1 (2013): Girardet, Pecheur, CLE International

Écho - Cahier personnel d'apprentissage, A1 (2013): Girardet, Pecheur, CLE International

A votre service – 1, A1 (2011): Chanderasekar, Hanga et al., Hachette

Course Code	ENVIRONMENTAL SCIENCE	L	T	P	Credits
1000192130	(Audit Course)	2	0	0	0

Course Overview:

Environmental Studies is a specialized course that is meant to train the students in various fields related to the environment like Natural Resources Conversation, Ecology, Environment Impact Assessment, Pollution Management Techniques, and Environmental Protection Laws

Course Objectives:

1. Classify, describes and explains the concept of Ecosystems and Environmental Engineering
2. Overall understanding of different types of natural resources and its conservation
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
4. An understanding of environmental impact of developmental activities and the importance of environmental management and Awareness on the social issues, environmental legislations and global treats

Course Outcomes:

	Course outcome	Blooms Cognitive level	PO
CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental resource problems and its sustainable conservation practices.	Understand	PO 7 ,PO12
CO2	Overall understanding of the relationship between man and ecosystem & biodiversity	Understand	PO 6, PO7,PO 8,PO 9,PO 12
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century	Understand	PO 2,PO 6,PO 7, PO8, PO9 and PO 12
CO4	Recognize the interconnectedness of human dependence on the earth's ecosystems and Influence their society in proper utilization of goods and services.	Understand	PO 6,PO 7,PO 9 and PO12

Unit-I:
Environmental Science: Definition Scope and its importance, Multidisciplinary nature of Environmental science.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources

Unit-I Outcome:
- Learn about the basics of environment, natural resources and its conservation

Activity/Event on Unit-1: Collects the case studies on Natural resources

Unit-II:

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Energy flow in the ecosystem – Ecological pyramids - Ecological succession.

BIODIVERSITY AND ITS CONSERVATION: Definition: genetic, species and ecosystem diversity –Value of biodiversity, Threats to biodiversity, –Biodiversity conventions- Conservation of biodiversity.

Unit-II Outcome:
- Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century

Activity/Event on Unit-II: Prepares the models of food chain, web and pyramids

Unit-III:

Social Issues and the Environment
Human population growth: Impacts on environment.– Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people; Case studies Climate change, Global warming, Acid rain, Ozone layer depletion. Environmental laws: Wildlife Protection Act 1972 –Water pollution prevention and control Act 1974 - Forest Conservation Act 1980n –Air pollution prevention and control Act 1981. Environmental Protection Act 1986.

Unit-III Outcome:
- Understand the concept of climate change, its mitigation and environmental legislations

Activity/Event on Unit-III: prepares the models on green house effect and watershedestablishment inthe college campus

Unit-IV:

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

    1. Air Pollution,

    2. Water pollution,

    3. Soil pollution,

    4. Noise pollution,

5. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies.

Unit-IV Outcome:

• Understand the harmful effects of human activities on environment and their solution

Activity/Event on Unit-IV: collects case studies on different pollution

Unit-V:

Environmental Management

EIA and EA: Introduction, definition, scope, objectives and methodology.Disaster management: Definition, floods, earthquake, cyclone and landslides.Ecotourism: Definition, advantages and disadvantagesEnvironmental Diary

Field Trip

Field work/Environmental Visit: Visit to a local area to document environmental assets – reserve forest/ eco-tourist spot : Visit to a local polluted site - Study of local environment - common plants, insects, birds - Study of simple ecosystems –pond, river, hill slopes etc - Visit to industries/water treatment plants/effluent treatment plants.

Unit-V Outcome:

Understand the importance of EIA and EA, various disasters and its mitigation measures

Activity/Event on Unit-V: Environmental diary preparation and field trip

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

Reference Books:

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

Course Code	Communication Skills Lab	L	T	P	Credits
1000192110		0	0	2	1

Course Overview:
- In this course will develop the English proficiency of students and enable them to function effectively in different professional contexts,which enhances their employability skills.

Course Objectives:
- To impart employability skills like resume preparation and facing interviews
- To enable trainees to develop interpersonal and leadership skills
- To train them on work place skills like making presentations, participating in group discussions etc.

Course Outcomes: After completion of the course, students are able to:
- CO1: Analyze the functions of language and grammar in spoken and written forms with an emphasis on LSRW Skills.
- CO2: Disseminate the relevant skills while performing GDs, interviews, oral presentations with a focus on Non verbal communication.
- CO3: Prepare and exhibit oral presentation skills by using ICT.(Individual/Team)

- CO4: Organize proper life skills for their employability.

