आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

Course Structure

&

Syllabus

of

B.Tech
Civil Engineering

[Applicable w.e.f. Academic Session - 2022-23]

[As per CBCS guidelines given by UGC]

DEPARTMENT OF CIVIL ENGINEERING
SCHOOL OF ENGINEERING & TECHNOLOGY
IFTM UNIVERSITY, MORADABAD

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Dravid
Registrar
IFTM University
Moradabad.

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SCHOOL OF ENGINEERING & TECHNOLOGY
IFTM UNIVERSITY, MORADABAD.
www.iftmuniversity.ac.in

Study & Evaluation Scheme of
Bachelor of Technology (B.Tech) Civil Engineering

Programme:	***Bachelor of Technology in Civil Engineering***
Course Level:	***Graduate Degree***
Duration:	***04 Years (Eight semesters) Full Time***
Medium of instruction:	***English***
Minimum Required Attendance:	***75%***
Maximum credits:	***226***

Programme Outcomes (POs):

Students completing this programme will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems of local as well as global importance.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations at local, national and international level.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for local, national and international challenges.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering local and global activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues of local and global importance and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development at local and global level.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design

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documentation, make effective presentations, and give and receive clear instructions at national and international level.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects at local and global level and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change at national as well as international level.

Programme Specific Outcomes (PSOs):

The learning and abilities or skills that a student would have developed by the end of four-year B.Tech. Program:

PSO1 – UNDERSTANDING: Graduates will have an ability to describe, analyze and solve problems using mathematics and systematic problem solving technique.

PSO2 – ANALYTICAL SKILL: Graduates will have an ability to apply knowledge in various fields to provide solution to new ideas and innovations through the departmental expertise in various fields like structural, geotechnical, water resource, environmental, transportation, surveying and project management.

PSO3 – EXECUTIVE SKILL: Graduates will have an ability to plan, execute, manage, maintain and rehabilitate civil engineering systems and processes.

PSO3 – RESPONSIBILITY: Graduates will have requisite understanding on impact of civil engineering projects and processes in a global, economic and societal context.

Choice Based Credit System (CBCS):

Choice based credit system (CBCS), provides a learning platform wherein the student or knowledge seeker has the flexibility to choose their course from a list of elective, core and soft skill courses. This is a student-centric approach to achieve his target number of credits as specified by the UGC and adopted by our University.

Groups of CBCS:

07 Groups of courses have been identified to provide student comprehensive exposure to a large number of areas, leading to the holistic development of an individual. These groups / clusters are as follows:

1. Humanities, Management courses, Language and Literature (HML)
2. Elementary / Fundamental Science courses (FSC)
3. Engineering Core Courses (ECC)
4. Engineering laboratory Courses (ELC)
5. Engineering departmental Elective (EDE)
6. MOOCs/NPTEL/Mandatory Course/Value added courses (VAC)
7. Project/Seminar/Industrial training/General Proficiency (PST)

- **Humanities, Management courses, Language and Literature (HML):** These coursesare actually Ability Enhancement Course (AEC) which is designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture.These courses are of 4 credits each.

- **Elementary / Fundamental Science courses (FSC):**
These courses include science courses from the disciplines of Physics Chemistry and Mathematics department, crafted for engineering students. These courses are of 4 credits each.

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- **Engineering Core courses (ECC):**
  Core courses of B.Tech. Program will provide a holistic approach to engineering education, giving students an overview of the field, a basis to build and specialize upon. These core courses

  are the strong foundation to establish technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.
  The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the society at large.
  A wide range of core courses provides groundwork in the field of surveying, engineering analysis and designs, transportation and construction engineering etc.
  We offer core courses in semester III, IV, V, VI, VII &VIII during the B.Tech. – Civil Engineering program. These courses are of 4 credits each.

- **Engineering Laboratory Courses (ELC):**
  These courses includes various laboratories of Engineering designed to provide the student solid foundation to the domain of engineering. In each laboratory Course, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and understanding of the experiment done. These courses are of 1 credit each.

- **Engineering Departmental Elective (EDE):**
  The departmental elective course is chosen to make students impart specialized knowledge of a specific domain. The student will have to choose any one out of the given list of specialization offered. These courses are of 4 credits each.

- **MOOCs/NPTEL/Mandatory Course/Value added courses (VAC):**
  A Value-Added Course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop a quality to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day- to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world.
  This is recommended for every student to take at least one MOOC Course throughout the programme. Every student completing a MOOC course through only NPTEL.

- **Project /Seminar/Industrial training/General proficiency (PST):**
  1. Project with a department faculty.
  2. The students, who take up experiential projects in companies, where senior executives with as take in teaching guide them, drive the learning. All students are encouraged to do some live project other than their regular classes.
  3. Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students exposure to practical learning and work out for are port of such a visit relating to their specific topic, course or even domain.

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Sanjeev Bansal

B.Tech. Civil Engineering: Four-Year (8-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S.No.	**Type of Course**	**Credit**	**Total Credits**
1	**Humanities, Management courses, Language and Literature (HML)**	4 Courses of 4 Credits each (Total Credit 4X4)	16
2	**Elementary / Fundamental Science courses (FSC)**	12 Courses of 4 Credits each (Total Credit 12X4)	48
3	**Engineering Core courses (ECC)**	27 Courses of 4 Credits each (Total Credit 27X4)	108
4	**Engineering Laboratory Courses (ELC)**	26 Courses of 1 Credits each (Total Credit 26X1)	26
5	**Engineering Departmental Elective (EDE)**	1 Courses of 4 Credits (Total Credit 1X4)	04
6	**MOOCs/NPTEL/Mandatory course/Value added courses (VAC)**	1 Course of 4 Credits (Total Credit 1X4) 2 Course of 0 Credits each (Total Credit 2X0)	04
7	**Project /Seminar/Industrial training/General Proficiency (PST)**	10 Courses of 1 Credits each (Total Credit 10X1) 1 Course of 10 Credits (Total credit 1x10)	20
Total Credits			**226**

Evaluation of Performance

1. Programmes: Evaluation of performance of the students in a programme shall be a continuous process based on their performance in the class test, quizzes, assignments and the end semester examinations.

a. Theory papers in semester system (Maximum Marks: 100)

The evaluation will be done through two class test and one end semester examination. This will be in addition to quizzes, assignments, attendance, etc. Each class test will carry a weightage of 10 marks, and the end semester examination will carry a weightage of 70 marks. The remaining 10 marks will be awarded on the basis of attendance and performance in quizzes and assignments.

b. Practical in semester system (Maximum Marks: 100)

In each practical, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and understanding of the experiment done, which will carry a weightage of 30 marks. There shall be an end semester practical examination with or without an external examiner which will carry a weightage of 70 marks.

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2.Summer Training, Project, Dissertation, Seminar etc.: Summer Training, Project, Seminar, Dissertation, and other learning-oriented activities shall have associated maximum marks and credits, as stated in the syllabus.

3. Examination:

a. The minimum Grade required to pass in each Theory & Practical paper is 'GRADE D'.

b. A candidate, in order to pass, minimum CGPA of 4.50 is required in a particular academic year inclusive of both semesters of that academic. And maximum numbers of Carryover paper permissible for promotion to next academic year are 06 theory / practical / project papers.

c. There shall be no minimum Grade required to pass in General Proficiency (GP). However, Grade obtained in General Proficiency (GP) shall be included in SGPA.

d. In case of audit paper, the minimum Grade required to pass is Grade D. However, the Grade obtained in audit paper shall not be included in SGPA.

e.For further information, examination ordinance of IFTM University can be followed.

Evaluation Scheme:			
Type of Exam	***Internal***	***External***	***Total***
Theory	***30***	***70***	***100***
Practical	***30***	***70***	***100***
Seminar/Industrial Training	***100***	***--***	***100***
Project	***300***	***400***	***700***

Unique practices adopted:

Our teachers' use of communicative strategies encourages pedagogic practices that are interactive in nature and is more likely to impact on student learning outcomes. Some specific strategies, that promoted this interactive pedagogy includes:

Audio-Visual Based Learning:

It is clear that audio visual aids are important tools for teaching learning process. It helps the teacher to present the lesson effectively and students learn and retain the concepts better and for longer duration. Use of audio-visual aids improves student's critical and analytical thinking. It helps to remove abstract concepts through visual presentation. However, improper and unplanned use of these aids can have negative effect on the learning outcome. Therefore, teachers should be well trained through in-service training to maximize the benefits of using these aids. The curriculum should be designed such that there are options to activity-based learning through audio-visual aids. In addition, government should fund resources to purchase audio-visual aids in colleges

Field / Live Projects:

The objective of their training program is to enhance knowledge of the students on any one of the trending technologies according to the industry standards without which the student degree is a mere degree. This is done by making students work on live projects which equip them with the required skill needed for the corporate world.

Personality Development Program (PDP):

It is conducted by professional trainers/experts from corporates as also by dedicated in-house faculty to actually bring a change in the traits of students in terms of values, behavior and personal growth. It enhances their body language, self-discipline, includes boosting one's confidence, improving language speaking abilities and widening one's scope of knowledge. Following PDP programs are undertaken in the Institute.

- **Aptitude:** Prepare students for placements by enhancing students' understanding in reasoning, numeric aptitudes, language proficiencies and general awareness.

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- **Resume Writing:** Trains students about the current trend to present their Personal, Educational & Professional achievements and Strengths in an impressive manner. They learn how to write covering letter through which they can efficiently present their extra information. They also get an exposure to the Social Professional Sites like LinkedIn.
- **Group Discussion:** Help students to improve their ability to understand a topic/idea from different perspectives. They are able to realize its importance as a standard recruitment and selection tool. Students are trained to demonstrate their leadership, team work, oral and body language skills.
- **Personal Interview:** A platform to train students in improving their listening abilities and handling interviewer's questions and answer accordingly so that they are able to remove hesitation and anxiety during placement process.

Student Development Programs (SDP):
SDP has various modules dealing with professional development, awareness and opinion building, communication and self-presentation etc. The purpose of these modules is to help students grow as individuals, develop the power of critical thinking and, at a material level, secure better placements

Special Guest Lectures (SGL):
Guest lectures are a highly useful medium to provide exceptional knowledge to students, it also adds an extra variety to the classroom routine and universities put a lot of emphasis on the importance of Guest lectures. The Guest lecturers are the "real-world" arriving in the classroom in order to make classes more interesting.

Industrial Visits:
Industrial visits are an integral part of engineering and acknowledgment of technological up-gradation. Industrial visit is considered as one of the tactical methods of teaching. The main reason behind this, it lets student to know things practically through interaction, working methods and employment practices. Moreover, it gives exposure from academic point of view. Main aim of industrial visit is to provide an exposure to students about practical working environment. They also provide students a good opportunity to gain full awareness about industrial practices. Through industrial visit students get awareness about new technologies. Technology development is a main factor, about which a student should have a good knowledge. Visiting different companies actually help students to build a good relationship with those companies.

Industry Focused Programs:
Industry oriented education is an approach to learning from an industry perspective where core subjects are taught in the context of application of that knowledge to product design, development and operation.

Mentoring Scheme:
The new process has been established as "Mentoring System". Each faculty will be the mentor of a group of 20 to 25 students. First, second, third and fourth-year students will have mentors from the parent department. Departmental faculties will continue to be mentors for the same group of students till their post-graduation.

Extracurricular Activities:
In IFTM University, various Co-Curricular and Extra-Curricular activities are regularly conducted along with regular academic activities and students are continuously inspired and motivated to participate in these various activities to ensure the overall development of the students.
Cultural Activities: The various activities undertaken are – Singing, Dancing, Playing Musical Instruments, Compering, Skit, Band, Stand-up Comedy, Poetry, Fashion Show etc. These activities help to develop self-confidence, cultural interest, creativity and sense of cooperation among students.

Games & Sports: IFTM strongly believes that a healthy physique leads to a healthy mind. The Institute encourages sports culture and students also reciprocate by actively participating and distinguishing themselves at Sports Meets. IFTM possesses proper playgrounds and hard courts for outdoor sports. In Boys hostels students enjoy the facilities of Gym, badminton, and Table Tennis. The various sports activities undertaken are – cricket, football, basketball, volley ball, carom, chess, badminton, athletics etc. They increase self-esteem & mental alertness among students and promote team spirit. They also lead to balanced mental andphysical growth of the students and teach them life skills like discipline, teamwork, leadership, patience, perseverance etc.

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Induction program: Every year induction program is organized for 1st year students to make them familiarize with the entire academic environment of university including curriculum, classrooms, labs, faculty/ staff members, academic calendar and various activities.

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SCHOOL OF ENGINEERING & TECHNOLOGY
IFTM UNIVERSITY
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DEPARTMENT OF CIVIL ENGINEERING
Bachelor of Technology
CBCS Programme
Effective from Session 2022-23

Course Code	CBCS BASKET	Credits			
Humanities, Management courses, language and literature(HML)		**L**	**T**	**P**	**C**
TPSD101/ TPSD201	Professional Skill Development-I	3	1	0	4
TPSD401	Professional Skill Development-II	3	1	0	4
TEHU601	Human Values & Professional Ethics	3	1	0	4
TEHU801	Industrial Management	3	1	0	4
Elementary/Fundamental Science courses(FSC)		**L**	**T**	**P**	**C**
TEMA101	Engineering Mathematics-I	3	1	0	4
TEPH101	Engineering Physics-I	3	1	0	4
TECH101/ TECH201	Engineering Chemistry	3	1	0	4
TEEE101/ TEEE201	Electrical Engineering	3	1	0	4
TEEC101/ TEEC201	Electronics Engineering	3	1	0	4
TECS101/ TECS201	Computer Fundamentals & Programming	3	1	0	4
TEME101/TEME201	Engineering Mechanics	3	1	0	4
TEME102/TEME202	Materials & Manufacturing	3	1	0	4
TEMA201	Engineering Mathematics-II	3	1	0	4
TEPH201	Engineering Physics-II	3	1	0	4
TEMA301	Engineering Mathematics –III	3	1	0	4
TEMA401	Computer based Numerical &Statistical Techniques	3	1	0	4
Engineering Core Courses(ECC)		**L**	**T**	**P**	**C**
TECE301	Engineering Geology	3	1	0	4
TECE302	Building Materials & Construction	3	1	0	4
TECE303	Surveying Practice - I	3	1	0	4
TECE304	Fluid Mechanics	3	1	0	4
TECE305	Strength of Materials	3	1	0	4
TECE401	Concrete Technology	3	1	0	4
TECE402	Surveying Practice - II	3	1	0	4
TECE403	Structural Analysis - I	3	1	0	4
TECE404	Estimation, Costing Evaluation	3	1	0	4
TECE501	Environmental Engineering - I	3	1	0	4
TECE502	Transportation Engineering - I	3	1	0	4
TECE503	Geotechnical Engineering-I	3	1	0	4
TECE504	Structural Analysis - II	3	1	0	4
TECE505	Reinforced Cement Concrete - I	3	1	0	4
TECE506	Open Channel Flow	3	1	0	4
TECE601	Environmental Engineering - II	3	1	0	4
TECE602	Transportation Engineering - II	3	1	0	4
TECE603	Hydrology	3	1	0	4
TECE605	Reinforced Cement Concrete - II	3	1	0	4
TECE606	Design of Steel Structure-I	3	1	0	4
TECE701	Geotechnical Engineering-II	3	1	0	4
TECE702	Irrigation Engineering	3	1	0	4
TECE703	Design of Steel Structure-II	3	1	0	4
TECE704	Construction Planning & Management	3	1	0	4
TECE706	Earthquake Resistant Design	3	1	0	4

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TECE801	Water Resources Engineering	3	1	0	4
TECE802	Bridge Engineering	3	1	0	4
Engineering Laboratory Courses (ELC)		**L**	**T**	**P**	**C**
TEPH151/TEPH251	Physics Lab	0	0	2	1
TECH151/TECH251	Chemistry Lab	0	0	2	1
TEEE151/TEEE251	Electrical Engineering Lab	0	0	2	1
TEEC151/TEEC251	Electronics Engineering Lab	0	0	2	1
TEME152/TEME252	Materials & Manufacturing Lab	0	0	2	1
TECS151/TECS251	Computer Lab	0	0	2	1
TEME153/TEME253	Engineering Graphics Lab	0	0	2	1
TEME151/TEME251	Mechanical Engineering Lab	0	0	2	1
TECE351	Engineering Geology Lab	0	0	2	1
TECE352	Building Material Lab	0	0	2	1
TECE353	Surveying - I Lab	0	0	2	1
TECE354	Fluid Mechanics Lab	0	0	2	1
TECE451	Concrete Technology Lab	0	0	2	1
TECE452	Surveying - II Lab	0	0	2	1
TECE453	Building Planning & Drawing Lab	0	0	2	1
TEMA451	Computer Based Numerical & Statistical Techniques Lab	0	0	2	1
TECE551	Environmental Engineering. Lab	0	0	2	1
TECE552	Transportation Engineering. Lab-I	0	0	2	1
TECE553	Soil Mechanics Lab	0	0	2	1
TECE554	Structural Analysis Lab	0	0	2	1
TECE651	CAD Lab - I	0	0	2	1
TECE652	Transportation Engineering. Lab-II	0	0	2	1
TECE653	Hydraulic Engineering. Lab	0	0	2	1
TECE751	CAD Lab - II	0	0	2	1
TECE752	Geotechnical Engineering Lab-II	0	0	2	1
TECE755	Structural Detailing Lab	0	0	2	1
Engineering Departmental Elective (EDE)		**L**	**T**	**P**	**C**
Elective - I	NCC01 NCC General	3	1	0	4
	TECE705 Rural Water Supply and Sanitation	3	1	0	4
	TECE071 Transportation System & Planning	3	1	0	4
	TECE072 Finite Element Method for Civil Engineering	3	1	0	4
	TECE073 Advance Foundation Design	3	1	0	4
	TECE074 Industrial Pollution Control	3	1	0	4
	TECE075 Prestressed Concrete Structure	3	1	0	4
	TECE076 Analysis and Design of Hydraulic Structures	3	1	0	4
	TECE077 Principle of Town Planning and Architectural	3	1	0	4
	TECE078 Precast and Modular Construction Practice	3	1	0	4
	TECE079 Ground Improvement Techniques	3	1	0	4
	TECE079(A) Tunnel Engineering	3	1	0	4
	TECE079(B) Rural Development Engineering	3	1	0	4
	TECE079(C) River Engineering	3	1	0	4
	TECE079(D) Modern Construction Materials	3	1	0	4
	TECE079(E) Sensor and instrumentation Technology for Civil Engineering	3	1	0	4
	TECE079(F) Noise and Air pollution control	3	1	0	4
	TECE079(G) Railway Engineering	3	1	0	4
	TECE079(H) Airport Engineering	3	1	0	4
	TECE079(I) Digital Image processing	3	1	0	4
	TECE079(J) Advance Geology and Remote Sensing	3	1	0	4
	TECE079(K) Industrial Waste Treatment	3	1	0	4

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	TECE079(L)	Solid Waste Management	3	1	0	4
	TECE079(M)	Traffic Management & Design	3	1	0	4
MOOCs/NPTEL/ Mandatory Course/ Value added courses (VAC)			**L**	**T**	**P**	**C**
TECE101/ TECE201		Environmental Science	3	1	0	4
TEHU301 / TEHU401		Disaster Management (Audit Paper)	2	1	0	0
Project /Seminar/Industrial Training/ General Proficiency (PST)			**L**	**T**	**P**	**C**
TGP101		General Proficiency	-	-	-	1
TGP201		General Proficiency	-	-	-	1
TGP301		General Proficiency	-	-	-	1
TGP401		General Proficiency	-	-	-	1
TGP501		General Proficiency	-	-	-	1
TGP601		General Proficiency	-	-	-	1
TGP701		General Proficiency	-	-	-	1
TGP801		General Proficiency	-	-	-	1
TECE654		Seminar	0	0	2	1
TECE754		Industrial Training (Evaluation & Viva)	0	0	2	1
TECE851		Project	0	0	20	10

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IFTM UNIVERSITY, MORADABAD.

Bachelor of Technology (B.Tech) Civil Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR I, SEMESTER- I

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	FSC	TEMA 101	**Engineering Mathematics-I**	3	1	0	20	10	30	70	100	4
2.	FSC	TEPH 101	**Engineering Physics-I**	3	1	0	20	10	30	70	100	4
3.	VAC	TECE101	**Environmental Science**	3	1	0	20	10	30	70	100	4
4.	HML	TPSD 101	**Professional Skill Development-I**	3	1	0	20	10	30	70	100	4
5.	FSC	TEEE 101	**Electrical Engineering**	3	1	0	20	10	30	70	100	4
6.	FSC	TEME 102	Materials & Manufacturing	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TEPH 151	**Physics Lab**	0	0	2	-	-	30	70	100	1
8.	ELC	TEEE 151	**Electrical Engg. Lab**	0	0	2	-	-	30	70	100	1
9.	ELC	TEME152	**Materials & Manufacturing Lab**	0	0	2	-	-	30	70	100	1
10.	ELC	TEME153	**Engineering Graphics Lab**	0	0	2	-	-	30	70	100	1
11.	PST	TGP101	**General Proficiency**	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

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STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR I, SEMESTER- II

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	FSC	TEMA 201	**Engineering Mathematics-II**	3	1	0	20	10	30	70	100	4
2.	FSC	TEPH 201	**Engineering Physics-II**	3	1	0	20	10	30	70	100	4
3.	FSC	TECH201	**Engineering Chemistry**	3	1	0	20	10	30	70	100	4
4.	FSC	TEME201	**Engineering Mechanics**	3	1	0	20	10	30	70	100	4
5.	FSC	TEEC201	**Electronics Engineering**	3	1	0	20	10	30	70	100	4
6.	FSC	TECS 201	**Computer Fundamentals & Programming**	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TECH 251	**Chemistry Lab**	0	0	2	-	-	30	70	100	1
8.	ELC	TEEC 251	**Electronics Engg. Lab**	0	0	2	-	-	30	70	100	1
9.	ELC	TECS 251	**Computer Lab**	0	0	2	-	-	30	70	100	1
10.	ELC	TEME 251	**Mechanical Engg. Lab**	0	0	2	-	-	30	70	100	1
11.	PST	TGP201	**General Proficiency**	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

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STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR II, SEMESTER-III

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	FSC	TEMA301	Engineering Mathematics -III	3	1	0	20	10	30	70	100	4
2.	ECC	TECE301	Engineering Geology	3	1	0	20	10	30	70	100	4
3.	ECC	TECE302	Building Materials & Construction	3	1	0	20	10	30	70	100	4
4.	ECC	TECE303	Surveying Practice - I	3	1	0	20	10	30	70	100	4
5.	ECC	TECE304	Fluid Mechanics	3	1	0	20	10	30	70	100	4
6.	ECC	TECE305	Strength of Materials	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TECE351	Engineering Geology Lab	0	0	2	-	-	30	70	100	1
8.	ELC	TECE352	Building Material Lab	0	0	2	-	-	30	70	100	1
9.	ELC	TECE353	Surveying - I Lab	0	0	2	-	-	30	70	100	1
10.	ELC	TECE354	Fluid Mechanics Lab	0	0	2	-	-	30	70	100	1
11.	PST	TGP301	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

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STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR II, SEMESTER-IV

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	FSC	TEMA401	Computer Based Numerical & Statistical Techniques	3	1	0	20	10	30	70	100	4
2.	ECC	TECE401	Concrete Technology	3	1	0	20	10	30	70	100	4
3.	ECC	TECE402	Surveying Practice - II	3	1	0	20	10	30	70	100	4
4.	ECC	TECE403	Structural Analysis - I	3	1	0	20	10	30	70	100	4
5.	ECC	TECE404	Estimation, Costing Evaluation	3	1	0	20	10	30	70	100	4
6.	HML	TPSD401	Professional Skill Development - II	3	1	0	20	10	30	70	100	4
7.	VAC	TEHU401	Disaster Management **(Audit Course) #**	2	1	0	20	10	30	70	100	0
PRACTICALS / PROJECT												
7.	ELC	TECE451	Concrete Technology Lab	0	0	2	-	-	30	70	100	1
8.	ELC	TECE452	Surveying - II Lab	0	0	2	-	-	30	70	100	1
9.	ELC	TECE453	Building Planning & Drawing Lab	0	0	2	-	-	30	70	100	1
10.	ELC	TEMA451	Computer Based Numerical & Statistical Techniques Lab	0	0	2	-	-	30	70	100	1
11.	PST	TGP401	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Audit paper:

 # The Subject (EHU-401), Disaster Management will be offered as a compulsory audit course and each student has to pass the subject at the minimum by getting 35 Marks out of 100.

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STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR III, SEMESTER-V

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	TECE501	Environmental Engineering - I	3	1	0	20	10	30	70	100	4
2.	ECC	TECE502	Transportation Engineering - I	3	1	0	20	10	30	70	100	4
3.	ECC	TECE503	Geotechnical Engineering-I	3	1	0	20	10	30	70	100	4
4.	ECC	TECE504	Structural Analysis - II	3	1	0	20	10	30	70	100	4
5.	ECC	TECE505	Reinforced Cement Concrete - I	3	1	0	20	10	30	70	100	4
6.	ECC	TECE506	Open Channel Flow	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TECE551	Environmental Engineering. Lab	0	0	2	-	-	30	70	100	1
8.	ELC	TECE552	Transportation Engineering. Lab-I	0	0	2	-	-	30	70	100	1
9.	ELC	TECE553	Soil Mechanics Lab	0	0	2	-	-	30	70	100	1
10.	ELC	TECE554	Structural Analysis Lab	0	0	2	-	-	30	70	100	1
11.	PST	TGP501	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

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STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR III, SEMESTER-VI

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	TECE601	Environmental Engineering - II	3	1	0	20	10	30	70	100	4
2.	ECC	TECE602	Transportation Engineering - II	3	1	0	20	10	30	70	100	4
3.	ECC	TECE603	Hydrology	3	1	0	20	10	30	70	100	4
4.	HML	TEHU601	Human Value & Professional Ethics	3	1	0	20	10	30	70	100	4
5.	ECC	TECE605	Reinforced Cement Concrete - II	3	1	0	20	10	30	70	100	4
6.	ECC	TECE606	Design of Steel Structure-I	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TECE651	CAD Lab - I	0	0	2	-	-	30	70	100	1
8.	ELC	TECE652	Transportation Engineering. Lab-II	0	0	2	-	-	30	70	100	1
9.	ELC	TECE653	Hydraulic Engineering. Lab	0	0	2	-	-	30	70	100	1
10.	PST	TECE654	Seminar	0	0	2	-	-	30	70	100	1
11.	PST	TGP601	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Note: ***Industrial Training of 4 – 6 Weeks after VI Semester which will be evaluated in VII Semester.***

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STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR IV, SEMESTER-VII

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	TECE701	Geotechnical Engineering-II	3	1	0	20	10	30	70	100	4
2.	ECC	TECE702	Irrigation Engineering	3	1	0	20	10	30	70	100	4
3.	ECC	TECE703	Design of Steel Structure-II	3	1	0	20	10	30	70	100	4
4.	ECC	TECE704	Construction Planning & Management	3	1	0	20	10	30	70	100	4
5.	ECC	TECE706	Earthquake Resistant Design	3	1	0	20	10	30	70	100	4
6.	EDE	TECE I	Departmental Elective – I	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TECE751	CAD Lab - II	0	0	2	20	10	30	70	100	1
8.	ELC	TECE752	Geotechnical Engineering Lab-II	0	0	2	20	10	30	70	100	1
9.	ELC	TECE755	Structural Detailing Lab	0	0	2	20	10	30	70	100	1
10.	PST	TECE754	Industrial Training (Evaluation & Viva)	0	0	2	-	100	100	-	100	1
11.	PST	TGP701	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

Departmental Elective – I

1. NCC01: NCC General.
2. TECE705: Rural Water Supply and Sanitation.
3. TECE071: Transportation System & Planning.
4. TECE072: Finite Element Method for Civil Engineering.
5. TECE073: Advance Foundation Design.
6. TECE074: Industrial Pollution Control.
7. TECE075: Prestressed Concrete Structure.
8. TECE076: Analysis and Design of Hydraulic Structures.
9. TECE077: Principle of Town Planning and Architectural.
10. TECE078: Precast and Modular Construction Practice.
11. TECE079: Ground Improvement Techniques.

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12. TECE079(A): Tunnel Engineering
13. TECE079(B): Rural Development Engineering.
14. TECE079(C): River Engineering.
15. TECE079(D): Modern Construction Materials
16. TECE079(E): Sensor and instrumentation Technology for Civil Engineering Application.
17. TECE079(F): Noise and Air pollution control.
18. ECE079(G): Railway Engineering.
19. TECE079(H): Airport Engineering.
20. TECE079(I): Digital Image processing.
21. TECE079(J): Advance Geology and Remote Sensing.
22. TECE079(K): Industrial Waste Treatment
23. TECE079(L): Solid Waste Management
24. TECE079(M): Traffic Management & Design.

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STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR IV, SEMESTER-VIII

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	TECE801	Water Resources Engineering.	3	1	0	20	10	30	70	100	4
2.	ECC	TECE802	Bridge Engineering	3	1	0	20	10	30	70	100	4
2.	HML	TEHU801	Industrial Management	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
2.	PST	TECE 851	Project	0	0	20	-	-	300	400	700	10
3.	PST	TGP801	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**02**	**00**	**20**	-	-	-	-	**1100**	**23**

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Bachelor of Technology (B.Tech) Programme
(Effective From Session 2022-23)

TEMA101: ENGINEERING MATHEMATICS–I

Objective: -The main aims of this course are to recall and remember basics of matrices, differential, integral and vector calculus. The focus of the subject to understand the concepts of basic mathematical methods to solve engineering problems analyze engineering problems and evaluate the results for skill development and employability.

UNIT I **(12 Sessions)**

Matrices : Introduction of matrices, Special type of matrices, Elementary row and column transformation, Adjoint & inverse of matrices , Rank of matrix, , Consistency of linear system of equations, Characteristic equation, Cayley-Hamilton theorem, Eigen values and Eigen vectors, Linear dependency and Independency of vector, Diagonalization of matrices for skill development and employability

UNIT II **(10 Sessions)**

Differential Calculus–I: Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem, Change of variables, Total differentiation, Jacobian, Expansion of function of several variables for skill development and employability.

UNIT III **(10 Sessions)**

Differential Calculus–II: Asymptotes, Curve tracing, Approximation of errors, Maxima & Minima of functions of several variables, Lagrange's method of multipliers for skill development and employability.

UNIT IV **(08 Sessions)**

Multiple Integrals : Definite integral, Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Dirichlet integral, Liouville's extension formula, Applications to area and volume for skill development and employability.

UNIT V **(12 Sessions)**

Vector Calculus: Point functions, Gradient, Divergence and Curl of a vector and their properties, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems, Statements and problems (without proof) for skill development and employability.

Course Outcomes:

Students completing this course will be able to:

CO1: Remember the basics of matrices and apply the concept of rank for solving linear simultaneous equations for skill development and employability

CO2: Apply the concept of limit, continuity and differentiability in the study of Rolle's, Lagrange's, Cauchy mean value theorem and Leibnitz theorem at National level for skill development and employability

CO3: Apply partial differentiation for evaluating extreme values, expansion off unction and Jacobian for skill development and employability

CO4: Apply the methods of multiple integral for finding area, volume, center of mass and center of gravity at Global level for skill development and employability

CO5: Apply the concept of vector for evaluating directional derivatives, tangent and normal planes, line, surface and volume integrals at Local level for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Suggested Readings:

1. Prasad C. Advanced Mathematics for Engineers, Prasad Mudralaya.
2. B. S .Grewal, Engineering Mathematics, Khanna Publishers.
3. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
4. C. Ray Wylie & Louis C .Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
5. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

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TEPH101: ENGINEERING PHYSICS-I

Objective: The aim of this course is to impart knowledge of statistical mechanics, quantum mechanics, Laser system and their applications, special theory of relativity for skill and employability development.

UNIT I **(08 sessions)**

Relativistic Mechanics: Frame of reference, Michelson-Morley Experiment, Develop skillsto understand the employability of Lorentz transformation equation, Length contraction & Time dilation, Addition of velocities, Variation of mass with velocity and Mass energy relation.

UNIT II **(10 sessions)**

Statistical Mechanics: Concept of phase space, Density of states as a function of energy, Maxwell- Boltzmann statistics, Distribution law and its application in case of ideal gas, Energy and velocity distribution.
Bose -Einstein statistics Distribution Law and its application to Black body radiation to obtain Plank's law of radiation.
Develop skills to understand Fermi –Dirac statistics, Distribution law and its application to electrons in metals, Calculation of Fermi energy and average energy of electrons in metals.

UNIT III **(10 sessions)**

Quantum Mechanics: De-Broglie Hypothesis, Davisson - Germer Experiment, wave function and its properties, Develop skills to understand the Uncertainty principle and its importance. Time Dependent & Time Independent Schrodinger Equation, Particle in one dimensional box, Eigen values and eigen function

UNIT IV **(08 sessions)**

Laser: Principle of Laser, Stimulated and spontaneous emission, Population inversion, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Develop skills to understand the application of Lasers.

UNIT V **(08 sessions)**

Fibre Optics: Develop skills to understand the fundamental ideas of optical Fiber and its employability in communication applications, Propagation Mechanism, Numerical aperture, Acceptance angle and Acceptance cone, Single and multi-mode fibers, Applications of optical fibres.

Course Outcomes:
Students completing this course will be able to:
CO1: Develop skills to understand and learn Frame of reference, Lorentz transformation equation at International
CO2: Develop skills to understand Statistical Mechanics, Maxwell-Boltzmann statistics and its application.
CO3: Understand De-Broglie Hypothesis, Davisson-Germer Experiment at Local level by developing skills.
CO4: Develop skills to attain basic knowledge on different types of LASERs and their applications.
CO5: Gain knowledge of optical fibre and its applications at Global level for skill development, employability & entrepreneurship development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1

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CO3	1	3	1
CO4	3	1	2
CO5	1	1	3

Suggested Readings:

1. Beiser, "Concepts of Modern Physics".
2. Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.
3. W.T. Silf vast, "Laser Fundamental" Cambridge University Press (1996).
4. G. Keiser "Optical Fiber Communication" New York.
5. K.M. khanna" Statistical Mechanics".
6. C. Kittel" Elementary Statistical Mechanics"

Website Sources:

- https://web.stanford.edu
- https://sites.google.com
- https://en.wikipedia.org
- https://www.khanacademy.org
- https://www.rp-photonics.com
- https://nptel.ac.in
- https://www.eatm.in

Note: Latest editions of all the suggested readings must be used.

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TECE101/202: ENVIRONMENTAL SCIENCE L T P 3 1 0

Objective:
The goals of environmental science are to provide every student with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment. To develop and reinforce new patterns of environmentally sensitive behavior among individuals, groups and society as a whole for a sustainable environment. Understand the trans-national character of environmental problems such as global warming, climate change, ozone layer depletion etc and ways of addressing them for skill development and employability, including interactions across local to global scales.

UNIT I **(8 Sessions)**
Environment: Definition of environment. Environmental education. Need for the public awareness. : Concept of Ecology: Ecosystem, energy and nutrients flow in ecosystem food chain.
Environmental segment: Atmospheric structure. Classification of air pollutants, sources of air pollution and their effect on human health and property

UNIT II **(8 Sessions)**
Air quality and standard: Meteorological phenomenon and their influence on air quality, lapse rates, dispersion of pollutants. Air pollution control: Introduction to particulates and gaseous pollutants such as SOx, NOx& CO, and their effects.

UNIT III **(8 Sessions)**
Water quality: Physical. Chemical & biological parameters. Water quality standard, BOD. COD and BOD COD calculations for skill development and employability.
Environmental Analysis for skill development and entrepreneurship: pH, alkalinity, conductivity, ammonia, fluoride, sulphate, chloride. Analysis and measurement of gaseous pollutants.

UNIT IV **(8 Sessions)**
Pollution: Pollution from industry and agriculture. Polymers and plastic, food additives, fertilizers, insecticides, fungicides and herbicides. Heavy metal and energy their environmental implications. Solid waste and its managements for employability. Pollution and public health aspect Environmental Protection- Role of government, initiatives by non-governmental organizations (NGO) for entrepreneurship.

UNIT V **(8 Sessions)**
Air and Noise Pollution: Air pollution chemistry, meteorological aspects of air pollution dispersion. Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels. Noise indices. Noise control methods

Course outcome: After completion of this course student will be able to:
CO1: Understand the issues and challenges related to environmental and ecosystem for global, national and international importance due to some human activities, it will develop the skills of students.
CO2: Understand about the different sources of air pollution and their impact on human health it will develop the skills of students
CO3: Understand about the quality parameter for water and standards related to water, and make the students employable.
CO4: Know about different types of pollution and their sources and control methods for the same, to develop the skills of students.
CO5: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world, at local and global level it will develop the entrepreneurship skill of student.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2

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CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	**3**	**1**	**1**
CO2	**3**	**2**	**1**
CO3	**1**	**3**	**1**
CO4	**3**	**1**	**2**
CO5	**1**	**1**	**3**

Suggested Readings:

- "Environmental studies" Benny Joseph, Tata McgrawHill-2005
- "Environmental studies"-Dr D.L. Manjunath, Pearson Education-2006
- "Environmental studies" R. Rajagopalan, Oxford Publication-2005
- "Text book of environment science & Technology", M. Anji Reddy, BS Publication.

Website Sources:

- https://www.india.gov.in/official-website-ministry-environment-and-forests-0
- https://www.earthshare.org/environews/

Note: Latest editions of all the suggested readings must be used.

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TPSD101: PROFESSIONAL SKILL DEVELOPMENT-I

Course Objectives: The objectives of Professional Skill Development-I are:

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To increase understanding and recall of what is read and listen including facts and main idea.
- To enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resume, bio-data, letters and applications of different kinds.
- To develop all the four skills of English language.

