

B.TECH. CURRICULUM

ACADEMIC YEAR: 2024-25

DEPARTMENT OF CIVIL ENGINEERING

**Undergraduate Rules and Regulations-2024 (URR24)
In accordance with the National Education Policy 2020
w.e.f AY 2024-25**

**Regulations Governing the Choice Based Credit System and
Multiple Entry and Multiple Exit Options with
Competency-Focused Outcome Based Curriculum (CF-OBC)**



**KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL - 506 015
TELANGANA
(UGC Autonomous Institute Under Kakatiya University, Warangal)**

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DEPARTMENT OF CIVIL ENGINEERING

History:

PROGRAM	DESCRIPTION	
	INTAKE	NBA ACCREDITATION
UG- B.Tech. Civil Engineering	<ul style="list-style-type: none">• Started with 40 seats in 1980• Intake increased to 60 in 1994-1995• Intake increased to 120 in 2012-2013• Intake decreased to 60 in 2023	<ul style="list-style-type: none">• First time accreditation: 2001-2004• Reaccreditation-1: 2006-2009• Reaccreditation-2 2011-2014• Reaccreditation-3 2016-2019• Reaccreditation-4: 2019-2022• Reaccreditation-5: 2022-2025

INSTITUTE VISION AND MISSION

INSTITUTE VISION

To make our students technologically superior and ethically strong by providing quality education with the help of our dedicated faculty & staff and thus improve the quality of human life

INSTITUTE MISSION

- M1 ■ To provide latest technical knowledge, analytical & practical skills, managerial competence and interactive abilities to students, so that their employability is enhanced
- M2 ■ To provide strong human resource base to cater to the changing needs of the industry and commerce
- M3 ■ To inculcate a sense of brotherhood and National Integrity

DEPARTMENT OF CIVIL ENGINEERING: VISION AND MISSION

VISION

The Vision of the department is to become a leading centre of excellence in producing quality human resource in civil engineering by developing a sustainable technical education system to meet the changing technological needs of the Country. The Department will make significant contributions to the economic development of the state, region and nation.

MISSION

M1:	The Mission of Civil Engineering Department is to produce outstanding Civil Engineering graduates with highest ethics.
M2:	To impart quality education in civil engineering to raise satisfaction Level of all Stake holders.
M3:	To serve society and the Nation by providing professional civil Engineering Leadership to find solution to community, regional and Global problems and accept new challenges in rapidly changing Technology.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1 :	Technical Competence: Consistently build multifaced technical competencies to integrate proficiency with warring industrial demands
PEO2:	Successful Career Demonstrate professionalism in all strides of life to protect constitutional interests of society.
PEO3 :	Soft Skills and Life-long Learning Accustomed to acquire enduring familiarity with modern tools and technology for accomplishing sustainable prospects

PEO TO MISSION MAPPING

	M1	M2	M3
PEO1	2	3	1
PEO2	3	3	2
PEO3	2	3	3

PEO Statements	Mission Statements	Mapping Level	Justification
PEO1	M1	2	The focus on professional competence and higher academic qualifications differ from the objective of nurturing ethical graduates in civil engineering.
	M2	3	Mapped strongly aiming to interact with research organizations and industries, exposing students to state-of-the-art technologies for a successful professional career.
	M3	3	Quality education and comprehensive knowledge is imparted to the students, by highly qualified faculty in a congenial environment, to meet the changing needs of society.
PEO2	M1	3	By providing the state of the art facilities, the experienced and dedicated staff nurtures the reasoning, problem solving and research capabilities of students in Civil and allied Engineering problems.
	M2	3	By imparting quality education through qualified faculty and the state of the art facilities so that students exhibit professionalism in all strides of life.
	M3	2	Addressing challenging issues concerning safety and sustainability is consistent with offering top-notch civil engineering education to meet the expectations of stakeholders.
PEO3	M1	2	The ethical excellence of Civil Engineering graduates is linked to their proficient use of advanced technology and their awareness of its impact on society.
	M2	3	To identify and develop a sense of responsibility towards Socio - technical, economical and environmental related issues.
	M3	3	To sensitize the students to exhibit leadership and to provide solutions to global challenges.

PROGRAM SPECIFIC OBJECTIVES (PSO)

PSO1:	Practice Civil engineering as a profession addressing contemporary issues related to safety, sustainability, public health, and to safeguard the environment at large.
PSO2:	Enhance enduring research capabilities, personifying the changing needs of technological advancements.

PO/PSO TO PEO MAPPING

PO's		PEO1	PEO2	PEO3
PO1	Engineering Knowledge	3	1	3
PO2	Problem Analysis	3	1	3
PO3	Design/Development of solutions	3	2	3
PO4	Conduct investigations of complex problems	3	1	3
PO5	Modern tool usage	3	2	3
PO6	The engineer and society	1	3	1
PO7	Environment and sustainability	1	2	3
PO8	Ethics	2	3	3
PO9	Individual and Teamwork	3	3	2
PO10	Communication	2	3	3
PO11	Project management and finance	1	2	2
PO12	Lifelong Learning	3	2	3
PSO1:	Practice Civil engineering as a profession addressing contemporary issues related to safety, sustainability, public health, and to safeguard the environment at large.	3	3	2
PSO2:	Enhance enduring research capabilities, personifying the changing needs of technological advancements.	3	3	2

DESIGN OF CURRICULUM

Salient Features

- The URR24 regulations are inline with the National Education Policy 2020 (NEP 2020) and the AICTE model curriculum to provide multidisciplinary holistic education to produce well-rounded engineering graduates.
- Multiple Entry Multiple Exit (MEME) option.
- Multidisciplinary four year UG programme with award of following degrees
 - B. Tech
 - B. Tech with “Minor”
 - B. Tech “Honours”
 - B. Tech “Honours with Research”
- 170+ Credit Liberal Engineering Education.
- A strong program core of 16 courses and 6 baskets of program electives to ensure the breadth and depth in a chosen domain of studies. Program electives are arranged either to grow in a specified vertical or have diversified exposure.
- Full semester industry internship to the interested students.
- Aggressive model of “Learning-by-doing” in the form of PRACTICUM.
- Activity Based Learning (ABL) about Life, Literature and Culture is embedded in to the curriculum in four semesters, ensuring all dimensional holistic growth of the learner. These four activity based mini courses are offered as two sequels namely Social Empowerment Activities (SEA) and Self Accomplishment Activities (SAA).
- These regulations follow holistic approach of education, ensures strong science, mathematics foundation and program core, develops expertise in domain vertical through sequel of electives, ensures significant exposure of additional discipline through “Minor” programme, challenges good learners through “Honours” programme and for the research oriented students through “Honours with Research” programme.
- Along with Major and Minor disciplinary courses, students are expected to learn Multidisciplinary open elective courses (MOPEC), skill enhancement courses (SEC), ability enhancement courses (AEC), value added courses (VAC), activity based learning (AL) and experiential learning (EL) towards multidisciplinary holistic education and for increased employability.
- These regulations provide competency-focused outcome based curriculum (CF-OBC) for skill development, multidisciplinary learning, wider access, inclusiveness and entrepreneurship.
- In our CF-OBC, each course has an additional component of “Contents for self-study”, which is carefully designed to ensure additional hours of learners engagement. The learner thus is nurtured towards the “Self-Learning” and “lifelong learning” which are essential attributes of a 21st Century learner. The same is incorporated in the scheme of instructions in the form of (i) Outside the class work (self-study) hours, (ii) total engagement hours for every course.
- In summary, these regulations are expected to develop technical competencies, through

courses from programme core, programme electives, engineering science and basic science; and also develop generic competencies, soft skills, social, physical, mental and spiritual personality through carefully articulated courses from MOPEC baskets, Liberal Learning and humanities sequels. Thus, offers a unique “T-Shaped” liberal “Pi-Model” of Engineering Education

The Curriculum consists of the following components of study:

BSC	Basic Science Course	ABL-SAA	Self- Accomplishment Activities
HSMC	Humanities and Social Sciences including Management Course	ABL-SEA	Social Empowerment Activities
ESC	Engineering Science Course	VAC	Value Added Course
PCC	Program Core Course	AEC	Ability Enhancement Course
PEC	Program Elective Course	EXL	Experiential Learning
MOPEC	Multidisciplinary Open Elective Course	SEC	Skill Enhancement Course

Multidisciplinary Open Electives Courses (MOPEC)

The Curriculum provides four slots of open electives with fourteen baskets. This is planned to give exposure to interdisciplinary and cross disciplinary domains. The courses in these baskets are planned both at department and institute level. Students can choose any combination of these courses (not floated by the parent department) to get familiar with other domains of learning.