Co-Po Mapping:

Course Name	Course Code	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CS Lab		CO1					2					3		2
		CO2					1					3		2
		CO3					2					3		2
		CO4					2					3		3

Experiments:

Expt.1: JAM (Just A Minute)

Expt.2: Interactions

Expt.3: Group Discussion

Expt.4: Reading Comprehension

Expt.5: Listening Comprehension

Expt.6: Presentation Skills

Expt.7: Resume Preparation and Covering Letter

Expt.8: Mock Interviews

Suggested Books:

Interact- Orient Blackswan,2019

FURTHER REFERENCES:

- Elaine Kirn,Pamela Hartmann-**Interactions,** McGraw Hill,2007
- Edward Holffman, **Ace the corporate personality**, McGraw Hill,2001
- Adrian Furnham, **Personality and intelligence at work**, Psychology Press, 2008.
- John Adair Kegan Page, "**Leadership for innovation"** 1st edition, Kogan, 2007.
- Krishna Mohan & NP Singh, "**Speaking English effectively"** 1st edition, Macmillan, 2008.
- Dr. S.P. Dhanvel**, English and Soft skills,** Orient Blackswan, 2011
- Rajiv K. Mishra, Personality **Development**, Rupa& Co. 2004.

Course Code	MINI PROJECT – I	L	T	P	Credits
1001192170	(EPICS/Societal Relevant Project)	2	1*	0	3

Course Overview:

Course will explain the importance of engineers in the society. Itwill give a brief understanding of various social and global issues of the world. Course reminds that every engineer has a responsibility to solve the social problems of world, to make the world a better place to livein. In the process of serving the society, students need to identify a community problem for which a community project needs to be developed. After successful completion of project, the Project needs to be submitted to community for their benefit. For the effective development of the project, concepts like 'Design thinking' & 'Project management' will be taught in the course. In addition to that, various platforms like IoT, 3D Printing, Mobile app etc. will be explained which will be useful for effective project development.

EPICS means **- Engineering Projects In Community Service**

Course Objectives

Course objective is to remind students, that every engineer has a responsibility to serve the society. As part of fulfilling the responsibility, Students will create an Engineering project in the service of community. Students will learn the necessary concepts & technologies to developeffective projects

Course Outcomes with Bloom's Taxonomy level and PO mapping:

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	**Understand** the various social problems present in the world & they will be able to identify and select a community problem to develop a technological project.	Understanding, Identifying	L2 L3	PO-1, PO-2 PO-6, PO-9 PO-10
CO2	**Learn** the concepts of Design Thinking and Project management. **Learn** the technologies like Internet of Things, 3D Printing, Mobile App Creation, Thinker CAD, and Web	Understanding	L2	PO-3, PO-5, PO-11

	page development.			
CO3	**Apply** the engineering knowledge, mathematics, design thinking and project management to **develop** a community project.	Applying, Testing Summarize, Develop Validate	L3, L4 L5, L6 L6	PO-1, PO-2, PO-3, PO-5 PO-6, PO-7, PO-9, PO-10 PO-11,
CO4	Students will submit the project to the intended community and feedback to be collected from community. Any future support also will be provided by the students.	Understanding	L2	PO-1, PO-6, PO-8 PO-12

UNIT- I   **L: 08**

ENGINEER'S CONTRIBUTION TO SOCIETY :
Major roles played by engineers in building a society – Importance of engineers to society – Variousglobal issues, social problems & problems faced by different communities in the world – Engineering inventions which reduced the impact of many social problems.

EPICS:

Introduction to EPICS – Learning pedagogies - History of EPICS – Case studies of various EPICS projects of Purdue university – Case studies of various EPICS projects in India– Community visit – Selection of a community project by visiting a community / Studying about a community.

Outcome: Students will be able to understand the importance of Engineers in the society &will also recognize various ways by which engineerscan contribute to society.Students will realize the need of Community projects.

Activity:
- ➢ Visiting a Community / Studying about a community to understand their Problems.
  Analyzing their problems and Identifying problems which can be solved through technology.
- ➢ Selecting one Social / Community problem from the identified problems to develop a technological solution/project.

UNIT II   **L: 08**

DESIGN THINKING & PROJECT MANAGEMENT:

DESIGN THINKING:
Introduction to Design Thinking – Case study for design thinking process(IDEO)–Requirement & Specifications from Users and community partners – Ideation and Concept generation – Design

and Prototyping – Testing & Redesign – Detailed design and delivery.

PROJECT MANAGEMENT:

Introduction to Project & Project Management – Project Management Process – Stake Holders – AgilePractices in Project Management – Project management tools (Checklist, Precedence Table, Timeline using Gantt Chart) – Advanced project management tools – Significance of Documentation.

Outcome: Students will be able to understand process of 'Design' for any kind of project. Students will be able to learn the project management techniques. Students will apply this knowledge for developing projects.

Activities:
- ➢ Studying the Design thinking process of Shopping cart developed by IDEO
- ➢ Creating a project plan for the community project.