Unit I **(08 Sessions)**

Basic Applied Grammar and Usage

The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech.
Noun: Kinds; Gender; Case; Number; Usage. **Pronouns:** Definition; Kinds; Usage. **Adjectives:** Kinds, Degrees of Comparison, Transformation of Degrees. **Determiners:** Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. **Articles:** Kinds, Articles and Number system, Articles and Gender systemfor skill development and employability, Omission of Articles, Repetition of Articles. **Verbs:** Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage

Unit II

Basic Applied Grammar Continued **(06 Sessions)**

Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. **Adverbs:** Kinds and Usage for skill development and employability. **Prepositions:** Kinds and Usage. **Conjunctions:** Kinds; Usage. **Interjections:** Definition; Usage.

Unit III **(10 Sessions)**

Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech for skill development and employability.

Unit IV **(06 Sessions)**

Précis Writing: Techniques of Précis Writing; examples. **Paragraph Writing:** Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. Reading Comprehension. Listening Comprehension for skill development and employability.

Unit V **(08 Sessions)**

Writing of Resume, Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment for skill development and employability.

Course Outcomes:

Students completing this course will be able to:

CO1: Write paragraph, gist or abstract/précis of the passage in their own words/language, resume, bio-data, letters and applications of different kinds for skill development and employability.
CO2: Use targeted grammatical structures meaningfully and appropriately in oral and written production at international level for skill development and employability.
CO3: Enhance competence in the four modes of literacy: writing, speaking, reading & listening for skill development and employability.
CO4: Understand and recall facts and main idea locally for skill development and employability.
CO5: Understand writing of resume, bio-data, Letters & Applications for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	1	1	1	2	1	2	3
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	3	2	1	1	1	2	1	1	2
CO4	3	3	3	2	2	1	1	1	2	1	1	2
CO5	3	3	3	2	2	1	1	1	2	1	1	2

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Suggested Readings:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
3. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources

- www.wikipedia.com
- www.englishgrammar.org
- www.usingenglish.com
- www.grammarly.com

Note: Latest editions of all the suggested readings must be used.

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TEEE101: ELECTRICAL ENGINEERING

Objective: To provide comprehensive idea about AC and DC circuits for skill development and employability and its analysis along with the working principles and applications of basic machines in electrical engineering.

UNIT I **(08 Sessions)**

D.C. Circuit Analysis: Network, Active And Passive Elements, Concept of Linearity And Linear Network, Unilateral And Bilateral Elements, Sources, Source Transformation, Kirchhoff's Laws, Star-Delta Transformation, **Network Theorems:** Thevenin's Theorem, Superposition Theorem, Norton's Theorem, Maximum Power Transfer Theorem for skill development and employability.

UNIT II **(08 Sessions)**

Single Phase AC Circuits: AC Waveforms, Average and Effective Values, Form and Peak Factors, Analysis of Series, Parallel and Series-Parallel RLC Circuits, Active, Reactive and Apparent Powers, Power Factor, Causes of Low Power Factor, Resonance in Series and Parallel Circuits for skill development and employability.

UNIT III **(08 Sessions)**

Three Phase AC Circuits: Three Phase System, Advantages, Phase Sequence, Star and Delta Connections, Balanced Supply and Balanced Load, Three-phase Power and its Measurement, **Measuring Instruments:** Types of Instruments, PMMC and Moving Iron Instrument, Single-Phase Dynamometer Wattmeter, Induction Type Energy Meter for entrepreneurship development.

UNIT IV **(08 Sessions)**

Magnetic Circuits: Magnetic Circuit Concepts, Analogy between Electric & Magnetic Circuits, Magnetic Circuits with DC and AC Excitations, B-H Curve for skill development and employability, Hysteresis and Eddy Current Losses, **Single Phase Transformer:** Principle, Working, Construction, E.M.F. Equation, Power Losses, Efficiency, Introduction to Auto-Transformer (Excluding Numerical)

UNIT V **(08 Sessions)**

Principles of Electro-Mechanical Energy Conversion,

DC Generator: Construction & Working, E.M.F. Equation of Generator, Types of D.C. Generator, Applications for entrepreneurship development, **D.C. Motor:** Principle of operation, Torque Equation of a Motor, Types of D.C. Motor, Applications (Excluding Numericals)

Three Phase Induction Motor: Construction-(Squirrel cage and slip-ring motor),Principle of Operation, Applications (Excluding Numerical)

Course Outcomes:

On completion of the course students will be able to

CO1: Use basic electrical DC concepts and theorems to analyze circuits for skill development.

CO2: Draw the relevant phasor diagrams and waveform diagrams of voltage and current along with the concepts of reactance and impedance and power factor. Use of resonance and implications for practical circuits nationally for skill development and employability.

CO3: Understand the preference of poly phase system over single phase system, star anddeltaconnectionsalongwithdevelopstheknowledgeoftheoreticalandmathematicalprinciples of electrical measuring instruments globally for skill development, employability and entrepreneurship development.

CO4: Analyze magnetic circuit and differentiate magnetic and electric circuits and understand single phase transformer, auto transformer and three phase transformer for skill development and employability.

CO5: Understand the construction of D.C machine, different windings, their merits and demerits and the basic concept of Three-phase induction motor and its working principle instruments internationally for skill development, employability and entrepreneurship development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	1	1	1	2	1	2	3
CO2	3	3	3	2	2	1	1	1	2	1	1	2

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CO3	3	3	3	3	2	1	1	1	2	1	1	2
CO4	3	3	3	2	2	1	1	1	2	1	1	2
CO5	3	3	3	2	2	1	1	1	2	1	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc- Graw Hill
4. T.K. Nagsarkar& M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
5. W.H. Hayt P, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.lecturenotes.in
- www.examupdates.in
- www.iare.ac.in
- www.notes.specworld.in

Note: Latest editions of all the suggested readings must be used.

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TEME102: MATERIALS & MANUFACTURING

Objective: The objective of this course is to familiarize the students with different types of engineering materials and manufacturing processes and to understand the design, selection and processing of materials for a wide range of applications in engineering and elsewhere for entrepreneurship and skill development and employability.

UNIT I **(09 Sessions)**

Basic Manufacturing: Importance of Materials & Manufacturing towards Technological & Socio-Economic developments, Classification of manufacturing processes, Plant location, Plant layout and its types, Production and its classification, Production versus Productivity, Misc. Processes: Powder-metallurgy process and its applications, Plastic-products manufacturing, Galvanizing and Electroplating, Properties of Engineering Materials: Mechanical properties, Chemical properties, Electrical properties, Dielectric and Magnetic properties, Optical and Physical properties, Introduction to elementary corrosion and oxidation, Elementary ideas of fracture, fatigue &creep for skill development.

UNIT II **(09 Sessions)**

Engineering Materials: Ferrous Materials, Iron ore and its extraction, Furnaces, Cast iron, Steels & its classification based on percentage of carbon, its properties & applications. Alloy steels: stainless steel and tool steel, Non-Ferrous metals & alloys: Various non-ferrous metals, Common uses of various non-ferrous metals. Alloying elements and their effect, Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin, Non-Metallic Materials: Common types & uses of different non-metals such as Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite materials for skill development.

UNIT III **(09 Sessions)**

Introduction to Metal Forming and its Applications: Basic metal forming process: hot working and cold working process, Rolling, Forging, Extrusion, Drawing, Wire & Tube-drawing, Product applications and their defect. Press - work, Die & Punch assembly, Sheet metal operations, Cutting and forming and its applications. Casting: Casting terms. Casting processes, Pattern & allowances, Pattern and mold making materials and its desirable properties, Molding method, mould making with the use of a core, Gating system, Die-casting and its uses, Casting defects & remedies, Heat Treatment: Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening for skill development and employment.

UNIT IV **(07 Sessions)**

Introduction to Metal Cutting: Cutting tool, Chips and its formation process; Working principle, classification and operations performed on Lathe machine, Shaper machine and Planer machine. Operations performed on Drilling, Milling & Grinding machine for entrepreneurship and skill development and employability.

UNIT V **(06 Sessions)**

Introduction to Welding and its Applications: Importance and basic concepts of welding, Classification of welding processes. Gas-welding, Types of flames, Electric-Arc welding, Resistance welding, Soldering & Brazing and its uses for skill development.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the importance of materials and manufacturing, various properties of materials, plant layout and production locally for skill development.

CO2: Understand the ferrous and non-ferrous metals their alloys and application, non-metals and their applications for skill development.

CO3: Able to get a brief knowledge of metal forming operations, working of machines and heat treatment process and their importance Nationally for skill development and employment.

CO4: Able to understand the methods and techniques associated with the process of metal cutting operations on various metal cutting machines for entrepreneurship and skill development and employability.

CO5: Able to understand various type of welding process and their application in specific field nationally for skill development.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1

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CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	1	1
CO2	3	1	1
CO3	3	3	3
CO4	3	3	1
CO5	3	1	1

Suggested Readings:

1. Manufacturing Process, B.S Raghuvanshi, DhanpatRai Publication.
2. Manufacturing Processes, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3. Materials Science, Narula&Narula, McGraw Hill Education Private Limited.
4. Manufacturing Technology, R. K. Rajput, Laxmi Publications Private Limited.
5. An Introduction to Engineering Materials and Manufacturing Processes, NIIT, Prentice Hall of India Private Limited.

Website Sources:

- www.wikipedia.org
- www.sciencedaily.com
- www.youtube.com
- www.slideshare.net
- https://onlinecourses.nptel.ac.in

Note: Latest editions of all the suggested readings must be used.

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TEPH151: PHYSICS LAB

Objective: To achieve perfectness in experimental skills. The study of practical applications will bring more confidence and to learn the usage of electrical and optical systems for various measurements for skill and employability development.

List of Experiments (Any Ten) **(16 Sessions)**

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil to generate employability.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter and their employability scopes.
10. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up and its employability scope.
11. To determine energy band gap of a given semiconductor material and its employability scope.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen and its employability scope.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

Course Outcomes:
The students completing this course will be able to:
CO1: Develop skills locally to understand principle, concept, working and application of technology and comparison of results with theoretical calculations.
CO2: Apply the various procedures and techniques for the experiments to create employability scopes.
CO3: Develop skills to understand usage of instruments and real time applications in engineering studies.
CO4: Develop skills nationally to understand the basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CO5: Determine the wavelength of monochromatic light & spectral lines using different methods to create employability scopes.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1
CO3	1	3	1

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CO4	3	1	2
CO5	1	1	3

Suggested Readings:

1. Engineering Practical Physics by S. L. Gupta
2. Engineering Practical Physics by Navneet Gupta
3. Engineering Practical Physics by S. K. Gupta

Website Sources:

- http://www.iiserpune.ac.in
- https://www.toppr.com
- https://wp.optics.arizona.edu
- https://www.gopracticals.com
- http://vlab.amrita.edu
- https://circuitglobe.com

Note: Latest editions of all the suggested readings must be used.

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TEEE151: ELECTRICAL ENGINEERING LAB

Objective:

1. To design electrical circuits on bread board. **(16 Sessions)**
2. To analyze a given network by applying various network theorems for skill development and employability.
3. To expose the students to the operation of dc/ac motor and transformer.

LIST OF EXPERIMENTS:

1. Verification of Kirchhoff's current law for employability.
2. Verification of Kirchhoff's voltage law for employability.
3. Verification of Superposition theorem for skill development and employability.
4. Verification of Thevenin's Theorem for skill development and employability.
5. Verification of Maximum Power Transfer Theorem for skill development and employability.
6. To study a Single phase induction motor and its various methods of starting for employability and entrepreneurship development.
7. To study running and speed reversal of a Three Phase Induction Motor and determine the slip for employability and entrepreneurship development.
8. To determine the transformation ratio and turns ratio and current ratio of a single-phase transformer for employability and entrepreneurship development.
9. To study the construction of a dc machine for skill development, employability and entrepreneurship development.
10. To study a single phase Induction type Energy meter for skill development, employability and entrepreneurship development.

Course Outcomes:

After successfully studying this course, students will be able to:

CO1: Explain the concept of circuit laws and network theorems and apply them to laboratory measurements for skill development, employability and entrepreneurship development.

CO2: Systematically obtain the equations that characterize the performance of an electriccircuitaswellassolvingbothsinglephaseandDCMachinesInternationallyforemployabilityand entrepreneurship development.

CO3: Acknowledge the principles of operation and the main features of electric machines and their applications for skill development and employability.

CO4: Discuss the starting methods of a single phase induction motor globally for employability and entrepreneurship development.

CO5: Acquire skills in using electrical measuring devices for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	1	1	1	2	1	2	3
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	3	2	1	1	1	2	1	1	2
CO4	3	3	3	2	2	1	1	1	2	1	1	2
CO5	3	3	3	2	2	1	1	1	2	1	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	1	3	2

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CO3	2	3	1
CO4	1	3	2
CO5	3	2	1

Suggested Readings:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc- Graw Hill
4. T.K. Nagsarkar& M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
5. W.H. HaytP, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.iare.ac.in
- www.ocw.mit.edu
- www.nptel.ac.in
- www.vlab.co.in

Note: Latest editions of all the suggested readings must be used.

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TEME152: MATERIALS & MANUFACTURING LAB

Objective: The objective of this course is to meet curriculum requirements and provide knowledge of different types of tools, instruments and machines and their applications in manufacturing to produce different metal components and articles and develop skills in the students for skill development, employability and entrepreneurship.

List of Experiments: (Minimum 10 experiments are required to be performed)

1. Carpentry Shop: **(03 Sessions)**
- a. Study of tools & operations and carpentry joints.
- b. Simple exercise using jack plane for skill development, employability and entrepreneurship.
- c. To prepare half-lap corner joint, mortise & tenon joints for skill development, employability and entrepreneurship.
- d. Simple exercise on woodworking lathe for skill development, employability and entrepreneurship.

2. Fitting Bench Working Shop: **(03 Sessions)**
- a. Study of tools & operations
- b. Simple exercises involving fitting work for skill development, employability and entrepreneurship.
- c. Making perfect male-female joint for skill development, employability and entrepreneurship.
- d. Simple exercises involving drilling/tapping/dieing for skill development, employability and entrepreneurship.

3. Black Smithy Shop: **(03 Sessions)**
- a. Study of tools & operations
- b. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering &Swagingfor skill development, employability and entrepreneurship.

4. Welding Shop: **(03 Sessions)**
- a. Study of tools & operations of Gas welding & Arc welding for skill development, employability and entrepreneurship
- b. Making simple Butt and Lap arc welded joints for skill development, employability and entrepreneurship.
- c. Simple exercises involving Oxy-acetylene Gas welding for skill development, employability and entrepreneurship.

5. Sheet-metal Shop: **(02 Sessions)**
- a. Study of tools & operations for skill development, employability and entrepreneurship.
- b. Making Funnel complete with 'soldering' for skill development, employability and entrepreneurship.
- c. Fabrication of tool-box, tray, electric panel box etc. for skill development, employability and entrepreneurship

6. Machine Shop: **(03 Sessions)**
- a. Study of machine tools and operations.
- b. Simple exercises involving Plane turning for skill development, employability and entrepreneurship.
- c. Simple exercises involving Step turning for skill development, employability and entrepreneurship
- d. Simple exercises involving Taper turning for skill development, employability and entrepreneurship

7. **Foundry Shop:** **(03 Sessions)**
- a. Study of tools and operations.
- b. Preparation of sand for molding for skill development, employability and entrepreneurship.
- c. Mould making using core for skill development, employability and entrepreneurship.

Course Outcome:
Students completing this course will be able:

CO1: To define and use different manufacturing processing. casting, forging, turning, drilling etc. locally for skill development, employability and entrepreneurship.

CO2: To define and use different welding processes e.g. gas welding and electric arc welding for skill development, employability and entrepreneurship.

CO3: To acquire thorough knowledge of carrying out various operations on lathe machine nationally for skill development, employability and entrepreneurship.

CO4: To acquire skills for creating different objects from raw materials for skill development, employability and entrepreneurship.

CO5: To acquire thorough knowledge of carrying out various operations on Sheet metals for skill development, employability and entrepreneurship.

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PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Manufacturing Process, B.S Raghuvanshi, DhanpatRai Publication.
2. Manufacturing Processes, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3. Materials Science, Narula & Narula, McGraw Hill Education Private Limited.
4. Manufacturing Technology, R. K. Rajput, Laxmi Publications PVT. LTD.

Website Sources:

- www.wikipedia.org
- www.brcmcet.edu.
- www.slideshare.net
- https://onlinecourses.nptel.ac.in

Note: Latest editions of all the suggested readings must be used.

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TEME153: ENGINEERING GRAPHICS LAB

Objective: The course is aimed at developing Basic Graphic skills, Develop Skills In Preparation of Basic Drawings and Skills in Reading and Interpretation of Engineering Drawings for skill development, employability and entrepreneurship.

Unit I

Introduction **(03 Sessions)**

Introduction, Drawing Instruments and their uses, BIS conventions, Lines & Lettering, Dimensioning and free hand practicing. Coordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale.

Unit II

Orthographic Projections **(05 Sessions)**

Introduction, Definitions- Planes of projection, reference line and conventions employed. Principle of Orthographic projections, First and Third Angle projections.

Projection of Points, Pictorial view for skill development and employability.

Terms used in Projection of lines. Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems. **(First Angle Projection Only)**for skill development and employability

Unit III

Projections of Solids (First Angle Projection Only) **(06 Sessions)**

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. Sections and Development of Lateral Surfaces of Solids, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. Development of lateral surface of above solids, their frustums and truncations for skill development, employability and entrepreneurship.

Unit IV

Isometric Projection (Using Isometric Scale Only) **(06 Sessions)**

Introduction, Principle of isometric projection, Terminology, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids for skill development, employability and entrepreneurship.

Course outcomes:

Students completing this course will be able to:

CO1: Use the drawing instruments effectively and able to dimension the given figures skill development and employability.

CO2: Appreciate the usage of engineering curves in tracing the path of simple machine components nationally skill development and employability.

CO3: Understand the concept of projection and acquire visualization skills, projection of points globally for skill development and employability.

CO4: Able to draw the basic views related to orthographic projections of Lines, Planes skill development, employability and entrepreneurship.

CO5: Able to draw the basic views related to isometric projections of Lines, Planes skill development, employability and entrepreneurship.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005 Charotar Publishing House, Gujarat.
2. A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.
3. Engineering Graphics – K.R. Gopalakrishna, 32nd edition, 2005 – Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production – Luzadder Warren J., duff John M., Eastern Economy Edition, 2005 – Prentice- Hall of India Pvt. Ltd., New Delhi.
5. Engineering Drawing with an introduction to Auto CAD by Dhananjay A Jolhe, Tata McGraw Hill Book Company, New Delhi.

Website Sources:

- https://lecturenotes.in/
- http://home.iitk.ac.in/
- http://www.fkm.utm.my/
- https://lecturenotes.in/

Note: Latest editions of all the suggested readings must be used.

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TEME201: ENGINEERING MECHANICS

Objective: The primary purpose of the study of engineering mechanics is to develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering. This capacity requires more than a mere knowledge of the physical and mathematical principles of mechanics; also required is the ability to visualize physical configurations in terms of real materials, actual constraints ,and the practical limitations which govern the behavior of machines and structures for entrepreneurship and skill development and employability.

Unit I **(10 Sessions)**

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and non-concurrent force systems, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications for skill development.

Unit II **(08 Sessions)**

Trusses: Introduction, Simple Truss and solution of simple truss, Method of Joints and Method of sections for skill development and employability.

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application for skill development and employability.

Unit III **(08 Sessions)**

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorem, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetryfor skill development and employability.

Unit IV **(06 Sessions)**

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beamsfor skill development and employability.

Unit V **(08 Sessions)**

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion. Relative Velocity for skill development and employability.

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium for skill development and employability.

Course outcome:

Students completing this course will be able to:

CO1: Recognize different force systems, moments and couple for skill development.
CO2: To draw Free Body Diagram and label the reactions on it locally for skill development and employability.
CO3: Find centroid and Moment of Inertia of different bodies for skill development and employability.
CO4: To draw shear force diagram and bending moment diagram locally for skill development and employability.
CO5: Understand Newton's law in motion, and recognize different kinds of particle motions for kill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	3	1	2	1	3	1	2	1
CO2	2	1	1	2	1	3	1	3	2	1	2	1
CO3	2	1	3	1	3	2	1	1	1	2	1	1
CO4	2	1	1	1	1	3	1	3	1	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

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CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Engineering Mechanics by R.K.Bansal, Laxmi Publications, New Delhi.
4. Engineering Mechanics by SS BhaviKatti, New age International Publisher, New Delhi.

Website Sources:

- https://nptel.ac.in/courses/122/104/122104014/
- https://www.coursera.org/learn/engineering-mechanics-statics
- https://www.edx.org/course/engineering-mechanics-2
- https://www.youtube.com/watch?v=ADR04oYgpAM

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TEMA201: ENGINEERING MATHEMATICS–II

Objective: - To develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics Differential equation, series solutions, Fourier series and PDE introduced to serve as basic tools for specialized studies in many fields of engineering and technology for skill development and employability.

UNIT I **(12 Sessions)**

Differential Equations: Ordinary differential equations of first order and first degree, Linear differential equations of n^{th} order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solutions of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation) for skill development and employability.

UNIT II **(10 Sessions)**

Series Solutions and Special Functions: Series solutions of ODE of 2nd order with variable coefficients with special emphasis to differential equations of Legendre and Bessel, Legendre polynomials, Bessel's functions for skill development and employability.

UNIT III **(10 Sessions)**

Fourier Series: Periodic functions, Trigonometric series, Fourier series of period 2π , Euler's formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series for skill development and employability.

UNIT IV **(10 Sessions)**

Partial Differential Equations: Introduction of partial differential equations, Solution of first order differential equations, Linear partial differential equations with constant coefficients of second order and their classification – Parabolic, Elliptic and Hyperbolic with illustrative examples for skill development and employability.

UNIT V **(10 Sessions)**

Applications of Partial Differential Equations : Method of separation of variables for solving partial differential equations, Wave equation upto two dimensions, Laplace equation in two-dimensions, Heat conduction equations upto two-dimensions, Equations of transmission Lines for skill development and employability.

Course Outcomes:

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

CO1: Apply differential calculus and higher order problems and necessary and sufficient condition for total differential equations nationally for skill development and employability.

CO2: Students learn about the how to solve Legendre and Bessel, Legendre polynomials, Bessel's functions for skill development and employability.

CO3: Know about Fourier series initial conditions and its applications to different engineering models globally for skill development and employability.

CO4: Solve second and higher order linear Partial differential equations with constant coefficients and constructall solutions from the linearly independent solutions for skill development and employability.

CO5: Solve partial differential equations with methods & its Applications for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Suggested Readings:

1. Prasad C. Advanced Mathematics for Engineers, Prasad Mudralaya.
2. A Textbook of Differential Equations, Pitamber Publications.
3. B. S .Grewal , Engineering Mathematics , Khanna Publishers, New Delhi.
4. E.Kreyszig, Advanced Engineering Mathematics , John Wiley & Sons.
5. C.Ray Wylie & Louis C .Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
6. Chandrika Prasad ,Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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TECH201: ENGINEERING CHEMISTRY

Objectives

- To emphasize the relevance of fundamentals and applications of chemistry in the field of engineering.
- To take into account appropriate combinations of old and new emerging concepts for the potential uses in engineering.
- To address the principles of general chemistry and specific topics relevant to various engineering disciplines.
- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT I: Matter - Chemical Bonding and its States **(10 Sessions)**

Types of bonds (Ionic, covalent and chemical bonds), valence bond theory, molecular orbital theory and its applications to homo and hetero (CO & NO) diatomic molecules. Solid state- Types of unit cells, space lattice (only cubes) calculation of density of the unit cell, two dimensional solids such as graphite and its conduction properties. Fullerenes and their applications for skill development and employability.

UNIT II: Chemical Kinetics and Electrochemistry **(10 Sessions)**

Molecularity and order of reactions, zero, first and second order reactions, theories of reaction rates, electrode potential, electrochemical cells (galvanic and concentration), Nernst equation, electrochemical and galvanic series, definition, significance for skill development and employability and classification of corrosion, electrochemical corrosion.

UNIT III: Reaction Mechanism and Spectroscopy **(10 Sessions)**

Electrophile, Nucleophile (SN^1 and SN^2reactions)
Mechanism of the following reactions:
(i) Aldol condensation (ii) Beckmann rearrangement (iii) Cannizaro reaction
(iv) Hoffmann rearrangement (v) Diels-Alder reaction and ((vi) Friedel craft reaction
Basic principle, instrumentation and general application of UV, Visible, IR/FTIR & ^{1H}NMR spectroscopy (excluding specific applications) for skill development and employability.

UNIT IV: Polymers **(10 Sessions)**

Polymers, classification and applications, polymerization (addition and condensation), Thermoplastic and Thermosetting polymers, preparation, properties and uses of PVC, Dacron, nylon66 and Bakelite. Elastomers (Natural rubber, bunaN, bunaS) vulcanization, conducting polymers (Intrinsic & Extrinsic), doping, ion exchange resins, biodegradable polymers for skill development and employability

UNIT V: Water Treatment And Fuels **(10 Sessions)**

Hardness of water, calculation on hardness and its determination by EDTA method, sludge and scale formation, causes and prevention of scale formation (colloidal, phosphate, and calgon conditioning), removal of hardness (Soda lime process, zeolite process & ion-exchange process), calculations based on lime soda process for skill development, employability& entrepreneurship development.
Definition of fuels, classification of fuels, calorific value, determination by Dulong's formula, analysis of coal (Proximate and ultimate analysis), petroleum, important fractions of petroleum and their uses, gaseous fuels (CNG & LPG)

Course Outcomes:

Upon completion of course, students will be able to:
CO1: Gain knowledge about the basic concepts of chemistry and states of matter for skill development and employability.
CO2: Understand kinetic and electrochemical methods for various reactions nationally for skill development and employability.
CO3: Demonstrate the mechanism of different reactions and their characterization using spectroscopy for skill development and employability.
CO4: Learn about the various kinds of polymers and their applications locally for skill development and employability.
CO5: Demonstrate knowledge of science behind common impurities in water, methods to treat them and gain the basic

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knowledge of various types of Fuels, their properties for skill development, employability& entrepreneurship development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1
CO3	1	3	1
CO4	3	1	2
CO5	1	1	3

Suggested Readings:

1. Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.
2. Liquid Crystals and Plastic Crystals, vol.-l, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, N York.
3. Corrosion Engineering by M.G. Fontana McGraw Hill Publications Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co. New Delhi (2004)
4. Chemistry of Engineering Materials by C.P. Murthy. C.V. Agarwal and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org
- https://w w w.engineeringvillage.com
- https://www.technicalsy mp0sium.com

Note: Latest edition of all the suggested readings must be used.

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TEPH201: ENGINEERING PHYSICS-II

Objective: The goal of this course is to familiarize students about electromagnetic theory, magnetic materials, solid state Physics, superconductors and their applications for skill and employability development.

UNIT I **(10 Sessions)**

Electromagnetic Theory

Gauss law, continuity equation, Ampere's Law, Maxwell's equations (differential and integral forms), Poynting vector and Poynting Theorem, propagation of plane electromagnetic waves in free space Non conducting and in conducting media, Skin depth andits employability scopes.

UNIT II **(08 sessions)**

Dielectric and Magnetic Properties of Materials

Dielectric Properties: Dielectric constants, Polarization of dielectric materials, Polarizability, Claussius- Mossotti Equation, Application of dielectric.

Magnetic Properties: Magnetization, Magnetic moment, Skills to understand Dia, Para and Ferro magnetism, Langevin theory for diamagnetic material, Hysteresis Curve.

UNIT III **(08 Sessions)**

Solid State Physics

Energy bands in metals, Semiconductors and insulators, Intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors, P-N junction, Tunnel diode, Zener diode andtheir scopes in employability.

UNIT IV **(08 Sessions)**

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), London's Equation, Properties of superconductors, applications of superconductors and their scopes in employability.

Nano Materials: Basic principle of nano science and technology, Structure, properties and uses of Fullerene and carbon nano tubes, Application of nano technology and their scopes in employability.

Unit V **(08 Sessions)**

X-Rays: Diffraction of X-rays, Production and properties, Bragg's Law, Bragg's spectrometer, Applications of X-rays and their scopes in employability.

Ultrasonics: Introduction, Production of Ultrasonics (Magneto striction and piezoelectric methods), properties & applications of Ultrasonic waves.

Course Outcome:

The students completing this course will be able to:

CO1: Develop skills locally to understand Gauss law, Ampere's Law, Maxwell's equations and their applications.
CO2: Develop skills to understand Dielectric and magnetic properties of the materials.
CO3: Develop skills to explain intrinsic and extrinsic semiconductors and the construction, operation and characteristics of diodes.
CO4: Develop skills internationally to understand concepts of superconductors, Properties of superconductors & applications of superconductors and the basic principle of nano science and technology and applications of nanotechnology.
CO5: Gain basic knowledge on the properties, production, applications and employability scopes of X-rays.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1
CO3	1	3	1
CO4	3	1	2
CO5	1	1	3

Suggested Readings:

1. Concept of Modern Physics: A. BEISER
2. Atomic Physics: Rajam
3. Greiner : Quantum Physics
4. Griffth : Introduction to Electrodynamics
5. S. K. Gupta: Engineering Physics
6. Beiser : Perspective of Modern Physics

Website Sources:

- https://www2.ph.ed.ac.uk
- http://web.mit.edu
- http://pcwww.liv.ac.uk
- http://sites.science.oregonstate.edu
- https://eng.libretexts.org
- https://shodhganga.inflibnet.ac.in
- https://www.electrical4u.com
- https://vardhaman.org

Note: Latest editions of all the suggested readings must be used.

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TECS201: COMPUTER FUNDAMENTALS & PROGRAMMING

Objective: The objective of this course is to introduce the concepts of computer basics & programming with particular attention to Engineering examples and to learn the fundamentals of the C programming language for skill development and employability.

UNIT I **(08 Sessions)**

Introduction: Introduction to Computer Systems, Generation of Computers, BIOS, Various types of memories, CPU organization, ALU, registers. Introduction to various operating Systems. Number systems: Binary, hexadecimal, octal and their inter conversions. Computer Languages and Software & hardware: High Level Languages and Low Level Language, Various types of software. Firmware, Compiler, Interpreter and Assembler for skill development. File Allocation Table, Hardware.

UNIT II **(10 Sessions)**

Input, Output and storage units: Introduction to various Input and output Devices. Printers: Various type of Impact and Non-Impact Printers. Introduction to algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code. Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs for skill development and employability. Use of high level programming languages for the development of programs.

UNIT III **(08 Sessions)**

Standard I/O in "C", Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static for skill development and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity.

UNIT IV **(09 Sessions)**

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue for skill development.

UNIT V **(07 Sessions)**

Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules. Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structure, union, enumerated data types. Functions: Introduction, types of functions, functions with array, recursive functions, Introduction to pointers, Introduction to file handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler helpful in skill development and employability.

Course Outcome:

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

CO1: Understand Basic knowledge of components of Computer Locally for skill development.

CO2: Understand the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming for skill development and employability.

CO3: Understand how to write, compile and debug programs in C language and use different data types for writing the programs internationally for skill development.

CO4: Understand how to design programs using the concepts decision statements, loops, functions, arrays pointers etc.for skill enhancement.

CO5: Do programming by using function, recursion and pointers which is helpful in employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1	1	1	1	1	1
CO2	2	2	1	1	1	1	1	1	1	1	2	1
CO3	3	2	1	1	1	2	1	1	1	1	1	1
CO4	3	3	1	3	1	2	1	1	1	1	2	1
CO5	3	3	1	3	1	1	1	1	1	1	1	2

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	2	1
CO3	3	1	1
CO4	3	1	1
CO5	3	3	1

Suggested readings:

1. "Let us C", Yashvant Kanitkar
2. "Programming with C", Byron Gottfried
3. "Computer Fundamentals", Anita Goel, Pearson Education
4. "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
5. "C programming", Kernighan and Ritchie, PHI
6. "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

Website Sources:

- en.wikipedia.org
- onlinecourses.nptel.ac.in
- www.scribd.com
- www.tutorialspoint.com

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TEEC201: ELECTRONICS ENGINEERING

Course Objective: The objective of the course is to familiarize the students with the concepts of semiconductor technology and devices along with their applications in real life for employability.

UNIT I **(08 Sessions)**

Theory of Semiconductor material: Energy band Theory of crystals, Insulators, Semiconductors and Metals, classification of semiconductors, Mobility and Conductivity, Donor and Acceptor Impurities, Mass- Action law, Variation in semiconductor parameters with Temperature, Hall – Effect for skill development and Employability.

UNIT II **(10 Sessions)**

Semiconductor Diodes and Applications: p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance, p-n junction as rectifiers, filter (Shunt capacitor filter), clipping circuits, clamping circuits, breakdown mechanism, breakdown characteristics, zener resistance, zener diode application as shunt regulator. Introduction of LED, and Photo diode and their application in Employability

UNIT III **(08 Sessions)**

Bipolar Junction Transistor (BJT): construction, transistor action, CB, CE and CC configurations, concept of voltage gain, current gain. Field Effect Transistor (FET): JFET: construction, principle of working, concept of pinch-off, drain saturation current, characteristics, characteristic equation, CG, CS and CD configurations, MOSFET: depletion and enhancement type, construction and their application in Employability.

UNIT IV **(09 Sessions)**

Number system: conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, understanding of Boolean algebra, logic gates, concept of universal gates for skill development, Canonical forms, minimization using K-map (Upto four variable, don't care conditions also)

UNIT V **(07 Sessions)**

Operational Amplifier (Op-Amp): concept of ideal operational amplifier, parameters. Inverting, non-inverting and unity gain configurations, Op-amp as adder, subtractor, Block diagram of Communication Systems, Introduction to Modulation, Need for modulation, Definition of AM and FM for understanding and skill development in field of communication system.

Course Outcome:

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

CO1: Understand the basics of semiconductor technology globally for skill development and Employability.
CO2: Understand P-N junction diode and its applications for Employability.
CO3: Understand the basics of BJT and MOSFET for Employability.
CO4: develop understanding of numbers system and basics of Logic Gates Nationally for skill development.
CO5: discuss the operational amplifier and its application and the need of modulation in the communication system for skill development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	1	1	1	1	2	1	1	1	1
CO 2	1	1	1	1	1	1	1	2	1	1	1	1
CO 3	1	3	2	1	1	1	1	1	2	1	1	1
CO 4	1	1	1	1	1	1	1	1	1	3	1	1
CO 5	1	1	1	1	1	1	1	1	1	1	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	1	3	1
CO2	2	3	1

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CO3	1	3	1
CO4	2	1	1
CO5	2	1	1

Suggested readings:

1. S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
2. Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education
3. Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH
4. Morris Mano "Digital Computer Design", PHI 2003
5. Kennedy, Davis, "Electronics Communication System" 4th Edition, TMH

Website Sources:

- en.wikipedia.org
- onlinecourses.nptel.ac.in
- www.scribd.com
- www.tutorialspoint.com

Note: Latest editions of all the suggested readings must be used.

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TEME251: MECHANICAL ENGINEERING LAB

Objective: The objective of the course is to introduce students to different engineering material and create an understanding of different mechanical properties by using Destructive testing methods. Also the students will be familiar with the basic working of IC engines & boilers for skill development, employability and entrepreneurship.

List of Experiments: (Minimum 08 experiments are required to be performed) **(16 Sessions)**

1. To conduct tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen using UTM Machine for skill development and employability.
2. To conduct compression test and determine the ultimate compressive strength for a specimen using UTM Machine for skill development and employability.
3. To conduct Impact-tests (Izod / Charpy) on Impact-testing machine to find the toughness for skill development and employability.
4. To determine the hardness of the given specimen using Brinell/Rockwell hardness testing machine for skill development and employability.
5. To study 2-stroke & 4-stroke I.C. Engine models for skill development and employability.
6. To study Lancashire, Babcock Wilcox and Locomotive boiler models for skill development and employability.
7. To study Steam Engine & Steam Turbine models for skill development and employability.
8. To study vapor compression Refrigerator unit tutor / refrigerator for skill development and employability.
9. To study window type Air conditioner for skill development and employability.
10. To conduct torsion test on mild steel or cast iron specimens to find out modulus of rigidity for skill development and employability.

Course outcome:
Students completing this course will be able to:
CO1: Describe the behaviour of materials upon normal external loads locally for skill development and employability.
CO2: Predict the behaviour of the material under impact conditions for skill development and employability.
CO3: Recognize the mechanical behaviour of materials locally for skill development and employability.
CO4: Recognize parts of IC engines for skill development and employability.
CO5: Recognize components of boilers for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	2	1	3	2	1	3	1	3	2	1	2	1
CO3	3	3	3	1	3	3	3	2	1	2	1	1
CO4	3	1	1	1	2	3	1	3	3	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

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Suggested Readings:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Engineering Mechanics by R.K.Bansal, Laxmi Publications, New Delhi.
4. Engineering Mechanics by SS BhaviKatti, New age International Publisher, New Delhi.

Website Sources:

- https://www.sciencedirect.com/topics/engineering/izod-impact
- https://www.twi-global.com/technical-knowledge/faqs/faq-what-is-charpy-testing
- https://www.hardnesstesters.com/test-types/brinell-hardness-testing
- https://www.youtube.com/watch?v=liiopCScMck

Note: Latest editions of all the suggested readings must be used.