Practicum

The curriculum provides ample opportunities for experiential learning (learning-by-doing) to impart important skills like problem solving, critical thinking and communication. Under experiential learning the PRACTICUM is a semester long project work included in I to IV semesters, having a weightage of 1 credit in each semester. Under PRACTICUM, The students are expected to implement a micro level project (at a level of course project) solving a practical problem or a project based on the combination of different theory or lab courses being studied in a corresponding semester. The experiential learning is continued in the form of a Seminar in fifth semester, a mini project in sixth semester, major project in seventh & eight semesters and mandatory 6-8 week internship during summer breaks.

(Note to HoDs: A batch of students (according to Roll Numbers) will be allotted to each of the course handling teachers of the corresponding semester. The teacher will be assigning a micro level project to each student. At the end of the semester the student will demonstrate a prototype / working model / system / process and submit a four to six page report. Course teacher is expected to evaluate the allotted batch of students and submit grades to the HoD. There will not be ESE for PRACTICUM. The batch of students will be allotted to a course handling teacher on the basis of series of Roll Numbers, similar to the allotment done for tutorial matrix.

Example: The project work under PRACTICUM for the course ACT may be Advanced Concrete Technology may be

1. *Mechanical & Durability properties of Geopolymer concrete*
2. *Experimental investigation on self curing concrete*
3. *Bacterial Concrete*

4. Limestone calcined clay cement (LC3)

The URR24 focuses on CF-OBC with program depth component in terms of Program Core Courses (PCCs) and Program Elective Courses (PECs)

Program Core Courses (PCC)

The curriculum offers Sixteen core courses referred to as Program Core. Several academic models from reputed institutions in the country and outside the country are studied in articulating this Program Core, to make curriculum globally competitive. The courses are augmented with laboratory components as per the need.

Program Electives Courses (PEC)

The curriculum offers Six baskets of Program Electives, each basket having identified courses corresponding to the programme specializations called verticals. This enables learners to grow in a domain-specialization or domain-vertical. The student can opt courses in sequel (PEC-1 to PEC-4) in any of the specific vertical or across the verticals.

(Note to HoDs: For example, the CE programme shall offer verticals in “Structural Engineering”, “Transportation Engineering”, “Geotechnical Engineering”, etc.)

Activity-Based Learning (ABL) about Life, Literature and Culture

Activity based learning (ABL) is blended with the Curriculum for ensuring holistic growth of the learner. These activity based minicourses are offered as two sequels namely “SEA” (Social Empowerment Activities) and “SAA” (Self Accomplishment Activities).

According to Dr. K. M. Munshi, “Education will fail ignominiously in its objective if it manufactures only a robot and called him an economic man stressing the adjective economic and forgetting the substantive man. A university cannot afford to ignore the cultural aspects of education whatever studies it specializes in. Science is a means, not an end. Whereas culture is an end in itself. Even though you may ultimately become a scientist, a doctor, or an engineer, you must, while in college, absorb fundamental values which will make you a man of culture...”

The NEP-2020 quotes, “Higher education must develop good, well-rounded and creative individuals, with intellectual curiosity, spirit of service and a strong ethical compass”. Moving towards a more liberal undergraduate education is one of the most important feature of the NEP2020. “The needs of the 21st century require, that liberal broad-based multidisciplinary education become the basis for all higher education. This will help develop well-rounded individuals that possess critical 21st century capacities in fields across arts, humanities, sciences, social sciences, and professional, technical, and vocational crafts, an ethic of social engagement, and rigorous specialization in a chosen field or fields. Such a liberal education would be, in the long run, the approach across all undergraduate programs, including those in professional, technical, and vocational disciplines. Imaginative and flexible curricular structures will enable creative combinations of disciplines for students to study, thus demolishing currently prevalent rigid boundaries and creating new possibilities for lifelong learning. The notion of ‘knowledge of many arts’- i.e. what is called ‘liberal arts’ in modern times – must be brought back to Indian education, as it is exactly the kind of education that will be required for the 21st century.”

To ensure holistic development of the learner, an attempt has been made in this curriculum to blend engineering education appropriately with arts, humanities, crafts, ethic of personal and social engagement to ensure holistic development of the learner. Activity based liberal learning courses covering life, literature, and culture are added. Every learner is expected to take one such course in first four semesters. We strongly believe that these four liberal learning modules will expose the learners to multidisciplinary and holistic education as envisaged in NEP 2020.

(END OF THE SALIENT FEATURES OF URR24)

Undergraduate Rules and Regulations-2024 (URR24) In accordance with the National Education Policy 2020, w.e.f AY 2024-25

1. Title:

URR24 Regulations governing the Choice Based Credit System (CBCS) with Multiple Entry and Multiple Exit (MEME) options with Competency-Focused Outcome Based Curriculum (CF-OBC)

2. Scope:

These regulations are applicable to the undergraduate programmes being offered by the Institute

3. Duration of Programmes:

The undergraduate degree should be of four years duration, with multiple entry and multiple exist (MEME) options. The maximum duration for a student for complaining the degree requirement is as per NEP2020/UGC/AICTE guidelines. Four years multidisciplinary undergraduate programme allows the opportunity to experience the full range of holistic and multidisciplinary education with a focus on major and minor subjects as per the student's preference. The four-year programme may also lead to a degree with Research, if the student completes a rigorous research project in the major area(s) of study. The undergraduate programmes shall extend over four academic years (eight semesters).

With multiple entry and multiple exit options, the students can exit after the completion of one academic year (two semesters) with the UG certificate in CE; UG Diploma in CE after the study of two academic years (four semesters); and B. Voc in CE degree after the completion of three academic years (six semesters). The successful completion of four years undergraduate programme would lead to B. Tech in CE degree with optional Minor/Honours/ Honours with Research.

4. Credit Requirement:

As per the guidelines released by UGC under National Higher Education Qualification Framework (NHEQF), for Multiple Entry and Multiple Exit (MEME) in Academic Programmes offered in Higher Educational Institutions, the students shall complete the courses equivalent to minimum credit requirements as shown in the table given below for the award of UG certificate, UG diploma, Bachelor degree, Postgraduate diploma and Master's degree:

Qualification Type and Credit Requirements		
NHEQF Levels	Exit with	Credit Requirements
4.5	Undergraduate Certificate (in the field of learning/discipline) for those who exit after the first year (two semesters) of the undergraduate programme. (Programme duration: first year or two semesters of the undergraduate programme)	36-40
5	Undergraduate Diploma (in the field of learning/discipline) for those who exit after two years (four semesters) of the undergraduate programme. (Programme duration: First two years or four semesters of the undergraduate programme)	72-80
5.5	Bachelor's Degree (Programme duration: Three years or six semesters).	108-120
6	Bachelor's Degree (Honours/ Research) (Programme duration: Four years or eight semesters).	144-160
6.5	Post-Graduate Diploma for those who exit after the successful completion of the first year or two semesters of the two-year Master's degree programme. (Programme duration: One year or two semesters of the Post-Graduate programme)	36-40
7	Master's Degree (Programme duration: Two years or four semesters after obtaining four year Bachelor's degree).	72-80
7	Master's Degree (Programme duration: One year or two semesters after obtaining a four-year Bachelor's degree (Honours/Research).	36-40
8	Doctoral Degree	Minimum prescribed credits for course work and a thesis with published work

* Details of course-wise credits are described in the later part of the Regulations.

5. Commencement:

These Regulations in accordance with National Education Policy 2020 shall come into force from Academic Year 2024-25 onwards. These regulations shall be implemented from the academic year as mentioned below.

NHEQF Level	Programme	From Academic Year
Undergraduate Programme		
Level 4.5	Undergraduate Certificate (One year or two semesters)	2024-25
Level 5	Undergraduate Diploma (Two years or four semesters)	2025-26
Level 5.5	Bachelor's Degree (Three years or six semesters)	2026-27
Level 6	Bachelor's Degree with Honours/ Research (Four years or eight semesters)	2027-28

6. Eligibility Criteria:

- (i) **Level 4.5:** The students who have successfully completed Grade 12 / Intermediate with MPC or its equivalent course shall be eligible for admission to the first year degree programme.
- (ii) **Level 5 :** The students who have successfully completed Level 4.5 of the undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal
- (iii) **Level 5.5 :** The students who have successfully completed Level 5 of the undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal
- (iv) **Level 6 :** The students who have successfully completed Level 5.5 (bachelor degree of three years or six semesters) of undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal

7. Academic Bank of Credits (ABC):

The Academic Bank of Credits (ABC), a national-level facility promotes the flexibility of curriculum framework and interdisciplinary/ multidisciplinary academic mobility of students across the HEIs in the country with appropriate “credit transfer” mechanism. It is mechanism to facilitate the students to choose their own learning path to attain a Certificate / Diploma / Degree, working on the principle of multiple entry and exit as well as anytime, anywhere, and any level of learning. ABC will enable the integration of multiple disciplines of higher learning leading to the desired learning outcomes including increased creativity, innovation, higher order thinking skills and critical analysis. ABC will provide significant autonomy to the students by providing an extensive choice of courses for a programme of study, flexibility in curriculum, novel and engaging course options across a number of higher education disciplines / institutions.