Unit-III   **L: 10**

PLATFORMS FOR DEVELOPING COMMUNITY PROJECTS:
Various platforms are used for developing projects. Some of the platforms used for project development are

        a. Internet of Things (IoT)& Embedded Systems
        b. 3D Printing
        c. Thinker CAD
        d. Mobile App creation
        e. Web Development

Internet of Things (IoT)& Embedded Systems:

Introduction to Internet of Things (IoT) & Embedded systems – Difference between IoT & Embedded systems - Before IoT vs. After IoT - Stages of IoT - Components of IoT&Embedded systems (boards, sensors, actuators) - Programming of IoT & interfaces to hardware- Cloud integration & Data collection - Application of IoT & future scope

3D Printing:

Introduction to 3D Printing - Before and After 3D Printing - Components for 3D Printing - Types of 3D Printing - Steps for creating a 3D Model - Scope of 3D Printing - 3D Milling, Laser cutting, 3D Carving machine using 3D Printing technology

Thinker CAD:

Thinker CAD circuit making: Circuit Design - Programming – Simulate

Thinker CAD 3D Modelling: Place – Adjust – Combine - 3D Print

Mobile App Creation:

1. Applications and Scope of Mobile Apps in society
2. Tools for creation of mobile apps (MIT APP, AppsGeyser&AppyBuilder)

Web Development:

1. Applications / Need for Webpage
2. Tools (various websites) for creation of Web pages (Wix, Weebly & GoDaddy)

Outcome: Students will be able to learn various platforms and apply the knowledge for developing social projects

Activities:
- ➢ Based on the requirements of community projects, students will select one or more platforms for project completion. Corresponding online courses will be learnt by students.

Unit-IV   **P: 12**

PROJECT DESIGN& PROTOTYPING:

Defining the Problem – Requirements & Specifications from Users / Community partners – Detailed Design – Creating a Prototype by considering key parameters.

Outcome: Students will be learning the fundamental process of Design. They will learn how to make use of customer requirements to the effective design process and the process of making a prototype.

Activities:

- ➢ Developing the Community Project

Unit-V   **P: 12**

PROJECTTESTING& SUBMISSION:
Prototype testing – Analyzing the performance of prototype – Redesign (in case of testing failure) – Submission to community partners / beneficiaries – taking the feedback for improvement of the project.

Outcome: Students will be able to learn the importance of testing and redesign in the real time projects.

Activity:
- ➢ On testing, if results are positive, project needs to be submitted to the community.

Reference Papers:

1. **EPICS:** Engineering projects in community service*, Edward j. Coyle, Leah H. Jamieson and William C. Oakes, International Journal of Engineering Education, 2005

Web links:

1. https://en.wikipedia.org/wiki/List_of_global_issues
2. https://engineering.purdue.edu/EPICS/purdue/role-specific/purdue/team-documents/design-documents - For Design thinking
3. https://www.coursera.org/learn/uva-darden-project-management
4. https://www.coursera.org/specializations/project-management
5. https://www.coursera.org/learn/introduction-iot-boards - Learn IoT.
6. https://en.wikipedia.org/wiki/3D_printing
7. https://www.coursera.org/learn/3d-printing-applications
8. https://www.tinkercad.com/ - For Thinker CAD
9. https://appinventor.mit.edu/- For creating MIT Mobile APP
10. http://appybuilder.com/ - For Creating own mobile app
11. https://www.weebly.com/in - For creating own websites
12. https://www.wix.com/ - For Creating own websites

III Year- I Semester

S.No.	Course Code	Name of the Subject	L	T	P	Credits
1	1099192100	Managerial Economics and Financial Analysis	3	0	0	3
2	1001193120	Concrete Technology	2	1*	3	3.5
3	1001193121	Geotechnical Engineering	3	1*	3	4.5
4	1001193100	Hydrology and Water Resources Engineering	3	1*	0	3
5	1001193101	Design of Reinforced Concrete Structures	3	1*	0	3
6		Open Elective-2	3	0	0	3
7	1001193180	Technical seminar	0	0	0	1
8	1099193130	Professional Ethics and Human Values (Audit Course)	2	0	0	0
		Total Credits				**21**

Subject code	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	L	T	P	Credits
1099192100		3	0	0	3

Course Overview:

The present course is designed in such a way that it gives an overview of concepts of Economics. Managerial Economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial Analysis gives clear idea about concepts, conventions and accounting procedures along with introducing students to fundamentals financial statements. Break Even Analysis is very helpful to the Business Concern for Decision Making, controlling and forward Strategic Planning. Ratio analysis gives an idea about financial forecasting, financial planning, controlling the business and decision making

Course Objectives:

1. Understand the concepts of managerial economics and the market dynamics namely Demand, Elasticity of demand and pricing in different market structures.
2. Acquire the knowledge about production theories and cost analysis besides dealing with the production and factors of production.
3. Analyze the different market structures and understand various pricing methods which are adopted in attracting the customers under different markets.
4. To provide the basic knowledge on financial accounting
5. To understanding Capital budgeting decisions.