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TECH251: CHEMISTRY LAB

Objectives

- Practical implementation of fundamental concepts of qualitative and quantitative analysis.
- To gain the knowledge on existing future upcoming devices, materials and methodology used in chemistry practical
- To rely on elementary treatment and qualitative analysis and makes use of concepts involved for skill development and employability.
- To provide an overview of preparation and identification of organic compounds

List of Experiments **(16 Sessions)**

1. Determination of alkalinity of the given sample of water for skill development and employability.
2. Determination of temporary and permanent hardness of water sample by versinate method for skill development and employability.
3. Determination of available chlorine in bleaching powder for skill development and employability.
4. Determination of quantity of dissolve oxygen in given sample of water for skill development and employability.
5. Determination of iron content in the given water sample by Mohr's methods for skill development and employability.
6. Determination of ion exchange capacity of given sample of ion-exchange material for skill development and employability.
7. Determination of Equivalent weight of iron by the chemical displacement method. The equivalent weight of copper is 63.5 for skill development and employability.
8. Determination of viscosity of polystyrene by Ostwald Viscometer for skill development and employability.
9. Preparation of Bakelite resin for skill development and employability.
10. Element detection and functional group identification in organic compounds for skill development and employability.

Course Outcomes:
Upon completion of course, students will be able to:
CO1: Estimate the impurities present in water for skill development and employability.
CO2: Prepare advanced polymer materials locally for skill development, employability and entrepreneurship development.
CO3: Know the strength of an acid present in secondary batteries for skill development and employability.
CO4: find the Fe^{+2},Ca^{+2}&Cl^{-}present in unknown substances using titrimetric and instrumental methods for skill development, employability and entrepreneurship development.
CO5: Element detection and functional group identification in organic compounds nationally for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1
CO3	1	3	1
CO4	3	1	2
CO5	1	1	3

Suggested Readings:

1. Applied Chemistry by R. S. Katiyar & J.P. Chaudhary Publication B.B.P. & Co. Meerut
2. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
5. Principles of Physical Chemistry, by Puri B.R., Sharma L.R., S. Nagin & Company, Delhi

Website Sources:

- https://www.gopracticals.com/basic-engineering/
- https://edu.rsc.org/resources/practical

Note: Latest edition of all the suggested readings must be used.

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TEEC251: ELECTRONICS ENGINEERING LAB

Objective: The objective of this lab is to familiarize the students with the basic working of diodes and also help them calculate voltage and currents through simple devices such as multimeter to improve skill and provide knowledge for employability and entrepreneurship.

Experiments: **(16 Sessions)**

1. To study of Digital Multimeters (measurement of AC and DC voltage, measurement of current, measurement of resistance, capacitance), passive components (resistor, capacitor) and verify using color code to inculcate knowledge for employability
2. To Study Cathode Ray Oscilloscope (To study of controls of CRO, to measure amplitude, time period and frequency of time varying signals), function generator, power supply & Bread Board for skill development.
3. To study the Characteristics of a P-N Junction diode in forward & reverse bias connection.
4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier.
5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers.
6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance.
7. To Plot input / output characteristics for common base transistor for employability
8. To verify the truth table of basic logic gates (AND, OR, NOT)
9. To build and test the clipper circuit using diode.
10. To build and test the clamper circuit using diode for skill development.

Course Outcome:
Students taking this lab will be able to:
CO1: understand the basics of semiconductor technology globally for skill development and Employability.
CO2: understand P-N junction diode and its applications for Employability.
CO3: understand the basics of BJT and MOSFET for Employability.
CO4: develop understanding of numbers system and basics of Logic Gates nationally for skill development.
CO5: discuss the operational amplifier and its application and the need of modulation in the communication system for skill development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	2	1	1	3	1	1	1	2	1
CO2	1	1	2	3	2	2	3	3	1	1	1	1
CO3	1	1	3	3	1	2	3	3	1	1	1	1
CO4	1	1	1	2	1	1	3	3	1	3	1	1
CO5	1	1	1	3	1	1	3	1	1	3	2	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	2	2
CO2	1	2	1
CO3	3	3	2
CO4	2	2	1
CO5	2	3	2

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Suggested Readings:

1. S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
2. Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education 2007
3. Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH
4. Morris Mano "Digital Computer Design", PHI

Website Sources:

- www.nptel.ac.in
- www.gradeup.in
- en.wikipedia.org
- www.electr_basic.in

Note: Latest edition of all the suggested readings must be used.

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TECS251: COMPUTER LAB

List of Experiments **(16 Sessions)**

1. Write a program in C to add, subtract, multiplication and division of two numbers for skill development.
2. Write a program in C to compute the compute the average for skill development.
3. Write a program in C to calculate Factorial of a Number for skill development.
4. Write a program in C to print a Table for skill development.
5. Write a program in C to check whether a number is even or odd for skill development.
6. Write a program in C to check whether a number is prime number or not for skill development.
7. Write a program in C to find largest of three numbers for skill development.
8. Write a program in C to Read n integers, store them in an array and find their sum and average for skill development.
9. Write a program in C to find the addition of two matrix for skill development.
10. Write a program in C to find the factorial of a given Natural Number n using recursive for skill development.

Course Outcome:
After the successful completion of this course, the students will be able to:
CO1: Understand Basic knowledge of components of Computer Locally for skill development.
CO2: Understand the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming for skill development and employability.
CO3: Understand how to write, compile and debug programs in C language and use different data types for writing the programs internationally for skill development.
CO4: Understand how to design programs using the concepts decision statements, loops, functions, arrays pointers etc. for skill enhancement.
CO5: Do Programming by using function, recursion and pointers which is helpful in employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1	1	1	1	1	1
CO2	2	2	1	1	1	1	1	1	1	1	2	1
CO3	3	2	1	1	1	2	1	1	1	1	1	1
CO4	3	3	1	3	1	2	1	1	1	1	2	1
CO5	3	3	1	3	1	1	1	1	1	1	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	2	1
CO3	3	1	1
CO4	3	1	1
CO5	3	3	1

Suggested readings:

1. "Let us C", Yashvant Kanitkar
2. "Programming with C", Byron Gottfried
3. "Computer Fundamentals", Anita Goel, Pearson Education
4. "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
5. "C programming", Kernighan and Ritchie, PHI
6. "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

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Website Sources:

- en.wikipedia.org
- onlinecourses.nptel.ac.in
- www.scribd.com
- www.tutorialspoint.com

Note: Latest editions of all the suggested readings must be used.

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TECE301: ENGINEERING GEOLOGY

L T P 3 1 0

Objective: The objectives of the course are:

- To study the physical properties of rocks, minerals and various defects in rocks.
- To understand the various natural dynamic processes their influence on the surface features, natural material and their consequences such as earthquake, landslide etc.
- To identify different types natural materials like rocks & minerals and soil for skill development
- To know the importance of geological maps and terms helpful in various Civil Engineering related projects for skill development and employability.

UNIT I

Minerals: Type physical and detailed study of certain rock forming minerals for skill development and employability.Geological masses.Curvelet-Based Joint Waveform and Envelope Inversion of Early-Arrival Imaging Shallow Geological Structure. **(05 Sessions)**

UNIT II

Defect in Rocks: The origin, structure, texture and classification of igneous, sedimentary and metamorphic rocks and their suitability as Engineering Materials understanding for entrepreneurial & skill development. Terminology: Stratification, Lamination bedding. Outcrop- its relation to topography, dip and strike of bed, overlap, outlier and inliers. Folds, faults and joints-causes, types, classification, engineering importance to these defects. Experimental Study on the Failure Characteristics and Damage Evolution of Sandstones from Typical Buried Depths in High In Situ Stress Area. **(12 Sessions)**

UNIT III

Earthquake: Its causes, classification, seismic zones of India and Geological consideration for construction of building for better skilling of entrepreneurship projects in seismic areas. Landslides and its causes, classification and preventive measures.Plate tectonic theory.Characteristics and Main Controls of Tectonic Fractures and Their Contribution to Deep Tight Reservoirs: A Case Study of the Huoshiling-Shahezi Formations in Gudian **(10 Sessions)**

UNIT IV

Underground water: Origin, Aquifer, Aquicludes, Artesian Wells, underground provinces of India and knowledge for better skilling and employability and its role as geological hazard **(10 Sessions)**

UNIT V

Geological investigations for site selection of Dams and reservoirs tunnels, bridges and Highway and knowledge for skill development and entrepreneurship development. Development.Paleoenvironmental Evolution of a Forearc in Response to Forcings by Drainage, Climate, Volcanism, and Tectonics: The Quillagua Depocenter. **(08 Sessions)**

Course Outcomes:

Students completing this course will be able to:

CO1: Know about natural material like rocks and minerals and their usage as well as their availability and information about their formationat local levelfor skill development and employability.

CO2: Understand the influence of natural processes and geological factors of rock on civil structures and help them to take decision while planning, design and execution stage of the structures in their professional life for building models for skill development.

CO3: Get a diverse knowledge of earthquake and geological construction of Civil Engineering related projectsfor facing national and international challeneges for enhancing entrepreneurship development.

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CO5: Get the knowledge of subject will also help them to understand the geological maps and terminologies at national and international levelfor the discussion on underground water of earth surface and information about the geological hazard of the earth surface to build knowledge for skill development and entrepreneurship development.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped , 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	1	3	3	1	1	1	2	3
CO2	3	2	1	2	3	3	3	1	3	2	3	3
CO3	3	3	3	3	2	3	2	3	3	3	2	1
CO4	2	3	1	3	1	3	3	1	2	3	3	3
CO5	3	3	2	3	3	2	3	1	2	3	1	3

CO-Curriculum Enrichment mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	3	1	3
CO4	3	3	2
CO5	3	2	3

Suggested Readings:

- "Text Book of Engineering Geology" , K V G K Gokhale ; B S Publication
- "Engineering and General Geology", PrabinSingh ;Katson Publishing House.

Website sources:

- https://nptel.ac.in/courses/105/105/105105106/
- https://bis.gov.in/other/quake.htm

Note: Latest editions of all the suggested readings must be used.

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TECE302: BUILDING MATERIALS AND CONSTRUCTION

L T P 3 1 0

Objective:

- To recognize materials to be used for the construction work.
- To gain knowledge of different types of masonry for skill development and employability.
- Selection of materials, design and supervision of suitable type of floor and roof for skill development.
- To gain knowledge about doors, windows, plastering, painting, damp proofing, scaffolding, shoring, underpinning and to take suitable engineering measures.

UNIT I

(10 Sessions)

Classification of materials, materials and their performance, economics of the building materials
Stones: Requirement of good building stone, characteristics of stones and their testing. Common building stones.Preservation of stones
Bricks: Manufacture of clay bricks, and their classification. Properties of clay bricks and their testing problems of efflorescence & lime bursting in bricks & tiles.
Timber: Classification and identification of timber, Fundamental Engineering properties to inculcate skill and provide employability. Bamboo as a building material.Modern materials, Neoprene, thermocol, vinyl flooring, decorative panels and laminates, anodised aluminium, architectural glass and ceramics, Ferro cement, PVC, polymer base materials and Fibre Reinforced Polymer (FRP).

UNIT II

(08 Sessions)

Components of building area considerations, Construction Principle and Methods for layout, Damp proofing ant termite treatment, for skill development Vertical circulation means staircases ramp design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonry construction. Cavity wall hollow block and Waffle slab construction.Decorative concrete. Introduction to pre-fabricated structures and its use in repair and rehabilitation of pre-fabricated structures. ISI specification for bricks IS-1077-1971(sizes)

UNIT III

(06 Sessions)

Doors, Windows and Ventilations, Construction details types and relative advantages &disadvantages. Roofs, types and treatments, Lintels and Chhajja Functional efficiency of Buildings for better skilling of entrepreneurship. Tiles -Types of tiles- roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Morbonite. Common varieties of stones-granite, marble, Kadapa slab, Shahabad stones.

UNIT IV

(08 Sessions)

Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electricity. Heating Ventilation & Air conditioning, Mechanical Lifts and Escalators, Fire Fighting, Acoustics. Plastering different types, pointing, Distempering, Color washing, Painting etc. Principles &Methods of building maintenance provide skill development.

UNIT V

(08 Sessions)

Chemistry of Plastics manufacturing process, classification, advantages of plastics, Mechanical properties and their use in construction help in understanding entrepreneurship skills.Paints varnishes and distempers, Common constituents, types and desirable properties, Cement paints.types Glass: Ingredients, properties and use in construction. Insulating Materials: Thermal and sound insulating material desirable properties and type.Site investigation for foundation as per N.B.C, Trial pit, auger boring. Classification of stone masonry - Random rubble and Coursed Rubble Masonry – general principles to be observed while constructing stone masonry.

Course Outcomes:

On the completion of the course one should be able to understand:
CO1: Property, use, advantage and disadvantage of different materials used in building construction for national importance and to develop skill development and Employability.

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CO2: Various components of building with their function and to help student to build their Entrepreneurship Development

CO3: Construction procedure of different components of building for national importance and to enhance Employability

CO4: Different types of plastering, and building maintenance techniques help in the analysis of skill development

CO5: Understanding about the insulating materials, its properties and types at local level and to build a model for skill development and Employability

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	3	3	1	2	1	1	3
CO2	3	1	1	1	3	2	2	3	3	3	2	3
CO3	3	3	3	3	3	3	3	1	2	1	3	3
CO4	3	1	1	1	3	3	3	3	3	2	3	3
CO5	3	1	1	3	3	2	3	1	3	3	2	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	2	1	3
CO3	1	3	2
CO4	3	2	2
CO5	3	3	2

Suggested Readings:

- "Building Materials", S K Duggal; New Age International
- "Building Materials", P.C. Varghese; PHI
- "A Text Book of Building Construction", B.C. Punmia; Laxmi Publications, Delhi.
- "Civil engineering Materials and Construction Practices", R.K. Gupta, Jain Brothers, (New Delhi).

Website Sources:

- https://en.wikipedia.org/
- https://www.aboutcivil.org/engineering-materials.html
- https://www.aboutcivil.org/building-construction-and-design.html
- https://nptel.ac.in/
- http://www.nptelvideos.in/2012/11/building-materials-and-construction.html

Note: Latest editions of all the suggested readings must be used.

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TECE303: SURVEYING PRACTICE – I

L T P 3 1 0

Objective:

The objective of this course is to introduce the students about the basic concept of measurement such as distance, direction and elevation and to explore the knowledge of instruments used for measurement such as Auto level, theodolite, compass, total station for skill development and provide employability and entrepreneurial skills.The objectives of surveying may vary depending on the type of project such as roads, public transit systems, bridges, power plants, dams, pipelines and waste management systems.

UNIT I

(8 Sessions)

Linear and direction measurement: Importance of surveying to engineers for skill development, plane and geodetic surveying, principles of surveying, classification of surveys, Surveying adjustment, error, sources, precautions and corrections.Linear measurement, chain survey, classification of map and importation of mapcompass survey, bearing, meridian, survey station and survey line.

UNIT II

(8 Sessions)

Elevation measurement: Methods of determining elevations, Direct leveling- basic terms and definitions, principle, booking and reduction of field notes for skill development and entrepreneurship, curvature and refraction, automatic levels, Contouring- methods and uses. Definition, Principles of stadia systems, sub-tense bar and tangential methods.

UNIT III

(8 Sessions)

Curves: Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, setting out off works- buildings, culvert , simple circular curves ,equations of various transition curves, Introduction to vertical curves for skill development.

UNIT IV

(8 Sessions)

Theodolite surveying: Principles of traversing by compass and theodolite, computations of traverse coordinates for skill development, Principles and classification of triangulation systems, strength of figures, satellite stations, inter-visibility of stations, selection of station, triangulation field work.

UNIT V

(8 Sessions)

Plane table surveying: Principles, plane table equipments, methods for skill development and for better skilling of entrepreneurship, resection by three point problem, Engineering Project survey requrment and scpecifications, various stages of suravey work ,

Course Outcomes:

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

CO1: Apply the principle and knowledge of surveying at local level for distance and direction measurement which will helpful to make student employable.

CO2: Understand different types of leveling and determine elevation of different points for national importance andimproveand develop the student's skills.

CO3: Draw different types of curves using various linear and angular approaches and make students employable

CO4: Use Theodolite and other instruments for various types of traverse and develop the skills of students

CO5: Demonstrate different methods of plane table surveying and their applications in Civil Engineering for facing global challenges which are helpful for entrepreneurship development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	3	3	3	3	3	1	3
CO2	3	2	3	2	3	1	1	1	1	3	3	3
CO3	3	3	3	1	3	1	3	2	3	2	3	3

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CO4	3	2	3	3	3	2	1	1	3	1	1	3
CO5	3	2	3	3	3	2	1	3	3	3	1	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	3	2
CO2	3	1	2
CO3	2	3	1
CO4	3	2	2
CO5	2	1	3

Suggested readings:

- "Surveying Vol 1 & 2", S K Duggal; McGraw Hills Publication.
- "Surveying & Leveling"; R Subramanian; Oxford University Press
- "Surveying & Leveling"; B C Punamia, Laxmi Publications
- "Text Book of Surveying"; C Venkatramaih University Press

Website resources:

- https://nptel.ac.in/courses/105/107/105107122/
- http://ecoursesonline.iasri.res.in/course/view.php?id=523
- https://freevideolectures.com/course/98/surveying

Note: Latest editions of all the suggested readings must be used.

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TECE304: FLUID MECHANICS

L T P 3 1 0

Objective: The objective of this course is to familiarize the students with the properties of fluids and the applications of fluid mechanics. To formulate and analyze the problems related to fluid flow.To understand the concept of flow measurement, types of flows and dimensional analysis for skill development.

UNIT I

(10 Sessions)

Fundamental Concepts of Fluid Flow: Flow characteristics, Classification, Fluid properties, Foundations of flow analysis help in understanding entrepreneurship skills. Definition of fluid, Newton's law of viscosity, UNIT s and dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension.

Fluid statics: Fluid pressure and its measurement, hydrostatic forces on submerged bodies, buoyancy and floatation, liquids in relative equilibrium.

Fluid kinematics: Continuity equation, rotational and irrotational flow, circulation and vorticity, velocity potential and stream function, flow net.

UNIT II

(10 Sessions)

Fluid dynamics: Euler's equation, energy equation and Bernoulli's equation, application of Bernoulli's equation-orifice meter, venture meter, pivtot tube etc., flow through orifice, mouth piece, weir and notches, impulse momentum equation and its application to inculcate skill and provide employability pipe junction, bends, stationary flat and curved vanes.

Flow through pipes: Darcy-Weisbach equation, energy losses in pipelines, equivalent pipes, multiple pipe systems.Linear and volumetric deformation: Perspective from mass conservation. Continum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows.

UNIT III

(8 Sessions)

Laminar flow: Laminar flow through circular pipes, parallel plates, open channel, Porous media, Stokes law, measurement of viscosity, transition from laminar to turbulent flow.

Turbulent flow: Shear stresses, establishment of flow, types of boundaries, mixing length concept, velocity distribution, mean velocity and resistance to flow in smooth and rough pipes, friction in non-circular conduits knowledge for better skilling and employability

Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration. power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

UNIT IV

(6 Sessions)

Dimensional analysis and similitude: Dimensional homogeneity, Buckingham's π theorem, important dimensional numbers and their significance, geometric, Kinematic and dynamic similarity, model studies help in understanding entrepreneurship skills. Measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces.

UNIT V

(6 Sessions)

Boundary Layer Theory and Applications: Concepts of boundary layer, boundary layer thickness and equations, momentum integral equation, boundary layer separation and its control, Circulation, Drag and lift on immersed bodies, Magnus effect to inculcate skill and provide employability. Important dimensionless numbers and their significance, undistorted and distorted modelstudies.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the properties, behavior of fluids at local level and to select a suitable fluid for a particular requirement, it will develop the skills of students.

CO2: Understand the concept of fluid pressure, buoyancy and analyze the stability of submerged and floatingbodies at national level that will develop the skills of students

CO3: Establish the relation between different heads of fluid flow and derive Bernoulli's Equation and applying it to calculate the discharge of fluid through various devices. It will help to make student employable.

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CO4: To know about the various energy losses in pipe flow and establish the equations of motion for laminar flow through pipes and understanding entrepreneurship skills
CO5: Understand the concept of boundary layer flow and dimensional analysis for facing global challeneges to establish and to inculcate skill and provide employabilitya relationship between different parameters involved in a physical phenomenon.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	3	3	3	1	2	1	1	3
CO2	3	3	2	1	3	2	2	2	1	2	1	2
CO3	3	3	1	2	2	3	3	1	2	1	1	3
CO4	3	2	2	1	3	2	3	1	2	1	1	3
CO5	3	3	1	2	3	3	2	1	1	2	2	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	3
CO2	3	3	2
CO3	2	3	1
CO4	3	1	3
CO5	3	3	2

Reference Books:

- "Fluid Mechanics" Dr A.K. Jain
- "Hydraulics and Fluid Mechanics" P.N.Modi and S.M.Seth
- "Fluid Mechanics" Wiley and Streeter
- "Engineering fluid mechanics" R.J Gardeand A.G. Mirajkaoker

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of all the suggested readings must be used.

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TECE305: STRENGTH OF MATERIALS

L T P 3 1 0

Objectives:
To provide the basic concepts, principles and knowledge for determining the mechanical properties (stress, strain, elastic constants, deflection etc.,) produced in structural members under various type of loading to develop skill. The students will be able to design for engineering applications with the knowledge provide for better employability and entrepreneurship.

UNIT I

(08 Sessions)

Introduction: Properties of Materials-Elasticity, Plasticity, Ductility, Brittleness, Strength, etc. for skill development.

Simple stresses and strains: Types of stresses and strains, stress strain diagram, Hooke's law, Principle of superposition, bars of varying section of different materials, compound bars, temperature stresses etc.

UNIT II

(08 Sessions)

Elastic Constants: Modulus of elasticity, Poison's Ratio, Modulus of Rigidity and bulk modulus, and their relationships.

Principal Stresses: Stresses induced due to uniaxial stress, stresses induced by state of simple shear, stresses induced due to biaxial stress, Mohr Circle, Ellipse of stress, principal stresses and principal planes, maximum shear stresses, Principal strains. Member subject uniaxial stress,Theory of failure and factor of safety to develop skill and employability

UNIT III

(08 Sessions)

Strains Energy, Resilience and Impact loading: Load deflection diagram: Strain energy of prismatic bars with varying section, for non-prismatic bars with stresses under gradual, sudden and impact loadings, shear resilience, Relation between Elastic moduli and strain energy to develop skill and employability.

UNIT IV

(08 Sessions)

Shear Force and Bending Moment: Types of structures, loading, supporting conditions, structural actions, equation of equilibrium, Point of copntraflexure, SFD and BMD under different loads for determinate beams, frames and arches for skill and entrepreneurship development.

Stresses of Beam: Theory of simple bending, Distribution of bending stresses, distribution of shear stresses. Deflection in beams, Light Weight Ferro cement Sandwich Composite Beam for skill development.

UNIT V

(08 Sessions)

Columns and Struts: Concept of structural stability, analysis of long and short columns by Euler's, Rankin's and Secant formulae for skill development, analysis of eccentrically and laterally loaded columns.

Combined bending and Torsion**:** Introduction, Torsion of shafts of circular section, Torsion Equation, Torque and Twist, Shear stress due to torque to develop skill and employability member subjected to combined loading, member subjected to load, member subjected to torsion load

Spring: Introduction of spring , leaf spring ,coil spring , torion spring , compression spring ,conical helical spring.

Course Outcomes: After completion of this course the students will be able:

CO1: Students will be introduced to mechanical properties at local level and able to handle the problems of stress andstrain in different sections of various materials, it will develop the skills of students. .

CO2: Able to understand the importance of different elastic constants and their relationships followed bytheories of principal stress and theories of failures at national level, It will be helpful to develop the skill of students.

CO3: Able to handle the problems related to load deflection, variable load, impact loading and strainenergy, and it will make students employable. .

CO4: Students will be able to draw SFD& BMD of members under various loading and supportconditions, also able to understand the theory of deflection of beam, bending of beams and distribution of shear stresses for skill and entrepreneurship development

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CO5: Ability to understand the concept of structural stability at local and global level, analysis of eccentrically and laterallyloaded columns and struts followed by Theories of Bending and torsion in shafts of circular sections. It will be helpful to develop the employability skills of students.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	2	2	1	2	2	2	3
CO2	3	2	2	2	3	1	1	1	2	3	2	3
CO3	3	3	3	1	2	2	2	1	3	1	1	3
CO4	3	2	3	3	3	1	2	2	2	1	1	2
CO5	3	2	3	2	3	1	1	2	3	2	2	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	2	3	1
CO4	3	2	3
CO5	2	2	2

Reference Books:

- "Strength of Materials" Ryder.
- "Strength of Materials" Dr. R.K.Bansal.
- "Strength of Materials" Timoshenko and &Yσungs.
- "Strength of Materials" R.C. Hibbler

Web Sources:

- www.nptel.ac.in
- www.utube.com
- gradeup.co/gate-me-notes
- alphalearning.in/ese-gate/strength-of-material

Note: Latest editions of all the suggested readings must be used.

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TEMA301: ENGINEERING MATHEMATICS- III

Objective: - The main aims of this course are to exposing the students to learn the Laplace transform and Z-transform and introduce the fundamental ideas of the functions of complex variables and developing a clear understanding of the fundamental concepts of Complex Analysis such as analytic functions, complex integrals and a range of skills which will allow students to work effectively with the concepts in the field of engineering for skill development, employability and entrepreneurship.

UNIT I **(12 Sessions)**

Laplace Transform : Existence theorem, Laplace transform of derivatives & Integrals inverse Laplace transforms, Unit step functions delta functions , Laplace transform of periodic functions, Convolution theorem, Applications to solve simple linear and simultaneous differential equations for skill development and employability.

UNIT II **(08 Sessions)**

Integral Transform: Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z- transforms and its applications to solve difference equations for skill development and employability.

UNIT III **(10 Sessions)**

Functions of a complex variable – I : Analytic functions, C- R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental theorem of algebra for skill development and employability.

UNIT IV **(10 Sessions)**

Functions of a Complex Variable – II : Representation of a function by power series ,Taylor's series and Laurent's series, Singularities, Zeroes and poles, Residue theorem, Evaluation of real integrals of type $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$ and $\int_{-\infty}^{+\infty} f(x)dx$, Conformal mapping and Bilinear transformations for skill development and employability.

UNIT V **(12 Sessions)**

Method of least squares and curve fitting of straight lines, Polynomials, Exponential curves etc., Solution of cubic and Bi-quadratic equations for skill development and employability.

Course Outcomes:

CO1: Develop the concepts of Laplace transformation & Inverse Laplace Transformation with its property to solve PDE which is helpful in all engineering & research work for skill development and employability.
CO2: Gain knowledge of Fourier series representation for even/odd functions and Z- transforms and its applications for skill development and employability.
CO3: Apply the concept of analyticity and the Cauchy-Riemann equations to analyze results on harmonic and including the fundamental theorem of algebra for skill development and employability.
CO4: Learn about Cauchy's theorem and its uses in complex integration. Taylor's and Laurent's series in complex form for skill development and employability.
CO5: To be able to apply the knowledge of least square and curve fitting of straight lines for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	3	1	2	1	3	1	2	1
CO2	1	1	3	2	1	3	1	3	2	1	2	1
CO3	2	3	2	1	3	3	3	2	1	2	1	1
CO4	3	1	1	1	2	3	1	3	3	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

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CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. B. S .Grewal , Engineering Mathematics , Khanna Publishers, New Delhi.
2. B . S . Grewal , Higher Engineering Mathematics , Khanna Publishers,New Delhi.
3. E.Kreyszig, Advanced Engineering Mathematics , John Wiley & Sons
4. C.Ray Wylie & Louis C . Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
5. Chandrika Prasad ,Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

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TECE351: ENGINEERING GEOLOGY LAB

L T P 0 0 2

Objective: The objective of this lab isto understand the role of geology in the design and construction process of underground openings in rock and study of rocks using basic geologic classification systems and various physical properties such as color, texture etc for skill development and for employability .

List of Experiments

(16 Sessions)

1. Identification of minerals based on their physical properties- five samples for skill development
2. Identification of rocks based on their physical properties- five samples for skill development
3. To draw contour patterns of hills, valleys, rivers, plateau, saddle, topographic basin etc for skill development and employability
4. To draw geological section from the given map for skill development
5. To determine the strike & dip of rock formation for skill development.
6. To determine the thickness of beds of the geological formation for skill development and employability.

Course Outcomes: After completion of this course, students will be able:

CO1: To Identity different types of rocks and minerals at local and global level for skill developmenton the basis of their physical properties.
CO2: To draw and analysis topographic maps and contour maps of different terrain features for global importance to develop skills and employability.
CO3: To draw contour patterns of hills, valleys, rivers, plateau, saddle, topographic basin etc to develop skills and employability
CO4: To draw geological section from the given map at local level to develop skills and employability
CO5: To determine the strike & dip of rock formation to develop skills.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	2	1	2	2	2	3
CO2	3	3	2	3	2	2	2	1	2	2	2	2
CO3	3	3	2	2	2	3	2	1	2	1	1	2
CO4	3	3	3	2	3	1	2	1	1	2	2	1
CO5	3	2	2	3	2	2	1	1	2	2	2	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	2	1

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Suggested Readings:

- "Text Book of Engineering Geology" , K V G K Gokhale ; B S Publication
- "Engineering and General Geology", PrabinSingh ;Katson Publishing House.

Website sources:

- https://nptel.ac.in/courses/105/105/105105106/
- https://bis.gov.in/other/quake.htm
- https://www.britannica.com/science/rock-geology#ref80177

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TECE352: BUILDING MATERIAL LAB

L T P 0 0 2

Objective:
To impart knowledge of tests on cement, course aggregates, fine aggregates, concrete, bricks used as building materials including measurement, calculation and sampling.

List of Experiments

I. Cement (Two turns only) **(16 Sessions)**
1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement for skill development
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.

II. Coarse Aggregate (Two turns only)
1. Crushing value of aggregate for skill developmentfor employability
2. Impact value of aggregate for skill developmentfor employability
3. Water absorption of aggregate
4. Sieve Analysis of Aggregate
5. Specific gravity & bulk density
6. Grading of aggregates.

III. Fine Aggregate: (one turns only)
1. Sieve analysis of sand for skill development and for employability
2. Silt content of sand
3. Bulking of sand

IV. Destructive and non destructive testing on concrete.

V. Bricks:
1. Water absorption.
2. Dimension Tolerances
3. Compressive strength for skill development and for better skilling of entrepreneurship.
4. Efflorescence.
5. Test on burnt clay building bricks

VI. To determine the Tensile strength of Steel for skill development..

VII. Hydrometer Analysis &Swell Index Test,

VIII. To determine the Atterberg limit LL PL Flow Index for skill development.

Course Outcomes:

On the completion of the course one should be able to:
CO1: Reproduce the basic knowledge of mathematics and engineering in evaluating the properties of building materials like cement, aggregates, bricks, etc.**at** local level it will develop the skills of students and Provide employability.
CO2: Use the techniques and testing methods of modern engineering necessary for building materials for facing global challengesthat will help to make student employable.
CO3: Identify, formulate and solve engineering problems related to civil engineering materials, to inculcate skill and provide employability
CO4: Apply the principle of material testing for civil Engineering Applications. It will develop the skills of students
CO5: Write a technical laboratory report at local level thatwill develop the skills of students

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	3	1	2	1	1	3
CO2	3	3	2	3	2	2	2	2	2	2	2	3
CO3	3	3	2	2	2	3	3	1	1	1	2	3
CO4	3	3	3	2	3	1	2	2	1	2	2	3
CO5	3	2	2	3	2	2	3	1	2	2	3	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	2
CO3	2	3	2
CO4	3	1	3
CO5	3	2	2

Suggested Readings:

- "Building Materials", S K Duggal; New Age International
- "Building Materials", P.C. Varghese; PHI
- "Civil Engineering Materials and Their Testing", Syed Danish Hasan; Alpha Science International, 2006

.

Website Sources:

- http://www.iricen.gov.in/iricen/books_jquery/material_testing.pdf
- https://nptel.ac.in/
- https://theconstructor.org/

Note: Latest editions of all the suggested readings must be used.

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TECE353: SURVEYING – I LAB

Objective: **L T P 0 0 2**

The objective of this lab is to impart the practical knowledge of distance and direction measurements in the field, perform various methods of leveling and familiarize students with various advance surveying tools such as theodolite, total stations etc.

List of Experiments (Any 8)

(16 Sessions)

1. To find out the distance between two station by Chain survey
2. To find out the angle with the help of Compass
3. Study of different types of topographical maps and to prepare conventional symbols chart for skill development and for better skilling of entrepreneurship.
4. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method for skill development and for employability.
5. To find out reduced levels of given points using dumpy/Auto level for skill development
6. To perform fly leveling with Auto /tilting level.
7. To study parts of a vernier / Electronic theodolite and practice for taking angle measurements for skill development and for employability.
8. To measure vertical angle of given points by Electronic theodolite.
9. To measure horizontal angle between two objects by repetition method with three repetitions.
10. To measure horizontal angle by method of reiteration for employability and for better skilling of entrepreneurship.
11. To determine the elevation of chimney top by trigonometrical leveling by taking observations in single vertical plane.
12. To set out a simple circular curve by Rankine's method for skill development.
13. To plot contour map of given area.
14. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
15. To check leveling of terrain using auto level for skill development.
16. To Measure heights and distances by Tangential Tacheometry for skill development
17. To Measure heights and distances by stadia Tacheometry for skill development

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CO1: Understand the calculation of fly leveling with Auto / tilting level for facing global challenges to develop the skills of students.

CO2: Calculate area, distance, elevation, drawing plans and contour maps using different measuring equipment at field level, it will develop the skills of students

CO3: Measure horizontal and vertical height by direct and indirect measurement at local level to inculcate skill and provide employability

CO4: Apply the principle of surveying for civil Engineering Applications. it will develop the skills of students.

CO5: Write a technical laboratory report, at local level thatwill help to make student employable.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	3	3	3	1	2	1	1	3
CO2	3	3	2	2	2	3	2	2	2	2	2	3
CO3	3	3	3	1	3	3	3	1	1	1	2	3
CO4	3	2	1	2	2	2	2	2	1	2	2	3
CO5	3	3	2	2	2	3	3	1	2	2	3	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	1	3
CO3	2	3	2
CO4	3	1	3
CO5	2	2	2

Suggested Readings:

- "Surveying", Vol.2. S K Duggal, Tata McGraw Hill publications
- "Surveying, Vol. II and III, Dr B C Punmia, Laxmi Publications
- "Advanced Surveying" SatheeshGopi, Pearson Education.

Website sources:

- https://nptel.ac.in/courses/105/107/105107122/
- http://ecoursesonline.iasri.res.in/course/view.php?id=523

Note: Latest editions of all the suggested readings must be used.

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TECE354: FLUID MECHANICS LAB

L T P 0 0 2

Objective:

The objective of this lab course is to familiarize the students with the application of Bernoulli's theorem for calculating velocity, flow and discharge through different types of notches and weirs, calculation of the discharge through orifice meter and venture-meter. To study the significance of Reynolds number and friction factor in pipe flow.

List of Experiments:

(16 Sessions)

1. Verification of Bernoulli's theorem for skill development and for better skilling of employability
2. To calibrate a venturimeter and to determine its coefficient of discharge for skill development.
3. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number
4. To determine the hydraulic coefficient of discharge of a mouth piece for skill development.
5. To determine the coefficient of friction of pipes of different diameters.
6. To determine the form losses in a pipe line
7. To verify the momentum equation experimentally for better skilling of entrepreneurship and for skill development.
8. To study the flow over V- notch (weir) and to find the coefficient of discharge
9. To measure the surface tension of a liquid.
10. To study the flow behavior in a pipe bend and to calibrate the pipes bend for discharge Measurement for skill development and for employability
11. Boundary layer flow over a flat plate
12. Demonstration of Hele Shaw Apparatus
13. Demonstration of Reynolds Experiment for skill development and for employability
14. To measure the meta centric height for skill development and for employability
15. To measure the Impact of Jet

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the application of Bernoulli's theoremat national level to various flow measuring devices, it will develop the skills of students.
CO2: Understand the significance of Reynolds number, it will develop the skills of students
CO3: Learn the concept of surface tension of various liquids. It will help to make student employable.
CO4: To Understand the application of momentum equation in turbines.and understanding entrepreneurship skills
CO5: Understand the concept of friction factor in pipe flow for national importanceto inculcate skill and provide employability

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	3	3	1	2	1	1	3
CO2	3	3	2	2	3	2	2	2	1	2	2	3
CO3	3	3	3	2	2	3	3	1	1	2	1	3
CO4	3	2	2	1	2	2	3	1	2	1	2	3
CO5	3	3	1	2	3	3	2	1	2	2	2	2

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(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	2	2
CO3	2	3	2
CO4	3	1	3
CO5	3	3	1

Suggested Readings:

- Som, S K & Biswas, G: Introduction of fluid mechanics and fluid machines, TMH, 2000, 2nd edition.
- Das, M M: Fluid mechanics &turbomachines , Oxford University Press.
- Agarwal, S K: Fluid mechanics and machinery, TMH.
- Garde, R J: Fluid mechanics through problems, New Age International Pvt. Ltd, New Delhi, 2nd Edition.
- Rouse, H: Elementary mechanics of fluids, John Wiley & Sons, 1946.
- Gupta, V and Gupta, S K: Fluid Mechanics and its Applications, Wiley Eastern Ltd, 1984.

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of all the suggested readings must be used.

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TPSD401: PROFESSIONAL SKILL DEVELOPMENT-II

Objectives: The objectives of course is to develop critical thinking and abilities to make correct use of grammar, to enhance competencies in written and oral communication, to develop mutually beneficial relationships through communication and cooperation with others, collaborate to achieve group goals, practice living and leading with integrity and learn about issues of local and global significance in order to become active members of communities for entrepreneurship and skill development and employability.

Unit I: Communicative Skills **(05 Session)**
Communication: Concept, Classification, Purpose, Process, Importance, Flow & Level of Communication, Barriers & Gateways in Communication, 7 C's of Communication, Types of Communication & communication without words for skill development.