7.1 Operationalization of ABC:

Shall appoint institutional nodal officer for ABC as per UGC directives. The nodal officer shall be responsible for proper operationalization of ABC within the college and with the university.

The ABC related operations shall be as follows:

- (i) The MEME option for student is facilitated at the undergraduate and postgraduate levels.
- (ii) It would facilitate credit accumulation through the facility created by the ABC scheme in the “Academic Bank Account” opened for students across the country to transfer and consolidate the credits earned by them by undergoing courses in any of the eligible HEIs. The eligibility of HEIs to offer courses shall be as per UGC (Establishment and Operationalization of ABC scheme in Higher Education) Regulations 2021 dated 28.7.2021 and changes therein notified by the UGC from time to time.
- (iii) The ABC allows credit redemption through the process of commuting the accrued credits in the Academic Bank Account maintained in the ABC for the purpose of fulfilling the credits requirements for the award of certificate/ diploma/ PG diploma/ degree by the authorized HEIs.

- (iv) Upon collecting a certificate, diploma, PG diploma or degree, all the credits earned till then, in respect of that certificate, diploma, PG diploma or degree shall stand debited and redeemed from the account concerned.
- (v) HEIs offering programmes with the MEME system need to register in the ABC to enable acceptance of multidisciplinary courses, credit transfer, and credit acceptance.
- (vi) The validity of credits earned will be for a maximum period of seven years or as prescribed by the UGC.
- (vii) The procedure for depositing credits earned, its shelf life, redemption of credits, would be as per UGC (Establishment and Operationalization of ABC scheme in Higher Education) Regulations 2021 dated 28.7.2021 and changes therein notified by the UGC from time to time.

7.2 Monitoring, Support and Quality by Universities and ABC:

- (i) It shall be the responsibility of Registered HEIs, to monitor the development and operationalization of the ABC programme at the university level and at the level of their affiliated colleges.
- (ii) Registered HEIs shall offer teachers training, staff training, mentoring, academic and administrative audit and other measures for improving the quality of performance of the ABC facility and promotion of holistic and multidisciplinary education with the support of ABC.
- (iii) The quality assurance of the implementation of ABC at the level of the registered university shall be looked by the Director, Examinations and Evaluation of the Institute of the officer nominated by him different from ABC nodal officer, under the directives and guidance of Controller of Examinations of the Institute.
- (iv) The Institute shall upload, annually, on its website, a report of its activities related to the Academic Bank of Credits, as well as of measures taken by it for Quality Assurance, Quality Sustenance and Quality Enhancements.
- (v) The Grievance Redressal Committee constituted by the examination section shall be responsible for addressing the Grievance and appeals related to ABC.

8. Building Competencies through Pedagogy:

Effective learning requires appropriate competency focused outcome based curriculum (CF- OBC), an apt pedagogy, continuous formative assessment and adequate student support. The intention is to contextualize curriculum through meaningful pedagogical practices, which determine learning experiences directly influencing learning outcomes expected competencies. ICT will be used in creating learning environment that connects learners with content, peers and instructors all through the learning process respecting pace of learners. The faculty shall follow innovative learner centric pedagogical approaches:

- (i) Classroom process must encourage rigorous thinking, reading and writing, debate, discussion, peer learning and self-learning

- (ii) The emphasis is on critical thinking and challenge to current subject orthodoxy and develop innovative solutions. Curricular content must be presented in ways that invite questioning and not as a body of ready knowledge to be assimilated or reproduced. Faculty should be facilitators of questioning and not authorities on knowledge.
- (iii) Classroom teaching should focus on the 'how' of things i.e. the application of theory and ideas. All courses including social sciences and humanities shall have design project and practicums to enable students get relevant hands-on experiences.
- (iv) Learning must be situated in the Indian context to ensure that there is no sense of alienation from their context, country and culture.
- (v) Classroom processes must address issues of inclusion and diversity since students are likely to be from diverse cultural, linguistic, socio-economic and intellectual backgrounds.
- (vi) Cooperative and peer supported activities shall be part of empowering students to take charge of their own learning.
- (vii) Faculty shall have the freedom to identify and use the pedagogical approach that is best suited to a particular course and student.
- (viii) Pedagogy PBL (Problem/Project Based Learning) shall be brought into practice as part of curriculum. Experiential learning in the form of practicum, seminar, miniproject, major project and internship with a specified number of credits is made mandatory.
- (ix) The course faculty shall provide the "Contents for self-study", and motivate the learners to engage in outside the class work learning (self-learning). The learner thus is nurtured towards the "Self-Learning" and "lifelong learning" which are essential attributes of a 21st Century learner.
- (x) Blended Learning (BL) mode shall be used to help learners develop 21st century skills. BL should be carefully implemented and should not be replacing classroom time as a privilege.
- (xi) The UGC regulations, 2021 on Credit Framework for Online Learning Courses through SWAYAM, facilitates an institution to allow up to 40 percent of the total courses being offered in a particular programme in a semester through massive open online courses (MOOCs) offered by the SWAYAM / NPTEL and other e-learning platforms. Students shall be encouraged to complete equivalent courses through SWAYAM / NPTEL and other e-learning platforms, approved by the BoS chair and Dean AA, towards obtaining required credits wherever necessary.

9. Skill Enhancement, Ability Enhancement, Value Added Courses through e-learning:

Students shall be encouraged to obtain the required credits related to the skill enhancement courses (SECs), ability enhancement courses (AECs) and value added courses (VAC) through MOOCs platforms such as:

- (i) SWAYAM
- (ii) IIM-B
- (iii) University LMS
- (iv) CEC

- (v) NPTEL
- (vi) IGNOU
- (vii) Infosys Spring Board
- (viii) Future Skills Prime (digital skilling ecosystem developed by Govt. Of India and NASSCOM)
- (ix) Wadhvani Foundation
- (x) Tata Strive
- (xi) Any other platform approved by the BoS chair and Dean AA

After completing such courses, students have to submit the certificate to the concerned department and then after verification of the certificate the respective department will communicate the credits earned to the Dean, Academic Affairs for approval and onward transmission to examination section of the institute to deposit the credits in academic bank of credits (ABC).

10. CONFORMANCE TO NEP2020

MULTIPLE EXIT OPTIONS

Sl. No.	Exit Description	Exit Point	Degree/Certificate offered	Goal
1.	First Exit	After completion of First year.	UG Certificate in CE	The student should be employable as Technical Assistant (CE) in any industry/organization.
2.	Second Exit	After completion of Second year.	UG Diploma in CE	The student should be employable as Technician (CE) in any industry/organization.
3.	Third Exit	After completion of Third year.	B. Voc in CE	The student should be employable as Technical Supervisor (CE) in any industry/organization.
4.	Normal Exit	After completion of Fourth year.	B.Tech in CE	The student should be employable as an Engineer (CE) in any relevant industry/organization.

10.2 MULTIPLE ENTRY OPTIONS

Sl. No.	Entry Descriptions	Entry Point	Eligibility
1.	Normal (First) Entry	I-Sem. of the program	As per the TGSCHE guidelines & through Common Entrance Examination TSEAPCET
2.	Second Entry	III-Sem. Of the	The successful completion of first year with UG certificate in CE from our

		program	institute.
3.	Third Entry	V-Sem.of the program	The successful completion of UG Diploma in CE from our institute.
4.	Fourth Entry	VII-Sem. Of the program	The successful completion of B.Voc in CE from our institute.

- (i) **No. of maximum exits:** as per NEP2020/UGC/AICTE guidelines on MEME
- (ii) **No. of maximum entry:** as per NEP2020/UGC/AICTE guidelines on MEME
- (iii) **Maximum gap between exit and entry:** as per NEP2020/UGC/AICTE guidelines on MEME
- (iv) **Academic Bank of Credits shall be maintained**

11. Options for Degree Certificate

(i). Learners who earn a minimum of total 174 credits will be **awarded “B.Tech” degree which confirms to NEP2020 requirements of multidisciplinary holistic education.**

(ii). Fast Learners will have the following options to earn **B. Tech degree with Honours/ Minor.**

a) B.Tech with “Minor” degree (with additional 18 credits): 174+18 Credits

Students opting for Minor degree in identified cutting-edge technologies offered by other departments, have to successfully complete four theory courses (each of 4 credits) and two lab courses (each of 1 credit) during the semester break. One theory & One lab course have to be completed during 5th and 6th semesters. During 7th and 8th semesters one theory course to be completed. All four theory courses will have to be completed through MOOCS and lab courses will be offered by respective department offering the Minor Degree.

b) B.Tech with “Honours” degree (with additional 18 credits): 174+18 Credits

Students opting for Honours degree have to successfully complete four theory courses (each of 4 credits) and two lab courses (each of 1 credit) as per the specified list of subjects by their own department. One theory & One lab course have to be completed during 5th and 6th semesters. During 7th and 8th semesters one theory course to be completed. All four theory courses will have to be completed through MOOCS and lab courses will be offered by respective department offering the Minor Degree.

c) B.Tech-“Honours with Research” degree (with additional 18 credits by research): 174+18 credits

Students are expected to complete 2-months research internship in summer after 2nd year (5 credits), 3rd year (5 credits) and work towards individual research-based project during 4th year. They have to complete one course on “Research Methodology” through

MOOCS or can complete a one week FDP on “Research Methodology”, during 7th semester (4 credits) and finally publish a research paper in a journal indexed by SCI/SCOPUS/WEB OF SCIENCE (4 credits).