Course Outcomes:

Cos	Course outcome	PO's Mapping	Strength of mapping
CO1	Analyze the Demand, Price and Cost.	PO3, PO8, PO11, PO12	3
CO2	Identify the Nature of different markets	PO5, PO8, PO11, PO12	2
CO3	Understand Various Business Forms	PO5, PO8, PO11, PO12	3
CO4	Evaluate investment project proposals	PO3, PO11, PO12	3

Unit-I: Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Law of Demand and its Exceptions- Elasticity of Demand & Its types - Demand forecasting and Methods of forecasting.

(10 hours)

Unit-II: Production and Cost Analysis: Concept of Production function- Cobb-Douglas Production function – Production Function with One variable Input, Two Variable Inputs and Concept of Returns to scale -Different cost concepts – Cost –Volume-Profit (CVP) analysis (simple problems) **(06 hours)**

Unit-III

Part-I: Introduction to Market Structures: Perfect Competition, Monopoly, Duopoly, Monopolistic competition and Oligopoly.

Part-II: Introduction to Business: Features, Merits and Demerits - Sole Trader, Partnership, Joint Stock Company – Public Enterprises – Business Cycles: Meaning and Features – Phases of Business Cycle.   **(06 hours)**

Unit-IV: Introduction to Financial Accounting: Double Entry Systems, Rules of Accounting, Accounting Concepts, Accounting Conventions, Journal, Ledger, Trail Balance, Preparation of Trading Account, P&L Account and Balance Sheet (Simple Problems)

(10 hours)

Unit-V: Capital and Capital Budgeting Decisions:

Introduction to Capital, Classification of Capital, Time value of money. Types of Capital Budgeting Decisions: Traditional Methods (Payback period, Accounting rate of return) and Modern methods (Net Present Value method, Internal Rate of Return Method and Profitability Index Method) (Simple Problems)   **(08 hours)**

Text Books:

1. M.Kasi Reddy & Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 10th Revised Edition, 2012.

2.Varshney &Maheswari, "Managerial Economics", Sulthan Chand Publishers, 1st Revised Edition, 2009.

3.S.N. Maheshwari &S.K.Maheshwari, "Financial Accounting", Vikas Publication House Pvt.Ltd, 4th Edition, 2012.

Reference Books:

1. D.N. Dwivedi, "Managerial Economics", Vikas Publication House Pvt.Ltd, 2nd Edition, 2012.

2.R.Narayana Swamy, "Financial Accounting- A managerial Perspective", Pearson publications, 1st Indian Reprint Edition, 2012.

3.J.V.Prabhakar Rao &P.V.Rao, "Managerial Economics & Financial Analysis", Maruthi Publishers, 1st Revised Edition, 2011

NPTEL/SWAYAMMOOCS:

1.https://onlinecourses.swayam2.ac.in/imb19_mg08/preview

2.https://www.coursera.org/learn/strategic-management

Subject code	CONCRETE TECHNOLOGY	L	T	P	Credits
1001193120		2	1	3	3.5

Course Overview:
Building Materials &Concrete Technology is the art and science of proportioning economic and ecological concrete with available raw materials meeting the strength and durability criteria and workability constraints including detailed study of durability, fracture mechanics and elastic properties of concrete and its ingredients under various conditions and combinations

Course Objectives:
The students will be taught
1. The types and classification of aggregates, cement and admixtures & manufacturing process of cement
2. The different tests on fresh concrete and factors effecting workability
3. The different tests on Hardened Concrete and Elasticity, Creep & Shrinkage of concrete
4. The Indian standard concrete mix design, its proportions and factors influencing
5. The special concretes include ready mixed concrete, shot Crete, light weight concrete etc.

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

CO'S	At the end of the course, the student will have the ability to:	Cognitive level as per Bloom's Taxonomy	POs
CO1	Describe types and classification of aggregates, cement and admixtures & manufacturing process of cement	Applying	1,2
CO2	Describe different tests on fresh concrete and factors effecting workability	Applying	1,2
CO3	Describe different tests on Hardened Concrete and Elasticity, Creep & Shrinkage of concrete	Analyzing	1,2
CO4	Describe the Indian standard concrete mix design, its proportions and factors influencing and Describe special concretes include ready mixed concrete, shotcrete, light weight concrete etc.	Analyzing	1,2

Unit-I:

Cement: Manufacture of Portland cement by dry process- approximate oxide composition limits of OPC- Bogue's compounds- Hydration of cement-heat of hydration- structure of hydrated cement. Test`s on physical properties of cement- Different grades and Types of cement.

Chemical and Mineral Admixtures: Functions of admixtures- accelerators- retarders-air entraining admixtures- plasticizers and super plasticizers- water proofers- fly ash- silica fume-ground granulated blast furnace slag.

Aggregates: Classification of aggregate – Particle shape & texture – strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

Experiments:
1. Determination of (a) Normal consistency of cement (b) Fineness of cement using microns IS sieve.
2. Determination of Initial setting and final setting time of cement.
3. Determination of (a) Specific gravity of cement (b) soundness of cement.
4. Determination of grading and fineness modulus of coarse aggregate by sieve analysis.
5. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.
6. Determination of specific gravity of fine aggregate and coarse aggregate.
7. Determination of bulking of sand.