Unit II: Intrapersonal Relationship Skills **(07 Session)**
Personality: Characteristics of Healthy & Sick Personality, Self-Awareness, Self Esteem, Self Confidence, Assertiveness V/S Aggressiveness, Values: Types & Importance for skill development

Unit III: Interpersonal Relationship Skills **(08 Session)**
Group: Concepts, Types, Stages, Team: Concepts, Elements, Types, Stages, Presentation Skills& strategies, Interview: Concepts, Types, Process, Interview Preparation Checklist, Interview Handling Skills, Common Interview mistakes for skill development and employability.

Unit IV: Argumentative Skills **(10 Session)**
Debate, Role Play, Speeches, Elocution, Group Discussion for skill development and employability

Unit V: Campus to Company Skills **(08 Session)**
The corporate Fit: Dressing and Grooming, Basic Etiquette: Office (Do's and Don'ts for men and women), Telephone, Email, Dealing with People in Corporate for skill development and employability

Course Outcomes: Students completing this course will be able to:
CO1: Apply the comprehensive set of skills and knowledge for life success for skill development and employability.
CO2: Understand the communication process, its benefits and challenges for skill development and employability.
CO3: Learn to effectively lead others on a project or in an organization for skill development and employability.
CO4: Develop and articulate respect for the diversity of talents, ways of knowing and learning for skill development and employability.
CO5: Learn to effectively speak on any topic at any time for skill development and employability

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	2	1	3	3	2	3	2	1	2	2	1	3
CO2	2	1	2	1	3	1	1	1	3	1	3	2
CO3	2	1	1	1	3	1	2	3	1	2	1	1
CO4	2	3	2	1	2	3	1	1	2	1	2	3
CO5	2	1	1	3	1	3	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	1

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Suggested Readings:

1. M.K. Sehgal & V. Khetrapal's Business Communication published by Excel Books.
2. Rajendra Pal's Business Communication published by Sultan Chand & Sons Publication.
3. P. D. Chaturvedi's Busines Communication published by Pearson Education, Delhi.
4. Elizabeth B. Hurlock's Personality Development by Tata McGraw Hills, Delhi.

Website Sources:

- www.wikipedia.com
- www.fluentu.com
- www.mindstool.com
- www.digitalcommons.pace.edu

Note: Latest editions of all the suggested readings must be used

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TECE401: CONCRETE TECHNOLOGY

L T P 3 1 0

Objective:

The objectives of this course are to define and understand concepts related Concrete technology which involves types and property of concrete and different adhesive materials and its vital use for safe, economic development for the buildings. The aim of this course also includes designing of various grades of concrete for skill development and employability.

UNIT I

(6 Sessions)

Cements & Admixtures: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties will provide employability – Different grades of cement – Admixtures – Mineral and chemical admixtures.Concrete in aggressive environment, Alkali – aggregate reaction, sulphate attack, chloride attack, acid attack, effect of sea water, special coating for water proofing, sulphate chloride and acid attack, concretefor hot liquids.

UNIT II

(8 Sessions)

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate for better skilling of entrepreneurship– 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.Repair and Rehebitation :Distress in structure – causes and precautions, damage assessment of structural elements, repairing techniques and repairing materials.

UNIT III

(10 Sessions)

Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water to develop skills.
Special Concretes: Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fiber reinforced concrete – Different types of fibers – Factors affecting properties of F.R.C – Applications – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete – Applications help to inculcate skill deveopment – High performance concrete – Self consolidating concrete.Ultra high performance concrete, Self healing concrete, graphic concrete

UNIT IV

(8 Sessions)

Hardened Concrete: Water /Cement ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength will provide knowledge for better employability in industry- Curing.
Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods.
Jointing: Location of construction joints, treatment of construction joints, expansion joints in buildings – their importance and location Finishing concrete slabs – screeding, floating and trowelling

UNIT V

(8 Sessions)

Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods will help in skill development– Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage. Transportation of concrete: Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, Dumpers and trucks, tremie, mono rail system, pumps, tower crane and hoists.

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Course Outcomes:

After completion of this course students will able to:

CO1: Identify the functional role of ingredients of concrete material at national level and to build a model for skill development and Employability such as Cement and Admixtures and apply this knowledge to mix design philosophy.

CO2: Understand the theoretical concept of Concrete material which includes Aggregates, and to learn different types of aggregates, admixtures & know the mechanism of hydration of cement for global and national importanceand develop strategic alliance for skill development and employability.

CO3: Understand of constituent materials for properties of fresh and hardened concrete properties and to do analysis for skill development.

CO4:Know the different mechanisms causing volume change from fresh (plastic settlement, shrinkage) via young (temperature, autogenously shrinkage) to hardened concrete (drying shrinkage) and to develop basic curing technology models (maturity, property development) at local levelfor Entrepreneurship Development

CO5: Get basic understanding of hydration as well as important physical and chemical properties of the hydration products for building skill development and Employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	3	3	1	2	1	2	3
CO2	3	2	1	1	3	3	3	1	1	3	1	3
CO3	3	3	3	3	2	2	2	3	3	1	3	2
CO4	3	3	3	3	2	1	2	3	3	1	3	2
CO5	3	2	1	1	3	3	3	3	3	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	2	1
CO4	1	2	3
CO5	3	3	1

Suggested readings:

- "Properties of Concrete", A.M.Neville
- "Concrete Technology", M.S.Shetty., S.Chand& Co
- "Concrete Technology", M.L. Gambhir., Tata Mc. Graw Hill Publishers, New Delhi
- "Concrete Technology", Indian Concrete Institute. P Kumar Mehta, Monteiro;

Website Resources:

- https://nptel.ac.in/courses/105/102/105102012/
- https://civilengineeringnotes.com/cement-concrete-specification/

Note: Latest editions of all the suggested readings must be used.

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TECE402: SURVEYING PRACTICE – II **L T P 3 1 0**

Objective:
The objective of this course is to introduce the students about the some advance techniques of surveying which may be used for measurement such as distance, direction and elevation and to explore the knowledge of instruments used for measurement such as Auto level, theodolite, compass, total station, GPS and EDM. Also apply geometric principles to arrive at solutions to surveying problems and analyze spatial data using appropriate computational and analytical techniques.

UNIT I **(8 Sessions)**
Remote Sensing: Introduction, Electromagnetic energy, electromagnetic spectrum, interaction of Electromagnetic energy with matter, effect of atmosphere on electromagnetic radiation, energy interaction with earth surface features, remote sensing sensor systems, platforms, data acquisition and interpretation, resolution concept in remote sensing, Application of remote sensing in civil engineering help to inculcate skill and provide employability.

UNIT II **(8 Sessions)**
Photogrammetry: Introduction, Comparison between a map and an aerial photograph, Aerial photography, Definitions and mathematical relationships, Type of aerial photographs, Stereo-scopic vision, Different types of stereoscopes, stereo model, Ground control, Aerial Triangulation, Advantages and limitation of air photo interpretation, Visual Interpretation, Computer techniques in image interpretationimprove knowledge for better employability in Industry.

UNIT III **(10 Sessions)**
Geographic Information System: Introduction, Subsystems of GIS, Hardware of GIS Data for GIS Representation of Features, Data Structure for GIs, Vector vs Raster Data Structures, Data format conversions, Capabilities/Functionalities of GIS, Map Overlay Analysis, Data Quality, Sources of Errors in GIS, Application of GIS, Selective GIS Softwarehelp for better skilling of entrepreneurship.Data base design- editing and topology creation in GIS, Linkage between spatial and non-spatial data, Data inputting in GIS. Rectification, Transformation Methods; Root Mean Square (RMS) ErrorApplication of GIS in rain water recharge to enhance the ground water

UNIT IV **(8 Sessions)**
Global Positioning Systems: GPS Overview, Satellite Constellation, Equipment Segment, Principle of Position Determination via Satellite Generated Ranging Signals, GPS Surveying Techniques, GPS Accuracy, Field procedure – Observation and processing -G.P.S applications in Civil Engineering measurementUses and Applications of GPSwill develop skills.

UNIT V **(6 Sessions)**
Electro-Magnetic Distance Measurement (EDM): Introduction, Electromagnetic waves, Modulation, Types of EDM Instruments, Geodimeter, Tellurometer, Wild 'Distomats'Total Station Introduction-Application – Component parts -Accessories used – Features – Total station characteristics -Electronic display and data readinghelp in building entrepreneurship skills.

Course outcomes:
After a successful completion of the course, the student will be able to:
CO1: Apply the knowledge of geometric principles of aerial and satellite remote sensing systemfor facing global and national challenges to solve the surveying problems and the skill development.
CO2: Use modern instruments to obtain geo-spatial data and analyze the same by developing the models for skill development and employability. Also to understand the concepts of Photogrammetry and compute the heights of objects.
CO3: Understand the basic concept of GIS and its applicationsat local, national and international level, to know different types of data representation in GIS and to Develop models for GIS spatial Analysis and employability.

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CO4: Capture geodetic data to process and perform analysis for survey problems with the use of electronic instruments such as GPS and developingskills for Entrepreneurship Development.
CO5: Perform some practical work model for skill development and employabilityby by using advanced instruments and get more accurate and precise result by using Total Station & advanced surveying instrumentsfor global and national importance.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	2	2	3	3	1	3	3
CO2	3	3	3	3	3	1	2	1	3	3	1	3
CO3	3	3	2	2	3	1	3	1	3	1	1	3
CO4	3	3	2	1	3	1	3	1	3	1	2	3
CO5	3	3	2	2	3	3	1	1	3	2	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	**3**	2	2
CO2	**3**	**3**	1
CO3	2	**3**	1
CO4	1	1	**3**
CO5	**3**	**3**	1

Suggested Readings:

- "Surveying", Vol.2. S K Duggal, Tata McGraw Hill publications
- "Surveying, Vol. I and II, Dr B C Punmia, Laxmi Publications
- "Advanced Surveying" SatheeshGopi, Pearson Education.

Website Sources:

- https://www.gisresources.com/total-station-and-its-applications-in-surveying/
- https://www.photomodeler.com/uav-photogrammetry-for-surveying/
- https://nptel.ac.in/courses/105/104/105104100/
- https://www.wwu.edu/huxley/spatial/tut/tutorials.htm

Note: Latest editions of all the suggested readings must be used.

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TECE403: STRUCTURAL ANALYSIS-I **L T P 3 1 0**

Objective:
To have better understanding about types of structures and their responses to various applied loading and to enable students to determine forces, stresses, deflection and behavior of various structural members when subjected to different types of loadingto inculate skill, provide better employability and entrepreneurship development.

UNIT I **(08 Sessions)**
Classification of structure, static and kinematic indeterminacy of structure (determent and in determent structure) Structural Systems: Conditions of equilibrium, degrees of freedom, simple systems, Compound systems, redundant systems, Linear and non-linear structural systemsfor skill development.Idealization of structure threats and responses.

UNIT II **(08 Sessions)**
Deflection of beams: Moment area theorems, derivation of moment area theorems, sign convention in the moment area method applied to beams, moment area method and conjugate beam theorems, conjugate beam method for skill and employability development.

UNIT III **(08 Sessions)**
Strain energy : Strain energy and complementary strain energy, Strain energy due to axial load, bending and shear, theorem of minimum potential energy, principle of virtual work, the first theorem of Castigilano, Betti's law, Clark Maxwell's theorem of reciprocal deflection; Kani's theorem deflections of beams and frames using Strain energy methodfor skill development..

UNIT IV **(08 Sessions)**
Rolling loads and influence lines: Influence line diagrams for simply supported, cantilever, overhanging beams, use of influence line diagrams, criteria for maximum shear force and bending moment values due to moving loads, series of loads and uniformly distributed loadsto understand skill and employability..

UNIT V **(08 Sessions)**
Redundant Structures : Consistent deformation method for propped cantilever, fixed beams and frames – fixed end moments for beams due to UDL, central load, uniformly varying load, Analysis of frames (maximum two degree of indeterminacy)for skill and employability development.Classification of pin jointed determinate trusses. Analysis of plane truss continues beam plane frame and grids by flexible method and stiffness method. Method of tension coefficient for analysis of plane trusses.

Course Outcomes:
On successful completion of the course, the students shall be able to understand the following
CO1: For skill development and employability,classify& discuss statically determinate & indeterminate structure at local level.
CO2: Apply& analyze the concept of influence lines for facing global challenegs for deciding the critical forces and sections for skill development and employability while designing.
CO3: Apply the concept of strain energy to analyze beams and frame for skill development.
CO4: Identify, analyze, & solve problems using moment area method and conjugate beam method for skill development.
CO5: To understand theconcept of redundant structures and their analysis at local, national and **international level for skill development and employability.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

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CO1	3	3	2	2	3	2	2	1	3	1	3	3
CO2	2	3	3	3	3	1	2	1	3	3	1	3
CO3	3	3	2	2	3	1	3	1	3	1	1	3
CO4	3	3	2	1	3	2	3	1	3	1	2	3
CO5	3	3	2	2	3	3	1	1	3	2	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	1
CO2	3	2	1
CO3	3	1	1
CO4	3	2	1
CO5	3	2	1

Suggested Readings:

- "Structural analysis-I" SS Bhavikatti,Vikas publishing house pvt ltd
- "Elementary structural analysis" Norris and Wilber.
- "Statically indeterminate structures" C.K.Wang
- "Basic structural Analysis" C.S. Reddy

Website Sources:

- https://civildigital.com/powerpoint-presentations/
- https://www.aboutcivil.org/structural-engineering.html
- https://en.wikipedia.org/
- http://www.nptelvideos.in/2012/11/advanced-structural-analysis.html
- https://www.asce.org/

Note: Latest editions of all the suggested readings must be used.

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TECE404: ESTIMATION, COSTING AND EVALUATION L T P 3 1 0

Objective:
To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items for skill development and entrepreneurship.

UNIT I **(10 Sessions)**
Importance of estimation, different types of estimates, specifications: general and detailed. Methods of estimation for skill development and entrepreneurship, Estimates of RC works, Estimates of Buildings.Method of measurement of building and civil engineering works. Various method of taking out quantities.

UNIT II **(10 Sessions)**
Analysis of rates, Prime cost, Work charge establishment, Quantity of materials per UNIT of work for major Civil Engineering items, Resource planning through analysis of rates, justify rate for given itesm for work using rate analysis techniques, market rates, P.W.D. Schedule of rates and cost indices for building material and labour. Introduction to valuationpurpose of valuation, principle of valuation, depression, sinking fund, salvage and scrap value, valuation of a building: cost method, rental-return method for skill development and employability. Different types of payments – first and final, running- advanced and final payment.

UNIT III **(06 Sessions)**
Project cycle, Organization, Planning, Scheduling, Monitoring, Updating and Management System in Construction. Bar Chart, Milestone charts, Work down structure and preparation of networks for skill development.

UNIT IV **(06 Sessions)**
Project monitoring; cost planning, resources allocation through network techniques. Time value of money, Present economy studies, Equivalence concept, financing of projects for employability and entrepreneurship, economic comparison, present worth method, equivalent annual cost method, discounted cash flow method.

UNIT V **(08 Sessions)**
Legal aspects of contracts, their relative advantages and disadvantages, Different types of contracts, their relative advantages and disadvantages, Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tender preparation process of tendering, Evaluation of tender for betterment of skilling of entrepreneurship.

Course Outcomes:
On the completion of the course one should be able to understand:
CO1: Analyze and assess the quantity of materials at local, national and international levelrequired for civil engineering works as per specification and develop the skills.
CO2: Evaluate & estimate the cost of expenditure and prepare a detailed rate analysis report, it will develop the entrepreneurship skill.
CO3: Construct detailed report on estimation and valuation process at local leveland make students employable.
CO4: Financial Planning and Management for the construction project, Economical analysis and entrepreneurship development.
CO5: Utilize contracts and tenders in construction practicesfor global importance and it will develop the skills of students.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	3	1	1	3	3	3	3	3
CO2	2	3	2	1	3	1	3	3	2	2	3	3
CO3	1	2	3	3	2	3	3	1	1	1	3	3
CO4	2	3	1	2	1	3	1	1	2	1	3	3
CO5	1	1	3	1	1	1	2	3	1	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	2	2	3
CO3	1	3	2
CO4	1	2	3
CO5	3	3	1

Suggested Readings:

- "Estimating and Costing in Civil Engineering", B.N. Dutta; UBS Publishers & Distributors Pvt. Ltd., 2003.
- "A Text Book of Estimating and Costing (Civil)", D DKohli and R.C. Kohli, S.Chand& Company Ltd., 2004
- "Civil Estimating, Costing &Evaluation",A. Aggarwal& A K Upadhyay,S K Kataria& Sons
- "Civil Estimating & Costing", S.P. Mahajan.

Website Sources:

- https://en.wikipedia.org/
- https://theconstructor.org/search/estimation+and+costing/posts/
- https://civildigital.com/powerpoint-presentations/
- https://nptel.ac.in/

Note: Latest editions of all the suggested readings must be used.

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TEHU401: DISASTER MANAGEMENT **L T P 3 1 0**

Objective: The objective of this course is to provide students an understanding to the concepts and aspects of disaster and its relationship with development to develop skills. To ensure awareness of Disaster Risk Reduction (DRR) approaches among students. To assist students develop ability to respond to their environment with potential response to disaster to provide better knowledge of employability.

UNIT I Introduction to Disasters **(12 Sessions)**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks; Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.; Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc.; Differential impacts- in terms of caste, class, gender, age, location, disability; Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disastersfor skill development.

UNIT II Approaches To Disaster Risk Reduction **(10 Sessions)**

Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness; CommUNIT y based DRR (Disaster Risk Reduction), Structural-nonstructural measures; Roles and responsibilities of commUNIT y: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholdersfor skill development.

UNIT III Inter-Relationship between Disasters and Development **(08 Sessions)**

Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.; Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources; Role of international cooperation's in Disaster Managementfor skill development and employability.

UNIT IV Disaster Risk Management in India **(08 Sessions)**

Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management; Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation; Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessmentfor skill development.

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UNIT V Disaster Management: Applications, Case Studies and Field Works **(07 Sessions)**

The project /fieldwork are meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below:
Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and commUNIT y based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations.
Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs.
Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid.
Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work to develop employability.

The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.

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- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Course Outcome:

CO1: Ability to understand major types of disaster in Indian context at local level, it will develop the skills in students.

CO2: Understanding of approaches to reduce disaster risks to develop skill.

CO3: Capable of understanding relationship between development and disaster, Sustainable development and make students employable.

CO4: Develop skills to understanding of when an event becomes disaster and the phases to handle the situationfor facing global challeneges.

CO5: Ability to analyze how to handle a situation of disaster at local, national and international levelby taking case studies of events in past, it will make students employable.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	3	2	1	3	3	2	3	3
CO2	2	2	1	1	3	2	3	3	2	2	3	3
CO3	1	1	2	2	2	3	3	1	2	2	3	3
CO4	2	2	1	2	2	3	1	1	2	1	3	3
CO5	1	1	2	1	1	2	2	2	2	2	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1
CO3	2	3	1
CO4	3	2	1
CO5	2	3	1

Suggested Readings:

- SatishModh, Introduction to Disaster Management, Macmillan Publisher India Ltd
- Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
- Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.

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- Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
- Singhal J.P. "Disaster Management", Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
- Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., . ISBN-10: 1259007367, ISBN-13: 978-1259007361]
- Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
- KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
- Carter, Nick. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
- Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.
- Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009.
- Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi Indian Journal of Social Work.
- Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.

Website sources:

- https://www.physio-pedia.com/Disaster_Management
- http://www.ifrc.org/en/what-we-do/disaster-management
- http://www.wcpt.org/disaster-management/what-is-disaster-management
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

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TEMA401: COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

Objective: - The main aims of this course are to provide suitable and effective methods by numerical analysis, for obtaining approximate representative numerical results of the problems. To have a proper understanding of Statistical applications in different areas to provide skill development and employability.

UNIT I **(12 Sessions)**

Introduction: Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation

Solution of Algebraic and Transcendental Equations: Bisection Method, Iteration method, Method of false position, Newton- Raphson method, Methods of finding complex roots, Muller's method, Rate of Convergence, Polynomial equations to provide skill development and employability.

UNIT II **(10 Sessions)**

Solution system of linear equations:Gauss-Seidal method, LU decomposition method.

Interpolation: Finite differences, Differences tables

Polynomial Interpolation: Newton's forward and backward formula.

Interpolation with unequal intervals: Lagrange's interpolation, Newton divided difference formula to provide skill development and employability.

UNIT III **(10 Sessions)**

Numerical Integration and Differentiation: Introduction to numerical differentiation, Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Boole's rule, Waddle's rule.

Solution of differential equations: Picard's method, Euler's method, Taylor's method, Runga- Kutta methods, Predictor-Corrector methods to provide skill development and employability.

UNIT IV **(10 Sessions)**

Statistical Techniques –I: Moments, Moment generating functions, Skewness, Kurtosis, Linear, non- Linear and multiple regression analysis, Probability theory, Correlation, Binomial, Poisson and Normal distributions to provide skill development and employability.

UNIT V **(10 Sessions)**

Statistical Techniques –II: Sampling theory (small and large), Test of significances: Chi-square test, t- test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, X, R, p, np, and c charts to provide skill development and employability.

Course Outcomes:

After successfully studying this course, students will be able to:

CO1: Apply Numerical analysis which has enormous application in the field of Science and Engineering to provide skill development and employability.

CO2: Understand numerical integration and differentiation, numerical solution of ordinary differential equations to provide skill development and employability.

CO3: Compare and analyze the methods statistical analysis and the omnipresent role of variability nationally to provide skill development and employability.

CO4: Predict and evaluate the efficient design of studies and construction of effective sampling plans locally to provide skill development and employability.

CO5: Exploratory data analysis and form a reference process to provide skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2

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CO3	3	3	3	2	2	1	1	1	2	1	1	2
CO4	3	3	3	3	3	1	1	1	2	1	1	2
CO5	3	3	3	3	3	1	1	1	2	1	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Suggested Readings:

1. V. Raja Raman: "Computer Oriented Numerical Methods", PHI.
2. P.P. Gupta & G. S. Malik: "Numerical Analysis", Krishna Prakashan media, Meerut.
3. B. S. Grewal: "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
4. PradipNiyogi: "Numerical Analysis and Algorithms", TMH.
5. S. C. Gupta & V.K. Kapoor: "Fundamentals of Mathematical Statistics", Sultan Chand& Sons, Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

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TEMA 451: CBNST Lab

List of Experiments: **(16 Sessions)**

1. Write a Program in 'C' for Newton's forward interpolation formula for skill development

2. Write a Program in 'C' for Newton's backward interpolation formula for skill developmentfor better skiing of entrepreneurship.

3. Write a Program in 'C' for Newton's divided difference formula.

4. Write a Program in 'C' for Lagrange's interpolation formula for skill development.

5. Write a program in 'C' for Trapezoidal rule to evaluate $\int_{x_0}^{x_n} f(x)dx$ by dividing the range into n equal parts.

6. Write a program in 'C' for Simpson's 1/3 Rule to evaluate $\int_{x_0}^{x_n} f(x)dx$ by dividing the range into n equal part.

7. Write a program in 'C' for Simpson's 3/8 Rule to evaluate $\int_{x_0}^{x_n} f(x)dx$ by dividing the range into n equal parts

8. Write a program in 'C' for the Euler's method for skill development.

9. Write a program in 'C' for the Runga-kutta method for skill development.

10. Write a program to find out a real root of equation f(x) = 0 by Bisection method.

11. Write a program to find out a real root of equation f(x) = 0 by Newton's Raphson method.

12. Write a computer program in 'C' to solve a system of equations Ax = B by Gauss

Seidal method.

Course Outcomes:

CO1: Apply Numerical analysis which has enormous application in the field of Science and Engineering of national importance for skill development and for employability.

CO2: Understand and implement using C language numerical integration and differentiation, numerical solution of ordinary differential equations for skill development

CO3: Compare and analyze the methods statistical analysis using C program for global importance and the omni present role of variability for better skilling of entrepreneurship.

CO4: Predict and evaluate the efficient design of studies and construction of effective sampling plans susing C program at local level

CO5: Exploratory data analysis and formal inference process for skill development and for employability.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	1	2	1	1	3	2	3	3
CO2	2	2	1	1	1	2	3	1	2	2	3	3
CO3	1	1	2	2	2	3	3	1	2	2	3	3
CO4	2	2	1	2	1	3	1	1	2	1	3	3
CO5	1	1	2	1	1	2	2	2	2	2	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1
CO3	2	2	1
CO4	3	2	1
CO5	2	3	1

Suggested Readings:

6. V. Raja Raman: "Computer Oriented Numerical Methods", PHI.
7. P.P. Gupta &G.S.Malik: "Numerical Analysis", Krishna Prakashan media, Meerut.
8. B. S. Grewal: "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
9. PradipNiyogi: "Numerical Analysis and Algorithms", TMH.
10. S. C. Gupta &V.K. Kapoor: "Fundamentals of Mathematical Statistics", Sultan Chand& Sons, Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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TECE451: CONCRETE TECHNOLOGY LAB

L T P 0 0 2

Objective: The objective of this lab is to perform various tests on concrete by preparing samples of structural concrete to test and analyze its behavior and strength characteristic. This lab also deals with to conduct all quality control tests on cement, aggregates and concrete (Fresh and hardened). Students learn the standard procedure to test the quality of building materials in line with the corresponding IS codes.

List of Experiments: **(16 Sessions)**

1. Normal Consistency of fineness of cement for skill development and for better skill of employability.
2. Initial setting time and final setting time of cement.
3. Specific gravity and soundness of cement.
4. Compressive strength of cement for skill development and for better skill of entrepreneurship.
5. Workability test on concrete by compaction factor, slump and Vee-bee.
6. Young's modulus and compressive strength of concrete for skill development.
7. Bulking of sand.
8. Non-Destructive tests on concrete (for demonstration) for skill development
9. Mix design for skill development and for better skilling of entrepreneurship and employability.
10. To determine the tensile strength of the cement for skill development.
11. Demonstration of Heat of Hydration Test.
12. Chemical Composition Test for skill development.
13. Demonstration of Tensile Strength Test for skill development.

Course Outcomes:

After completing this lab, students will able to

CO1: Get the practical knowledge of various types of testing on concrete at local level forskill development
CO2: Perform various tastings on cement and concrete to check its strength for skill development and employability.
CO3: Able to apply theoretical consideration in field and other engineering projects for global importance for employability and skill development
CO4: Operate various advanced instruments which will help in developing their skill and entrepreneurship development
CO5: Write a technical laboratory report at local, national and international level that will develop the skills of students

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	3	1	2	3	3	1	3	3
CO2	3	1	2	1	3	3	2	1	3	3	1	3
CO3	3	1	3	1	3	1	3	1	3	1	1	3
CO4	3	1	3	1	3	1	3	1	3	1	2	3
CO5	3	3	1	1	3	2	1	1	3	2	3	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	3	3	1
CO3	3	3	2
CO4	3	1	3
CO5	3	2	1

Suggested readings:

- "Properties of Concrete", A.M.Neville
- "Concrete Technology", M.S.Shetty., S.Chand& Co
- "Concrete Technology", M.L. Gambhir., Tata Mc. Graw Hill Publishers, New Delhi
- "Concrete Technology", Indian Concrete Institute. P Kumar Mehta, Monteiro;

Website Resources:

- https://nptel.ac.in/courses/105/102/105102012/
- https://civilengineeringnotes.com/cement-concrete-specification

Note: Latest editions of all the suggested readings must be used.

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TECE452: SURVEYING – II Lab **L T P 0 0 2**

Objective: The objective of this lab is make familiarize students with some advanced surveying instruments and introduce students out their applications, this lab also deals with direct and indirect measurements of distance, direction and elevations.

List of Experiments: **(16 Sessions)**

1. Study of survey of India Topo sheet for skill development
2. Study & Interpretation of Satellite Imagery for skill development and for entrepreneurship skill development
3. Interpretation of aerial photograph using pocket stereo scope
4. To determine the reduce level by auto level for skill development
5. To carry out temporary adjustment of theodolite for skill developmentand for employability
6. To measure the horizontal angle using theodolite
7. To determine the height of wall using theodolite
8. To study & working of tilting level for skill development
9. To carry out the general study of GPS for skill development
10. To find the location and tracking of the position or object using the GPS for skill developmentand for employability
11. Demonstration & Study of Total Station for skill developmentand for employability
12. To determine the height and distance using principle of techeometric surveying.
13. Study of planimeter for skill development.
14. L-section and cross section of road (one full size drawing sheet each for L-section and cross section)
15. To draw layout for given planning building for skill development for employability.

Course Outcomes: After completion of this course, students will be able:
CO1: Able to apply theoretical consideration in field and other engineering projectsat local, national and international level for employability and skill development.
CO2: Interpret the aerial and terrestrial photographs and make some decision by analysis such photographs for skill development
CO3: Make measurements by instruments such as theodolite, auto level and tilting levelfor facing global challneges for skill development and employability.
CO4: Able to determine the location of any point horizontally and vertically using Tacheometer for building their entrepreneurship skills.
CO5: Operate various advanced surveying instruments such as total station and GPS for national and international importancewhich will help in developing their skill and entrepreneurship development

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	2	2	3	3	1	3	3
CO2	3	3	3	3	3	1	2	1	3	3	1	3
CO3	3	3	2	2	3	1	3	1	3	1	1	3
CO4	3	3	2	1	3	1	3	1	3	1	2	3
CO5	3	3	2	2	3	3	1	1	3	2	3	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	1	2
CO3	3	3	1
CO4	2	1	3
CO5	3	2	3

Suggested Readings:

- "Surveying", Vol.2. S K Duggal, Tata McGraw Hill publications
- "Surveying, Vol. II and III, Dr B C Punmia, Laxmi Publications
- "Advanced Surveying" SatheeshGopi et al., Pearson Education.

Website Sources:

- https://www.gisresources.com/total-station-and-its-applications-in-surveying/
- https://www.photomodeler.com/uav-photogrammetry-for-surveying/
- https://nptel.ac.in/courses/105/104/105104100/

Note: Latest editions of all the suggested readings must be used.

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TECE453: BUILDING PLANNING & DRAWING LAB

L T P 0 0 2

Objective:

- To understand basic principles of planning and drawing of building including its components.
- To gain knowledge of layout of different civil engineering projects.

List of Experiments: **(16 Sessions)**

1. Symbols used in Civil Engineering drawing for skill development for better skilling of entrepreneurship,
2. Drawing of Masonry Bonds for skill development.
3. Drawing of Doors for skill development
4. Drawing of Windows for skill development
5. Drawing of Staircases for skill development
6. Plumbing fitting drawing for skill development.
7. Electrical fitting drawing for skill development.
8. Preparation of Layout planning of different Civil Engineering Projects for skill developmentand for employability.

Course Outcomes:

On the completion of the Lab one should be able to:

CO1: Draw symbols used in civil engineering drawing at local level for skill development.
CO2: Draw masonry bonds, doors, windows and staircases for skill development and for better skilling of entrepreneurship.
CO3: Draw plumbing and electrical fittings at local and national levels for skill development
CO4: Draw the plan, section and elevation of buildings (residential and public) for skill development.
CO5: Prepare layout of different civil engineering projects for skill development and for employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	2	2	3	3	1	3	3
CO2	3	3	3	3	3	1	2	1	3	3	1	3
CO3	1	1	2	2	3	1	3	1	3	1	1	3
CO4	3	3	2	1	3	1	3	1	3	1	2	3
CO5	3	3	2	2	3	3	1	1	3	2	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	1	3
CO3	3	2	1
CO4	2	1	1
CO5	3	3	1

Suggested Readings:

- A course in Civil Engg. Drawing by V. B. Sikka, S. K. Katarian and sons, Fifth Edn.
- Civil Engineering Drawing by Malik and Meo, New Asian Publishers, Fifth Edn.
- IS: 962-1989 (Code of practice for architectural and building drawing)

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Website Sources:

- https://www.youtube.com/watch?v=XSczZnEPISY
- https://www.youtube.com/watch?v=rIhfw-ngyZI
- https://www.construction53.com/2011/09/blueprint-the-meaning-of-symbols/
- https://www.designingbuildings.co.uk/wiki/Symbols_on_architectural_drawings

Note: Latest editions of all the suggested readings must be used.

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IFTM University, Moradabad
Department of Civil Engineering

Bachelor of Technology (B.Tech) Programme
(Effective From Session 2021-22)

ECE501: ENVIRONMENTAL ENGINEERING-I **L T P 3 1 0**

Objective:

The objective of this course is to apply knowledge of mathematics, physics, chemistry, and microbiology to solve and analyze engineering problems related to water and wastewater collection, transport, quality and treatment for skill development and for better skilling of entrepreneurship. It also includes introduce diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology, provide an awareness of the numerous health hazards, both biological and chemical, that threaten the well-being of humankind throughout the world. To have a working knowledge of the public health engineering principles for employability those have been developed for protection against biological and chemical threats for skill development and entrepreneurship.

UNIT I **(6 Sessions)**

Water demands: Types of demands domestic, commercial, industrial, fire, public use and losses, per capita demand, variations in demand, factors affecting demand. Design period. Forecasting population-different methods for skill development and their suitability. Water supply key issues and concerns. Urban water services and water supply system.Capital and operational cost of water supply system.

UNIT II **(8 Sessions)**

Sources of water: surface sources rivers, streams, lakes and impounded reservoirs, determination of quantity of water in the above sourcesfor skill development. Underground sources springs, wells and infiltration galleries, measurement of yield of open wells, tube wells, artesian wells and infiltration galleries. Water pollution, Classification of pollutants, conveyance of water.

UNIT III **(10 Sessions)**

Comparison of surface source and subsurface sources in respect of quality and quantity. Quality of water: Pollution and contamination of water. Sources, classification and prevention of pollution. Waterborne diseases, Impurities in water. Collection of water samples. Water analysis Physical chemical and biological testsfor skill development and employability, standards for potable water.Water balance for water loss assessment and performance indicators

UNIT IV **(10 Sessions)**

Water Treatment: Aeration, Plain sedimentation, sedimentation with coagulation- coagulant feeding devices, optimum dosage of coagulant. Filters and their different types, disinfection, water softening. The functional design of treatment Unit. Removal of iron, manganese, colour, odour and tastetestsfor skill development and employability, Fluoridation, desalination. Advance carbon dioxide management, Advance oxidation technologies.Advance and alternate treatment systems.

UNIT V

Water Distribution: **(6 Sessions)**

(i) **Pipes**: Different types of pipes cast iron, steel, plastic, (PVC, LDPE, HDPE), asbestos cement, concrete, plastic, GI and lead pipes, Details of their sizes, joints and uses.Requirement of good distribution system, pressure in the distribution system. Intakes and its types and design of intakes
(ii) **Appurtenances:** Sluice (Gate and spindle), air, reflux, scour and safety valves, fire hydrants, their working and uses for skill development. Conduits and its types, coincident draft
Case study and practice problem on water pricing.

Course outcomes:

After completion of this students will be able to:

CO1: Understand different types of water demand and different methods for population forecast methods at local, national and international levelwhich will be helpful in development of skills of students.

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CO3: Understand different characteristics of water, quality of water from different sources and issues related to polluted waterfor global importanceand develop the skills of students.
CO4: Demonstrate different water treatment methods at national level and depends on the quality of raw water and desired used of treated water, it will develop the entrepreneurship skillof students.
CO5: Study and Establish the suitable distribution system for a locality and know the appurtenances used and develop the skills of students.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	3	3	3	3	3	3	3
CO2	2	2	3	1	3	2	3	3	2	1	2	3
CO3	3	3	2	3	3	1	3	1	1	2	1	3
CO4	2	1	3	3	3	3	3	3	2	3	3	3
CO5	3	2	3	2	3	2	3	2	3	3	2	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	1
CO3	3	1	2
CO4	1	3	3
CO5	3	2	1

Suggested readings:

- "Environmental Engineering Vol. I & II", S.K. Garg, Khanna Publishers, New Delhi, 1994.
- "Environmental Engineering Vol. I & II", P.N. Modi; Standard Book House, New Delhi, 2001.
- "Environmental Engineering Vol. I & II", B.C. Punmia; Lakshmi Publications (P) Ltd., New Delhi, 2002

Website resources:

- https://www.indiawaterportal.org/articles/indian-standard-drinking-water-bis-specifications-10500-2012-second-revision
- https://www.ngwa.org/what-is-groundwater/About-groundwater/information-on-earths-water.
- https://nptel.ac.in/courses/105/106/105106119/

Note: Latest editions of all the suggested readings must be used.

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ECE502: TRANSPORTATION ENGINEERING-I **L T P 3 1 0**

Objective:

- To introduce different transportation systems and their importance and role in development.
- Analyze how signal systems, visual aids and Markings etc. help in safe working of transportation systems.
- To take up the concepts of highway alignment and design various components of highway.
- To design elements like horizontal curves, vertical curves, super elevation for skill development and employability.
- To impart knowledge of tests on aggregates, gravel, sand, bitumen, cement and concrete.

UNIT I **(06 Sessions)**

Highway Development & Planning: Brief history and development; characteristics of road transport; road classification; road patterns; Nagpur plan; Jaykar Committee recommendations; Bombay plan; Road Plan – 2020; road layoutsdevelop understanding for entrepreneurship skills.Highway Alignment Optimization Incorporation Bridges and Tunnels.

UNIT II **(10 Sessions)**

Traffic Engineering: Traffic characteristics, Accidents and their preventive measures, Traffic studies, Traffic control devices, Types and design of traffic signal systems – Approximate method, Trial cycle method, Webster's method. Traffic Islands, Divisional islands, Channelizing islands, Rotaries, Design of intersections, Design of parking facility will develop skills, Highway lighting. Design consideration for road side safety. Evaluation of highway materials and design performance.