11.1 Summary of requirements for earning additional credits leading to “Minor”, “Honours” and “Honours with Research” degrees:

Semester	B. Tech with “Minor”	B. Tech with “Honours”	B. Tech “Honours with Research”
I	-	-	-
II	-	-	-
III	-	-	-
IV	-	-	-
Summer breakafter 2 nd year	-	-	2-Months Research Internship -I (5 credits)
V	1 theory (4 credits) + 1 lab (1 credit)	1 theory (4 credits) + 1 lab (1 credit)	-
VI	1 theory (4 credits) + 1 lab (1 credit)	1 theory (4 credits) + 1 lab (1 credit)	-
Summer breakafter 3 rd year	-	-	2-Months Research Internship -II (5 credits)
VII	1 theory (4 credits)	1 theory (4 credits)	“Research Methodology” Theory Course (4 Credits)
VIII	1 theory (4 credits)	1 theory (4 credits)	One research publication in Journalindexed by SCI / SCOPUS / Web of Science (4 Credits)
Total additional credits to be earned	18	18	18

11.2 Credit requirements for four different options of the B. Tech Degree

	I	II	III	IV	V	VI	VII	VIII	Total
B. Tech	22	23	24	24	23	22	21	15	174
B. Tech with Minor	22	23	24	24	23+5*	22+5*	21+4*	15+4*	174+18*
B. Tech with Honours	22	23	24	24	23+5*	22+5*	21+4*	15+4*	174+18*
B. Tech. Honours with Research	22	23	24	24	23+5*	22	21+5*+4*	15+4*	174+18*

*Optional additional Credits leading to Minor/Honours/Honours with Research as applicable

11.3 Options for earning of “Additional Points” for Honours certification

S. No.	Activity	Points earned			Maximum Limit
		Percentile	Points		
1	Success in the GATE Exam	Above 98	8		8 Points
		Above 95	6		
		Above 90	4		
		Qualified	2		
2	Research Publication indexed by SCI / SCOPUS / Web of Science*	SCI Journal: 8 Points SCOPUS / Web of Science Journal: 4 Points Patent: 8 Points			8 Points
3	Winning Prestigious Technical Competition at National Level#	Rank	Points		6 Points
		1	4		
		2	3		
4	Completion of PG level MOOCS	Percentile	Points		6 Points
		Above 95	6		
		Above 90	5		
		Above 80	4		

Note: As the activities mentioned in the above Table of 11.3 are aimed at an additional professional dimension to the professional personality of the learners, each Point earned is given 1 credit equivalency. Thus, Honours registered students are allowed to accumulate a maximum of 8 additional Points through these activities equivalent to two courses (8 credits) of Honours curriculum requirement.

*In identified journals only. Journal to be approved by the BoS chair and Dean AA.

#In events approved by the BoS chair and Dean AA.

12. Distribution of Courses:

(i) Humanities & Social Sciences including Management (HSM)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	HSM 01	U24MH105/ U24MH205	English Communication and Report Writing	I	2
2.	HSM 02	U24MH508	Technical English	V	1
3.	HSM 03	U24ST505 / U24ST605A	S&E Basket*	V/VI	3

(For Example: (sample Courses)

- (i) English for Technical Writing
- (ii) Universal Human Value
- (iii) Management / Economics / Accounting / Taxation)

ii) Basic Science Courses (BSC)

S.No	Course Type	Course Code	Course Name	Semester	Credits
1.	BSC 01	U24MH101	Differential Calculus and Ordinary Differential Equations.	I	3
2.	BSC 02	U24PY102A	Engineering Physics	I	4
3.	BSC 03	U24MH201	Matrix Theory and Vector Calculus	II	3
4.	BSC 04	U24CH102A/ U24CH202A	Chemistry for Civil Engineering	II	4
5.	BSC 05	U24MH301B	Numerical and Statistical Methods	III	3

iii) Engineering Science Courses (ESC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	ESC 01	U24CS104	Programming for Problem Solving with C	I	4
2.	ESC 02	U24EE105B/ U24EE205X	Basic Electrical & Electronics Engineering	I	4
3.	ESC 03	U24CS204	Data Structures through C	II	4
4.	ESC 04	U24CE207	Engg. Graphics through CAD*	II	3
5.	ESC 05	U24CS305	OOP through Java [#]	III	4
6.	ESC 06	U24CS405	Python Programming	IV	4
7.	ESC 07	U24CS504	Advanced Data Structures	V	4
8.	ESC 08	U24CS604	Introduction to Data Bases	VI	4

iv) Program Core Courses (PCC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	PCC 01	U24CE103	Engineering Mechanics	I	3
2.	PCC 02	U24CE203	Strength of Materials	II	3
3.	PCC 03	U24CE302	Concrete Technology	III	4
4.	PCC 04	U24CE303	Surveying	III	4
5.	PCC 05	U24CE304	Mechanics of Materials	III	3
6.	PCC 06	U24CE401	Fluid Mechanics	IV	4
7.	PCC 07	U24CE402	Soil Mechanics	IV	4
8.	PCC 08	U24CE403	Design of Reinforced Concrete Structures	IV	3
9.	PCC 09	U24CE404	Estimation & Valuation	IV	3
10.	PCC 10	U24CE502	Transportation Engineering	V	4
11.	PCC 11	U24CE503	Theory of Structures	V	3
12.	PCC 12	U24CE602	Design of Steel Structures	VI	4
13.	PCC 13	U24CE603	Sustainable Materials & Green Buildings	VI	3
14.	PCC 14	U24CE703	Environmental Engineering	VII	4
15.	PCC 15	U24CE704	Hydrology & Water resources	VII	3
16.	PCC 16	U24CE705	Construction Technology Management	VII	3

v) Program Elective Courses (PEC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	PEC 01	U24CE601	Program Elective -I/ MOOCs-I	VI	3
2.	PEC 02	U24CE702	Program Elective - II/ MOOCs-II	VII	3
3.	PEC 03	U24CE802	Program Elective - III/ MOOCs-IV	VIII	3
4.	PEC 04	U24CE803	Program Elective - IV/ MOOCs-V	VIII	3

PEC 01: From Verticals of
PEC PEC 02: From Verticals
of PEC PEC 03: From
Verticals of PEC PEC 04:
From Verticals of PEC

vi) Experiential Learning Courses (ELC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	ELC 01	U24EL108	Practicum-1	I	1
2.	ELC 02	U24EL209	Practicum-2	II	1
3.	ELC 03	U24EL308	Practicum-3	III	1
4.	ELC 04	U24EL408	Practicum-4	IV	1
5.	ELC 05	U24CE509	Seminar	V	1
6.	ELC 06	U24CE608	Mini Project	VI	1
7.	ELC 07	U24CE706	Internship Evaluation*	VII	1
8.	ELC 08	U24CE707	Major Project, Phase-1 / Industrial Internship - 1	VII	4
9.	ELC 09	U24CE804	Major Project, Phase - 2 / Industrial Internship - 2	VIII	6

vii) Indian Knowledge System Courses(IKSC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	IKSC 01	U24SK100	AICTE Mandated Student Induction Programme (Universal Human Values - I)	I	0
2.	IKSC 02	U24SK506A	Essence of Indian Traditional Knowledge	V	2
3.	IKSC 03	U24SK606B	UHV-II	VI	2

IKS 01: From Basket

viii) **Multidisciplinary Open Electives Courses (MOPEC)**

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	MOPEC 01	U24OE501YYX	MOPEC Elective -I#	V	3
2.	MOPEC 02	U24OE701YYX	MOPEC Elective -II	VII	3
3.	MOPEC 03	U24OE801YYX	MOPEC Elective - III	VIII	3