Unit-I Outcome:
- Able to perform various tests on different grades and types of cement for finding their physical properties
- Able to know functionaries of various chemical and mineral admixtures
- Able to perform aggregate classification and find mechanical properties of aggregates by conducting tests

Activity/Event on Unit-1:
Collect the different grades of cement, different admixtures and mix it separately. Then test their strengths and compare to indicate/suggest their suitability for different constructions

Unit-II:

Fresh Concrete: Workability – Factors affecting workability – Measurement of workabilityby different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

Experiments:
1. Determination of workability of concrete by compaction factor method.
2. Determination of workability of concrete by slump test.
3. Determination of workability of concrete by Vee-bee test.

Unit-II Outcome:
- Able to perform different tests for measurement of workability
- Able to perform mixing, vibration and manufacturing of concrete

Activity/Event on Unit-II:
Collect the materials include different grades of cement, fine aggregate and coarse aggregate and prepare cubes for different concrete mixes. Then after 48 hours test the strength of all cubes and compare them to indicate/suggest their suitability to various constructions.

Unit-III:

Hardened Concrete: Water/Cement ratio – Abram's Law – Gel space ratio – Maturity concept – Relation between compressive & tensile strength - Curing.

Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests- Pull-out test, Non-destructive testing methods – codal provisions for NDT

Elasticity, Creep & Shrinkage: Modulus of elasticity–Dynamic modulus ofelasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage

Experiments:
1. Determination of compressive strength of cement concrete and its young's modulus.
2. Determination of split tensile strength of concrete.
3. Non-Destructive testing on concrete (for demonstration).

Unit-III Outcome:
- Able to perform the different tests of hardened concrete
- Able to differentiate the Elasticity, Creep and Shrinkage

Activity/Event on Unit-III:
Collect the materials include different grades of cement, fine aggregate and coarse aggregate and prepare cubes for different concrete mixes. Then after 28 days moist curing test the strength of all the cubes and compare them to indicate/suggest their suitability to various constructions.

Unit-IV:

Mix Design: Basic considerations for concrete mix design-factors influencing the choice of mix proportions- Indian standard method of concrete mix design, Nominal mix design as per IS 456

Unit-IV Outcome:
- Able to design the concrete mix proportion as per Indian Standard method and Normal mix design as per IS 456

Activity/Event on Unit-IV:
Choose any Standard Mix, Example M25 and collect the material include cement, fine aggregate and coarse aggregate. Test the required properties of the materials for calculating volume of water content, cement, fine aggregate and coarse aggregates for the standard Mix.

Then calculate the mix proportion and based on the mix proportions cast cubes for calculating compressive strengths. Finally validate the compressive strength values with characteristic strength of the M25.

Unit-V:

Special Concretes: Ready mixed concrete- Shotcrete -Light weight concrete – Cellular concrete – No-finesconcrete – High density concrete – Fiber reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Unit-V Outcome:
- Able to differentiate the special concretes like Ready mixed concrete, Shotcrete, Cellular concrete and so on

Activity/Event on Unit-V:
Collect the materials include various types of cement, fine aggregate and coarse aggregates as per requirements of special concrete. Then the cast the cubes for special concrete to find the compressive strengths. Validate the compressive strength values with the standard values of corresponding special concrete

Textbooks:
1. Concrete technology by A.R.Santhakumar, Oxford University Press.
2. Concrete technology by M.S.Shetty, S.Chandlkuo& Company Pvt. Ltd., New Delhi.

Reference Books:
1. Properties of Concrete by A.M.Neville,Pearson,4th edition.
2. Concrete technology by M.L.Gambhir, Tata McGraw-Hill Publishing company Ltd., New Delhi.

Subject code	GEOTECHNICAL ENGINEERING	L	T	P	Credits
1001193121		3	1	3	4.5

Course Overview:

Geotechnical engineering deals with the behavior of soils under the influence of loading. It is one of the most important branches of civil engineering. It uses the concepts of soil and rock mechanics to model real world engineering problems, aided by empirical observations and a systematic classification of soil materials which seeks to correlate classification and physical properties with engineering behavior. This course serves as an introduction to geotechnical engineering and covers basic concepts and terminology.

Course Objectives

The students will be able to

1.   Gain adequate knowledge on index properties of soil and classify the soil

2.   Understand the concept of permeability and seepage through soil

3.   Emphasize the importance of soil stress distribution due to various loads.

4.   Explain how soil shear parameters are affected by drainage conditions and estimate the magnitude and time-rate of settlement due to consolidation

Course Outcomes: At the end of the course, the student will be able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Classify the different types of soil using I.S classification analysis	Applying	1
CO2	Determine the permeability of soil and solve seepage related problems	Understanding, Applying	1
CO3	Understand how stresses are transferred through soils and be able to compute both geostatic and induced stresses	Analyzing	1,2
CO4	Evaluate the rate of consolidation, time-rate of settlement and shear parameters of the effected by different drainage conditions	Analyzing	1,2

Unit-I:
Introduction: Origin and Formation of soils - Three phase system - physical properties - Functional Relationships - determination of water content, specific gravity, In-situ density-Relative density.