UNIT III **(10 Sessions)**

Highway Alignment, Survey and General Considerations: Fundamental principles of alignment. Factors controlling the selection of alignment provide knowledge for better employability in industry.Highway survey, Width of formation, Right of way, Width of pavement, Camber, Gradient, Super elevation, Extra widening on curves, Design speed, Sight distances, Set back distances, Road Cross-section; Provision of Shoulders, Cycle tracks, Footpaths and Drains; Arboriculture. Pavement design by using geotextile

UNIT IV **(08 Sessions)**

Geometric Design of Highways: Simple curves – scope, Degree of curve, characteristics, offset from chord produced, Rankine's method, obstacles in curve setting Compound and Reverse Curves : Different cases Transition Curve- Super elevation: Length of transition curve; Characteristics; equations; shift; tangent length and curved length of combined curve; setting out of combined curve
Vertical curve – scope, assumption of vertical curve, equations, setting out vertical curve Summit and Valley curveshelp to inculcate skill and employability.

UNIT V **(06 Sessions)**

Tests on Road Materials and Proportioning of Mixes: Tests on aggregates, gravel, sand, moorum, bitumen, cement, concrete; concrete mix design; CBR of soil; relevant IS and IRC Codes of Practicefor better skilling of entrepreneurship.Exploring BRTS for Accident Reduction: Case Study. Experimental Study of Gap Graded Cement Asphalt Concrete For Highway Pavement.

Course Outcomes:

On successful completion of the course, the students shall be able to understand the following
CO1: Basic concepts about highway engineering and its development for national and international importance.
CO2: Different types of traffic studies and traffic control devices for skill development.
CO3: Concepts and design of highway alignment and components of highwayfor facing global challenges foremployability
CO4: Principles of highway geometrics design as per IRC standards for entrepreneurship development

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	3	1	2
CO3	2	3	1
CO4	2	1	3
CO5	3	2	3

Suggested Readings:

- "Highway Engineering";S.K. Khanna and C.E.G. Justo
- "Highway Engineering";N.K. Vaswani
- "A Course in Highway Engineering";S.P. Bindra
- "Transportation Engineering";L.R. Kadiyali

Website Sources:

- https://theconstructor.org/
- https://www.aboutcivil.org/highway-transportation-engineering-lectures-notes.html
- https://en.wikipedia.org/
- https://nptel.ac.in/

Note: Latest editions of all the suggested readings must be used.

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ECE503: GEOTECHNICAL ENGINEERING-I **L T P 3 1 0**

Objective: The objective of this Course is to provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures to identify factors controlling soil behavior and methods to determine soil propertiesfor skill development.

UNIT I **(6 Sessions)**

Introduction: Introduction of soil mechanics, field of soil mechanics, phase diagram physical and index properties of soil. Formation of soil, weathering of rocks and types of soils classification of soils, general classification based on particles size, textural classification and I.S. soil classificationdevelopunderstanding for entrepreneurship skills. Soil nailing

UNIT II **(12 Sessions)**

Permeability: Definition, Hydraulic gradient, Darcy's Law, Factors affecting permeability, Permeability of stratified soils, Laboratory and field determination of coefficient of permeability.
Compaction: Definition, Compaction fundamentals, Moisture density relationships, Standard Proctor test, Factors affecting compaction, Compaction equipment, properties and structure of compacted soils, Specificationsdevelop understanding for entrepreneurship skills

UNIT III **(10 Sessions)**

Shear strength- Mohr stress circle, theoretical relationship between principle stress circlesand help to inculcate skilling of entrepreneurship.theoretical relationship between principal stress, Mohr-coulomb failure theory, and effective stress principle. Determination of shear parameters by direct shear test, triaxial test, unconfined compression test, vane shear test. Numerical exercise based on various types of tests.Mohr-Coulomb failure criterion, direct; unconfined compression test; pore pressure, Skempton's pore pressure coefficients

UNIT IV **(6 Sessions)**

Effective stress principal: Effective stress principal, nature of effective stress, effect of water table fluctuations of effective stress, will develop skills increase in effective stress due to surcharge, seepage pressure, effective stress under steady seepage condition, quick sand conditions. Capillarity effect, confined flow and flow net, exit gradient and failure due to piping. Soil liquefactionStress Distribution in soil: Elastic constants of soils and their determination, Boussinesq equation for vertical stress, The Westergaard equation, Stress distribution under loaded areas, Concept of pressure bulb, contact pressure

UNIT V **(6 Sessions)**

Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory Laboratory consolidation text, calculation of void ratio and coefficient of volume change, Taylor's and Casagrand's method, determination of coefficient of consolidation.
Stability of slopes: Types of slope failure, Analysis of finite and infinite slopes in cohesion less and cohesive soil, Swedish And friction circle method, earthen slope test, and help to inculcate skilling of entrepreneurship.
Stabilityof slopes: finite and infinite slopes, types of slope failure, stability number and chart, bishop's method

Course Outcomes:
After completion of this course students will able to
CO1: Understand the theoretical and practical aspects of geotechnical engineering along with the design and management applications for Building at local, national and international level for skill development and Employability.
CO2: Understand basics principles of flow and soil permeability through porous media including Bernoulli's equation, Darcy's Law, and Hydraulic conductivity to build a model for skill development

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CO4: Understanding the concept of effective stress principleat local level, effect of water table occurring in the soil and to enhance the skill development and Employability
CO5: Study about the analysis of finite and infinite slopes in different soil conditions and to implement them for facing global challenegesfor building skill development and Entrepreneurship Development

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	1	1
CO3	3	1	3
CO4	3	3	2
CO5	3	2	3

Suggested readings:

- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.
- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.3
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://www.geoengineer.org/education/soil-mechanics
- https://www.classcentral.com/course/swayam-soil-mechanics-geotechnical-engineering-i-10099

Note: Latest editions of all the suggested readings must be used.

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ECE504: STRUCTURE ANALYSIS-II **L T P 3 1 0**

Objective:

The objectives of the course are:

- The objective of this course is to impart concepts of static and kinematic indeterminacyto develop skills.
- Introduce the fundamental concepts of analysis of determinate beams, frames, trusses, cables and three hinge arches for skill development andbetter employability
- Finding slope and deflection of determinate structuresfor skill and entrepreneurship development

UNIT I **(10 Sessions)**

Calculation of Determinate and indeterminate structures (beam, frame and truss), Arches: Introduction. Three hinged arch-analysis and influence line. Two hinged arch--application of UNIT load method, Castigliano's method- analysis the frame, beam, Influence line for archesto understand skill and employability.

UNIT II **(6 Sessions)**

Portal frame: Solution by- UNIT load method, Castigliano's method– analysis the beam truss and frame, structural damage detection in plates using of wavelet theories will develop skills.

UNIT III **(8 Sessions)**

Moment distribution method - solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway forskill and entrepreneurship development.

UNIT IV **(6 Sessions)**

Slope Deflection Method – Method and application in continuous beams and Framesforskill and entrepreneurship development.

UNIT V **(10 Sessions)**

Kani's method: application to indeterminate beams. Cables & Suspension bridges with three hinged stiffening girders. Matrix method of structural analysis, Bamboo as Building Material, Base Isolation Systemfor provides knowledge for better employability in industry.

Course Outcomes:

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

CO1: Identify the concept of analysis of arch type structures and draw the influence lines for arches and to build a model at local level for skill development and employability.

CO2: Assess the results obtained for castigliano's method by solving above problems and analysis it for facing global challeneges for skill development

CO3: Know get the concept of moment of beam, settlement and rotation of support for enhancing skill and entrepreneurship development.

CO4: Analyze and determine slope and deflection of determinate trussesfor national importance, beams and frames for strategic alliance of skill and entrepreneurship development.

CO5: Calculate the internal forces in cable and analysis the indeterminate structure for matrix for better employability.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	2	2	1	3	1	1	2
CO2	3	3	3	2	2	2	1	2	2	2	3	3
CO3	3	3	3	3	2	1	1	3	2	1	1	3
CO4	3	3	3	3	3	2	1	2	1	2	2	3
CO5	3	3	3	2	2	1	2	2	1	2	2	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	3
CO4	3	2	3
CO5	2	3	1

Suggested readings:

- 'Theory of Structures' by S.Ramamrutham, DhanpatRai Publishing, New Delhi.
- "Basic structural analysis", C.S. Reddy, McGraw Hill Education.
- "Structural Analysis-A Matrix Approach" by G.S. Pandit, Tata McGraw Hill, New Delhi
- "Theory of structures": Vazirani and Rathwani Vol. II and Vol. III.
- "Intermediate structural Analysis": C. K. Wang. Tata McGraw hill Edition.
- "Structural Analysis" , R. C. Hibbeler, 8th edition, Pearson Prentice Hall, 2012.
- "Structural Analysis Vol II" by BhaviKatti, Vikash Publishing House Pvt. Ltd.
- 'Theory of Structures' by B.C. Punmia, Laxmi Publication House.

Website Resources:

- https://ocw.mit.edu/courses/find-by-topic/#cat=engineering&subcat=civilengineering&spec=structuralengineering
- https://nptel.ac.in/courses/105/105/105105166/
- https://nptel.ac.in/courses/105/105/105105041/

Note: Latest editions of all the suggested readings must be used.

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ECE505: REINFORCED CEMENT CONCRETE- I

L T P 3 1 0

Objective:

- To make Civil Engineering students able to design various RCC members of building using Limit State
- Design methodfor skill development and employability.
- This course topics covered will include: design of beams and slabs for flexure and shear, behaviour of RC beams; detailing of flexure and shear reinforcement, introduction of development length; design of short column, behaviour and design of slender column.

UNIT I **(06 Sessions)**

Introduction to working stress method and Limit state method of design provide better skilling of entrepreneurship, Assumptions in Limit State Design Method. fiber reinforce concrete, high performance concrete.Classification of water tank and method of analysis, permissible stresses, codal provisions, Design of circular and rectangular under-ground water tanks using latest IS code method, Design of elevated water tank with Intze type of container, frame and shaft type of staging and foundation considering effect of earthquake and wind forces.

UNIT II **(06 Sessions)**

Design of singly & doubly reinforced rectangular beams L- beams and T- beams by using Limit state method will help in developing skills.Design and detailing of longitudinally loaded stairs. Introduction to Earthquake Resistant Design and Provisions for Ductile Detailing

UNIT III **(10 Sessions)**

Behavior of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural blood, Failure of beam under shear, Concept of Equivalent Shear and Moments provide knowledge for better employability in industry.Damage to RCC structures in earthquake. Philosophy of design of structures in earthquake prone region.

UNIT IV **(08 Sessions)**

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations help in skill development.

UNIT V **(10 Sessions)**

Design of Columns by Limit State Design Method help to inculcate skill and employability, - Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts. Design for strength and ductility. Provision of ductility in building codes. Ductility requirement for beam, column and joints

Course Outcomes:

On successful completion of the course, the students shall be able:

CO1: To understand conceptually the difference between working stress method and limit state design method at local, national and international level for skill development.

CO2: To understand design of rectangular beam, L beams and T beams for singly and doubly reinforced for skill development, employability and entrepreneurship developmentby limit state design method as per I.S.456-2000.

CO3: To understand the behaviour of RC beam in shear, shear strength of beam with and without reinforcement for skill developmentand design of beam in shear.

CO4: To designone way slab & two way continuous slabs for global importance for skill and entrepreneurship development.

CO5: To understand the design of columns for skill development and employability by limit state design method.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	3	2	1	2	1	1	2
CO2	3	3	3	3	2	2	3	3	2	1	3	3
CO3	3	3	3	3	3	2	3	1	1	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	3	1
CO5	3	3	3	3	3	1	3	1	3	1	2	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	3
CO3	3	1	2
CO4	3	1	3
CO5	3	3	2

Suggested Readings:

- IS: 456 – 2000.
- "Reinforced Concrete – Limit State Design", A. K. Jain, Nem Chand & Bros., Roorkee. "Reinforced Concrete Design",
- P. Dayaratnam.
- "Plain and Reinforced Concrete Vol. I & II", O. P. Jain & Jai Krishna, Nem Chand & Bros.
- "Reinforced Concrete Structures", R. Park and Pauley.
- "Reinforced Concrete Design", S. UnnikrishnaPillai& D. Menon, Tata Mc-Graw Hill Book Publishing Company Limited, New Delhi.

Website Sources:

- http://www.nptelvideos.in/2012/11/design-of-reinforced-concrete-structures.html
- https://nptel.ac.in/
- https://theconstructor.org/search/RCC/posts/
- https://en.wikipedia.org/
- https://theconstructor.org/structural-engg/

Note: Latest editions of all the suggested readings must be used.

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ECE506 OPEN CHANNEL FLOW **L T P 3 1 0**

Objective:
The objectives of the course are to provide a physical understanding of phenomena and concepts in advanced water flows and to introduce calculation methods to analyze a number of important hydraulic problems. The course deals mainly with free-surface flows with emphasis on open-channel hydraulics and introduce the fundamental concepts relevant to flow in open channels, GVF, RVF, energy dissipation, soil moisture, irrigation requirement, canals and water resources management.

UNIT I **(6 Sessions)**
Basic fluid flow concepts: Classification of open channel flow, Velocity and pressure distribution. Energy and Momentum Equation applied to open channel flow, Energy and momentum coefficients, Channel Geometry and geometrical elements will develop skills.Types and regime of flow, energy in non prismatic channel

UNIT II **(10 Sessions)**
Uniform and critical flow: Energy depth relationships, Resistance formulae, Concepts of First and Second hydraulic exponent, Determination of critical and normal depth, hydraulically most efficient channel sections, Analysis of Flow in Channel transitions help to inculcate skills and provide employability.Scouring & Slitting. Design of erodible channel, non erodible channels

UNIT III **(8 Sessions)**
Gradually varied flow: Differential equation governing GVF, Classification and analysis of GVF profiles and control sections, Computation of GVF profiles by different methods for better skilling of entrepreneurship. Drawdown and backwater curve, spatially varied flow, analysis of spatially varied flow profiles.

UNIT IV **(10 Sessions)**
Rapid varied flow: Type, Analysis and characteristics of Hydraulic jump in rectangular channelshelp in building knowledge for better employability in Industry, Location of jump, Introduction to jump in non-rectangular channel and on sloping floor, Use of jump as Energy dissipater. Flow Measurement –Weir, spillways, notches critical depth flumes.

UNIT V **(6 Sessions)**
Unsteady Flow: types and examples of unstable flows. Surge, Classification of surges and analysis of Surges develop entrepreneurship skills.Flow through bridge piers, uniform flow approximation for flood discharge.

Course Outcomes:
Students completing this course will able to
CO1: Understand the common ways of classifying open channel flow (laminar or turbulent, steady state or unsteady state, uniform or non-uniform, and critical, subcritical or supercritical) at local, national and international level, Channel geometry and geometrical elements and to develop the models for skill development and employability.
CO2: Calculate open channel flow resistance, Manning equation, uniform and non-uniform flow, and develop strategic alliance for skill development.
CO3: Analysis of non-uniform flow and computation of flow profiles for facing global challengesfor Entrepreneurship Development.
CO4: Formulate advanced models based on the governing equations for free-surface flows and to study different system of flow measurements for developing employability.
CO5: Gain knowledge about the unsteady flowfor national importance, to study about the surge and its analysis for skill development and entrepreneurship development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	1	1	3	3	1	3
CO2	3	3	3	3	3	1	1	3	3	1	3	2
CO3	2	3	3	2	3	3	1	1	3	1	1	3
CO4	3	3	3	2	3	1	3	3	3	3	3	2
CO5	3	3	3	3	1	1	2	1	3	1	1	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	2	2
CO3	2	1	3
CO4	2	3	2
CO5	3	1	2

Suggested readings:

- " Open Channel Hydraulics", VenTe Chow, McGraw-Hill civil engineering series
- " Open Channel Flow" F.M.Henderson.
- " Flow in open channels" K . Subramanya. Tata McGraw-Hill Publications
- " Fundamentals of Open Channel Flow" Glenn E Moglen, CRC press

Website Resources:

- https://nptel.ac.in/courses/105/107/105107059/
- https://civilenggforall.com/gate-material-ies-master-open-channel-flow-study-material-for-gate-psu-ies-govt-exams-free-download-pdf-www-civilenggforall-com/

Note: Latest editions of all the suggested readings must be used.

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ECE551: ENVIRONMENTAL ENGINEERING. LAB **L T P 0 0 2**

Objective: The objective of this lab is to introduce students to experimental design, procedures and analysis through material related to environmental engineering. There is an emphasis on assessing water quality and quantifying water resources. Students learn to correctly use glassware, a pH/conductivity meter, and spectrophotometer for analyses of various water samples. Analytical results will provide information on pH, conductivity, calcium, magnesium, phosphate and hardness.

List of Experiments: **(16 Sessions)**

1. Determination of turbidity, colour, and conductivityfor skill development and for employability skill development.
2. Determination of Total Solids (TS, SS) of a given sample.
3. Determination of pH, alkalinity and acidityfor skill development and for Better skilling of entrepreneurship.
4. Determination of hardness and chlorides.
5. Determination of fluoride contentfor skill development and for employability skill development
6. Determination of residual chlorine and chlorine demand.
7. Determination of dissolved oxygenfor skill development and for employability skill development
8. Determinatio of Sludge Value Index (SVI) for skill development and for employability skill development.
9. Determination of most probable number of coli-forms.
10. Measurement of air pollutants with high volume samplerfor skill development and for employability skill development.
11. Measurement of sound level with sound level meter.
12. Determination of COD, BODfor skill development and for employability skill development.
13. Optimum dose coagulant by jar test.

Course outcomes:
After completion of this students will be able to:
CO1: Operate and use of various equipments used for analytical analysis of waterat local levelwhich will be helpful in development of skills of students.
CO2: Know different types of water sources and their applications and their limitations, and make the students employable.
CO3: Determine various physical parameters of water such as turbidity, alkalinity, conductivity etc. for facing global challeegesrelated to polluted waterand develop the skills of students.
CO4: Determine various Chemical parameters of water such as hardness, DO, COD, BOD, chlorides etc. it will develop the entrepreneurship skillof students.
CO5: Study and Establish the suitable distribution system for a locality for national importanceand know the appurtenances used and develop the skills of students.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	3	3	3	3	3	3	3
CO2	2	2	3	1	3	2	3	3	2	1	2	3
CO3	3	3	2	3	3	1	3	1	1	2	1	3
CO4	2	1	3	3	3	3	3	3	2	3	3	3
CO5	3	2	3	2	3	2	3	2	3	3	2	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	1
CO3	3	1	2
CO4	2	3	2
CO5	3	2	1

Suggested readings:

- "Environmental Engineering Vol. I & II", S.K. Garg, Khanna Publishers, New Delhi, 1994.
- "Environmental Engineering Vol. I & II", P.N. Modi; Standard Book House, New Delhi, 2001.
- "Environmental Engineering Vol. I & II", B.C. Punmia; Lakshmi Publications (P) Ltd., New Delhi, 2002

Website resources:

- https://www.indiawaterportal.org/articles/indian-standard-drinking-water-bis-specifications-10500-2012-second-revision
- https://www.ngwa.org/what-is-groundwater/About-groundwater/information-on-earths-water

Note: Latest editions of all the suggested readings must be used.

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ECE552: TRANSPORTATION ENGINEERING LAB- I L T P 0 0 2

Objective:

- To impart knowledge of tests on aggregates used as construction materials in highways including measurement, calculation and sampling.
- To gain experimental knowledge of traffic volume and speed studies.

List of Experiments: **(16 Sessions)**

1. Crushing Value Test of Aggregatefor skill development
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregatefor skill developmentand for better skilling of employability
4. Flakiness Index of Aggregate
5. Elongation Index of Aggregatefor skill development
6. Stripping Value of road aggregatefor skill development
7. Classified both directional Traffic Volume Studyfor skill developmentand for better skilling of employability
8. Traffic Speed Study (Using Radar Speedometer or Enoscope)for skill development

Course Outcomes: After completion of this course, students will be able:
CO1: Identify the engineering properties of aggregate for national importance for theirskill development
CO2: Perform crushing value, impact value, Los Angeles abrasion value and shape test on aggregates in evaluating the properties of aggregates to be used as construction material in highways for employability and skill development
CO3: Carry out the surveys involved in planning and highway alignment at local, national and international level for building their entrepreneurship skills.
CO4: Conduct traffic studies for skill development (volume and speed studies) and for estimating traffic flow characteristics.
CO5: Calculate the design speed, maximum speed & minimum speed limits of a location through spot speed for facing global challeneges for developing entrepreneurship skills.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	3	2
CO3	2	1	3
CO4	3	1	2
CO5	1	2	3

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Suggested Readings:

- "Highway Engineering";S.K. Khanna and C.E.G. Justo
- "Highway Engineering";N.K. Vaswani
- Laboratory Manual in Highway Engineering; Ajay K. Duggal and Vijay P. Puri

Website Sources:

- https://en.wikipedia.org/
- https://ts-nitk.vlabs.ac.in/transportation-engineering/
- https://civildigital.com/powerpoint-presentations/transportation-engineering-ppts/

Note: Latest editions of all the suggested readings must be used.

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ECE553: SOIL MECHANICS LAB-I **L T P 0 0 2**

Objective: The objective of this lab is to describe the nature of soil problems encountered in civil engineering and gives an overall preview of the behavior of soil, describes the nature of soil, especially the transmission of stresses between soil particles and studying primarily the dry soil behavior since many aspects of soil behavior can be understood by considering the interaction of soil without the presence of water.

List of Experiments: **(16 Sessions)**

1. Determination of water content of soil for skill development and for employability.
2. Determination of specific gravity of soil for skill development and for employability
3. Determination of field density of soil by core cutter method for skill development and for employability
4. Determination of field density by sand replacement method for skill development and for employability
5. Grain size analysis by sieving (Dry sieve analysis) for skill development and for employability
6. Determination of permeability by constant head methodfor skill development and for better skilling of entrepreneurship.

Course Outcomes: After completion of this lab, students will able to
CO1: Understand the theoretical and practical aspects of geotechnical engineering at local levelalong with the design and management applications, skill development and Employability.
CO2: Determine various parameters such as water content parameters etc,for national importance for Employability Development
CO3: Determine various parameters such as specific gravity,for Entrepreneurship Development
CO4: Operate and use of various equipments related to geotechnical fieldfor facing global challeneges skill development and Employability Development
CO5: Determine the various implement them for building skill development and Entrepreneurship Development

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	1	3	2
CO3	2	1	3
CO4	3	3	2
CO5	3	2	3

Suggested readings:
- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.

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- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://www.geoengineer.org/education/soil-mechanics
- https://www.classcentral.com/course/swayam-soil-mechanics-geotechnical-engineering-i-10099

Note: Latest editions of all the suggested readings must be used.

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ECE554: STRUCTURAL ANALYSIS LAB **L T P 0 0 2**

Objective: The objective of this lab is to familiarize students with various theorems and experimental work related to analysis of any structure, and demonstrates and verifies theorem related to beams.

List of Experiments: **(16 Sessions)**

1. To verify Clark Maxwell's theorem by means of a mild steel beam for skill development.
2. Study of a three hinged arch experimentally for a given set of loading and to compare the results with those obtained analytically.
3. To obtain experimentally the influence line diagram for horizontal thrust in a three hinged arch and to comparethe same with the theoretical value.
4. To determine the flexural rigidity of a given beam for skill development..
5. To study the behavior of different type of struts for skill development..
6. To verify moment area theorem for slopes and deflection of a beams.
7. To find the deflection of a pin-connected truss and to verify the results by calculation and graphically.
8. To determine the ratio of fixed end moment at one end to the moment applied at the other end for skill development for employability.
9. To determine the moment required to produce a given rotation at one end of the beam when far end is
   (a) Fixed (b) pinned.
10. Determine experimentally the horizontal displacement of the roller end of a two hinged arch for a given set ofa loading and to compare the results with those obtained analytically for skill developmentand for entrepreneurship skill development.

Course Outcome:
After completion of this Lab, the students will be able to
CO1: Analyze and determine the Clark Maxwell's theorem at local and national level for skill development
CO2: Determine and draw the influence lines for reactions, shears, and bending moments in beams to develop skills and employability.
CO3: Determine and draw the influence lines for horizontal thrust in a three hinged arch to develop skills and employability.
CO4: Analyze and determine slope and deflection of determinate trusses, beams and frames by experimental work for facing global challenegs to develop skill and entrepreneurship.
CO5: Calculate the internal forces in cable and arch type structures for skill developmentand employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	1	1	1	2	2	2	2
CO2	3	3	2	2	2	1	1	1	2	2	2	2
CO3	3	3	3	2	2	1	1	1	2	2	1	2
CO4	3	3	3	2	2	2	1	1	2	2	2	1
CO5	3	3	2	2	2	1	1	1	1	2	2	2

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	1
CO4	3	1	3
CO5	3	2	2

Suggested readings:

- "Theory of Structures" by S.Ramamrutham, DhanpatRai Publishing, New Delhi.
- "Basic structural analysis", C.S. Reddy, McGraw Hill Education.
- "Structural Analysis-A Matrix Approach" by G.S. Pandit, Tata McGraw Hill, New Delhi
- "Theory of structures": Vazirani and Rathwani Vol. II and Vol. III.
- "Intermediate structural Analysis": C. K. Wang. Tata McGraw hill Edition.
- "Structural Analysis" , R. C. Hibbeler, 8th edition, Pearson Prentice Hall, 2012.
- "Structural Analysis Vol II" by BhaviKatti, Vikash Publishing House Pvt. Ltd.
- 'Theory of Structures' by B.C. Punmia, Laxmi Publication House.

Website Resources:

- https://ocw.mit.edu/courses/find-by-topic/#cat=engineering&subcat=civilengineering&spec=structuralengineering
- https://nptel.ac.in/courses/105/105/105105166/
- https://nptel.ac.in/courses/105/105/105105041/

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ECE601: ENVIRONMENTAL ENGINEERING-II **L T P 3 1 0**

Objective:
The objective of this course is to familiarize students with water quality issues, operate and maintain working treatment systems and do troubleshooting of the problems in these systems. This course also deals with various methods of water treatments for polluted water and calculation of various parameters to inculcate skill, provide employability &entrepreneurialskillsrelated to contaminated water such as BOD COD etc.

UNIT I **(8 Sessions)**
Introduction: Waste: Dry, semi-liquid, liquid, Necessity of systematic collection and disposal of waste. Briefdescription of sewage disposal system for skill development. Conservancy and Water carriage system, their advantages and disadvantages. Quantity of Sewage:(i)Sewage: Domestic, industrial and storm water. (ii) Volume of domestic sewage (DWF), variability of flow, limiting velocities in sewers.Relative stability, Environmental acts and rules

UNIT II **(8 Sessions)**
Sewerage System: Sewerage scheme and their importance, fluctuation sewage flow, maintenance of sewage.Collection and Disposal of sewage, Quantity and composition of sanitary sewage, Storm runoff estimation, Wastewater characteristics and significance, recycle of decomposition, oxygen sag analysis.Effluent disposal standards, Types of sewers, joints in sewers, planning of sewerage system for skill development and employability, layout and construction of sewer lines, Sewage Pumping.

UNIT III **(8 Sessions)**
Sewage Treatment & Design Principles: Design principles of primary and secondary treatment UNIT s for employability and entrepreneurship, screen chamber, grit chamber, primary sedimentation tank, activated sludge process, Aeration tank and oxidation ditch Trickling filter, Stabilization ponds, Septic tanks, Biogas recovery.Instrumentation involved in analysis, natural method of waste water disposal.

UNIT IV **(6 Sessions)**
Sewer Appurtenances:
Manholes, street inlets, catch basins, building connections, sewer junctions, inverted siphons, flushing tanks, air ejectors, storm regulators, regular and measuring devices for skill development.

UNIT V **(10 Sessions)**
Disposal of Sewage: General composition of sewage, importance & method of determination of O.D., B.O.D. and C.O.D for skill development and entrepreneurship. Disposal methods: Land disposal by dilution and disposal in sea. Merits and demerits. Nuisance due to disposal, self purification of streams, conditions of disposal. Sewage Treatment: Meaning and principle of primary and secondary treatment, constructional details of screening chamber, clarifier, secondary clarifiers. Sludge treatment, sludge digestion, sludge drying. Sludge disposal, Oxidation ponds.

Course Outcomes:
After completion of this course students will able to
CO1: Understand water quality concepts, different types of waste and their disposal methods, their effect on treatment process selection and it will develop the skills of students for national importance.
CO2: Understand the characteristics of wastewater water and different types of sewers, joints and planning of sewerage systemfor facing global challeneges it will improve the employability of the students.
CO3: Understand the different sewage treatment methods and design principle of the same, it will improve the employability of the students.
CO4: Understand the working principle and functioning of various water treatment components at local, national and international level that will helpful in the development of entrepreneurship skill.
CO5: Understand various disposal methods and components of sewage and their suitability,it will develop the skills of students.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	3	1	3	3	3	3	3	3	3
CO2	3	2	3	1	3	2	3	3	1	1	2	3
CO3	3	3	2	3	3	3	3	3	2	1	1	3
CO4	3	1	3	3	3	3	3	3	1	3	3	3
CO5	3	1	3	1	3	1	3	3	3	3	2	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	1	3	2
CO3	1	3	3
CO4	1	2	3
CO5	3	1	1

Suggested readings:

- "Environmental Engineering Vol. I", Garg, S.K., Khanna Publishers, New Delhi, 1994.
- "Sewage disposal and Air pollution Engineering". Garg, S. K., Khanna Publishers, New Delhi, 2010.
- "Environmental Engineering Vol. I & II", Modi, P.N., Standard Book House, New Delhi , 2001
- "Environmental Engineering Vol. I & II", Punmia B.C., Lakshmi Publications (P) Ltd., New Delhi, 2002.

Website resources:

- https://en.wikipedia.org/wiki/Water_treatment
- https://www.indiawaterportal.org/topics/technology
- https://www.waterworld.com/international/desalination/article/16202105/filtering-through-indias-drinking-water-challenges
- https://nptel.ac.in/courses/105/105/105105201/

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ECE602: TRANSPORTATION ENGINEERING-II **L T P 3 1 0**

- To understand the principles of construction and maintenance of highwaysfor skill development.
- To know various components, geometrics in a railway track and various techniques for the effective movement of trains.
- To acquire design principles of layout and geometrics of airport for skill development and entrepreneurship.
- To introduce students to basic concepts of tunneling.
- To know the planning, construction and maintenance of Docks and Harbours.

UNIT I **(08 Sessions)**

Road Construction and Maintenance: Highway Constructionand develop understanding for entrepreneurship skills. Construction of cement concrete pavements, Coal PavementsW B M roads; Soil stabilized roads; Drainage.Impact of digging on urban roads and its management, instant Concrete Road Repair Solutions.

UNIT II **(10 Sessions)**

Railways: Functions will develop skillsrequirements and components of permanent way - stations and yards - selection and requirements of site, classification - working principle of simple turnout Signals and their classifications. Sleepers and its classification. Modern development in railways, Railway track construction and maintenance.Geometric Design of Railway Track: Alignment – Engineering Surveys - Gradients- Grade, Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT III **(08Sessions)**

Airports: Selection of site for an airport development of skillingelements and typical layout of an airport - orientation, length and patterns of runways - identification of runways (runway numbering) - parking of aircraft's - navigational aids.Case study of Kansai International Airport.

UNIT IV **(08 Sessions)**

Tunnels: Introduction to tunneling: Considerations in tunneling provide knowledge for better employability in constructionshape and size of tunnels, tunnel alignment, shaft, pilot tunnels. Tunnelingthrough soils and soft rock: methods of tunneling through soils and soft rock, tunnel lining, shield method of tunneling. Tunneling in hard rock: Methods of attack, grouting and lining. Tunnel ventilation, Dust Removal etc.

UNIT V **(06 Sessions)**

Docks and Harbors: Seaport: Selection of site- elements and typical layout - functions, provide knowledge for entrepreneurship skills requirements and classifications of docks and harbors - break water and their types dredging.

Course Outcomes:

On the completion of the course one should be able to understand:

CO1: Different types of highway pavements and their construction and to build model for global importancefor skill development and employability

CO2: Knowledge of railway geometrics, signaling & interlocking Points, crossing and turnouts, etc at local, national and international level for skill development and entrepreneurship development.

CO3: Different terminology related to airport engineering- Layout, runway and parking of aircraftsfor enhancing skill development.

CO4: Fundamentals of tunnel- its excavation methods, support systems, and executional aspects of tunnel for global importancefor modeling employability.

CO5: Concepts of docks and harbours- Layout, functions and requirements for skill development and employability.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment mapping(Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	1	3
CO3	3	1	1
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

- "Highway Engineering", S K Khanna and C E G Justo, Nem Chand and Bros, Roorkee
- "A course in Highway Engineering", S P Bindra, DhanpatRai Publications, New Delhi
- "A text book of Railway Engineering", S Arora and S C Saxena, DhanpatRai& Sons, Delhi
- "Airport Engineering",SCRangwala and P S Rangwala, Charotar Publishing House, Anand,
- "Harbour, Dock and Tunnel Engineering ", Srinivasan R and Rangwala S C, Charotar

Website Sources:

- https://en.wikipedia.org/
- https://www.asce.org/
- https://www.aboutcivil.org/railway-engineering
- https://nptel.ac.in/

Note: Latest editions of all the suggested readings must be used.

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ECE603: HYDROLOGY

L T P 3 1 0

Objective:
The objective of this course is to comprehend basic concepts of the water cycle and hydrology and basic principles and movement of ground water and properties of ground water flow. This course also deals with diverse methods of collecting the hydrological information, which is essential; to understand surface and ground water hydrology for skill development.

UNIT I **(6 Sessions)**
Introduction: Definitions, Hydrologic Principles- Hydrologic cycles and weather, hydrologic losses, Precipitation measurement and analysis, for provide knowledge for building entrepreneurship skills, rainfall-runoff, depth and area and duration curve (DAD curve). Mass curve. Development of intensity duration – frequency (IDF) curve and equation.

UNIT II **(10 Sessions)**
Hydrologic Abstraction: Infiltration, factors affecting infiltration, measurement of infiltration, empirical and analytical models of infiltration, evaporation: its measurement and estimation, evapo-transpiration: its measurement and estimation, interception and depression storage, rain harvesting; Procedure and its design and skilling for entrepreneurship development. Global water budget, Reynolds transport theorem, conservation laws

UNIT III **(10 Sessions)**
Stream Flow: Measurement of stream flow, factors affecting stream flow, hydrograph analysis, base flow separation will develop skills methods of steam flow determination, hydrograph analysis and UNIT hydrograph theory and hydrological modeling for steam flow estimation, and methods for peak discharge estimation.Fitting probability distribution, instantaneous UNIT hydrograph

UNIT IV **(8 Sessions)**
Frequency Analysis: Return period, random variable, checks for persistency, frequency distributions, frequency analysis of hydrological data will develop skills and employabilityDependent and independent variables, simple correlation coefficient, method of least squares, variance analysis, partial correlation coefficient, simple and multiple regression analysis.Rain gauge network ground water modeling through porous media

UNIT V **(6 Sessions)**
Ground Water and Flood Routing: Aquifers, hydraulic conductivity, transmissivity, well hydraulics. Governing equations provide knowledge for entrepreneurship skills reservoir flood routing, hydrologic routing: Muskingum method.

Course Outcomes:
After completion of this course students will able to
CO1: Understand the principles of hydrologic cycles at local, national and international level for building models for skill development and employability.
CO2: Understand basic concepts of hydrologic simulation modeling to evaluate potential impacts of management decisions and skill development.
CO3: Understand systematic understanding of the nature of hydrological stores for global importanceand fluxes and a critical awareness of the methods used to measure and for the analysis of skill development and employability.
CO4: Analyze and forecast their variability; frequency analysis for entrepreneurship development.
CO5: Get knowledge in the field of theory of hydrological processes and flood routing and their measurement for facing global challenges for strategic alliance of skill development.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	1	2	3	2	3
CO2	3	3	2	3	3	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	1	1	1	3
CO4	3	2	3	3	2	1	2	1	2	1	3	2
CO5	3	2	3	3	3	3	3	2	2	3	3	3

CO-Curriculum Enrichment mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	1	2
CO3	3	3	1
CO4	3	1	3
CO5	3	2	2

Suggested readings:

- "Elementary Hydrology", Singh, V.P., Prentice Hall
- "Applied Hydrology", V.T. Chow, D.R. Maidment and W.L.,Mays, "McGraw Hill.
- "Hydrology", M.Wanielista, R. Kersten and R. Eaglin John Wiley
- "Engineering Hydrology" C.S.P. Ojha, R. Berndtsson and P. Bhunya, Oxford University Press.

Website resources:

- https://public.wmo.int/en/resources/bulletin/hydrology-distance-learning-courses-indian-and-international-professionals
- https://civilenggforall.com/hydrology-civil-engineering-gate-2020-study-material-free-download-pdf-civilenggforall/
- https://nptel.ac.in/courses/105/104/105104029/

Note: Latest editions of all the suggested readings must be used.

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ECE605: REINFORCED CEMENT CONCRETE- II **L T P 3 1 0**

Objective: To make Civil Engineering students able to design flat slab, footing, retaining wall, water tank and to introduce students to the concept of pre-stressed concreteto inculcate skill, provide better employability and entrepreneurship skill.

UNIT I **(08 Sessions)**

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method) for skill and entrepreneurship development.

UNIT II **(08 Sessions)**

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Corrosion Control by underwater piles.Design of strap footing for skill and entrepreneurship development. Earthquake Resistant Design of building Earthquake resistant design philosophy, capacity design concept, four virtues of Earthquake Resistant design: strength, stiffness, ductility and configuration, Irregularities in structures, Lateral load distribution – Torsionally coupled & uncoupled system, Seismic coefficient Method,Ductile detailing as per IS:13920.