MOPEC 01: From Baskets of
MOPEC MOPEC 02: From Baskets
of MOPEC MOPEC 03: From
Baskets of MOPEC

ix) **Value Added Courses (VAC)**

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	VAC 01	U24CY106	Environmental Studies	I	-
2	VAC 02	U24VA109	SEA - I / SAA-1	I	1
3	VAC 03	U24VA206	Sports & Yoga	II	-
4	VAC 04	U24VA210	SEA-2 / SAA -2	II	1
5	VAC 05	U24VA306A	QALR	III	2
6	VAC 06	U24VA309	SEA-3 / SAA -3	III	1
7	VAC 07	U24VA406A	Soft & Interpersonal Skills*	IV	2
6	VAC 08	U24VA409	SEA - 4 / SAA - 4	IV	1

x) **Skill Enhancement Courses (SEC)**

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	SEC 01	U24SE208	Programming Skill Development (PSD)Lab - 1	II	1
2.	SEC 02	U24SE307	PSD LAB-02	III	1
3.	SEC 03	U24SE407	PSD-03	IV	1
4.	SEC 04	U24SE507	PSD-04	V	1
5.	SEC 05	U24SE607	PSD-5	VI	1

xi) **Ability Enhancement Courses (AEC)**

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	MNCAU 01	U24AE107	IDEA Lab Makerspace	I	1
2.	MNCAU 02	U24AE110	Expert Talk Series-1	I	1
3.	MNCAU 03	U24AE211	Expert Talk Series-2	II	1
4.	MNCAU 04	U24AE310	Expert Talk Series-3	III	1
5.	MNCAU 05	U24AE410	Expert Talk Series-4	IV	1
6.	MNCAU 06	U24AE510	Expert Talk Series-5	V	1
7.	MNCAU 07	U24AE609	Expert Talk Series-6	VI	1

xii) Startups and Entrepreneurship Courses (STE)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	STE	U24ST505X	S&E Basket Basket*	V	3
Total:					3

xiii) Activity Based Learning (ABL) @ Value Added Courses:

Activity Based Learning (ABL) @ Value Added Courses

- Students are required to earn 4 credits through the first four semesters (2 credits from Social Empowerment Activities-SEA and 2 credits from Self Accomplishment Activities-SAA)
- If a student is not able to attend/ fulfill performance requirements, he/she shall be dropped from the course and will have to repeat by enrolling in the forthcoming semesters.
- The Student Activity Centre (SAC) and Centre for Innovation Incubation Research and Entrepreneurship (C-i2RE) shall act as nodal units for activities listed under SEA/SAA.

Social Empowerment Activities - SEA

- These activities are designed to uplift and empower a group or community. The emphasis is on collective benefit, social change, and improving the conditions or capabilities of a community or specific group within society.
- These are categorized under four groups namely
 1. **Swacch Bharat** (Clean India)
The aim of activities under Swachh Bharat is to promote cleanliness, hygiene, and sanitation across India.
 2. **Shikshit Bharat** (Educated India)
The aim of activities under Shikshit Bharat is to ensure inclusive and equitable quality education for all, promoting lifelong learning opportunities.
 3. **Samruddha Bharat** (Prosperous India)
The aim of activities under Samruddha Bharat is to promote economic growth, self-reliance, and prosperity for all citizens.
 4. **Surakshit Bharat** (Safe India)
The aim of activities under Surakshit Bharat is to ensure the safety, security, and well-being of all citizens.

Self-Accomplishment Activities - SAA

- These activities are centered on individual growth, personal development, and self-improvement. The emphasis is on enhancing one's own skills, knowledge, and well-being.
- These are categorized under four groups namely
 1. **Socho Bharat** (Think India)
The aim of activities under Socho Bharat is to foster critical thinking, innovation, and intellectual development among citizens.
 2. **Sanskarit Bharat** (Cultured India)
The aim of activities under Sanskarit Bharat is to preserve, promote, and celebrate India's rich cultural heritage, traditional values, and ethical practices by nurturing morals, fostering social harmony and creating awareness and appreciation of India's rich history.
 3. **Saksham Bharat** (Empowered India)
The aim of activities under Saksham Bharat is to empower individuals and communities with the skills, resources, and opportunities needed to achieve self-reliance and economic independence by fostering physical fitness, discipline, teamwork leadership and mental resilience.
 4. **Sunder Bharat** (Beautiful India)
The aim of activities under Sunder Bharat is to enhance the aesthetic and environmental beauty of India, making it a visually pleasing and environmentally sustainable country by emphasizing the importance of culture and heritage.

Table: SEA

Group	Guiding club/ center	Code of activity (U24VAYYY)*	Title of activity
SEA Group-1: Swacch Bharat	NSS	SE101	Clean India – Green India (River/ Beach/ Mohalla/ School/ Campus/ Govt offices Cleaning)
		SE102	Waste Management/ Waste Segregation Surveys
		SE103	Village Empowerment / NSS camp in village for a week
		SE104	Healthy habits-happy schools/Medical camps in schools / peer health

		SE105	Lifesaving skills /school clinics /First Aid training for a week
		SE106	Sustainable living /Surveys and Estimation for roof tops
		SE110	Any other activity approved by Dean Academic Affairs
SEA Group-2: Shikshit Bharat	Humanity Club	SE201	Peer mentoring /Mentoring of School Children
		SE202	Rural digital revolution / Digital Literacy for yielders & Participation in "Teach-for-India" movement
		SE203	Empowering learners -schools /Value addition for deprived schools
		SE204	Peer Mentoring /Mentoring junior (first year) students at KITSW
		SE205	Learning by Teaching /Teaching Assistantship at KITSW/Teaching AIDE
		SE206	Enriching Education/Development of learning material for schools/ITIs
		SE210	Any other activity approved by Dean Academic Affairs
SEA Group-3: Samruddha Bharat	C-i²RE	SE301	Innovation, Business Model & Entrepreneurship
		SE302	Product Development and Prototyping
		SE303	Design Thinking/ Critical Thinking & Problem Solving
		SE304	Fundraising and Proposal Writing in Entrepreneurship
		SE305	Digital Marketing & Branding
		SE306	Identify a Social Problem & Work on the Solution using AICTE-IDEA LAB
		SE307	Meet with Entrepreneurs and Understand Business Models
		SE308	Entrepreneurial Case Study Analysis
		SE310	Any other activity approved by Dean Academic Affairs
SEA Group-4: Surakshit Bharat	NCC	SE401	NCC participation/National Integrity
		SE402	Basics of fire safety/Community safety
		SE403	Disaster Management
		SE404	Environmental health & sustainability
		SE405	Road safety
		SE406	Pollution control
		SE410	Any other activity approved by Dean Academic Affairs

Code of each activity shall be: U24VAYYY + activity code of SEA/SAA

Example: U24VAYYYSE101 (for the activity Clean India – Green India (River / Beach /Mohalla /School / Campus / Govt offices Cleaning) under SEA Group1 Swacch Bharath)

Table: SAA

Group	Guiding club/ center	Code of activity (U24VAYYY)*	Title of activity
SAA Group-1: Socho Bharat	Literary Club	SA101	Study of Green & White Revolutions in India
		SA102	Study of any 2 Government Missions or National Policies
		SA103	Study of India's top 2 problems
		SA104	Study of World's top 2 problems
		SA105	Study of one department of the Central/ State Government
		SA106	Study of one of the identified Books on leadership or innovation
		SA110	Any other activity approved by Dean Academic Affairs
SAA Group-2: Sanskarit Bharat	Team - UHV	SA201	Values and Ethos of KITSW
		SA202	Philosophy of religion (any)
		SA203	Study of Life Management / Kindle Life / Life Empowerment and Enriching Program or any other book cited.
		SA204	Study of any of GREAT sons of INDIA (Ex. Gandhi, Ambedkar, Phule, Savarkar, Sardar Patel, Nehru, Shivaji, JRD Tata etc)
		SA205	Harmony in FAMILY & SOCIETY
		SA206	Harmony in NATURE
		SA210	Any other activity approved by Dean Academic Affairs
SAA Group-3: Saksham Bharat	Sports Club	SA301	Physical Fitness, Self-defence for Women, Target based Physical Exercise for example- Running (Test 5 kms in a stretch), Swimming (Test 1 km in a stretch), Walking (Test 20 kms in a stretch), Trekking (7days), Cycling
		SA302	Sports - Representation of Institute at University level/ Inter college level and above in ANY sport
		SA303	Pran-vidya (Yoga & Pranayama), Jeevan-vidya (work-life balance)
	Technical club	SA304	Participation in National Tech Fest, AICTE-Hackathon, industry floated global and National competitions, Robocon, BAHA etc
		SA305	Ambassador for events, Student member of regional level committees of Hyderabad

			section, Organizing committee member in National/Regional/Section level activities for technical societies like ISTE/IEEE/IETE/CSI/SAE etc.
		SA306	Present research papers at National and international conferences
		SA310	Any other activity approved by Dean Academic Affairs
SAA Group-4: Sunder Bharat	MDF	SA401	Institute representation in prestigious cultural fests/competitions
		SA402	Dance (Bharatanatyam /Kathak /Lavani /Western Dance). <i>Only for beginners</i>
		SA403	Music composition / Learning musical instrument (Any type). <i>Only for beginners.</i>
		SA404	Sculptures (focusing on themes of unity, peace and environmental conservation)/ /Seeing through Painting
	PMC	SA405	Film Appreciation/Dramatics
		SA406	Making short film/Photography
		SA410	Any other activity approved by Dean Academic Affairs