Plasticity Characteristics of soil: Atterberg's limits and their determination-liquid limit, plastic limit, shrinkage limit and index properties -Free swell index.

Unit-I Outcome:

Classify the different types of soil using I.S classification analysis

Activity/Event on Unit-1:

Solving the Previous GATE problems.

Experiments:

1. Specific gravity, G

2. Field density-Core cutter and Sand replacement methods

3. Atterberg's Limits.

4. Differential free swell (DFS)

Unit-II:

Soil Classification: Grain size analysis, sedimentation analysis - hydrometer analysis- grain size distribution curves - I.S. Soil classification.

Permeability - Soil water, Capillary rise, One dimensioned flow of water through soils, Darcy's law, Permeability – Factors affecting –laboratory determination of Coefficient of permeability –Permeability of layered systems. Seepage analysis – flow nets.

Unit-II Outcome:

Determine the permeability of soil and solve seepage related problems

Activity/Event on Unit-II:

Laboratory Demonstration on determination of Index Properties of soil.

Experiments:

1. Grain size analysis by sieving

2. Hydrometer Analysis Test

3. Permeability of soil - Constant and Variable head tests

Unit-III:

Stress due to self weight-Total, neutral and effective stresses –quick sand condition.

Stress Distribution: Vertical stress due to applied loads- Boussinesq theory- Concentrated load-Strip footing- Rectangular footing-Newmark's influence chart - Pressure bulb Significant depth- Westergaard theory - 2:1 distribution method.

Unit-III Outcome:

Understand how stresses are transferred through soils and be able to compute both geostatic and induced stresses

Activity/Event on Unit-III:

Laboratory Demonstration on determination of Permeability of Soil and a seminar on the determination of permeability of In-situ soil (At Site).

Seepage discharge calculation for a real life earthen dam.

Unit-IV:

Compaction: Compressibility of soils - Lab tests-IS light weight and heavy weight compaction tests, zero

air void line - factors effecting compaction.

Compressibility – Compressibility constants - Consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (Cv) - Over consolidated and normally consolidated clays.

Unit-IV Outcome:

Evaluate the rate of consolidation, time-rate of settlement

Activity/Event on Unit-IV:

Increase in vertical stress calculation for a G+3 stored building at foundation level

Experiments:

1. Compaction test

2. CBR Test

3. Consolidation test (to be demonstrated)

Unit-V:

Shear strength: basic mechanism of shear strength - Mohr's and Coulomb failure theories - Measurement of shear strength - direct shear - Triaxial compression, unconfined compression test and vane shear test- pore pressure parameters.

Unit-V Outcome:

Evaluate shear parameters of the effected by different drainage conditions

Activity/Event on Unit-V:

Laboratory Determination of shear parameters.

Solving previous GATE Problems.

Experiments:

1. Direct Shear test
2. Unconfined compression test
3. Triaxial Compression test (UU Test)
4. Vane Shear test

Text Books:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age International Publishers.

2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

3. Arora, K.R. (2001), "Soil Mechanics and Foundation Engineering", Standard Publishers, Delhi – 110 006.

Reference Books:

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.

2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.

3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi

Course Code	Hydrology and Water Resources Engineering	L	T	P	Credits
1001193100		3	0	0	3

Course Overview:

Hydrology is the study of the processes which cycle water among the oceans, atmosphere and land surface.. In many places water is relatively scarce with most precipitation falling as a snow on the high mountains.. This course is about learning the concepts and physical principles of water flow as well as the techniques that can be used to solve hydrologic problems. In practice hydrologists have to quantify rates at which water is exchanged among the atmospheres, ocean and land surface.

Course Objectives: The student will be taught

1. The hydrologic cycle, precipitation and its relevance to civil engineering
2. The abstractions from precipitation, evaporation, Evapo transpiration and Infiltration
3. The concepts of runoff and hydrograph analysis
4. The flood frequency analysis, design flood, flood routing
5. The concepts of groundwater movement and well hydraulics

Course Outcomes:

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

	Course Outcome	**Cognitive level as per Bloom's Taxonomy**	**PO**
CO1	Describe the hydrologic cycle, precipitation and its relevance to civil engineering	Understanding	1,6
CO2	Describe abstractions from precipitation, evaporation, Evapotranspiration and Infiltration.	Understanding	1
CO3	Describe concepts of runoff and hydrograph analysis	Understanding	1
CO4	Analyze flood frequency and design flood and flood routing	Applying	1,3
CO5	Analyze the groundwater movement and well hydraulics	Applying	1,3

Unit-I:

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, rain gauge network, presentation of rain fall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

Outcome:

- Introduce hydrologic cycle and its relevance to civil engineering

Activity/Event:

Study a topo sheet of Visakhapatnam region.