UNIT III **(08 Sessions)**

Structural behavior of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design and construction of Floating member.Design of R.C. slab culvert to understand the entrepreneurship skills

UNIT IV **(08 Sessions)**

Design criteria, material specifications and permissible stresses for tanks, design concept of circular tank situated on the ground / underground, overhead Tanks skilling for entrepreneurship development.Dome: Introduction, Stresses in spherical dome due static and wind load, Design of RCC spherical dome. Dome and Beam Curved in Plan. Beam curved in plan: Design and analysis of beam curved in plan supported symmetrically, design of semi-circular beam for different supports conditions, Torsion Factor, Stress due to torsion, reinforcement required for torsion. Recommendation of IS: 456.

UNIT V **(08 Sessions)**

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section to develop skills and employability.Circular Tank: Introduction, General design requirements according to IS: 3370-II. Joints in water tank, circular tank with flexible joint between floor and wall as well as rigid joint between floor and wall. IS code provision for circular tank.

Course Outcomes: On successful completion of the course, the students shall be able:

CO1: To understand the concept of nature of stresses in flat slab and design of flat slab for global importancefor skill and entrepreneurship developmentby limit state design method as per IS 456-2000

CO2: To understand the analysis and design of footings for skill and entrepreneurship developmentby limit state design method as per IS 456-2000.

CO3: To understand the analysis and design of retaining wallsat local and national level for skill development and employabilityby limit state design method as per IS 456-2000.

CO4: To understand the design concept of circular tank, ground, underground and overhead tanksfor skill and entrepreneurship development.

CO5: To understand the concepts of pre-stressed concrete and analysis of simple pre-stressed rectangular and T-sectionfor skill and employability.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	3	1	2	1	3	3
CO2	3	3	3	2	2	2	1	1	2	2	2	2
CO3	3	2	3	1	1	2	2	1	1	3	1	2
CO4	3	3	3	2	2	3	2	2	1	2	2	3
CO5	3	2	2	1	2	2	3	1	2	2	2	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	3
CO2	3	2	2
CO3	3	3	1
CO4	3	2	3
CO5	3	3	2

Suggested Readings:

- IS: 456 – 2000.
- "Reinforced Concrete – Limit State Design", A. K. Jain, Nem Chand & Bros., Roorkee.
- "Plain and Reinforced Concrete Vol. I & II", O. P. Jain & Jai Krishna, Nem Chand & Bros.
- "Reinforced Concrete Structures", R. Park and Pauley.
- "Reinforced Concrete Design", P. Dayaratnam.

Website Sources:

- http://www.nptelvideos.in/2012/11/design-of-reinforced-concrete-structures.html
- https://nptel.ac.in/
- https://theconstructor.org/search/RCC/posts/
- https://en.wikipedia.org/
- https://theconstructor.org/structural-engg/

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ECE606: DESIGN OF STEEL STRUCTURES- I **L T P 3 1 0**

Objective:
The objective of this course is to introduce the students to the general design of tension, compression, beam members and roof truss including connections, study of IS codes with latest design methods.

UNIT I
Introduction **(08 Sessions)**
Properties of steel – Structural steel sections – Limit State Design Concepts will develop skills – Loads on Structures – Metal joining methods using rivets, welding, bolting – Design of bolted, riveted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

UNIT II
Tension Members **(08 Sessions)**
Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members help in understanding better skilling of entrepreneurship – Use of lug angles – Design of tension splice – Concept of shear lag– Concrete filled steel tube column.Design ofAxially Loaded Tension Member, Design of Member Subjected to Axial Tension and Bending.

UNIT III
Compression Members **(08 Sessions)**
Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases provide knowledge for better employability in Industry – Gusseted base

UNIT IV
Beams **(08 Sessions)**
Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns help to inculcate skills and provide employability.

UNIT V
Roof Trusses And Industrial Structures **(08 Sessions)**
Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing – Design of gantry girder help in understanding of entrepreneurship skills.
Plastic design: Design of continuous beam of portal frame using platic design approach.

Course Outcomes:
On successful completion of the course, the students shall be:
CO1: Capable of using all loading and limit state design methods for steel structuresat local, national and international levelto develop model for skill development and Employability
CO2: Capable of elementary design of tension /compression members used in steel structures for enhancing the skill development.
CO3: Able to provide the design of beams and roof truss for building for global importance for Entrepreneurship Development.
CO4: Capable of understanding the types of structural fasteners with their behavior and connections and help in the analysis of skill development and Employability.
CO5: Able to understand the design of industrial structuresat local level for improving Entrepreneurship Development

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	3	1	3	3	3	3
CO2	3	3	3	3	3	1	2	3	2	1	1	3
CO3	3	3	3	3	2	3	1	1	2	3	1	3
CO4	3	3	3	3	2	1	3	3	2	1	2	3
CO5	3	3	3	3	2	2	3	1	3	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	1	2
CO3	2	1	3
CO4	3	2	3
CO5	1	2	3

Suggested Readings:

- "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta.
- "Design of Steel Structures", E.H., Gaylord, N.C. Gaylord and J.E., Stallmeyer, 3rd edition, McGraw-Hill Publications, 1992.
- Design of Steel Structures, L.S.Negi, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.
- IS 800-2007 Indian Standard General Construction in Steel – code of practice (3rd Revision).

Website Sources:

- https://theconstructor.org/structural-engg/steel/
- http://www.nptelvideos.in/2012/11/design-of-steel-structures.html
- https://en.wikipedia.org/
- https://www.aboutcivil.org/structural-engineering.html
- https://nptel.ac.in/

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ECE651: CAD Lab- I **L T P 0 0 2**

Objective:

- To introduce students with the AUTOCAD software.
- To gain knowledge of drawing various structural components of building using AUTOCAD software.

List of Experiments: **(16 Sessions)**

1. Draw Plan, Elevation and section of small residential building for skill development and for better skilling of entrepreneurship.
2. Recall 2D editing tools of AutoCAD for skill development and for better skilling of entrepreneurship
   Prepare two views showing reinforcement details of the following using AutoCAD
   a) Singly Reinforced beam
   b) Doubly Reinforced beam
   c) Simply supported one way slab
   d) Flat slab
   e) Column and column footing
   f) Stairs
3. Practice on 3D commands and draw different 3D models of the following for skill development and for better skilling of entrepreneurshipand for employability.
   a) 3D view of steps
   b) 3D view a small residential building
   c) 3D view of column footing
4. Introduction to SAP Softwarefor skill development.
5. Isometric projection

Course Outcomes:
On the completion of the course students should be able to:
CO1: Understand 2D and 3D commands used in AUTOCAD softwarefor national importance for skill development.
CO2: Draw Plan, Elevation and section of small residential building using AutoCADto employability and entrepreneurship.
CO3: Draw 2D views of singly and doubly reinforced beam using AutoCADat local level to employability and entrepreneurship.
CO4: Draw 2D views one way slab, column and column footing using AutoCADto develop skill and entrepreneurship.
CO5: Draw 3D model of steps, small residential building and column footing to develop skill and entrepreneurship.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	2	1	2	2	3	2
CO2	3	3	2	3	2	2	1	1	2	2	2	1
CO3	3	2	2	2	2	2	2	2	1	2	2	2
CO4	3	2	2	3	2	3	1	2	2	2	2	2
CO5	3	3	3	3	2	2	2	2	1	2	2	2

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	3
CO3	2	3	3
CO4	3	2	3
CO5	3	2	3

Suggested Readings:

- A general guide to computer aided design and drafting by Vijay duggal
- Introduction to AutoCAD 2019 for Civil Engineering Applications by NighatYasmin; SDC Publications
- Principles and Practice An Integrated Approach to Engineering Graphics and AutoCAD 2020 by Randy H. Shih;
  SDC Publications

Website Sources:

- https://www.autodesk.in/products/autocad-web-app/overview
- https://www.youtube.com/watch?v=Nu7doXaDbUk
- https://en.wikipedia.org/

Note: Latest editions of all the suggested readings must be used.

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ECE652: TRANSPORTATION ENGINEERING LAB- II **L T P 0 0 2**

Objective:
To learn the procedure of testing bituminous sample and sub-grade soil for suitability of usage in pavements.

List of Experiments: **(16 Sessions)**

1. Penetration Test of Bituminous Samplefor skill development and for better skilling of entrepreneurship
2. Softening Point Test of Bituminous Samplefor skill development
3. Stripping Test of Bituminous Samplefor skill development and for better skilling of entrepreneurship
4. Ductility Test of Bituminous Samplefor skill development and for better skilling of entrepreneurship
5. Flash & Fire Point Test of Bituminous Samplefor skill development and for employability
6. Measurement of mixing and compaction temperature of bituminous sample for skill development.
7. California Bearing Ratio (CBR) test (Soaked and Unsoaked)for skill development and for better skilling of entrepreneurship
8. Classified both directional traffic volume studyfor skill development and for better skilling of entrepreneurship

Course Outcomes:
On the completion of the course one should be able to:
CO1: Perform penetration test, softening point test, stripping test, at local, national and international level for enhancing skill development
CO2: Determine the various ductility test and flash & fire point test on bituminous sample for evaluating for employability
CO3: Perform properties to be used in pavementsfor skill development and employability.
CO4: Perform CBR test for evaluating the bearing capacity of sub-grade soil for design of flexible pavement.For global importance for Entrepreneurship development
CO5: Different types of highway pavements and their construction and to build model for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	1	3	1
CO3	3	3	1

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CO4	2	1	3
CO5	3	3	2

Suggested Readings:

- "Highway Engineering";S.K. Khanna and C.E.G. Justo
- "Highway Engineering";N.K. Vaswani
- Laboratory Manual in Highway Engineering; Ajay K. Duggal and Vijay P. Puri

Website Sources:

- https://en.wikipedia.org/
- https://ts-nitk.vlabs.ac.in/transportation-engineering/
- https://civildigital.com/powerpoint-presentations/transportation-engineering-ppts/
- https://www.aboutcivil.org/california-bearing-ratio-test.html

Note: Latest editions of all the suggested readings must be used.

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ECE653: HYDRAULIC ENGINEERING LAB **L T P 0 0 2**

Objective: The Objective of this lab is to explore the fundamental principles of fluid mechanics and hydraulics and to impart knowledge about various parameters related to fluid, this lab also deals with study of behavior of fluid in kinetic conditions and demonstrate and analyze key hydraulic phenomenon using equipments.

List of Experiments: **(16 Sessions)**

1. Determination of co-efficient of discharge for orifice for skill development
2. Determination of co-efficient of discharge for notches for skill development
3. Determination of co-efficient of discharge for venturimeter for skill developmentand for employability
4. Determination of co-efficient of discharge for orifice meter for skill development
5. Study of impact of jet on flat plate (normal / inclined) for skill development
6. Study of friction losses in pipes for skill development and for employability
7. Study of minor losses in pipes for skill development
8. Study on performance characteristics of Pelton turbine for skill development
9. Study on performance characteristics of Francis turbine for skill development
10. Study on performance characteristics of Kaplan turbine for skill development for better skilling of entrepreneurship.

Course Outcomes: After completion of this course, students will be able:

CO1: Determine the quantities like co-efficient of discharge for venturimeter, notches and orifice meter for national importance for skill development and employability
CO2: Calculated and build models for skill development by demonstrating the various types of losses in pipes.

CO3: Know about functioning and knowledge of various types of turbines for developing skills.

CO4: Gain exposure to modern computational techniques in fluid dynamics at national level for their employability.

CO5: Gaining knowledge in calculating the performance analysis in turbines and pumps and can be used in power plants for building entrepreneurship skills.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	1	1	3	3	1	3
CO2	3	3	3	3	3	1	1	3	3	1	3	2
CO3	2	3	3	2	3	3	1	1	3	1	1	3
CO4	3	3	3	2	3	1	3	3	3	3	3	2
CO5	3	3	3	3	1	1	2	1	3	1	1	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	2	1
CO3	3	1	2
CO4	2	3	2
CO5	1	2	3

Suggested readings:

- "Elementary Hydrology", Singh, V.P., Prentice Hall
- "Applied Hydrology", V.T. Chow, D.R. Maidment and W.L., Mays, "McGraw Hill.
- "Hydrology", M.Wanielista, R. Kersten and R. Eaglin John Wiley & Sons.
- "Engineering Hydrology" C.S.P. Ojha, R. Berndtsson and P. Bhunya, Oxford University Press.

Website resources:

- https://public.wmo.int/en/resources/bulletin/hydrology-distance-learning-courses-indian-and-international-professionals
- https://civilenggforall.com/hydrology-civil-engineering-gate-2020-study-material-free-download-pdf-civilenggforall/
- https://nptel.ac.in/courses/105/104/105104029/

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ECE701: GEOTECHNICAL ENGINEERING-II **L T P 3 1 0**

Objective: The objective of this course is to learn about types and purposes of soil exploration methods and different foundation systems and structures. This course also deals with systematic methods for designing and evaluates the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior, build the necessary theoretical background for design and construction of foundation system and study the nature of the soil behavior for different foundation.

UNIT I **(10 Sessions)**

Introduction: Role of civil engineer in the selection provide better skilling of entrepreneurship design andconstruction of foundation of civil engineering structures. Different types of loads on foundations.

Soil Exploration: Methods of soil exploration; boring, sampling, penetration tests, correlations between penetration resistance and soil design parameters.Stabilization of soft soil using industrial waste. Plastic as a soil stabilizer.

UNIT II **(6 Sessions)**

Earth Pressure and Retaining Walls : Earth pressure at rest, active and passive earth pressure, Rankine and Coulomb's earth pressure theories, earth pressure due to surcharge, will develop skills Rebhamn's and Culmann's Methods.

UNIT III **(8 Sessions)**

Foundations : Types of foundations, mechanism of load transfer in shallow and deep foundations, shallow foundations, Terzaghi's bearing capacity theory, computation of bearing capacity in soils, effect of various factors, use of field test data in design of shallow foundations, will develop skills and entrepreneurship stresses below the foundations, settlement of footings and rafts, proportioning of footings andrafts, Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision.

UNIT IV **(8 Sessions)**

Pile Foundation: Types and method of construction, estimation of pile capacity, capacity and settlement of group of piles, proportioning of piles.

Well Foundations: Methods of construction tilt and shift, remedial measures, bearing capacity, settlement and lateral stability of well foundation provide knowledge for better employability. Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity-Group capacity by different methods Feld's rule, Converse – Labarra formula and block failure criterion

UNIT V **(8 Sessions)**

Machine Foundations: Types of machine foundations, mathematical models, response of foundation – soil system to machine excitation, cyclic plate load test, block resonance test, criteria for design. **Retaining Wall:** Proportions of retaining walls, stability checks, coffer dam structures types and **suitabilityunderstanding for entrepreneurial skill** Retaining walls: Uses, types, stability and design principles of retaining walls, backfill drainage, settlement and tilt

Course Outcomes;

After completion of this course, students will able to:

CO1: Understand about behavior/nature of the soil and soil exploration methods to build models at local, national and international level for enhancing skill developmentand employability.

CO2: Understand about active and passive system of Earth pressure and to enhance skill development and entrepreneurship development.

CO3: Understand various types, analysis and design of foundationat national importance for skill development.

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CO4: Understand reason behind the structure and deep foundation of bearing capacity, settlement of foundationat local as well as global levelfor improving knowledge of skill development and employability.
CO5: Understand about response of foundation of soil system to machine excitation and stability check for retaining walls and to build skill development

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	3	1	3	3	3	3
CO2	3	3	3	3	3	1	2	3	2	1	1	3
CO3	3	3	3	3	2	3	1	1	2	3	1	3
CO4	3	3	3	3	2	1	3	3	2	1	2	3
CO5	3	3	3	3	2	2	3	1	3	3	3	3

CO-Curriculum Enrichment Mapping(Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	1	3
CO3	3	1	1
CO4	3	3	2
CO5	3	1	2

Suggested readings:

- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.
- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://nptel.ac.in/courses/105/101/105101001/
- https://nptel.ac.in/courses/105/105/105105176/
- https://onlinecourses.nptel.ac.in/noc20_ce52/preview
- https://www.geoengineer.org/education/soil-mechanics
- https://www.classcentral.com/course/swayam-soil-mechanics-geotechnical-engineering-i-10099

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ECE702: IRRIGATION ENGINEERING L T P 3 1 0

Objective:

- To take up the basic concepts of irrigation and construction of various hydraulic structures for skill development.
- To introduce students to basic concepts of water, plants, their interactions, as well as irrigation and drainage systems design, planning and management.
- The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part.
- To develop analytical skills relevant to the areas mentioned above, particularly the design of irrigation and drainage projects.

UNIT I **(10 Sessions)**

Irrigation technique and Water requirements of Crop: Definition, necessity of Irrigation in India, Advantages/Disadvantages of irrigation, Types of irrigation, Techniques of water distribution in the farms, Quality of irrigation water will develop skills. Crop period or Base period, Duty and Delta of a crop, Crop seasons and Indian Agriculture, Optimum Utilization of irrigation water, Irrigation efficiencies, Consumptive use or Evapotranspiration, Effective rainfall, Consumptive irrigation requirement, Net irrigation requirement, Factors affecting consumptive use, Estimation of consumptive use, soil-moisture- Irrigation relation, estimation depth and frequency of Irrigation on the basis of soil moisture region concept problem, Structured Irrigation Network.Concept for planning water resources development, design flood estimation, geomorphology of rivers, sediment dynamics in alluvial river

UNIT II **(10 Sessions)**

Canal Irrigation Systems: General, alluvial and non- alluvial canals, alignment of canal, distribution systems for canal irrigation, curves in canals, certain importance in definitions: gross command area, cultural command area, intensity of irrigation, losses of water in canals, Warabandi system of distribution of irrigation water, design of stable cannels in India, regime channels, Kennedy's theory, lacey's theory, cross-section of an irrigation canal, balancing depth for excavation canals, fixing the L-section of the canal and other design considerations, maintenance of irrigation canals provide better skilling of entrepreneurship. Estimating irrigation demands, regulating structure for canal flows, structure for flow diversion, and design of barrage appurtenant.

UNIT III **(06 Sessions)**

Lining of Irrigation canals and Economics of Lining: Advantages of lining, Justification for lining the existing canals, Permissible velocities in lined channels, Under drainage of lined canals, Lining of canals in Expansive soils provide knowledge for better employability, Definitions of salinity and water logging, Causes of water logging, water logging control, Reclamation of saline and alkaline lands, Surface drainage or open drainage, Sub-surface drainage or tile drainage. River bank protection work, GIS for water resources management, design of concrete sloping glacis weir

UNIT IV **(08 Sessions)**

Regulation works Canal falls-necessity and location, Development of Falls, design of cistern element, roughening devices, design of Sarda type fall, and design of straight Glacis fall. Off-take alignment, cross-regulator and distributory, head regulators, devices to control silt entry into the off-taking channel and silt ejector, canal escapes, types of escapes, fish ladders, Methods of pricing irrigation water, Economic water rates Vs Prevailing revenue rates in India help in understanding for entrepreneurship skills.

UNIT V **(06 Sessions)**

Rivers, Their Behaviour, Control and Training: Importance of rivers and Necessity of Controlling them, Types of rivers and their Characteristics, River Training works for skill development-Classification Types-Guidebanks, Groynes, Deflectors, Embankments, Cut-offs, Bank Protection.

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Course Outcomes:

On the completion of the course one should be able to:

CO1: Understand the basic concepts and terminology of irrigation engineering at local as well as global level to develop skill.

CO2: Understand types and design of canals at national level foremployability.

CO3: Perceive the effects of water logging and adapt the preventive measures; describe importance and differentiation between lined and unlined canals.

CO4: Explain canal regulation works, canals falls and formulate their design; canal escapes at local level forskill development and employability.

CO5: Describe importance, necessity and types of rivers; river training worksat local, national and international levelfor skill and entrepreneurship development.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	3	3	3	1	3	1	3
CO2	3	3	2	3	2	3	3	3	3	1	2	3
CO3	3	3	3	2	3	3	2	1	3	1	3	3
CO4	3	2	3	3	1	2	2	1	2	1	3	3
CO5	3	2	2	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	2	3	1
CO3	2	2	1
CO4	3	3	2
CO5	3	1	3

Suggested Readings:

- "Irrigation, Water Resources and Water Power Engineering", P.N.Modi.
- "Fundamentals on Irrigation Engineering", Bharat Singh.
- "Irrigation Engineering and Hydraulic Structures", S.K.Garg.
- "Theory and Design of Irrigation Structures Vol.I& II", R.S.Varshney, Gupta & Gupta.

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Website Sources:

- https://www.engineeringcivil.com/page/2?s=irrigation
- https://nptel.ac.in/
- https://www.aboutcivil.org/irrigation-engineering-water-resources-lectures.html
- https://en.wikipedia.org/

Note: Latest editions of all the suggested readings must be used.

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ECE703: DESIGN OF STEEL STRUCTURES- II **L T P 3 1 0**

Objective:
The objective of this course is to introduce the students to the design of roof trusses, gantry girder, plate girder, railway bridges, truss bridges and water tanks with latest design methods with reference to IS codes for skill development and for better skilling of entrepreneurship.

UNIT I **(08 Sessions)**
Design of gantry girder, Design of roof trusses for skill development

UNIT II **(08 Sessions)**
Design of plate girder: Design of section, connections for flange plate to flange angles & flange angles to web, web and flange splicing. Behaviour of longitudinally stiffened plate, welding of girder components. Vertical, Horizontal, Intermediate and Bearing stiffeners help in understanding of for entrepreneurship skills. Curtailment of plates.

UNIT III **(08 Sessions)**
Bridges: Introduction to bridges, classification of bridges, Standard loading for railway bridges, design of Deck type plate-girder bridges, design of bracings and frames. Bridge bearing and stability.Application of ILD to the design of bridges provide knowledge for better employability

UNIT IV **(08 Sessions)**
Design of through type truss bridges, design of members and joints, design of stringers, cross girder, lateral, sway and portal bracings to develop skills

UNIT V **(08 Sessions)**
Design of steel chimneys: Introduction, Use, Dimension of steel stacks,design of pressed steel tank with staging, chimney lining, design consideration, Design of base plate for entrepreneurship and employability

Course Outcomes:
On successful completion of the course, the students shall be:
CO1: Able to design gantry girder, and roof trusses and to build at local, national and international forEntrepreneurship Development
CO2: Able to provide the design of plate girder and design of different sections to create model at local as well as global for skill development and Employability.
CO3: Capable of detailed design of railway bridges including bracings and frames and Analysis of local well as global importance for skill development.
CO4: Able to provide the design of truss bridges including members, joints and stringers for enhancing skill development and Employability.
CO5: Competent enough to design of steel structures and able to provide the good quality control during the steel construction for building at local, national and international forEntrepreneurship Development

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	3	3	1	1	1	1	3
CO2	3	3	3	2	2	2	3	1	3	3	3	3
CO3	3	3	3	3	3	2	3	3	2	1	2	3
CO4	3	3	3	2	2	3	1	3	1	3	1	3
CO5	3	3	3	2	2	3	3	1	1	3	3	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	1	2	**3**
CO2	**3**	**3**	2
CO3	**3**	1	2
CO4	**3**	**3**	1
CO5	2	2	**3**

Suggested Readings:

- "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta.
- "Design of Steel Structures", E.H., Gaylord, N.C. Gaylord and J.E., Stallmeyer, 3rd edition, McGraw-Hill Publications, 1992
- Design of Steel Structures, L.S.Negi, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.
- IS 800-2007 Indian Standard General Construction in Steel – code of practice (3rd Revision).

Website Sources:

- https://theconstructor.org/structural-engg/steel/
- http://www.nptelvideos.in/2012/11/design-of-steel-structures.html
- https://en.wikipedia.org/
- https://www.aboutcivil.org/structural-engineering.html
- https://nptel.ac.in/

Note: Latest editions of all the suggested readings must be used.

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ECE704: CONSTRUCTION PLANNING & MANAGEMENT **L T P 3 1 0**

Objective:
The objective of this course is to describe project management and related activities and describe the project life cycle Diagram networks of project activities , estimate the completion time of a project and to impart knowledge about types, merit, and demerits of construction contracts, The objectives in CPM and PERT are to schedule the sequence of work activities in the project and to determine the total time the project will take and to introduce the fundamental concepts relevant to CPM and PERT, and to enable students to understand organizational structures in the construction industry for better skilling of entrepreneurship.

UNIT I **(6 Sessions)**
Planning: General consideration, Definition of aspect, prospect, roominess, grouping, circulation privacy, occlusion
Regulation and Bye laws: Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks, ventilation, Requirements for stairs, lifts in public assembly building, offices provide knowledge for better skill development and entrepreneurship.

UNIT II **(10 Sessions)**
Fire Protection: Firefighting arrangements in public assembly buildings, planning, offices, Auditorium
Construction plants & Equipment: Plants & equipment for earth moving, road constructions help in understanding of entrepreneurship skills, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants &Equipment for concrete construction: Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control.Impact of digging on urban roads and its management.

UNIT III **(12 Sessions)**
Planning & scheduling of constructions Projects:
Planning by CPM & PERT, Preparation of network, Determination of slacks or floats **provide knowledge for better employability**. Critical activities. Critical path, project duration .expected mean time, probability of completion of project, Estimation of critical path; problems.Time estimate, frequency distribution curve, probability distribution curve, critical path and crashing of activity.

UNIT IV **(6 Sessions)**
Management: Professional practice, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contract will develop skills.

UNIT V **(6 Sessions)**
Departmental Procedures: Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders provide better skilling of entrepreneurship, Arbitration.

Course Outcomes:
After completion of this course students will able to:
CO1: Understand the basic principles of planning and building by lawsfor skill development and employability at local as well as global level
CO2: Understand the plants and equipment used in the construction industry for enriching skill developmentat local level.
CO3: Develop critical path method-based network and estimate various times and floats, and develop PERT network and find probability of completion of a project in specified duration for producingfor importance of Entrepreneurship Development at national and international level
CO4: Understand the purpose, types, merit, and demerits of construction contracts to maintain at local for employability and entrepreneurship development
CO5: Gaining the knowledge about the tender, its notification and its acceptance and developing modelsat local level for skill development.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	3	3	2	3	2	2	3
CO2	2	1	1	1	3	2	3	1	3	3	2	3
CO3	3	3	3	3	3	2	3	3	3	1	3	3
CO4	2	2	2	1	1	3	1	3	3	3	3	3
CO5	3	1	1	3	1	3	2	2	3	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	2	2
CO3	2	1	3
CO4	2	3	3
CO5	3	2	2

Reference Books:

- "Construction Project Management, planning, scheduling & controlling" by K.K. Chitkara.
- "PERT & CPM -Principles & Applications" by L.S.Srinath.
- "Project Planning & Control with PERT & CPM" by B.C.Punmia&K.K.Khandelwal,
- "Construction Management & Planning" by B.Sengupta&H.Guha,

Website resources:

- https://www.mindtools.com/pages/article/critical-path-analysis.htm
- https://www.simplilearn.com/pert-and-cpm-important-tools-of-project-management-rar225-article
- https://nptel.ac.in/courses/105/103/105103093/

Note: Latest editions of all the suggested readings must be used.

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ECE706: EARTHQUAKE RESISTANT DESIGN

L T P 3 1 0

Objective:
The objective of this course is to impart knowledge on the seismology and behavior of buildings during earthquakes for skill development and introduce students about Various IS codes related to building design and seismology and involve the application of scientific and technological principles of planning, analysis, and design of buildings according to earthquake design philosophy to provide better employability and entrepreneurship.

UNIT I **(6 Sessions)**

Introductory Seismology: Various terminologies related with earthquake, Causes of earthquake, plate tectonics, Tsunami. Seismic wave propagation. Magnitude, intensity & energy of earthquake, magnitude & intensity scales, classifications of earthquakes, Seismic zoning case histories of earthquakes. Seismic hazards, induced hazards to develop skill and employability.

UNIT II **(10 Sessions)**

Earthquake recording, Seismic instruments, Seismographs & Seismograms. Basic concept of liquefaction and isolation, Introduction to various IS related codes. Structural systems, Effects of earthquake on buildings in general, structural and nonstructural failures Dynamic characteristics of buildings, natural period of vibration, damping, stiffness etc for skill development.Progressive collapse analysis of structures,Seismic performance of traditionally built masonry constructions, typical failure mechanism of masonry buildings under earthquakes to understand the skill of entrepreneurship.

UNIT III **(6 Sessions)**

IS 4326: 1993: Planning consideration & architectural concept, provisions for earthquake resistant construction/ seismic strengthening of masonry constructionsto understand the skill of entrepreneurship.Inertia forces in structures, behaviour of brick masonary structure, stone and RC structure.

UNIT IV **(10 Sessions)**

Seismic performance of reinforc ed concrete buildings. Plan, elevation & stiffness irregularities & their effects. Typical earthquake damages of RC constructions, short column effect, soft storey effect, strong column-weak beam analogyfor skill development and employability. IS 13920: 1993: Ductile detailing of reinforced concrete buildings and shear wall concept

UNIT V **(8 Sessions)**

Seismic design philosophy, IS 1893 (part I):2002 code provisions: Basic definition, Load combinations, Design lateral loads, response reduction factors, structural modeling of building frames, equivalent load method for earthquake analysis of multistory framesfor skill development and employability..

Course Outcomes:
After completion of this course, students will
CO1: Gain an experience in the implementation of Earthquake Engineering on engineering conceptsat local as well as global levelfor skill development and employability which are applied in field Structural Engineering.
CO2: Get a diverse knowledge of earthquake engineeringfor skill developmentpractices and employabilityapplied to real life problemsat local as well as global importance.
CO3: Learn to understand the theoretical and practical aspects of earthquake engineering for skill development and employability at local and national levelalong with the planning and design aspects as per IS code 1426:1993
CO4: To explain the concept of seismic performance of reinforced concrete buildings, plan, elevation & stiffness irregularities and their effect, and ductile detailing detailing of reinforced concrete buildings and shear wall conceptfor skill development and entrepreneurship development at national and international level.
CO5: To explain the concept of seismics design philosophy as per IS code 1893:2002 and analyze the multistory structurefor skill development and employabilityusing different method.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	3	3	1	3	2	2	1
CO2	3	3	3	1	3	2	2	2	2	3	2	3
CO3	3	3	2	3	2	2	2	2	3	1	1	1
CO4	3	3	2	2	1	1	1	1	1	2	2	2
CO5	3	3	3	3	2	1	2	1	1	2	3	1

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	3	3	1
CO4	3	2	3
CO5	3	3	1

Suggested reading:

- "Elements of Earthquake Engineering" Jai, Krishna , A.R. Chandrasekran,. and B.Chandra, , 2nd Edition, South Asia Publisher, New Delhi
- IS : 1893 Indian Standard – "Criteria for Earthquake Resistant Design of Structures General Provisions and Buildings", Bureau of Indian Standard, ManakBhawan, New Delhi.
- "Earthquake –Resistant Design of Masonry Building", MihaTomazevic, Imperial College Press.
- "Earthquake Resistant Design of structures", S. K. Duggal, Oxford University Press.
- "Earthquake Resistant Design of structures" ,Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
- IS: 4326 Indian Standard – "Earthquake Resistant Design and construction of buildings", Bureau of Indian Standard, ManakBhawan, New Delhi.
- IS: 13920 Indian Standard –" Ductile design and detailing of reinforced concrete structure subjected to seismic force", Bureau of Indian Standard, ManakBhawan, New Delhi.

Website sources:

- https://www.bigrentz.com/blog/earthquake-proof-buildings
- https://en.wikipedia.org/wiki/Earthquake-resistant_structures
- https://nptel.ac.in/courses/105/101/105101004/
- https://onlinecourses.nptel.ac.in/noc20_ce52/preview
- https://law.resource.org/pub/in/bis/S03/is.1893.1.2002.pdf

Note: Latest editions of all the suggested readings must be used.

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ECE751: CAD Lab- II **L T P 0 0 2**

Objective: To introduce students with the latest software tools for Modeling, Analysis and Design to be used in the field of Civil Engineering

1. Recall 3D editing tools of AutoCAD for skill development and for better skilling of entrepreneurship. Prepare plan, elevation and sectional view (including hatching wherever required) of any one of the following using AutoCAD and Auto LISP : (Computer Practice)
   a) Small Residential building
   b) Simple Irrigation structure like canal fall
   c) Septic tank, Manhole, Drop Manhole
   d) Section of a road pavement
2. Working on environmental engineering Software for analysis and Design of water & waste water treatment and distribution systems (water CAD / sewer CAD / water GEM / sewer GEM / Loop) for skill development and for employability
3. Working transportation engineering software / surveying Software's for skill development and for better skilling of entrepreneurship
4. Working on GIS software (Arc GIS / ENVI / GEPSY) for skill development and for better skilling of entrepreneurship
5. Working on project management software (Primaveera / ms project).
6. Working on geotechnical Software like geo-5 / Plaxis for skill development and for better skilling of entrepreneurshipfor employability
7. Working on structure analysis and detailing software (STAAD.Pro & ETabs) for skill development and for employability.
8. Introduction to BIM software for skill development and for employability.
9. Advanced CAD software such as Pro E/unigraphics

Course Outcomes: On the completion of the lab course one should be able to understand:
CO1: Draw 3D views of irrigation structure, septic tank, manhole, small residential building and road pavement using AutoCAD and AutoLISP for national importance of skill development
CO2: Working of environmental engineering Software for analysis and Design of water & waste water treatment and distribution systems using water CAD / sewer CAD for skill development and employability at local as well as global importance.
CO3: Working of transportation engineering software/GIS software for pavement design and surveyingfor building entrepreneurship skills at national and international level.
CO4: Working of project management software (Primavera / MS project) at local as well as global level for developing their skills.
CO5: Working of geotechnical Software like geo-5 / Plaxis for soil analysis and design of foundation of local level for skill development and entrepreneurship skills.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	2	1	2	2	3	2
CO2	3	3	2	3	2	2	1	1	2	2	2	1
CO3	3	2	2	2	2	2	2	2	1	2	2	2
CO4	3	2	2	3	2	3	1	2	2	2	2	2
CO5	3	3	3	3	2	2	2	2	1	2	2	2

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	2	1	3
CO4	3	2	1
CO5	3	1	3

Suggested Readings:

- Reference manual of AutoCAD Autodesk Inc
- The ABC's of AutolispGeorgeOmmura BPB
- Mastering in AutoCAD George Ommura BPB

Website Sources:

- https://www.autodesk.in/products/autocad-web-app/overview
- https://www.youtube.com/watch?v=Nu7doXaDbUk
- https://en.wikipedia.org/

Note: Latest editions of all the suggested readings must be used.

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ECE752: GEOTECHNICAL ENGINEERING LAB

L T P 0 0 2

Objective: The objective of this lab is to understand the laboratory tests used for determination of physical, index and Engineering properties of soil such as determination of permeability water content shear parameters etc.

List of Experiments **(16 Sessions)**

1. Determination of Atterberg Limits for skill development.
2. Determination of permeability by constant head method for skill developmentfor better skilling of entrepreneurship.
3. Determination of Consolidation (2D) Test on soil by Consolidometer.
4. Determination of compaction properties by standard proctor test for skill development
5. Determination of shear parameters by Direct shear test for skill development
6. Determination of shear parameters by Unconfined Compression Strength Test for skill development
7. Determination of shear parameters by Triaxial Test for skill development and for employability.
8. Determination of liquid limit of fine-grained soils by fall cone method.
9. Demonstration of Laboratory Vane Shear Test for skill Development.
10. Determination of in situ dry density-Sand Replacement method in laboratory for skill Development.

Course Outcomes;
After completion of this lab, students will able to:
CO1: Measure of the critical water contents of a fine-grained soil by Atterberg limitsof local levelfor skill development and employability.
CO2: Understand and determine shear parameters by various test such as direct shear test,for improving knowledge of skill development and employability at local as well as global importance.
CO3: Understand and determine unconfined Compression Strength test and to build skill development atlocal importance
CO4: Understand and determine the triaxial test of national and international level importance for enhancingskill development and entrepreneurship development.
CO5: Understand various types, analysis and strength of soil for employability development at local level.
Mapping Course Outcomes leading to the achievement of Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	3	1	3	3	3	3
CO2	3	3	3	3	3	1	2	3	2	1	1	3
CO3	3	3	3	3	2	3	1	1	2	3	1	3
CO4	3	3	3	3	2	1	3	3	2	1	2	3
CO5	3	3	3	3	2	2	3	1	3	3	3	3

CO-Curriculum Enrichment Mapping(Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	2
CO3	3	1	1
CO4	3	2	3
CO5	1	3	2

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Suggested Readings:

- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.
- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website Resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://nptel.ac.in/courses/105/101/105101001/
- https://nptel.ac.in/courses/105/105/105105176/
- https://onlinecourses.nptel.ac.in/noc20_ce52/preview
- https://www.geoengineer.org/education/soil-mechanics

Note: Latest editions of all the suggested readings must be used.

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ECE755: STRUCTURAL DETAILING LAB **L T P 0 0 2**

Objective:

To learn about design and detailing of various components of RCC structures.

List of Experiments: **(16 Sessions)**

1. General considerations: Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provisions.
2. Design & detailing of a i) simply supported R.C.C Beam ii) Continuous T- Beam.
3. Design & detailing of RCC columns- Tied columns and Spirally reinforced columns.
4. Design & detailing of Isolated and combined footings for RC Columns.
5. Design & detailing of a i) simply supported one way slab ii) One way Continuous slab.
6. Study of full set of structural drawing of a building as made available by Institute.