Code of each activity shall be: U24VAYYY + activity code of SEA/SAA

Example: U24VAYYYSA101 (for the activity Study of Green & White Revolutions in India under SAA Group1 Socho Bharat)

13. SUMMARY OF CURRICULUM COMPONENTS

S.NO.	CATEGORY	COURSE COMPONENT	TOTAL COURSES	TOTAL CREDITS	CURRICULUM CONTENT (%OF CREDITS)
1	HSMC	Humanity, Social Sciences and Management Courses	3	6	3.45
2	BSC	Basic Science Courses	5	17	9.77
3	ESC	Engineering Science Courses	8	31	17.82
4	PCC	Program Core Courses	16	55	31.61
5	PEC	Program Elective Courses	4	12	6.89
6	MOPEC	Multidisciplinary Open Elective Courses	3	09	5.17
7	ELC	Experiential Learning Courses	9	17	9.77
8	IKSC	Indian Knowledge System Courses	3	4	2.30
9	VAC	Value Added Courses	8	8	4.59
10	SEC	Skill Enhancement Courses	5	5	2.87
11	AEC	Ability Enhancement Courses	7	7	4.02
12	STE	Startups and Entrepreneurship Courses	1	3	1.72
Total			71	174	100

14. SEMESTER WISE COURSE / CREDIT DISTRIBUTION

Semester	Number of Courses / Number of Credits (<i>Course Category wise</i>)												TOTAL
	BSC	ESC	HSMC	PCC	MOPEC	PEC	SEC	VAC	ELC	AEC	IKSC	STE	
I	2/7	2/8		1/3				2/1	1/1	2/2	1/0		10/22
II	2/7	2/7	1/2	1/3			1/1	2/1	1/1	1/1			11/21
III	1/3	1/4		3/11			1/1	2/3	1/1	1/1			10/24
IV		1/4		4/14			1/1	2/3	1/1	1/1			10/24
V		1/4	2/4	2/7	1/3		1/1		1/1	1/1	1/2		10/23
VI		1/4		2/7		1/3	1/1		1/1	1/1	1/2	1/3	9/22
VII				3/10	1/3	1/3			2/5				7/21
VIII					1/3	2/6			1/6				4/15
Total	5/17	8/31	3/6	16/55	3/9	4/12	5/5	8/8	9*/17	7/7	3/4	1/3	71/174
% Weightage of Course Category	9.77% (17/174)	25.8% (31/174)	3.45 % (6/174)	31.61 % (55/174)	5.17% (9/174)	6.89 % (12/174)	2.87 % (5/174)	4.59% (8/174)	9.77% (17/174)	4.02% (7/174)	2.30% (4/174)	1.72% (3/174)	100 % (174/174)

* Seminar- 1 C , Mini Project- 1 C, Internship Evaluation-1C, Major Project : 4+6

B. Tech (CE) -CURRICULUM(KITSW-URR24)
SEMESTER-WISE CURRICULUM WITH SCHEME OF INSTRUCTIONS

Abbreviations

L	Lecture Hour	O	Outside the Class Work (Self Study) Hours
T	Tutorial Hour	E	Total Engagement in Hours
P	Practical Hour	C	Credit Assigned

I SEMESTER

Stream - I

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	C
U24SK100 AICTE Mandated Student Induction Programme (Universal Human Values - I)									
1	BSC	U24MH101	Differential Calculus and Ordinary Differential Equations.	2	1	-	6	9	3
2	BSC	U24PY102A	Engineering Physics	2	1	2	5	10	4
3	PCC	U24CE103	PCC 01 Engineering Mechanics	2	1	-	4	7	3
4	ESC	U24CE104	Programming for Problem Solving with C	2	1	2	5	10	4
5	ESC	U24EE105A	Basic Electrical & Electronics Engineering	2	1	2	5	10	4
6	VAC	U24CY106	Environmental Studies	2	-	-	3	5	-
7	AEC	U24AE107	IDEA Lab Makerspace	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-1	-	-	-	4	4	1
9	VAC	U24VA109	SEA - I / SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
Total:				12	5	8	37	62	22
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean, AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

Pool - I (Physics)		
Sr. No.	Course Code	Course Title
1.	U24PY102A	Engineering Physics (for Civil Engineering)
2.	U24PY102B	Engineering Physics (for ECIE)
3.	U24PY102C	Engineering Physics (for CSE)
4.	U24PY102D	Engineering Physics (for EEE)
5.	U24PY102E	Engineering Physics (for ECE)

Pool - II (Basic Electrical & Electronics Engineering)		
Sr. No.	Course Code	Course Title
1.	U24EE105A	Basic Electrical and Electronics Engineering (for Civil Engineering)
2.	U24EE105B	Basic Electrical Engineering (Common to ECE and ECIE)
3.	U24EE105C	Basic Electrical Engineering (for CSE)
4.	U24EE105D	Basic Electrical Engineering (for EEE)

II SEMESTER

Stream-I

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH201	Matrix Theory and Vector Calculus	2	1	-	6	9	3
2	BSC	U24CH202A	Engineering Chemistry	2	1	2	5	10	4
3	PCC	U24CE203	PCC 02 Strength of Materials	2	1	-	4	7	3
4	ESC	U24CE204	Data Structures through C	2	1	2	5	10	4
5	HSMC	U24MH205	English Communication and Report Writing	2	-	-	3	5	2
6	VAC	U24VA206	Sports & Yoga	-	-	2	2	4	-
7	ESC	U24CE207	Engg. Graphics through CAD*	1	-	4	2	7	3
8	SEC	U24SE208	Programming Skill Development(PSD) Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210	SEA-2 / SAA -2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
Total:				11	4	12	36	63	23
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

* For CE and ME, it will be a three (03) credit (1-0-4) course on Engineering Graphics & Design (Pedagogy: Sessions with conventional drafter and CAD). (For CE: U24CE107/U24CE207 and for ME: U24ME107A/U24ME207A)

Pool - III (Chemistry)		
Sr. No.	Course Code	Course Title
1.	U24CH202A	Engineering Chemistry (for Civil Engineering)
2.	U24CH202B	Engineering Chemistry (for ECIE)
3.	U24CH202C	Engineering Chemistry (for CSE)
4.	U24CH202D	Engineering Chemistry (for EEE)
5.	U24CH202E	Engineering Chemistry (for ECE)

Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute

OR

Successful completion of two suitable skill based courses (external) to qualify for Certification

A. After First Year: (UG Certificate in CE)

(i) The candidate should pass any two of the following additional courses (ITI Level) during the 2-Months internship at institute

Exit Option to Qualify UG Certificate in CE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CE212X	Fundamentals of Surveying	2	-	2	-	4	3
2	PCC	U24CE213X	Civil Engineering Materials	2	-	2	-	4	3
3	PCC	U24CE214X	Construction Practices	2	-	2	-	4	3
4	PCC	U24CE215X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

(OR)

(ii) Any two suitable skill based courses to qualify for Certification.

Exit Option to Qualify UG Certificate in CE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE212XCE	Drone Technician https://drive.google.com/file/d/1yMQdvaNzw1a_14laKsR9oxl8LrSAmBU/view	-	-	6	-	6	3
2	SEC	U24SE213XCE	Building Planning and Drawing in 3D https://nstihyderabad1.dgt.gov.in/sites/default/files/2023-07/Training%20Calendar%202023-24_compressed.pdf	-	-	6	-	6	3
3	SEC	U24SE214XCE	Training in Total Station http://www.geoinstituteoftechnologies.in/land-survey-courses-in-hyderabad	-	-	6	-	6	3
4	SEC	U24SE215XCE	Land Surveyor https://nac.edu.in/long-term-courses/	-	-	6	-	6	3
5	SEC	U24SE216XCE	Any other skill based course approved by BoS Chair and Dean AA	-	-	6	-	6	3

III SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH301B	Numerical and Statistical Methods	2	1	-	6	9	3
2	PCC	U24CE302	PCC 03 Construction Materials	2	1	2	5	10	4
3	PCC	U24CE303	PCC 04 Surveying	2	1	2	5	10	4
4	PCC	U24CE304	PCC 05 Mechanics of Materials	2	1	-	4	7	3
5	ESC	U24CE305	OOP through Java	2	1	2	5	10	4
6	VAC	U24VA306A	Quantitative Aptitude & Logical Reasoning (QALR)	2		-	2	4	2
7	SEC	U24SE307	PSD LAB-02	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309	SEA-3 / SAA -3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
Total:				12	5	8	36	61	24
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean, AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

* Branch Specific Mathematics:

S. No.	Course Code	Course Title
1.	U24MH301A	Numerical and Statistical Methods (for Civil Engineering)
2.	U24MH301B	Numerical and Statistical Methods
3.	U24MH301C	Probability, Statistics and Discrete Mathematics
4.	U24MH301D	Any other Course approved by BoS chair and Dean AA

IV SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	
1	PCC	U24CE401	PCC 06 Fluid Mechanics	2	1	2	5	10	4
2	PCC	U24CE402	PCC 07 Soil Mechanics	2	1	2	5	10	4
3	PCC	U24CE403	PCC 08 Design of Reinforced Concrete Structures	2	1	-	4	7	3
4	PCC	U24CE404	PCC 09 Estimation & Valuation	2	1	-	4	7	3
5	ESC	U24CE405	Python Programming	2	1	2	5	5	4
6	VAC	U24VA406B	Soft and Interpersonal Skills®	2	-	-	2	4	2
7	SEC	U24SE407	PSD-03	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409	SEA - 4/ SAA - 4	-	-	-	2	2	1
10	AEC	U24AE410	Expert Talk Series-4	-	-	-	1	1	1
11	VAC*	U24CH411*	Environmental Studies*	2*	1*	-	2*	5*	-
Total:				12	5	8	34	59	24
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

*For Lateral Entry Students Only

Bridge Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute

OR

Successful completion of two suitable skill based courses (external) to qualify for Certification

B. After Second Year: (UG Diploma in CE)

(i) The candidate should pass any two of the following additional courses (Diploma Level) during the 2-Months internship at institute

Exit Option to Qualify UG Diploma in CE : Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CE412X	Transportation Engineering	2	-	2	-	4	3
2	PCC	U24CE413X	Environmental Engineering	2	-	2	-	4	3
3	PCC	U24CE414X	Design, detailing and drawings of structures	2	-	2	-	4	3
4	PCC	U24EC415X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

(OR)

(ii) Any two suitable skill based courses to qualify for Diploma.

Exit Option to Qualify UG Diploma in CE : Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE416XCE	Certificate Course in Civil Structure https://www.citdindia.org/images/pdf/UPDATED-CAD-CAM-CAE-COURSES-DETAILS.pdf	-	-	6	-	6	3
2	SEC	U24SE417XCE	3DS MAX&REVIT STRUCTURE https://www.citdindia.org/images/pdf/UPDATED-CAD-CAM-CAE-COURSES-DETAILS.pdf	-	-	6	-	6	3
3	SEC	U24SE418XCE	Highway Works Supervisor https://nac.edu.in/long-term-courses/	-	-	6	-	6	3
4	SEC	U24SE419XCE	Training in DGPS http://www.geoinstituteoftechnologies.in/land-survey-courses-in-hyderabad	-	-	6	-	6	3
5	SEC	U24SE420XCE	Any other skill based course approved by BoS Chair and DeanAA	-	-	6	-	6	3

B. Tech Honours with Research:

Students opting for B. Tech Honours with Research, shall undergo a 2-Month Mandatory Research Internship-I (5 Credits) at respective department during the summer vacation after IV Semester.

V SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	
1	MOPEC	U24OE501YYX	MOPEC Elective -I [#]	2	1	-	3	6	3
2	PCC	U24CE502	PCC 10 Highway Engineering	2	1	2	5	10	4
3	PCC	U24CE503	PCC 11 Theory of Structures	2	1	-	4	7	3
4	ESC	U24CE504	Advanced Data Structures	2	1	2	5	10	4
5	STE	U24ST505X	S&E Basket Basket*	2	1	-	2	5	3
6	IKS	U24SK506A	Essence of Indian Traditional Knowledge	2	-	-	2	4	2
7	SEC	U24SE507	PSD-04	-	-	2	2	4	1
8	HSMC	U24MH508	Technical English	-	-	2	2	4	1
9	ELC	U24EC509	Seminar	-	-	-	2	2	1
10	AEC	U24AE510	Expert Talk Series-5	-	-	-	1	1	1
Total:				12	5	8	28	53	23
Additional Learning [@] :Maximum credits allowed for Honours/Minor				-	-	-	-	-	5
Total credits for Honours/Minor students:				-	-	-	-	-	29
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean, AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

#MULTIDISCIPLINARY OPEN ELECTIVES: Student has to select one course as multidisciplinary open elective from any of the MOPEC Basket of courses offered by other departments.

* Dean AA will allot the courses S&E Basket (Stream-I), Management Course Basket (Stream-II), to the branches as per Stream-I and Stream-II.

[@]List of courses for additional learning through MOOCs towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula

Startups &Entrepreneurship Basket		
Sr. No.	Course Code	Course Title
1.	U24ST505A/ U24ST605A	Design Thinking
2.	U24ST505B/ U24ST605B	Innovative Product Design and Development
3.	U24ST505C/ U24ST605C	Entrepreneurship
4.	U24ST505D/ U24ST605D	Design Studio
5.	U24ST505Z/ U24ST605E	Any other course approved by BoS Chair and Dean AA

Management Courses Basket		
Sr. No.	Course Code	Course Title
1.	U24MB505A/ U24MB605A	Managerial Economics and Accountancy
2.	U24MB505B/ U24MB605B	Industrial Psychology
3.	U24MB505C/ U24MB605C	E-Commerce and Digital Marketing
4.	U24MB505D/ U24MB605D	Organizational Behaviour
5.	U24MB505E/ U24MB605Z	Any other course approved by BoS Chair and Dean AA

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	PEC	U24CE601	Program Elective -I / MOOCs-I	2	1	-	4	7	3
2	PCC	U24CE602	PCC -12 Design of Steel Structures	2	1	2	4	9	4
3	PCC	U24CE603	PCC -13 Sustainable Materials & Green Buildings	2	1	-	4	7	3
4	ESC	U24CE604	Introduction to Data Bases	2	1	2	5	10	4
5	STE	U24MB605X	Management Course Basket	2	1	-	2	5	3
6	IKSC	U24SK606B	UHV-II	2	-	-	2	4	2
7	SEC	U24SE607	PSD-5	-	-	2	2	4	1
8	ELC	U24CE608	Mini Project	-	-	2	2	4	1
9	AEC	U24AE609	Expert Talk Series-6	-	-	-	1	1	1
Total:				12	5	8	25	50	22
Additional Learning [@] : Maximum credits allowed for Honours/Minor				-	-	-	-	-	5
Total credits for Honours/Minor students:				-	-	-	-	-	27
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean, AA) : 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

#MULTIDISCIPLINARY OPEN ELECTIVES: Student has to select one course as multidisciplinary open elective from any of the MOPEC Basket of courses offered by other departments.

[@]List of courses for additional learning through MOOCs towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula

B. Tech Honours with Research:

Students opting for B. Tech Honours with Research, shall undergo a 2-Month Mandatory Research Internship-II(5 Credits) at respective department during the summer vacation after VI Semester.

Startups & Entrepreneurship Basket		
Sr. No.	Course Code	Course Title
1.	U24ST505A/U24ST605A	Design Thinking
2.	U24ST505B/U24ST605B	Innovative Product Design and Development
3.	U24ST505C/U24ST605C	Entrepreneurship
4.	U24ST505D/U24ST605D	Design Studio
5.	U24ST505Z/U24ST605E	Any other course approved by BoS Chair and Dean AA

Management Courses Basket		
Sr. No.	Course Code	Course Title
1.	U24MB505A/ U24MB605A	Managerial Economics and Accountancy
2.	U24MB505B/ U24MB605B	Industrial Psychology
3.	U24MB505C/ U24MB605C	E-Commerce and Digital Marketing
4.	U24MB505D/ U24MB605D	Organizational Behaviour
5.	U24MB505E/ U24MB605Z	Any other course approved by BoS Chair and Dean AA

Bridge Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute

OR

Successful completion of two suitable skill-based courses (external) to qualify for Certification

C. After Third Year:(B. Voc. in CE)

(i) The candidate should pass any two of the following additional courses (Degree Level) during the 2-Months internship at institute

Exit Option to Qualify B. Voc in CE : Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CE610X	Engineering Geology	2	-	2	-	4	3
2	PCC	U24CE611X	Advanced Concrete Technology	2	-	2	-	4	3
3	PCC	U24CE612X	Traffic Engineering	2	-	2	-	4	3
4	PCC	U24CE613X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

(OR)

(ii) Any two suitable skill based courses to qualify for B. Voc in CE Degree.