Unit-II:

Abstractions from Precipitation: Initial abstractions.

Evaporation: factors affecting, measurement, reduction

Evapo transpiration: factors affecting, measurement, control

Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

Outcome:

- Understand the students understand physical processes in hydrology and,
- components of the hydrologic cycle
- Appreciate concepts and theory of physical processes and interactions
- Learn measurement and estimation of the components hydrologic cycle.

Activity/Event:

Estimate runoff using runoff co-efficient method.

Unit-III:

Runoff: Catchment characteristics**,** Factors affecting runoff, components, computation- empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rain fall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

Outcome:

Thorough understanding of hydrograph, its components, unit hydrograph theory and its analysis

Activity/Event:

Delineate the watersheds using the topo sheet.

Unit-IV:

Floods:

Causes and effects, frequency analysis- Gumbel's and Log-Pearson type distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

Outcome:
- Understand flood frequency analysis, design flood, flood routing

Activity/Event:
Derive the watershed map from the Digital Elevation Model.

Unit-V:

Groundwater:

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

Outcome:
- Understand the concepts of groundwater movement and well hydraulics

Activity/Event

Derive the stream line network from the Digital Elevation Model.

Text Books:

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

Reference Books:

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

Subject code	DESIGN OF REINFORCED CONCRETE STRUCTURES	L	T	P	Credits
1001193101		3	1	0	3

Course Overview:

Design of Reinforced Concrete Structures is an introductory design course in civil engineering. This course covers the structural design of reinforced concrete structural elements like beams-singly reinforced, doubly reinforced and T beams. Columns like short and long columns with axial, uniaxial and biaxial bending. Slabs like one way, two way and continuous slabs. Isolated footings and staircase in various constructions built up in reinforced concrete as per the IS 456-2000.

Course Objectives:

The course should enable the students to:

Identify, formulate and solve engineering problems of RC elements.

1. Differentiate between working stress design and limit state design.
2. Understand the importance of limit state design in reinforced concrete structural elements.
3. Design different structural members like beam, slab, column, footing and staircase as per IS code.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO 1	Illustrate the concepts of Reinforced Cement Concrete, compare various design methodologies and identify grades of concrete and steel, types of loads acting on structures and analysis of beams.	Understanding	1,2
CO 2	Design singly and doubly reinforced beams	Applying	1,2,3,6,8
CO 3	Differentiate between one way and two-way slabs, Design one way, continuous and two way slabs.	Applying	1,2,3,6,8
CO 4	Design columns, footings and Staircase.	Applying	1,2,3,6,8

Unit-I:

Introduction: Concept of reinforced concrete structures, Different grades of concrete and steel used in RCC Load and loading standards as per IS:875. Differentiate between working stress method ultimate load method and limit state method of design.

Design Based on Limit State Method: -Fundamentals of Limit State Method, types of limit state, Partial safety factors, characteristic strength of materials and loads, Material Stress–Strain curves. Introduction to stress block parameters**,** Assumptions in the theory of simple bending for RCC beams, Neutral Axis, Moment of resistance, critical neutral axis, actual neutral axis, concept of balanced, under-reinforced and over-reinforced sections.

Analysis of Beams: Analysis of Singly reinforced, doubly reinforced and T- beams as per IS:456-2000 (Simply supported)

Unit-I Outcome:

Able to describe the Concepts of RC design, and understand the limit state analysis of RC beams.

Activity/Event on Unit-1:

Make a field visit and observe reinforced concrete members.

Unit-II:

Design of singly reinforced concrete beams as per IS: 456 from the given data such as span load and properties of materials used. Design for shear reinforcement -Two legged vertical stirrups and design for torsional reinforcement. (simply supported beams)

Design of doubly reinforced concrete beams as per IS: 456 from the given data such as span, load and properties of materials used. Design for shear and torsional reinforcement. (simply supported beams)

Unit-II Outcome:

Able to design singly and doubly reinforced beams (shear and torsional reinforcement) as per IS code.

Activity/Event on Unit-II:

Draw the detailing of reinforcement in beams and make a model of RC beam with available materials.

Unit-III:

Design of RCC Slabs: Structural behavior of one way and two-way slabs under uniformly distributed load (UDL). Design of one-way slab (simply supported), design of One-way continuous slab and Design of Two-way slab.

a) Corners are not held down

b) Corners are held down: All the Four edges discontinuous case only.

Unit-III Outcome:

Able to understand the concept of slabs and design one-way, two-way and continuous slabs.

Activity/Event on Unit-III:

Draw the detailing of reinforcement in slabs and make a model of RC slab with available materials.

Unit-IV:

Design of Columns: Concept of long and short columns, Specifications for main and lateral reinforcement. Behavior of RCC column under axial load. Design of Axially loaded short columns (circular, square and rectangular as per IS specifications). Design of short column subjected to uniaxial and biaxial bending (Square and Rectangular).

Design of Footings: Concept of footing, Design criteria, Design of square, rectangular isolated column footings.