Course Outcomes:
On successful completion of the course, the students shall be able:
CO1:To understand the concept of nature of stresses in Beam and design of Beam of national and international levelfor skill and entrepreneurship development by limit state design method as per IS 456-2000
CO2:To understand the analysis and design of Column of local as well as global importance levelfor skill and entrepreneurship developmentby limit state design method as per IS 456-2000.
CO3:To understand the analysis and design of Footing for skill development and employability at local as well as global level importanceby limit state design method as per IS 456-2000.
CO4: To understand the designand detailing of various components of RCC structuresfor skill and entrepreneurship development.
CO5: To understand the conceptsof structural drawing of a building of national level for skill and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	3	1	2	1	3	3
CO2	3	3	3	2	2	2	1	1	2	2	2	2
CO3	3	2	3	1	1	2	2	1	1	3	1	2
CO4	3	3	3	2	2	3	2	2	1	2	2	3
CO5	3	2	2	1	2	2	3	1	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	3
CO2	3	2	2
CO3	3	3	1
CO4	3	2	3
CO5	3	3	2

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Suggested Readings:

- Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt.Ltd. Hyderabad.
- "Reinforced Concrete Design", S. UnnikrishnaPillai& D. Menon, Tata Mc-Graw Hill Book Publishing Company Limited, New Delhi.
- "Reinforced Concrete – Limit State Design", A. K. Jain, Nem Chand & Bros., Roorkee.

Website Resources:

- https://nptel.ac.in/courses/105/105/105105104/
- https://nptel.ac.in/courses/105/105/105105105/
- https://theconstructor.org/structural-engg/structural-detailing/
- https://www.engineeringcivil.com/presentation-on-reinforcing-detailing-of-r-c-c-members.html

Note: Latest editions of all the suggested readings must be used.

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ECE705: RURAL WATER SUPPLY AND SANITATION **L T P 3 1 0**

Objective:

- To introduce about various rural water supply and sanitation programs in India for entrepreneurship and employability.
- To introduce improved water supply and low cost sanitation methods in rural areas.
- To introduce feasible treatment and disposal techniques of sewage in rural areas to develop the skill.

UNIT I **(06 Sessions)**

Concept of environment and scope of sanitation in rural areas for skill development. Magnitude of problems of rural water supply and sanitation. Population to be covered, difficulties, National policy.

UNIT II **(08 Sessions)**

Water supply: Design population and demand loads. Various approaches of planning of water supply schemes in rural areas for better employability. Development of proffered sources of water springs. Wells, infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source. Specific practices and problems encountered in rural water supply.

UNIT III **(08 Sessions)**

Improved methods and compact systems of treatment of surface and ground waters for rural water supply. Brief Details of multi-bottom settlers (MBS), diatomaceous earth filter, cloth filter, slow sand filter, chlorine diffusion cartridges. Pumps, pipe materials, appurtenances and improved devices for use in rural water supply. Planning of distribution system in rural areas for skill development and entrepreneurship.

UNIT IV **(10 Sessions)**

Community and sanitary latrines. Various methods of collection and disposal of night soil. Planning of waste water collection system in rural areas for better skilling of entrepreneurship. Treatment and Disposal of waste water.

Compact and simple waste water treatment UNIT s and systems in rural areas such as stabilization ponds, septic tanks, Imhoff tank, soak pit etc. Disposal of waste water soakage pits and trenches.

UNIT V **(08 Sessions)**

Disposal of Solid Wastes. Composting, land filling, incineration, Biogas plants, rural health. Other specific issues and problems encountered in rural sanitation for skill development.

Course Outcomes: On the completion of the course one should be able to understand:

CO1: Understand various rural water supply and sanitation programs in India and challenges related to rural water supply it will of local level for developthe skills.

CO2: Understand various water supply approaches and different sources of water it will make student employable at local as well as global level.

CO3: Demonstrate various water filter and distribution techniques useful for rural water supply; it will develop the entrepreneurship skill at national as well international level.

CO4: Understand different methods for collection, disposal and treatment of waste water, sewage in rural areas, it will develop the skills at local level

CO5: Learn about different methods for disposal of Solid waste and related issues in rural sanitationit will develop the skills at local as well as global level

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	3	3	3	3	3	1	2	3	3
CO2	3	3	3	1	3	3	3	3	3	2	3	3

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CO3	3	1	2	3	2	2	3	3	3	3	3	3
CO4	1	3	3	2	3	3	3	3	2	1	1	3
CO5	3	1	3	1	1	3	3	3	1	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	2	2
CO2	1	3	1
CO3	2	1	3
CO4	3	1	2
CO5	3	1	2

Suggested Readings:

- "Water Treatment and Sanitation – Simple Method for Rural Area" by Mann H.T. and Williamson D.
- "Water Supply for Rural Areas & Small CommUNIT ies" by E.G. Wanger and J.N. Lanoix., WHO
- "Water Supply and Sewerage", by E.W.Steel& T.J.M, McGraw Hill.
- "Manual on Water Supply and Treatment", CPHEEO, Mini. Of Urban Development, Govt. of India.

Website Sources:

- https://www.who.int/water_sanitation_health/dwq/monograph42.pdf?ua=1
- https://en.wikipedia.org/wiki/Water_supply_and_sanitation_in_India
- https://www.oecd.org/dac/evaluation/Evaluation%20insights%20WASH%20final%20draft.pdf
- https://jalshakti-ddws.gov.in/sites/default/files/Sustainability%20Manual%20Final%2029032012_0.pdf

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ECE071: TRANSPORTATION SYSTEM AND PLANNING L T P 3 1 0

Course Objectives:-

- To introduce the recent advancements in the field of Sustainable Urban Development, Traffic Engineering and Management, Systems Dynamics Approach to Transport Planning, Highway Design and Construction, Economic and Environment Evaluation of Transport Projects.
- Finding specific transportation mode, but will use the various modes to apply the theoretical and analytical concepts presented in the lectures and readings.
- Key principles governing transportation planning, investment, operations and maintenance. It introduces the macroeconomic concepts central to transportation systems.
- Topics covered include economic theories of the firm, the consumer, and the market, demand models, discrete choice analysis, cost models and production functions.
- Application to transportation systems includes congestion pricing, technological change, resource allocation, market structure and regulation, revenue forecasting, public and private transportation finance

UNIT I **(8 Sessions)**

Introduction: Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning for skill development andfor better skilling of entrepreneurship.

UNIT II **(8 Sessions)**

Type of transportation system: Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

UNIT III **(8 Sessions)**

Travel demand: Estimation and fore casting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT IV **(8 Sessions)**

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods for entrepreneurship and employability, net-present-Value methods, Benefit Cost method, Internal rate of return method.

UNIT V **(7 Sessions)**

Transportation Facilities: Pedestrian facilities, Bicycle facilities, parking and 22 terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation for skill development and entrepreneurship.

Course Outcomes

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

CO1: Understanding the issues & challenges in the Transportation Sector of local as well as global level for skill development and employability

CO2: To develop skills required for Transport planning & formulationfor skill development and employability at local level.

CO3: Understand optimization techniques for skill development and entrepreneurship development oftransport Planning & Pricing.

CO4: Analysing the processes for skill development and employabilityof transport project execution and controlat local as well as global level.

CO5: Demonstrating contracting process as applied in Transport projectsfor skill development and employability at national as well as international level.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	2	3
CO4	3	2	1
CO5	3	3	1

Reference Books:

- "Introduction to Transportation Engineering": William W. Hay.
- "Introduction to Transportation Engineering planning" – E.K. Mortak.
- "Metropolitan transportation planning "– J.W. Dickey.
- "Traffic Engineering", L.R. Kadiyali

Website Sources:

- https://en.wikipedia.org/transportation system and planning
- https://ts-nitk.vlabs.ac.in/transportation-engineering/
- https://civildigital.com/powerpoint-presentations/transportation-engineering-ppts/
- https://www.aboutcivil.org/transportation system and planning

Note: Latest editions of all the suggested readings must be used.

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ECE072: FINITE ELEMENT METHODS FOR CIVIL ENGINEERING **L T P 3 1 0**

Course Objective:
The objective of this course is to introduce importance and applications of Finite Element Method in Simple one dimensional problem, analysis of beams and simplified modeling of two dimensional problems. This course also emphasis on the various applications of finite element method in civil engineering and allied fields for skill development and for better skilling of entrepreneurship.

UNIT I **(8 Sessions)**
Introduction: General description and analysis procedure; linear constitutive equations; two-dimensional problems; constitutive relationships for plane strain, plane stress and axis symmetric cases. The Basic Component Element: Concept of the Element; element shapes; two – and three – dimensional elements; choice of elements, Element Aspect Ratio; Element stiffness; nodal degrees of freedom

UNIT II **(8 Sessions)**
Displacement Models: Generalized coordinate form of displacement; Selection of Order of the Polynomial; Convergence requirements; Element compatibility. Interpolation displacement model; Interpolation function or Shape function; Interpolation Functions for a one-dimensional element; Comparison of Generalised Coordinate and Interpolation formulations; Isoparametric Element Concept

UNIT III **(8 Sessions)**
Element Stiffness: Direct formulation of element stiffness; force vector to be applied at nodes of element; Constant Strain Triangle Element; Element stress and strains
The Overall Problem: Discretization of the Body or Profile; Natural subdivisions at discontinuities; Bandwidth Minimization; Interconnections at Nodes; Stiffness matrix and Loads for Assemblage of Elements; Computer application of the Direct Stiffness Method for skill development and entrepreneurship.

UNIT IV **(8 Sessions)**
Civil Engineering Applications: Constitutive laws; Elastic-plastic Behaviour; Finite representation of Infinite Bodies –significant extent of profiles for discretisation; Boundary conditions; Strip Footing Finite element mesh for embankments and cuttings

UNIT V **(8 Sessions)**
Simulation of sequential construction in excavations (unloading) and in embankments (loading), Structural Engineering applications-Beam analysis for skill development and employability.

Outcomes: After the completion this course, the students will be able to
CO1: Identify the uses Finite Element Analysis in civil engineering for skill development at national as well as international level.
CO2: Describe different techniques and procedure for skill development and employabilityof the Finite Element Analysis in civil engineering.
CO3: Apply principles of different Finite Element Formulation Techniquesof local levelfor skill development and employability.
CO4: Assess the Applications of FEM in civil engineering of local as well as global importance for skill development
CO5: Apply the knowledge to solve problems using various software tools for skill development and entrepreneurship developmentat national as well as international level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	3	3	3	2	3	1	3
CO2	3	3	2	3	1	2	2	2	3	1	3	3
CO3	3	3	3	3	3	3	1	2	3	1	2	3
CO4	3	1	3	3	3	1	1	2	2	2	2	3
CO5	3	3	1	1	1	3	1	3	2	3	3	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	2	1
CO5	3	2	3

Suggested Readings:

- Finite Element Analysis - Theory and Programming, C. S. Krishnamoorthy, Tata McGraw Hill
- Finite Element Procedures in Engineering Analysis, K.J. Bathe, Prentice Hall of India
- Elementary Finite Element Method, C.S. Desai, Prentice Hall of India
- Concepts & Applications of Finite Element Analysis, R. D. Cook, D.S. Malkus& M.F. Plesha,, John Wiley
- An Introduction to the Finite Element Method, J.N. Reddy, McGraw Hill, 2006.
- Introduction to Finite Elements in Engineering, T.R. Chandrupatla& A.D. Belegundu, Pearson

Note: Latest editions of all the suggested readings must be used.

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ECE073: ADVANCED FOUNDATION ENGINEERING L T P 3 1 0

Course Objectives:-
To study about the different exploration techniques and to estimate the capacity of shallow and deep foundations on expansive soil. The objective of this course is to learn about types and purposes of soil exploration methods and different foundation systems and structures. This course also deals with systematic methods for designing and evaluates the feasibility of foundation solutions to different types of soil conditions.

UNIT I **(8 Sessions)**
Site Exploration and Characterization Purpose and scope, influence of soil conditions and type of foundation on exploratory programme, project assessment, phasing of site exploration will develop skills, excavation and boring methods of exploration, types of samplers and their design features, subsurface soundings – static and dynamic methods, planning of subsurface investigations, type and sequence of operations, lateral extent and depth of exploration, interpretation of field and laboratory data

UNIT II **(8 Sessions)**
Consolidation :Terzaghi's theory of one-d consolidation – derivation of equation (solution in detail need not be covered), estimation of Cc and Cv from laboratory tests for better skilling of entrepreneurship, estimation of Pc by various methods, field consolidation curves,

UNIT III **(8 Sessions)**
Stress and Strain Behaviour of Soils Triaxial test for entrepreneurship and employability - drained and undrained behaviour of sands and clays, failure criteria in soils - only Mohr - Coulomb's criteria, ideal, plastic and real soil behaviour, shear strength of sands and clays.

UNIT IV **(8 Sessions)**
Estimation of Stresses Boussinesq's theory help to inculcate skills, vertical stress due to concentrated load, horizontal and shear stress due to concentrated load, Isobar diagram, vertical stress distribution on horizontal plane, influence diagram, vertical stress distribution on vertical plane,

UNIT V **(8 Sessions)**
Bearing Capacity and Settlement Analysis of Shallow Foundations provide knowledge for better employability .Modes of failure, failure criteria, – Terzaghi solutions, Vesic's solutions, IS Code recommendations, assumptions in estimates of ultimate loads, effect of shape, embedment of footing, eccentricity in loading, compressibility (including critical rigidity index), choice of factor safety, settlement of foundations on sand – Schmertmann method, Plate load test, evaluation of bearing capacity using standard penetration test, Housel Method

COURSE OUTCOMES
At the end of the course, students will be able to
CO1: Identify and select suitable exploration techniques for different projectsof local, global and national level importance for skill development and employability.
CO2: Evaluate the bearing capacity and settlement of shallow foundationsfor skill development and employability at local as well as global level.
CO3: Estimate the pile capacity and settlement of pilesof local as well as global level importancefor skill development and entrepreneurship development.
CO4: Understand the various components and forces acting on well foundationfor skill development and employability at local level.
CO5: Gain knowledgefor skill development and employability about different types of foundations in problematic soilat local as well global level importance.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	3	3	3	1	3	1	3
CO2	3	3	2	3	2	3	2	1	3	1	3	3
CO3	3	3	3	3	3	2	2	1	3	1	3	3
CO4	3	2	3	3	3	1	3	1	2	1	1	3
CO5	3	2	2	1	2	3	3	3	1	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	1
CO3	3	2	3
CO4	3	3	2
CO5	3	3	1

Suggested readings:-:

- Narayan V. Nayak, Foundation Design Manual for Practising Engineers and Civil Engineering Students,
- DhanpatRai Publications Pvt. Ltd., Fourth edition 1996 (Reprint 2001).
- Bowles. J.E., Foundation Analysis and Design, Tata McGraw-Hill International Edition,5th edition 1997.
- Das B.M., Shallow Foundations: Bearing capacity and Settlement, CRC Press,1999.

Website resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://nptel.ac.in/courses/105/101/105101001/
- https://nptel.ac.in/courses/105/105/105105176/
- https://onlinecourses.nptel.ac.in/noc20_ce52/preview
- https://www.geoengineer.org/education/soil-mechanics
- https://www.classcentral.com/course/swayam-soil-mechanics-geotechnical-engineering-i-10099

Note: Latest editions of all the suggested readings must be used.

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ECE074: INDUSTRIAL POLLUTION CONTROL L T P 3 1 0

Course Objectives:-
This course introduces various concepts of water efficiency and waste minimization in industrial sectors. Characterization and classification of different types of wastes are discussed along with existing norms for waste disposal. Treatment methods of specific pollutant arising out of industrial process are explained for better skilling of entrepreneurship and skill development.

UNIT I **(8 Sessions)**
Industrial wastes & their sources: various industrial processes, sources and types of wastessolid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial processes requiring water use and water quality

UNIT II **(8 Sessions)**
Processes responsible for deterioration in water quality, various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc.
Wastewater re-uses & recycling for skill development, concept of zero discharges effluent.

UNIT III **(8 Sessions)**
Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management.

UNIT IV **(8 Sessions)**
Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries for employability and entrepreneurship, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

UNIT V **(8 Sessions)**
Environmental audit: definitions and concepts, environmental audit versus accounts audit for entrepreneurship and skill development, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000 for skill development.

Outcomes: After the completion of this course students will be able to
CO1: Analyze and industrial activity and identify the environmental problems for skill development at local level..
CO2: Model the atmospheric dispersion of air pollutants for skill developmentat local level.
CO3: Plan strategies to control and reduce pollution for skill development and employability at local level.
CO4: Select the most appropriate technique of local as well as global level for skill development and employability to control and treat industrial pollution
CO5: Apply environmental management systems (EMS) to an industrial activity of local and national level for skill development and employability

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	3	3	3	2	3	2	3
CO2	3	3	2	3	1	2	3	2	3	1	3	2
CO3	3	3	3	1	3	3	3	2	3	1	1	3
CO4	3	1	3	3	3	2	3	2	2	2	2	2
CO5	3	2	1	2	2	3	3	3	1	2	2	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	1	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	1

Suggested readings:

1. "Industrial Wastewater Management Handbook",HardomSinghAzad, Editor-in-Chief, McGraw Hill, New York.
2. "Wastewater Reuse and Recycling Technology-Pollution Technology Review-72, Culp, Gordan,
3. "The Treatment of Industrial wastes". B.Edmund , P.E. Besselieve ; McGraw Hill, New York.
4. "Industrial Pollution Control –Issues and Techniques". Nancy, J. Sell, Van Nostrand Reinhold Co, NY.

Web sources:

- https://nptel.ac.in/courses/103/107/103107084/
- https://nptel.ac.in/courses/123/105/123105001/

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ECE075: PRE-STRESSED CONCRETE STRUCTURES L T P 3 1 0

Course Objective:

The main objective of this course is to introduce

- To familiarize the students with concept of basic concepts pre-stressed concrete
- To Explain the effects of prestress on the behaviour of concrete beams and identify situations when prestress is needed
- To impart knowledge to design pre-stressed concrete structures.

UNIT I **(8 Sessions)**

Introduction to prestressed concrete: Basic concept and general principles, materials used and their properties, methods, techniques and systems of prestressing will develop skills

UNIT II **(8 Sessions)**

Analysis of prestressed concrete sections provide knowledge for better employability: Loading stages and computation of section properties, critical section under working load for pre tensioned and post tensioned members, stress method, load balancing method and internal resisting coup

UNIT III **(8 Sessions)**

Loss of prestress: Loss of stresses doe to elastic deformation of concrete, creep in concrete, creep in steel, shrinkage in concrete, relaxation in steel, anchorage slip and friction provide entrepreneurship skills and employability

UNIT IV **(8 Sessions)**

Deflections of prestressed concrete members: Short time and long time deflection, deflection of uncracked sections, uni-linear and bi-linear methods for cracked sections help in understanding of entrepreneurship skills.

UNIT V **(8 Sessions)**

Design of prestressed concrete sections for flexure in working stress and limit state method help in skill development: General philosophy of design, permissible stresses in concrete and steel, suitability of section, safe cable zone, design of simply supported pretension and post tension slabs and beams using limit state method Design for shear: Calculation of principle tension under working load, permissible principle tension, shear strength calculation under limit state of collapse for both sections cracked and uncracked in flexure..

Course outcomes:

After completion of this students will be able to:

CO1: Understand the behaviour of pre-stressed concretefor skill development and employabilityat local level.
CO2: Design pre-stressed concrete structures for skill development and employabilityat local level.
CO3: To define and determine the different types of losses of pre-stressed concrete for skill development and employabilityat local level as well as global level importance.
CO4: To define and determine method of pre-stressed concrete of local as well global forskill development and employability
CO5: Analysis the method and design and calculation under limits state for skill development and employability at national level

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	3	3	3	3	3	1	3	3
CO2	3	3	2	2	3	1	3	1	3	3	3	3
CO3	3	3	3	3	3	3	3	1	2	1	1	2
CO4	3	3	2	3	3	2	3	3	3	3	1	3
CO5	3	3	3	3	2	3	3	3	3	3	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	1
CO3	3	1	1
CO4	3	3	1
CO5	3	1	1

Suggested readings:

1. "Prestressed Concrete": N. Krishna Raju, McGraw Hill, New York.
2. "Prestressed Concrete": N. Rajgopalan, Narosa Publishing House.
3. "Fundamentals of Prestressed Concrete": Sinha N.C & S.K. Roy, S.C. Chand & Company.
4. "Prestressed Concrete Structures": Dayaratnam P, Oxford &mH
5. "Design of Prestressed Concrete Structures": T.Y.Lin& N.H. Burns, John Willey, New York.

Website resources:

- http://nptel.ac.in/courses/105106118/
- https://pec.ac.in
- https://nptel.ac.in/courses/105/106/105106117/
- https://www.bitmesra.ac.in/

Note: Latest editions of all the suggested readings must be used.

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ECE076: ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES L T P 3 1 0

Course Objective:-
Demonstrate and understanding of advanced fluid mechanics principles.Implementation of geotechnical engineering principles. To get knowledge of various types of dam .Understand the different elements of dam.

UNIT I **(8 Sessions)**
Canal head works: Introduction, layout, selection of site for diversion head work, various components and their functions, design of weirs and barrages on permeable foundation, Bligh's creep theory, Khosla's method of independent variables, use of Khowsla's charts, silt ejectors and their design principles for skill development and employability.

UNIT II **(8 Sessions)**
Canal falls: Necessity and location of canal falls, types, design of Sarda and Glacis falls, energy dissipation devices and arrangement.

UNIT III **(8 Sessions)**
Canal regulation works: Canal head regulators and cross regulators, their functions and design concepts, Cross drainage works, Introduction, types of cross drainage works and their selection, design aspects of aqueducts, siphon aqueducts, supper passages, canal siphon and level crossings.

UNIT IV **(10 Sessions)**
Storage works: Investigation and planning for reservoirs for employability and entrepreneurship, capacity and yield, storage works, types of dams and their choice, selection of suitable site.
Gravity dams: Two dimensional design, stability criteria and foundation treatment.
Earth dams: Design aspects of earth dams, simple design, seepage through earth dams, control seepage, design of filters for employability and entrepreneurship.
Arch dams: Constant angle and constant arch dams (simple design and sketch), buttress and multiple arch dams (principle and sketch).

UNIT V **(6 Sessions)**
Spillway and stilling basins: Introduction, spillway capacity, different types, energy dissipation below spillways, stilling basins: type-I and II, gates and valves aerators.

COURSE OUTCOMES:
On the completion of the course one should be able to understand:
CO1: Select hydraulic structural elementsfor skill development and employability at local level.
CO2: Evaluate surface water damfor skill development and employability at local level.
CO3: Be able to integrate relevant concept and methodologies in the area of hydraulics, hydrology and geotechnical engineeringof local as well as global level for skill development and employability.
CO4: Be able to select the type of dam, design and to constructpilesof local, national and international level for skill development and entrepreneurship development.
CO5: Understand the various types of spillway and capacityfor skill development and employability at local level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	1	3	2	1	3

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CO3	3	3	3	2	3	3	3	1	3	1	3	3
CO4	3	3	3	3	3	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	1
CO2	3	3	1
CO3	3	2	3
CO4	3	3	1
CO5	3	3	1

Suggested readings:

- "Elementary Hydrology", Singh, V.P., Prentice Hall
- "Applied Hydrology", V.T. Chow, D.R. Maidment and W.L., Mays, "McGraw Hill.
- "Hydrology", M.Wanielista, R. Kersten and R. Eaglin John Wiley & Sons.
- "Engineering Hydrology" C.S.P. Ojha, R. Berndtsson and P. Bhunya, Oxford University Press.

Website resources:

- https://public.wmo.int/en/resources/bulletin/hydrology-distance-learning-courses-indian-and-international-professionals
- https://civilenggforall.com/hydrology-civil-engineering-gate-2020-study-material-free-download-pdf-civilenggforall/
- https://nptel.ac.in/courses/105/104/105104029/

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ECE077: PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE **L T P 3 1 0**

Course Objective:-
To introduce the students the town planning and design of large-scale buildings with high degree of complexity by understanding architectural, socio-cultural, and economic issues connected with architecture for skill development and foe better skilling of entrepreneurship. Integrated approach to design encompassing site planning, building design, environment and services

UNIT I **(7 Sessions)**
Principles of town planning, Land use patterns, Population survey, Density concepts, and transportation planning,

UNIT II **(8 Sessions)**
Concept of habitat including environmental pollution, problems of metropolis, Satellite town concepts, Garden city movement, Neighbourhood planning, Brief history of architecture for skill development,

UNIT III **(8 Sessions)**
Impact of development of materials through ages, Evolution of architectural forms, Anesthetics and functional proportions,

UNIT IV **(9 Sessions)**
Principles of architecture Design for skill development and entrepreneurship, Building Bye-Laws, Scale, Forms, Texture, Colour, Balance, Composition of Space, Role of architects and town planners,

UNIT V **(8 Sessions)**
Architectural Drawing for skill development and entrepreneurship, Different symbols used in building industry, Design of typical buildings such as school, hospital, residential and commercial complex, etc.

Course Outcome
CO1: The course is intended to provide the students an overview and population of surveyof local as well as global level for skill development and employability.
CO2: Understanding of the History of Town Planning Politics and policy making in modern cities and to assess modern and contemporary theories of Town and Country Planningfor skill development and entrepreneurship development at national as well as international level.
CO3: To get the knowledge of the architectural forms and functional for skill development and employability.
CO4: Knowledge of the process involved in a balance, scale and design problem with emphasis on town planningof local level forskill development and employability.
CO5: Understanding of the architectural drawing, and symbols design of different types of building for skill development and entrepreneurship development at local as well as national level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	3	3	3	3	2	3	3	2
CO2	2	1	1	2	3	3	3	3	3	3	1	3
CO3	3	3	3	1	3	1	3	3	3	3	1	2
CO4	3	3	3	3	3	3	3	1	1	1	3	1
CO5	3	3	3	1	3	3	3	1	3	1	3	3

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	1	3
CO3	3	3	1
CO4	3	3	2
CO5	3	1	3

Suggested readings:

- "Principles of Town Planning and Development:; BiswasHiranmay
- "Fundamentals of Town Planning"; G.K.Hiraskar
- "Principlesof Architecture"; G.MuthuShoba Mohan

Website Sources:

- https://en.wikipedia.org/
- https://ts-nitk.vlabs.ac.in/transportation-engineering/
- https://civildigital.com/powerpoint-presentations/transportation-engineering-ppts/

Note: Latest editions of all the suggested readings must be used.

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ECE078: PRECAST AND MODULAR CONSTRUCTION PRACTICES L T P 3 1 0

Course Objectives:-To introduce the Building with Precast concrete components is as much old as constructing with concrete.Precast concrete construction however now has increased by leaps bounds and has taken industrialized form owing to development of heavy lifting equipment mechanized steel moulds, automated manufacturing systems. Precast concrete construction these days most sought after construction practice by developers as it facilitates construction, factory production presents excellent conditions for their use.

UNIT I **(7 Sessions)**
Overview of reinforced and prestressed concrete construction understanding for entrepreneurial & skill development. Design and detailing of recast / prefabricated building components.

UNIT II **(5 Sessions)**
Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance for better skilling of entrepreneurship.

UNIT III **(7 Sessions)**
Use of equipments in precast prefabricated structure, Productivity analysis, for better skilling of entrepreneurship Economics of form work, Design of Formwork and their reusability.

UNIT IV **(6 Sessions)**
Modular construction skill development and employability Practices, Fibonacci series, its handling and other reliable proportioning concepts.

UNIT V **(7 Sessions)**
Modular coordination, Standardization will prove skill system building, Lamination and Advantages of modular construction.

Course Outcomes
On completion of this course, the students will be able to
CO1: Understanding the for Building with Precast concrete components of local as well as global level for skill development and employability
CO2: To develop increased by leaps bounds and has taken industrialized form owing to skill development and employability at local level.
CO3: Understand optimization techniques and use for equipments in structure for skill development and entrepreneurship at national level importance.
CO4: Analysing the processes for skill development and employability for reliable proportioning conceptsof local as well as global level.
CO5: Developers as it facilitates construction, factory production presents excellent for employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	3	3	3	2	3	2	3
CO2	3	3	2	3	2	2	3	3	3	2	1	3
CO3	3	3	3	2	3	3	1	1	3	1	3	3
CO4	3	2	3	3	2	1	2	1	2	1	3	3
CO5	3	2	1	1	3	3	3	3	2	3	3	3

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	2
CO3	2	2	3
CO4	3	3	1
CO5	1	2	3

Reference Books:

- Handbook of low cost housing by A K Lal
- 2. Precast Concrete Structures by Kim Elliot

Website Sources:

- https://en.wikipedia.org/Precast and Modular Construction Practices
- https://ts-nitk.vlabs.ac.in/ Precast and Modular Construction Practices
- https://civildigital.com/powerpoint-presentations/Precast and Modular Construction Practices -ppts/

Note: Latest editions of all the suggested readings must be used.

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ECE079: GROUND IMPROVEMENT TECHNIQUES **L T P 3 1 0**

Course Objective:

- To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques for skill development.
- To bring out concepts of reinforced earth for employability.
- Applications of geotextile will develop skill and entrepreneurship in various civil engineering projects.

UNIT I **(08 Session)**

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime will develop skills, soil-cement, soil-bitumen and soillime flyash mixes.

UNIT II **(08 Session)**

Insitu densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation for skill development and employability, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement.

UNIT III **(08 Session)**

Insitu densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method for skill development and employability.

UNIT IV **(08 Session)**

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout Granular Piles: Ultimate bearing capacity and settlement, method of constructionwill develop skill and entrepreneurship, load test.

UNIT V **(08 Session)**

Underpinning of foundations: importance and situations for underpinning, methodology, typical examples. Geotextiles: types, functions, specifications, precautions in transportation and storage will develop skill and entrepreneurship.

Course Outcomes (CO):

CO1: Analyze the practical applications for skill development of reinforced soil and grid reinforced soils for better strength and durability of soils

CO2: Understand the concepts for skill development and employability at local as well as global level of In-situ densification methods in granular soils.

CO3: Understand the concepts for skill development and employabilityat local as well as global level of In-situ densification methods in cohesive soils.

CO4: Understand the various grouting techniques and its applications for improving loadbearing of beneath soils for skill development and entrepreneurship developmentat local as well as global level.

CO5: Will gain competence in properly devising alternative solutions to difficult and earth construction problems and in evaluating their effectiveness before, during and after construction for skill development and entrepreneurship developmentat local as well as global level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	2	2	1	2	1	2	2
CO2	3	2	3	2	2	1	1	2	2	1	1	2
CO3	3	2	3	1	2	1	1	2	2	1	1	1

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CO4	3	3	2	1	1	1	2	1	1	2	2	1
CO5	3	3	2	2	1	1	2	1	2	1	1	1

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	2	3
CO5	3	2	3

Suggested Reading:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. GopalRanjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergadoet. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

Website Source:
https://nptel.ac.in/courses

Note: Latest editions of all the suggested readings must be used.

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ECE079 (A): TUNNEL ENGINEERING **L T P 3 1 0**

Course Objective:
The aim of the course is to provide students with: a broad knowledge in all aspects of tunneling i.e. planning, design and construction; and deeper knowledge in four areas of tunneling:

- excavation with drilling and blasting method,
- design of support will develop skill and entrepreneurship
- hydrogeology, water related problems and grouting and
- Tunnel cost and time planning and risk management will develop skills.

UNIT I **(08 Session)**
Site investigations, Geotechnical Considerations of tunneling for skill development. Benefit from the Tunneling, Notation, Cross Section and Alignment, Cost and Planning of Tunneling.

UNIT II **(08 Session)**
Design of Tunnels will develop skill and entrepreneurship. Submerge floating tunnel.Construction of Tunneling, Installation in Tunnel, Drainage System in Tunnel, Joints and Weathering.

UNIT III **(08 Session)**
Construction & Excavation methods, soft ground tunnels, Rock tunnels for skill development and employability.Installation for Traffic Control, Fire Control and Road in Tunnel, Shotcrete, Steel Fibre Reinforcement Shotcrete (SFRS), Quality Assessment of Shotcrete

UNIT IV **(08 Session)**
Micro tunneling techniques, Tunnel support design for skill development and employability. Grouting in Tunnel, Timbering in Tunnel, Grouting in Tunnel, Jet Grouting.

UNIT V **(08 Session)**
Ventilation of tunnels, tunnel utilities, safety aspects for skill development and employability. Bolting in Tunnel, Q System, Rock Rating and Classification.

Course Outcomes (CO):
After completion of the course, students will be able to:-
CO1: compare various types and purpose of tunnels for skill development at local level.
CO2: Design tunnel reinforcement based on empirical, analytical and numerical assessment depending on complexity and acquires a holistic perspective on the design processfor skill development and entrepreneurship development.
CO3: Evaluate tunnel excavation method from technical and production aspectsfor skill development.
CO4: Analyze cost and time for ordinary tunnels based on risks and construction management principlesfor skill development and employability. .
CO5: Analyse water ingress to tunnels and identify possible water related problems for excavation, as well as plan and implement suitable tunnel draining and/or grouting methodsfor facing global challenges and for skill development and employability. .

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	2	2	2	1	2	1
CO2	3	2	3	1	2	1	1	1	1	2	1	2
CO3	3	2	2	2	2	2	1	1	1	2	1	1
CO4	3	3	3	1	1	2	2	2	2	1	2	2
CO5	3	3	2	2	2	1	2	1	2	1	1	1

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	3
CO3	3	2	1
CO4	3	3	1
CO5	3	3	2

Suggested Reading:

- Tunnel Engineering Handbook by J O Bickel & T R Kuesel
- Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski
- Harbour & Dock & Tunnel by R. Srinivasan
- Tunnel Engineering by S.C. Saxena

Website Source:
https://onlinecourses.nptel.ac.in
https://aktu.ac.in

Note: Latest editions of all the suggested readings must be used.

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ECE079(B): RURAL DEVELOPMENT ENGINEERING **L T P 3 1 0**

Course Objective: The objectives of this course are:

- The students will develop skillswho undergo this programme are able to understand the issues prevailing in rural areas
- Students will develop skill and employability to invent solutions for better rural housing development.

UNIT I **(08 Session)**

Rural Development Planning and Concept of Appropriate Technology: Scope; development plans; various approaches to rural development planning; concept of appropriate technology. Rural development programme/ projects will develop skill and employability.

UNIT II **(08 Session)**

Rural Housing: Low cost construction materials for housing; Architectural considerations for individual and group housing will develop skill and entrepreneurship; Composite material - ferro-cement & fly ash, autoclaved calcium silicate bricks and soil-stabilized un-burnt brick; Plinth protection of mud walls; design consideration and construction of: non-erodable mud plaster, Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry,Panels for roof, ferro-cement flooring / roofing UNIT s, Earthquake resistant measures for low cost houses.

UNIT III **(08 Session)**

Water Supply and Rural Sanitation: Sources of water. BIS & WHO water standards. Quality, Storage and distribution for rural water supply works; basic design principles of treatmentlow cost water treatment technologies; conservation of water; rainwater harvesting; drainage in rural areas, low cost waste disposal systems; septic tank for skill development and employabilit ; Biogas technology; low cost commUNIT y & individual Garbage disposal systems, Ferro-cement water storage tanks.

UNIT IV **(08 Session)**

Low Cost Roads and Transport: Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases, Bituminous Construction, Surface Treatments for roads in rural areas for better skilling of entrepreneurship. Soil Stabilization, Lime, Lime Flyash and Cement Treated Course. Crusher-run-Macadam. Use of local materials. Flexible Pavement: Design factors, Basic Principles, Guidelines for Surfacing for Rural Road.

UNIT V **(08 Session)**

Low Cost Irrigation: Consideration of low cost irrigation techniques, drip & sprinkler irrigation systems will develop skill and employabiliy.Watershed and catchments area development - problems and features of watershed management, watershed structures.

Course Outcomes (CO):

CO1: Understand the concepts for skill development and employabilityat local levelof Rural Development Planning and Concept of Appropriate Technology.
CO2: Apply the concept of rural housing for low construction materials of national level for skill development and entrepreneurship development of national as well as international level.
CO3: Understands the concept of source of water, BIS & WHO water standards. And Quality, storage and distribution for rural water supply worksfor skill development and employabilityat local as well as global level.
CO4: To enhance critical thinking by making them participate in social activities and imbibe human values among themfor skill development at local as well as global levelt.
CO5: To encourage the students to participate in research at different levels through projects, interviews, surveys and field visits them for skill development and entrepreneurship development.

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(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	2	1	1	2	2	2	2
CO2	3	2	3	2	2	1	2	2	2	1	1	2
CO3	3	2	2	1	2	2	1	2	2	1	1	1
CO4	3	3	2	1	1	1	2	1	1	2	2	2
CO5	3	3	2	2	1	1	2	1	2	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	3
CO3	3	3	1
CO4	3	2	1
CO5	3	2	3

Suggested Reading:

1. A.G.MadhovRao, D.S.Ramachandra Murthy, Appropriate Technologies for low cost Housing Oxfordand IBH Publishing Co. Pvt .Ltd.
2. CBRI, Roorkee, Advances in Building Materials and Construction.
3. C. Satyanarayana Murthy, Design of Minor Irrigation and Canal Structures. Wiley Eastern Ltd.,
4. Water supply and sanitary engineering by Rangwala, .Charotar publication
5. Rural Infrastructure by P.Nair, SBS Publication
6. Rural Infrastructure by SamaliaBihariVerma, Gyaneshwar Prasad & Sahib Kumari Singh, Sarup& Sons.
7. Rural Development by Katar Singh, SAGE Publication

Website Source:

https://nptel.ac.in/courses
https://www.nbu.ac.in/doc/acr/syllabus/PG_RuralDevelopment.pdf
https://www.kopykitab.com/Rural-Development
https://www.nbu.ac.in/doc/acr/syllabus/PG_RuralDevelopment.pdf

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ECE079(C): RIVER ENGINEERING L T P 3 1 0

Course Objective: The objectives of this course are:

- To understand the behaviour of alluvial rivers, morphological processes, sediment movementwill develop skills.
- To assess channel instability for skill development and employability
- To analyze flood management techniquesfor skill development.