Unit-IV Outcome:

Able to design compression members and footings.

Activity/Event on Unit-IV:

Draw the detailing of reinforcement columns and footings and make a model of columns and footings with available materials.

Unit-V:Design of Staircase: Introduction to staircases, design of dog-legged stair, Single flight stairs.

Unit-V Outcome:

Able to design Staircase.

Activity/Event on Unit-V:

Draw the detailing of reinforcement in staircase.

Text Books:
1. Design of reinforced concrete structures in Limit State Design, A. K. Jain
2. Design of Reinforced concrete Structures, N. Subrahmanyian
3. Dr. B. C. Punmia, "Limit state design of reinforced concrete", Laxmi Publications,NewDelhi.
4. S. Unnikrishna Pillai and Devdas Menon, "Reinforced concrete design", Tata Mc. Graw Hill, New Delhi.
5. N. Krishna Raju and R. N. Pranesh, "Reinforced Concrete Design", New AgeInternational Publishers, NewDelhi.
6. P. C. Varghese, "Limit state design of reinforced concrete", Prentice Hall of India, NewDelhi.
Reference Books:
1.M. L. Gambhir, "Fundamentals of reinforced concrete design", Prince Hall of India Pvt. Ltd,New Delhi.
2.P. Purushotham, "Reinforced concrete structural elements – behavior, Analysis and design", Tata McGraw Hill,1994.

Subject code	**TECHNICAL SEMINAR**	L	T	P	Credits
1001193180		0	0	0	1

Technical seminar: Technical seminar is carried out during the Thirdyear. For Technical seminar, the student shall present on an emerging/specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated through presentation by the Departmental Committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

Course code	UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS	L	T	P	Credits
1099193130		2	0	0	0

Course Overview:

Universal Human Values & Professional Ethicssubject provides character oriented education that instils basic values and ethnic value in one's individual professionalism.

Course Objectives:

1. To help the student to see the need for developing a holistic perspective of life.
2. To help students distinguish between values and skills and understand the need, basic guidelines, content and process of value education and Harmony.
3. To help the students understand their role as engineers, behavior and how to use ethical theories.
4. To help the students remember the codes, their responsibilities towards society, safety and risk.
5. Making the students aware and sensitive to value system in real life situations. To help the students to discriminate between ephemeral and eternal values.

Course Outcomes:

CO's	At the end of the course, the student will have the ability to:	PO's mapped	Strength of Mapping
CO1	Recognize importance of Universal human values, self-exploration and environment	PO8	3
CO2	Describe the core values that shape the ethical behavior of an engineerthrough value education, harmony and ethical human conduct.	PO8	3
CO3	Recall basics of professional ethics and Ethical theories.	PO8	3
CO4	Listing sustained happiness through identifying their responsibilities.		

Unit-I Universal Human Values-I – Introduction

Self-exploration- Aspirations and Concerns- Self-Management- Health- Relationships- Society- Natural Environment- Sharing and feedback

Unit-II
Universal Human Values-II - Understanding Harmony and Ethical Conduct

Introduction to Value Education- Harmony in the Human Being,Family and Society,Nature/Existence- Implications of the Holistic Understanding – a Look at Professional Ethics.

Unit-III
Engineering Ethics:
The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy – Professional and Professionalism –Professional Roles to be played by an Engineer

–Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics- Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma

Unit-IV
Engineering as Social Experimentation & Engineers' Responsibility for Safety and Risk

Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering-Engineers'- Responsibility for Safety and Risk: Safety and Risk, Concept of Safety – Types of Risks - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

Unit-V Engineers' Responsibilities and Rights:

Collegiality-Loyalty-Professionalism and Loyalty- Professional Rights –Professional Responsibilities-Conflict of Interest-Ethical egoism-Confidentiality-Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies- Occupational Crimes - Whistle Blowing -Cross-culture Issues.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar- PHI Learning Pvt. Ltd-2009
3. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana- Maruthi Publications
4. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
5. "Professional Ethics and Human Values" by Prof.D.R.Kiran

Reference Books:

1. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R.Gaur (1990), Commonwealth Publishers, New Delhi.
2. AvartansheelArthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester &Harper Collins, USA
5. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BSP Publication
6. "EthicsinEngineering"byMikeW.MartinandRolandSchinzinger–TataMcGraw-Hill–2003.
7. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
8. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.
9. Samagrakranti: Jaya Prakash Narayan's philosophy of social change, Siddharth PublicationsRenu Sinha, 1996.
10. Small Is Beautiful: A Study of Economics as if People Mattered, E. F.Schumacher, 1973, Blond & Briggs, UK.

E-Books and Online Resources:

1.https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values
%20by%20R.S%20NAAGARAZAN.pdf
2.https://india.oup.com/productPage/5591038/7421214/9780199475070

NPTEL/SWAYAMMOOCS:

1. https://nptel.ac.in/courses/109/104/109104068/
2. https://onlinecourses.swayam2.ac.in/ntr19_ge06/preview