UNIT I **(08 Session)**

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes will develop skills.

UNIT II **(08 Session)**

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control for skill development and employability.

UNIT III **(08 Session)**

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration for skill development.

UNIT IV **(08 Session)**

Bio-engineering Techniques, Classification review; Natural Channel Design Analysis will develop skill and employability, Time Series, Analysis of flow, Sediment and channel geometry data.

UNIT V **(08 Session)**

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band will develop skill, embankment and spurs/dampners and other river/ flood protection works.

Course Outcomes (CO):

CO1: Apply the governing principles of morphological processes for skill developmentat local as well as global level.
CO2: Estimate river shear stress, grain entrainment, dominant discharge and perform stream flow analysisfor skill development and employabilityat national level importance.
CO3: Explain socio-cultural influences and ethics of stream restorationswill skill development at local as well as global level.
CO4: Assess channel instabilityof local level importance for skill development and employability.
CO5: Assess different flood management techniquesfor skill developmentat local level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2	2	2	1	2	2	2	2
CO2	3	2	3	2	1	1	2	2	2	1	2	2
CO3	3	2	2	2	1	1	2	3	1	3	1	1
CO4	3	3	3	2	3	2	1	1	2	1	2	2
CO5	3	2	2	2	3	1	2	1	2	2	2	2

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	2	1
CO4	3	3	1
CO5	3	3	1

Suggested Reading:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson
4. Principles of River Engineering by (the non tidel alluvial) PH Jameen.

Website Source:

https://nptel.ac.in/courses

Note: Latest editions of all the suggested readings must be used.

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ECE079(D): MODERN CONSTRUCTION MATERIALS

L T P 3 1 0

Objective: To study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non-weathering materials, and smart materials.

UNIT I **(8 Sessions)**

Introduction, properties and uses of modern building materials: fly ash bricks, soil – cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC), glass reinforced gypsum for skill development. Transparent concrete and bacterial concrete. Modeling of shallow water flow in bays. Modern Concepts Of Rural Road Development.

UNIT II **(8 Sessions)**

Introduction, properties and use of geosynthesis bituminous material, fire resistant materials (chemicals, paint, tiles, bricks, glass), metals, light-weight concrete, mass concrete, and waste material based concrete provide knowledge for better employability. Modern Construction Materials and Techniques, Monolithic Concrete Domes.

UNIT III **(8 Sessions)**

Introduction, properties and use of: Ferro cement &fibre reinforced concrete, different types offibres, high density concrete, Nuclear concrete, heat resisting & refractory concretes, Prefabricated systems for better skilling of entrepreneurship.Microfluidics Micromechanics to develop high-performance fiber reinforced cementitious composite

UNIT IV **(8 Sessions)**

Introduction, properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), sulphur concrete and sulphur - infiltrated concrete help in skill development.Natural Fibres in Concrete.

UNIT V **(8 Sessions)**

Introduction, properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials thermal, sound and electrical insulating materials) help in understanding entrepreneurship skills, Concept of polymer floor finishes.

Course Outcomes:

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

CO1: Understand the use of modern construction materials for skill development at local as well as global level.

CO2: Use geosynthetics and bituminous materials in constructions provide employability.

CO3: Apply knowledge of modern materials in production of variety of concrete help in skill development and employabilityat local as well as global level.

CO4: Apply knowledge of composites and chemicals in production of modern concrete for skill development and entrepreneurshipat national and international level.

CO5: Use modern water proofing and insulating materials in constructions help in providing employability at local level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	3	2	2	1	2	1	3	2
CO2	3	1	1	1	3	2	2	1	2	2	1	3

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CO3	3	1	1	1	2	2	3	2	3	2	1	1
CO4	3	2	1	1	3	2	2	1	2	1	1	2
CO5	3	1	1	1	2	2	3	1	1	2	2	2

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	2	3	1
CO3	3	3	2
CO4	3	1	3
CO5	2	3	1

Suggested readings:

- GhambhirM.L."Concrete Technology" Tata McGraw Hill education private Limited.
- A.R. Santhakumar, Concrete Technology, Oxford University Press.
- Building Materials, P.C. Varghese, Prentice-Hall India.
- Shetty, M. S., "Concrete Technology" S. Chand Publication.
- Krishnaraju .N., Advanced Concrete Technology, CBS Published.

Website resources:

- https://archive.nptel.ac.in/courses/105/106/105106053/
- https://edurev.in/studytube/Modern-Construction-Materials/05be6271-241e-440a-bf95-49962baa5e38_p

Note: Latest editions of all the suggested readings must be used.

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ECE079 (E): SENSOR AND INSTRUMENTATION TECHNOLOGIES FOR CIVIL ENGINEERING APPLICATIONS

L T P 3 1 0

Course Objectives:-

Design and set up measurement systems and to evaluate the performance of the sensor installation

UNIT I **(8 Sessions)**

Fundamentals of Measurement, Sensing and Instrumentation covering definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics develop the skills, Permanent installations, Temporary installations;

UNIT II **(8 Sessions)**

Sensor Installation and Operation covering to: Predict the response of sensors to various inputs; Construct a conceptual instrumentation and monitoring program; Describe the order and methodology for sensor installation; for skill development and for better skilling of entrepreneurship and Differentiate between types of sensors and their modes of operation and measurement and Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty

UNIT III **(8 Sessions)**

Data Analysis for skill development and for better skilling of entrepreneurship and Interpretation covering Fundamental statistical concepts, Data reduction and interpretation, Piezometer, Inclinometer, Strain gauge, etc.
Use of strain gauges and calculation of bending moment using it. Self calibration, Self testing and self-communicating

UNIT IV **(8 Sessions)**

Time domain signal processing, Discrete signals, Signals and noise and a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range)

UNIT V **(8 Sessions)**

Frequency Domain Signal Processing and Analysis covering Explain the need for frequency domain analysis and its principles; Draw conclusions about physical processes based on analysis of sensor data develop the skills; Combine signals in a meaningful way to gain deeper insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution

Course Outcomes:

CO1: Analyze the errors during measurements will helpful to make student employable at local level.
CO2: Describe the measurement of electrical variables develop the skillsat local as well as global level.
CO3: Describe the requirements during the transmission of measured signals entrepreneurship development.
CO4: Construct Instrumentation/Computer Networks will helpful to make student employable at local level.
CO5: Suggest proper sensor technologies for specific applications develop the skillsat local as well as global level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	3	3	3	1	2	1	1	3
CO2	3	3	2	1	3	2	2	2	1	2	1	2
CO3	3	3	1	2	2	3	3	1	2	1	1	3

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CO4	3	2	2	1	3	2	3	1	2	1	1	3
CO5	3	3	1	2	3	3	2	1	1	2	2	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	2	**3**	2
CO2	**3**	1	2
CO3	2	**3**	1
CO4	**3**	2	2
CO5	2	1	**3**

Books and References:

Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis
Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of all the suggested readings must be used.

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ECE079(F): NOISE AND AIR POLLUTION CONTROL

L T P 3 1 0

Objective: The purpose of this course is to give the students an overview of air and noise pollution including methods for prevention, control, measures and management of the pollution.

UNIT I **(8 Sessions)**

Air pollution: composition and structure of atmosphere, global implications of air pollution, classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photochemical oxidants. Indoor air pollution. Effects of airpollutants on humans, animals, property and plants provide knowledge for better employability

UNIT II **(8 Sessions)**

Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence for skill development, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

UNIT III **(8 Sessions)**

Ambient air quality and standards, air sampling and measurements. Control of particulate air pollutants using gravitational settling chambers for skill development and entrepreneurship, cyclone separators, wet collectors, fabricfilters (Bag-house filter), electrostatic precipitators (ESP)

UNIT IV **(8 Sessions)**

Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons.
Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications for better employability

UNIT V **(8 Sessions)**

Noise pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoorand indoor noise propagation; psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods for better skilling of entrepreneurship

Course Outcomes:

At the end of the course, the student will be able to:
CO1: Understand air pollutants and their impacts for building models for skill developmentat local as well as global level.
CO2: Explain air pollution chemistry and meteorological aspects of air pollutants of local as well as national level forentrepreneurship and skills development
CO3:.Demonstrate methods for controlling particulate air pollutants for employability at local level
CO4:.Demonstrate methods for controlling gaseous air pollutants for skill development and employabilityat local as well as global level.
CO5: Understand automotive emission standards.Apply methods for controlling noise pollution for skill development at local as well as global level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	2	3	2	3	2	1	1
CO2	2	1	1	1	2	2	3	1	1	2	1	1
CO3	3	2	2	2	3	2	3	1	2	3	1	1

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CO4	3	3	3	2	2	2	3	1	1	2	2	2
CO5	3	1	1	1	2	1	3	1	2	2	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	1	2
CO2	3	2	3
CO3	1	3	2
CO4	3	3	1
CO5	3	1	2

Suggested readings:

- Peavy, Rowe and Tchobanoglous: Environmental Engineering.
- Martin Crawford: Air Pollution Control Theory.
- Wark and Warner: Air Pollution: Its Origin and Control.
- Rao and Rao: Air Pollution Control Engineering.
- Nevers: Air Pollution Control Engineering.
- Mycock, McKenna and Theodore: Handbook of Air Pollution Control Engineering and
- Technology.Suess and Craxford: W.H.O. Manual on Urban Air Quality Management
- C.S. Rao, Air pollution and control

Website resources:

- https://www.europarl.europa.eu/factsheets/en/sheet/75/air-and-noise-pollution
- https://www.eea.europa.eu/articles/noise-pollution-is-a-major
- https://archive.nptel.ac.in/courses/105/107/105107213/

Note: Latest editions of all the suggested readings must be used.

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ECE079 (G): RAILWAY ENGINEERING **L T P 3 1 0**

Objective:. The main objective of this subject is to provide knowledge to the student about the basic rail concept and its design features. The geometric design concept of railway engineering and the track layout concept will help them to learn about railway engineering

UNIT I **(8 Sessions)**

Components of Railway Engineering: Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast for skill development and entrepreneurship–Rail Fastenings. Track resistance, Track modulus, Stresses in track.

UNIT II **(8 Sessions)**

Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Coning of the wheels, Hauling capacity, Rail joints for skill development. Creeps in rails, wears and failures in rails, train controlling system, jointed or welded rails.

UNIT III **(8 Sessions)**

Geometric Design of Railway Track: Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves provide knowledge for better employability.Calculation of speed on track, design of turnout

UNIT IV **(8 Sessions)**

Turnouts &Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals for better skilling of entrepreneurship.Branching of Tracks-Points and crossing.

UNIT V **(8 Sessions)**

Signaling systems – Mechanical signaling system – Electrical signaling system – System for Controlling Train Movement – Interlocking – Modern signaling Installations for understanding of skill development and entrepreneurship.

Course Outcomes:

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

CO1: Gain the knowledge about the basic concept of components of railway engineering for building skill and entrepreneurship development at local as well as global level.

CO2: Understand the concept related to theories related to creep of local as well as national level forentrepreneurship and employability

CO3:.Understand the concept of geometric design of railway track for developing models related to employability at local level.

CO4: Create the track layout concepts for skill development and entrepreneurship skills.

CO5: Understand about the signaling system concept for skill developmentat local as well as global level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	3	2	2	1	2	1	3	2
CO2	3	1	1	1	3	2	2	1	2	2	1	3
CO3	3	1	1	1	2	2	3	2	3	2	1	1
CO4	3	2	1	1	3	2	2	1	2	1	1	2
CO5	3	1	1	1	2	2	3	1	1	2	2	2

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	3
CO2	1	3	3
CO3	2	3	2
CO4	3	1	3
CO5	3	2	1

Suggested readings:

- Railway Engineering. 1. " Principles Of Railway Engineering" by Rangawala S C ...
- Track Engineering. 1. "Railway Track Engineering" by J S Mundrey. ...
- Rail Vehicle Dynamics. 1. "Rail Vehicle Dynamics" by Klaus Knothe and Sebastian Stichel.

Website resources:

https://nptel.ac.in/
https://www.edx.org/learn/railway-engineering

Note: Latest editions of all the suggested readings must be used.

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ECE079 (H): AIRPORT ENGINEERING

L T P 3 1 0

Objective: The module introduces the Airport planning issues along with the designing of Runway. The visual aids required from Airport Traffic operating are dealt with. The necessary inputs required for efficiency drainage system has significance in maintenance the airport.

UNIT I **(8 Sessions)**

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

UNIT II **(8 Sessions)**

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

UNIT III **(8 Sessions)**

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

UNIT IV **(8 Sessions)**

Visual Aids: General- Airport Marking- Airport lighting for skill development.

UNIT V **(8 Sessions)**

Airport Grading And Drainage: General- Computation of Earthwork- Airport Drainage- Special Characteristics and Requirements of Airport Drainage- Design Data- Surface Drainage Design Subsurface Drainage Design for building models for entrepreneurship development

Course Outcomes:

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

CO1: Gain the knowledge about the airport planning basic concept for skill developmentat local as well as global level.

CO2: Understand the concept of runway design for strategic alliance of entrepreneurship and skill development.

CO3:.Understand the concept of structural design of airport pavement for building models for employability at local level.

CO4: Create the knowledge about the airport marking and lightning techniques for skill developmentat local as well as global level. .

CO5: Understand the concept of airport grading and drainage scheme for entrepreneurship development and employability at national level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	2	3	2	3	2	1	1
CO2	2	1	1	1	2	2	3	1	1	2	1	1
CO3	3	2	2	2	3	2	3	1	2	3	1	1
CO4	3	3	3	2	2	2	3	1	1	2	2	2
CO5	3	1	1	1	2	1	3	1	2	2	3	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	1	2
CO3	2	3	2
CO4	3	1	2
CO5	1	3	3

Suggested readings:

- Airport Planning and Designing by S.K. Khanna, M.G. Arora.
- Highway Engineering including Expressways and Airport Engineering by Dr. L. R. Kadyali, Dr. N. B. Lal.
- Highway Engineering including Airport Pavements by Dr. S. K. Sharma.
- Transportation Engineering by S. P. Chandola.
- Planning and Design of Airports, Fifth Edition: Robert Horonjeff, Francis McKelvey, William Sproule, Seth Young.
- Airport Engineering: Planning, Design and Development of 21st Century Airports: Norman J. ...
- AIRPORT PLANNING AND MANAGEMENT 6/E: Seth Young, Alexander Wells.

Website resources:

https://www.aboutcivil.org/airport-engineering-definitions
https://www.youtube.com/watch?v=WUq3uN4MDms

Note: Latest editions of all the suggested readings must be used.

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ECE079 (I): DIGITAL IMAGE PROCESSING L T P 3 1 0

Course Objectives:

- To get exposed to simple image enhancement techniques in Spatial and Frequency domainto develop skill employability.
- To learn concepts of degradation function and restoration techniquesfor employability.
- To study the image segmentation and representation techniquesto provide better employability and entrepreneurship development.
- To become familiar with image compression and recognition methods for skill development and employability.

UNIT I **(08 Session)**

Digital Image fundamentals: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels for skill development and employability - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II **(08 Session)**

Image Enhancement : Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement for skill development and employability

UNIT III **(08 Session)**

Image Restoration: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering for skill development and employability

UNIT IV **(08 Session)**

Image Segmentation: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm for skill and entreprenéurship development.

UNIT V **(08 Session)**

Image compression and recognition

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching. Hyper-spectral Image Analysis and Radar image analysis: Atmospheric correction – Hyper-spectral image analysis techniques to develop skills and entrepreneurship.

Course Outcomes:

At the end of the course, the students should be able to:

CO1: Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms for skill and entrepreneurship developmentat local as well as global level.

CO2: Operate on images using the techniques of smoothing, sharpening and enhancement will able to develop skill and employabilityat local as well as global level in students.

CO3: Understand the restoration concepts and filtering techniques to develop skillsat local levelin students

CO4: Implement the various Morphological operations on an image to develop skill and employability

CO5: Learn the basics of segmentation, features extraction, compression and recognition methods for color modelsfor skill and entrepreneurship developmentat local as well as national level.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	2	1	2	2	2	2
CO2	3	2	2	3	2	1	2	1	2	2	1	2
CO3	3	2	2	2	2	2	2	1	1	2	2	1
CO4	3	2	2	2	1	1	2	1	1	1	2	1
CO5	3	2	2	2	2	2	2	1	2	1	1	1

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	3
CO2	3	3	1
CO3	3	2	1
CO4	3	3	1
CO5	3	2	3

Suggested Reading:

- Rafael C. Gonzalez, Richard E. Woods, _Digital Image Processing', Pearson, Third Edition, 2010
- Anil K. Jain, _Fundamentals of Digital Image Processing', Pearson, 2002.
- Image Interpretation in Geology Drury S.A.

Website Source:
https://onlinecourses.nptel.ac.in
https://aktu.ac.in

Note: Latest editions of all the suggested readings must be used.

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ECE079(J): ADVANCED GEOLOGY AND REMOTE SENSING L T P 3 1 0

Course Objectives:
The course is aiming to cater the knowledge of studying satellite imagery and its interpretation in terms of geologic features on ground. The course enables the learners to bring about the information from satellite imagery by studying them both visually and digitally using image processing softwares to inculcate skill, provide employability and entrepreneurial skills.

UNIT I **(08 Session)**
Remote sensing: principles and significance; Electromagnetic Radiation – Characteristics and Remote Sensing Regions and bands; Spectra of common natural objects – soil, rock, water and vegetation; General Orbital characteristics of satellites; Concepts of radiometric, spectral, spatial and temporal resolutions of satellite sensors; Sensor characteristics of remote sensing satellites: Landsat, IRS, ASTER, Quickbird to provide knowledge for better employability.

UNIT II **(08 Session)**
Aerial photography: Planning and Execution, types of aerial photography; Aerial photos: classification, scale, resolution, stereoscopic parallax, image displacement will develop skill and employability; Properties of vertical and inclined aerial photographs; Elements of image and photo interpretations, Interpretations keys.

UNIT III **(08 Session)**
Earth Model: Geoid, Authalic sphere and ellipsoid and their uses in GIS; Concept of datum: geocentric and local geodetic, horizontal and vertical; Co-ordinate systems: Geographic and planar; Concept of Map projections: Principal scale and scale factor, Concept of cylindrical, conical and planar map projection to develop skills

UNIT IV **(08 Session)**
Map projections: Mercator, Transverse Mercator, Universal Transverse Mercator (UTM), Lambert Conformal, Conic and Polyconic; Digital Image Processing: Geometric and radiometric Corrections of satellite images will develop skill and entrepreneurship; Image enhancement and classification

UNIT V **(08 Session)**
Concept of GIS: Definition and components of GIS; Object based and field based GIS data model; Raster, vector, Spatial and nonspatial data structures; Data Based Management Systems and Model; Spatial Analysis: Spatial elements and analysis, local, focal, zonal and global operations; GIS query and output, Digital Elevation Model (DEM) and its derivatives for skill development and employability; Utility of GIS in Geological projects.

Course Outcomes (CO):
At the end of the course, the student will be able to:
CO1: Gaining knowledge on concepts and applications leading to modeling of earth resources management using Remote Sensingto develop skills and employability at local as well as national level.
CO2: Acquire skills in handling instruments, tools, techniques and modelingfor skill development andemployability at national as well as international levelwhile using Remote Sensing Technology
CO3: Fully equipped with concepts, methodologies and applications of Remote Sensing Technologywill develop skillsat local as well as global level.
CO4: Identify the earth surface features from satellite imagesof local, national and international level importance to develop skill and entrepreneurship
CO5: Analyse the basic components of GIS to develop skills at local, globalas well as national level.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	1	2	1	2	2	2	2
CO2	3	2	3	2	3	2	1	2	1	1	2	1
CO3	3	3	2	3	2	2	2	2	1	2	1	2
CO4	3	3	3	2	3	1	2	1	2	1	2	1
CO5	3	2	3	2	3	1	2	1	2	1	2	1

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	2
CO3	3	2	1
CO4	3	2	3
CO5	3	2	1

Suggested Reading:

- Lilles T.M., Kiefer, R.W. and Chipman, J. 2008: Remote Sensing and Image Interpretation. 6thEdition, John Wiley and Sons
- Bhatia, S. C. 2008: Fundamentals of Remote Sensing Atlantic Publications
- Bhatta B, 2011: Remote Sensing and GIS 2nd Edition, Oxford University Press
- Sabins, F.F. 2012: Remote Sensing Principles and Practice 3rd Edition, Levant Books
- Jensen, J R. 2013: Remote Sensing of the Environment : An Earth Resource Perspective 2nd Edition, Pearson India.

Website Source:

- https://onlinecourses.nptel.ac.in
- https://aktu.ac.in

Note: Latest editions of all the suggested readings must be used.

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ECE079(K): INDUSTRIAL WASTE TREATMENT L T P 3 1 0

Objective: This subject deals with the pollution from major industries and methods of controlling the same. The student is expected to know about the polluting potential of major industries in the country and the methods of controlling the same.

UNIT I **(8 Sessions)**

INTRODUCTION : Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes for skill development and employability.

UNIT II **(8 Sessions)**

CLEANER PRODUCTION: Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications for better skilling of entrepreneurship – Recycle, reuse and byproduct recovery – Applications.

UNIT III **(8 Sessions)**

POLLUTION FROM MAJOR INDUSTRIES: Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts for building knowledge for better employability.

UNIT IV **(8 Sessions)**

TREATMENT TECHNOLOGIES: Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes for understanding entrepreneurship skills– Residue management – Dewatering - Disposal

UNIT V **(8 Sessions)**

HAZARDOUS WASTE MANAGEMENT: Hazardous wastes - Physico chemical treatment – solidification – incineration – Secured land fills provide skill development.

Course Outcomes:

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

CO1: Gain the knowledge about the basic concept of industrial waste treatment for skill developmentat local as well as global level.

CO2: Understand the concept of cleaner production for developing entrepreneurship skills at local as well as national level.

CO3:.Gain the knowledge about the basic concept of pollution emerging from industries and develop models for skill developmentat local as well as global level.

CO4:.Understand the treatment concept and technology for employabilityat local level.

CO5: Understand the concept of hazardous waste management techniques and develop entrepreneurship skills and employabilityat local as well as global level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	3	3	1	1	2	1	1
CO2	3	2	2	1	2	2	3	2	1	2	2	3
CO3	3	3	3	2	3	3	3	1	2	2	2	2
CO4	3	3	3	3	2	2	3	1	2	1	1	2
CO5	3	1	1	1	3	3	3	2	2	1	2	1

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	1	2	3
CO3	3	2	2
CO4	2	3	2
CO5	2	3	3

Suggested readings:

- M.N.Rao&A.K.Dutta, "Wastewater Treatment", Oxford - IBH Publication, 1995.
- W .W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company, New Delhi, 2000.
- T.T.Shen, "Industrial Pollution Prevention", Springer, 1999.
- R.L.Stephenson and J.B.Blackburn, Jr., "Industrial Wastewater Systems Hand book", Lewis Publisher, New Yark, 1998

Website resources:

- https://nptel.ac.in/courses/105106119
- https://www.sourcecodesolutions.in/2011/03/ce1018-industrial-waste-management-syll.html
- https://tribhuvanwater.com/get-free-quote.html?gclid

Note: Latest editions of all the suggested readings must be used.

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ECE079 (L): SOLID WASTE MANAGEMENT L T P 3 1 0

Objective: The objectives of the course are to Define the terms and Understand the necessity of solid waste management Explain the strategies for the collection of solid waste Describe the solid waste disposal methods Categorize Hazardous Waste

UNIT I **(8 Sessions)**

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management – Integrated solid waste management, Solid Waste Management Rules 2016 for building knowledge for better employability

UNIT II **(8 Sessions)**

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems for skill development– Route planning – transfer and transport; processing techniques;

UNIT III **(8 Sessions)**

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing – recovery of thermal conversion products; Pyrolisis, Gasification, RDF – recovery of energy from conversion products; materials and energy recovery systems provide skill development and employability.

UNIT IV **(8 Sessions)**

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control for skill development – Monitoring landfills – Landfills reclamation.

UNIT V **(8 Sessions)**

Hazardous waste Management: Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration – Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management for better skilling of entrepreneurship.

Course Outcomes:

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

CO1: Identify the physical and chemical composition of solid wastes for building models for skill development at local as well as global level.

CO2: Analyze the functional elements for solid waste management for employability and entrepreneurship skills at local as well as national level

CO3: Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastesfor skill developmentat local as well as global level.

CO4: Identify and design waste disposal systems for building models for entrepreneurship developmentat local as well as national level

CO5: Gain the knowledge about the hazardous waste management concept for building entrepreneurship and employability

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	2	3	1	2	1	1	2	2
CO2	3	2	2	1	3	1	3	1	2	2	1	2
CO3	3	2	1	2	2	2	3	1	2	2	2	2
CO4	3	1	1	1	3	1	3	2	3	2	1	2
CO5	3	3	2	1	2	2	3	2	3	3	2	2

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	1	3	3
CO3	3	2	1
CO4	2	2	3
CO5	2	3	3

Suggested readings:

- Tchobanoglous, G., Theisen, H., & Vigil, S.A; Integrated Solid Waste Management: McGraw Hill,
- New York
- Solid Waste Engineering, Principle & Management issues by VenTe Chow
- Bhide, A.D., B.B. Sundaresan, Solid Waste Management in developing countries.
- Manual on Municipal solid Waste Management, CPHEEO, Govt. of India.
- Guidelines for Management and Handling of Hazardous wastes MOEF (1991), Govt. of India.
- Datta, M; Waste Disposal in Engineered Land fills, Narosa Publishers, Delhi.
- Waste Management "Asian and Pacific Center for Transfer of Technology (N.D.) India",
- September 1993.

Website resources:

https://archive.nptel.ac.in/courses/120/108/120108005/

Note: Latest editions of all the suggested readings must be used.

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ECE079 (M): TRAFFIC MANAGEMENT & DESIGN L T P 3 1 0

Objective: The students acquire comprehensive knowledge of traffic surveys and studies such as 'Volume Count', 'Speed and delay', 'Origin and destination', 'Parking', 'Pedestrian' and 'Accident surveys'. They achieve knowledge on design of 'at grade' and 'grade separated' intersections. They also become familiar with various traffic control and traffic management measures.

UNIT I **(8 Sessions)**

INTRODUCTION: Significance and scope, Characteristics of Vehicles andRoad Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics for skill development

UNIT II **(8 Sessions)**

TRAFFIC SURVEYS AND ANALYSIS: Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Problems for better skilling of entrepreneurship

UNIT III **(8 Sessions)**

TRAFFIC CONTROL: Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design for building knowledge for better employability

UNIT IV **(8 Sessions)**

GEOMETRIC DESIGN OF INTERSECTIONS: Conflicts at Intersections, Classification of Intersections at Grade, - Chanallised and Unchanallised Intersection - Grade Separators (Concepts only), Principles of Intersection Design for understanding entrepreneurship skills, Elements of Intersection Design, Chanallisation and Rotary design (Problems), Grade Separators

UNIT V **(8 Sessions)**

TRAFFIC MANAGEMENT: Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)for skill development

Course Outcomes:

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

CO1: Gain the knowledge about the concept of basics of traffic engineering for skill developmentat local as well as global level

CO2: Understand the concept of surveys and analysis for skill development and employabilityat local as well as national level

CO3: Understand the concept of traffic control for building modelsof national as well as international level importance for entrepreneurship skills

CO4: Create the geometric design concept for intersection and develop skillsat local as well as national level

CO5: Gain the knowledge about the traffic management and develop employabilityat local level

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	3	2	2	1	3	3	2	2
CO2	3	2	2	2	3	2	2	1	3	3	1	2
CO3	3	2	2	2	2	1	2	1	2	2	1	2
CO4	3	3	3	3	2	2	3	1	3	2	2	2
CO5	3	2	1	1	2	3	3	3	3	2	2	2

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(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	3	3	1
CO3	1	2	3
CO4	3	2	2
CO5	2	3	1

Suggested readings:

- Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
- Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.
- Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
- SubhashC.Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.
- Guidelines of Ministry of Road Transport and Highways, Government of India.

Website resources:

- https://nptel.ac.in/courses/105101008
- https://onlinecourses.nptel.ac.in/noc22_ce41/preview
- ttps://www.tmr.qld.gov.au/business-industry/business-with-us/traffic-management

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ECE801: WATER RESOURCES ENGINEERING

L T P 3 1 0

Objective:

- To study water resources of India, their importance and planning of water resources projectsfor better employability.
- To understand the structure of the gravity dams, earth dam, spillways, cross drainage works and diversion headworksfor skill and entrepreneurshipdevelopment.
- To introduce students to the concept of pumps, turbines and their applications in water resources engineeringto develop skills.
- To learn about watershed development, rain water harvesting and strategies for flood damagefor employability and entrepreneurship development.

UNIT I (06 Sessions)

Introduction: Water Resources of India, need of Irrigation and Power of India, need of harnessing water, importance and impact of irrigation projects and hydropower on environment, Water Quality Management of roof top rain water harvesting system, Optimization of water resource system, planning of water resources projects to develop skill. Introduction of Draft tubes, Cavitations in turbine. Turbine model testing.

UNIT II (10 Sessions)

Cross drainage works: Classification and their selection, hydraulic design aspects of aqueducts, siphon aqueducts, super passage, canal syphon and level crossing, design of transitions for skill development and employability

Diversion canal headwork's: Various components and their functions, layout plan, selection of site for diversion headworks, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections, silt excluders.

UNIT III (10 Sessions)

Design of storage structures: Types of dams, selection of a site, gravity dam-two dimensional design, forces acting, stability criterion, elementary profile of a dam, cutoffs and drainage galleries, arch dams constant angle and constant radius arch dam, simple design and sketchs, most economical angle, Earth dam, design principles, seepage through earth dams, seepage line, control of seepage, design of filters to provide better employability in industry. Types of spillways and energy dissipators. Tail water rating. Salient features like joints, water-seals, galleries and adits. Types of gates. Water resources system: Objective function Production function and optimality condition.

UNIT IV (08 Sessions)

Pumps and Turbines: Rotodynamic pumps, basic equations, axial and mixed flow pumps, cavitations in pumps, characteristics curves. Hydraulic Turbines: Introduction, Rotodynamic Machines, Including elementary concept of bulb and tubular turbines pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, basic equation for type, Head on reaction turbine, basic equation for rotodynamic machines, similarity law and specific speed, cavitations characteristic curves for employability and entrepreneurship development.

UNIT V (06 Sessions)

Managing our water resources: Erosion control and watershed development: their benefit towards conservation of national water wealth. Rain water harvesting and recharge of ground water: role of society and people's participation for sustainable water resource development. Mitigation strategies for flood damage: structural and non-structural measures for skill and entrepreneurship develcpment. Linear, non linear and dynamic programming Sensetivity analysis, Stochastic models, Statistical decision theory.

Course Outcomes:

On the completion of the course one should be able to understand:

CO1: Different terminology related to water resources engineering for employabilityat local level

CO2: Establish the understanding of cross drainage works, diversion headworks and their design for skill and entrepreneurship development.

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CO3: Identify various types of dams and their design aspects for better employabilityat local as well as global level

CO4: Application of pumps and turbines in water resources engineering for employability and entrepreneurship development at national level

CO5: Concepts of watershed development, rain water harvesting and strategies for flood damage for entrepreneurship developmentat local as well as national level

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	2	3	2	3	3	1	2
CO2	3	3	3	1	2	1	3	1	1	3	2	3
CO3	3	2	2	3	1	2	3	2	2	1	2	3
CO4	3	2	3	3	2	1	3	1	1	2	1	3
CO5	3	3	2	3	2	1	3	2	2	2	3	1

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required**)**
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	3	1
CO2	3	2	3
CO3	2	3	1
CO4	2	3	3
CO5	2	2	3

Suggested Readings:

- "Fundamentals of Irrigation Engineering", B Singh, 9th Ed., Nem Chand & Bros.
- "Irrigation and water Resources engineering", G.L.Asawa, New Age International.
- "Flow through open Channels", K.G., RangaRaju, 2nd Ed., Tata McGraw-Hill.
- "Irrigation Engineering and Hydraulic Structures", S.K.Garg.

Website Sources:

- https://nptel.ac.in/
- https://en.wikipedia.org/
- https://www.aboutcivil.org/irrigation-engineering-water-resources-lectures.html
- https://www.asce.org/

Note: Latest editions of all the suggested readings must be used.

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ECE802: BRIDGE ENGINEERING **L T P 3 1 0**

Objective:
The objective of this course is to familiarize students with the types, suitability, and selection, design criteria of various types of bridges and impart knowledge for analysis and equip the students with a thorough understanding of the behavior and design of bridges for overall development of skills

UNIT I **(6 Sessions)**
Introduction: Types of Bridges, selection of suitable type of bridge will develop skills, aesthetics, economic span.Highway Alignment Optimization Incorporation Bridges And Tunnels

UNIT II **(10 Sessions)**
Design loads and their distribution: IRC loads, analysis of deck slab and IRC loads provide knowledge for better employability, load distribution among longitudinal beams of a bridge, railway loading.

UNIT III **(10 Sessions)**
Design of superstructure: Design of balanced cantilever concrete bridge, design of prestressed concrete bridge, design of lattice girder Railway Bridge, introduction to design of RC Arch bridges and box girder bridgesIntelligent Bridges help in understanding entrepreneurship skills.

UNIT IV **(8 Sessions)**
Design of substructure: Different types of foundations, their choice and methods of construction, Polymer Composites In Bridge Rehabilitation
Design of well foundation for entrepreneurship and employability, design of piers and abutments, various types of bearings and their suitability

UNIT V **(6 Sessions)**
Construction Methods: Erection of bridge superstructure, Condition Assessment of Railway Bridges, cantilever construction, Bridge strengthening advanced composite system.Stress Ribbon Bridge

Course Outcomes:
At the completion of this course, students will be able to:
CO1: To develop an understandingof local as well as global foremployability and skill development and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
CO2: Understand the load-carrying capacity of various types of bridges, upon learning the structural responses to different kinds of loads and producing the models for skill development and employabilityat local as well as global level.
CO3: Plan and design the superstructure of RCC bridges for analysis of skill developmentat local as well as global level.
CO4: Design the substructure, superstructure and bearing of the bridge for strategic allianceof local, national as well as international level importance for Entrepreneurship development.
CO5: Design short and medium span bridges, with confidence using existing codes of practice and to develop models for skill developments and employabilityat local as well as global level.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	3	3	2	1	1	1	2	3
CO2	3	3	2	1	1	2	3	3	1	3	2	3
CO3	3	3	3	3	3	2	1	3	3	1	3	3
CO4	3	3	3	3	3	3	1	3	3	1	3	3
CO5	3	3	3	3	3	2	1	1	3	1	3	3

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CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	1
CO3	3	1	2
CO4	2	2	3
CO5	3	3	2

Suggested Readings:

- "Design of Bridges": N.K.Raju., Oxford & IDH
- "Bridge Engineering": S. Ponnuswamy, Tata McGraw Hill.
- "Concrete Bridge Practice": V.K. Raina, Tata McGraw Hill.
- "Essentials of Bridge Engineering": D.J. Victor, Oxford & IDH

Website Resources:

- https://onlinecourses.nptel.ac.in/noc17_ce24/preview
- https://nptel.ac.in/courses/105/105/105105165/
- https://onlinecourses.nptel.ac.in/noc19_ce23/preview
- http://engineering.buffalo.edu/home/academics/beyond/online/bridge-engineering.html

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EHU801: Industrial Management **L T P 3 1 0**

Objective: The objective of this course is to familiarize the students to gain insight about managerial techniques through various assessment tools/models to control and enhance the productivity of the work environment.

UNIT I **(10 Sessions)**

Introduction: Concept, Development, application and scope of Industrial Management for skill development and employability

Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.

UNIT II **(08 Sessions)**

Management Function: Principles of Management- Management Tools – time and motion study, work simplification- process charts and flow diagrams, Production Planning provide knowledge for better employability, Specification of Production requirements.

UNIT III **(08 Sessions)**

Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain management. Understanding for skill development and employability

UNIT IV **(07 Sessions)**

Quality control: Meaning, for better skill development and entrepreneurship process control, SQC control charts, single, double and sequential sampling, Introduction to TQM.

UNIT V **(07 Sessions)**

Environmental Issues: Environmental Pollution – various management techniques to control Environmental pollution – Various control acts for Air, Water, Solid waste and Noise pollution, Understanding for skill development and employability

Course Outcome: Students completing this course will be able to:

CO1: Understand the scope of Industrial Managementfor skill development and employabilityat local as well as global level

CO2: To apply various management tools in systems of different industrial configurations.for skill development and employabilityat local as well as global level

CO3: To use various control charts to determine the product acceptability as per designed criteria.for skill development and employabilityat local as well as global level

CO4: Get the Knowledge of chart and sequential sampling for entrepreneurship developmentat local as well as national level

CO5: To control environmental pollution by various management techniquesfor entrepreneurship development and skill development

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	3	3	3	3	3	3
CO2	3	2	1	3	3	1	2	3	3	3	3	3
CO3	3	1	2	3	2	3	1	2	2	3	3	3
CO4	3	2	2	3	2	1	2	3	3	3	2	3
CO5	3	3	3	3	2	2	3	1	3	2	3	3

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	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	2
CO4	3	1	3
CO5	3	1	3

Suggested Readings:

- Khanna O.P.: Industrial Engineering
- T.R. Banga: Industrial Engineering and Management
- Sharma B.R.: Environmental and Pollution Awareness.
- R.K.Singal: Industrial Management, Vayu Education of India Pub.
- Onkar N. Pandey: Industrial Management, S.K.Kataria& Sons (Katson) Pub.
- Dewan J. M. and Sudarshan K. N.: Industrial Management, Discovery Publishing Pvt. Ltd

Website sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net
- www.sanfoundry.com

Note: Latest editions of all the suggested readings must be used.

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