Exit Option to Qualify B. Voc in CE : Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE610XCE	Finishing School program for fresh Civil Engineering Graduates https://nac.edu.in/finishing-school/	-	-	6	-	6	3
2	SEC	U24SE611XCE	Digital Photogrammetry and Remotesensing - https://www.surveyofindia.gov.in/pages/courses-offered	-	-	6	-	6	3
3	SEC	U24SE612XCE	Practical Aspects of Construction Management (PACM) - Site Engineer(Construction Management Training Institute - https://cmti.co.in/civil-engineering-certification-courses.html	-	-	6	-	6	3
4	SEC	U24SE613XCE	NITI Aayog Internship - https://www.niti.gov.in/internship	-	-	6	-	6	3
5	SEC	U24SE614XCE	Any other skill based course approved by BoS Chair and Dean AA	-	-	6	-	6	3

VII SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	
1	MOPEC	U24OE701YYX	MOPEC Elective -II	2	1	-	3	6	3
2	PEC	U24CE702	Program Elective - II/ MOOCs-II	2	1	-	4	7	3
3	PCC	U24CE703	PCC-14 Environmental Engineering	2	1	2	4	9	4
4	PCC	U24CE704	PCC-15 Hydrology and Water Resources Engineering	2	1	-	4	7	3
5	PCC	U24CE705	PCC-16 Construction Technology and Management	2	1	-	4	7	3
6	ELC	U24CE706	Internship Evaluation*	-	-	2	-	2	1
7	ELC	U24CE707	Major Project, Phase-1 / Industrial Internship - 1	-	-	8	6	12	4
Total:				10	5	12	25	52	21
Additional Learning[@]: Maximum credits allowed for Honours/Minor				-	-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	-	24

#MULTIDISCIPLINARY OPEN ELECTIVES: Student has to select one course as multidisciplinary open elective from any of the MOPEC Basket of courses offered by other departments.

@ List of courses for additional learning through MOOCs towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula

B. Tech Honours with Research

Students opting for B. Tech Honours with Research, shall complete Research Methodology Course (4 Credits) through MOOCs (OR) a workshop / FDP of not less than one week on "Research Methodologies" (4 Credits).

Internship Evaluation for the students opting B. Tech Honours with Research, will be done during 2-Month Research Internship-II.

VIII SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	C
1	MOPEC	U24OE801YYX	MOPEC Elective -III	2	1	-	3	6	3
2	PEC	U24CE802	Program Elective - III/ MOOCs-IV	2	1	-	4	7	3
3	PEC	U24CE803	Program Elective - IV / MOOCs-V	2	1	-	4	7	3
4	ELC	U24CE804	Major Project, Phase - 2 / Industrial Internship - 2	-	-	12	4	16	6
Total:				6	3	12	15	36	15
Additional Learning [@] :Maximum credits allowed for Honours/Minor				-	-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	-	19

#MULTIDISCIPLINARY OPEN ELECTIVES: Student has to select one course as multidisciplinary open elective from any of the MOPEC Basket of courses offered by other departments.

@ List of courses for additional learning through MOOCs towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula

B. Tech Honours with Research

Students opting for B. Tech Honours with Research, shall Publish a research paper in reputed journal indexed by SCI/ SCOPUS/Web of Science (4 Credits).

SUMMARY

SEMESTER	I	II	III	IV	V	VI	VI I	VII I	TOTAL
CREDITS	22	23	24	24	23	22	21	15	174

MULTIDISCIPLINARY OPEN ELECTIVE COURSES (MOPEC) BASKETS:

There are three slots for MOPEC Courses (5th, 7th& 8th semesters). Students can opt any four courses (one course per semester under MOPEC slot) from the available 14 MOPEC Baskets.

Students those who opt open elective courses will be thinking to get introduced to the courses other than their program courses to start rooting their professional goals in their breadth component of study to explore the jobs in different fields. Hence the department shall carefully offer courses under the MOPEC Basket which create interest and impart basic knowledge and skills across the domains. For example the CS/IT MOPEC basket shall consist of courses like Introduction to AI&ML, Intro to web programming, Intro to Computer Networking, Intro to Operating Systems, etc.

Course code to be followed for all MOPEC courses:

U	2	4	O	E	X	0	1	C	E	A
URR24 Curriculum			MOPEC Elective		Semester in which MOPEC opted (5/6/7)	1 st Subject in that Semester		MOPECs offered by CE Dept.		Serial Order

(I) CIVIL ENGINEERING: CE-MOPEC BASKET

The following Courses will be offered by Civil Engineering Department under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01CEA	Engineering Mechanics
2	U24OEX01CEB	Strength of Materials
3	U24OEX01CEC	Fluid Mechanics
4	U24OEX01CED	Advanced Surveying
5	U24OEX01CEE	Energy Efficient Buildings
6	U24OEX01CEF	Net Zero Buildings
7	U24OEX01CEG	Forensic Engineering
8	U24OEX01CEH	Smart and Resilient Buildings
9	U24OEX01CEI	Infrastructure Engineering & Management
10	U24OEX01CEJ	Disaster Response & Preparedness
11	U24OEX01CEK	Introduction to Sustainable Development
12	U24OEX01CEL	Lifeline Services & Disasters
13	U24OEX01CEZ	Any other course approved by BoS Chair and Dean AA

(II) MECHANICAL ENGINEERING: ME-MOPEC BASKET

The following Courses will be offered by Mechanical Engineering Department under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01MEA	3D Printing Technologies
2	U24OE X01MEB	Joy of Mechanical Engineering
3	U24OE X01MEC	Introduction to Engineering Design
4	U24OE X01MED	Research Methodology
5	U24OE X01MEE	Thermal Science & Engineering
6	U24OEX01MEF	Automotive Pollution & Control
7	U24OEX01MEG	Applications of AI/ML in Mechanical Engineering
8	U24OEX01MEH	Computer Integrated Manufacturing
9	U24OEX01MEI	Elements of Automobile Engineering
10	U24OEX01MEJ	Finite Element Methods for Engineers
11	U24OEX01MEK	Design of Heat transfer equipment
12	U24OEX01MEL	Alternate Fuels
13	U24OEX01MEM	Digital Manufacturing
14	U24OEX01MEN	Industrial Engineering
15	U24OEX01MEO	Robotics Engineering
16	U24OEX01MEP	Composite Materials
17	U24OEX01MEQ	Jet Propulsion and Rocketry
18	U24OEX01MER	Cooling of Electronic Devices and circuits
19	U24OEX01MEZ	Any other course approved by BoS Chair and Dean AA

(III) ECE: EC -MOPEC BASKET

The following Courses will be offered by ECE and ECI Departments under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01ECA	Analog and Digital Electronics
2	U24OEX01ECB	Digital Electronics
3	U24OEX01ECC	Signals and Systems
4	U24OEX01ECD	Computer Architecture and Organization
5	U24OEX01ECE	Embedded System Design
6	U24OEX01ECF	Microprocessor and Microcontrollers
7	U24OEX01ECG	Linear Integrated Circuits
8	U24OEX01ECH	Digital Image Processing
8	U24OEX01ECI	Principles of Communication Systems
10	U24OEX01ECJ	Digital Signal Processing and Applications
11	U24OEX01ECK	Basic VLSI Design
12	U24OEX01ECL	Radar Engineering
13	U24OEX01ECM	Optical Communications and Networks
14	U24OEX01ECN	Wireless and Mobile Communications
15	U24OEX01ECO	Satellite Communications
16	U24OEX01ECP	Wireless Sensor Networks
17	U24OEX01ECQ	Microwave Communications

18	U24OEX01ECR	Introduction to Nanotechnology
19	U24OEX01ELZ	Any other course approved by BoS Chair and Dean AA

(IV) ECI: CI-MOPEC BASKET

The following Courses will be offered by ECI Departments under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01CIA	Fundamentals of Instrumentation
2	U24OEX01CIB	Switching Theory and Logic Design
3	U24OEX01CIC	Signals and Systems
4	U24OEX01CID	Digital Signal Processing and Applications
5	U24OEX01CIE	Sensors and Actuators
6	U24OEX01CIF	Fundamentals of VLSI
7	U24OEX01CIG	LabVIEW Programming
8	U24OEX01CIH	PLC and DCS
8	U24OEX01CII	Microcontrollers and Applications
10	U24OEX01CIJ	Internet of Things
11	U24OEX01CIK	Non - Destructive Testing
12	U24OEX01CIZ	Any other course approved by BoS Chair and Dean AA

(V) CSE: CS-MOPEC BASKET

The following Courses will be offered by CSE Departments under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01CSA	Operating Systems
2	U24OEX01CSB	Design and Analysis of Algorithms
3	U24OEX01CSC	Software Engineering
4	U24OEX01CSD	Compiler Design
5	U24OEX01CSE	Data Mining
6	U24OEX01CSF	Cryptography & Network Security
7	U24OEX01CSG	High Performance Computing
8	U24OEX01CSH	Software Quality Assurance & Testing
9	U24OEX01CSZ	Any other course approved by BoS Chair and Dean AA

(VI) IT ENGINEERING: IT-MOPEC BASKET

The following Courses will be offered by IT Departments under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01ITA	Computer Networks
2	U24OEX01ITB	Ethical hacking
3	U24OEX01ITC	Programming with C++
4	U24OEX01ITD	Web Design Technologies
5	U24OEX01ITE	Software Project Management

6	U24OEX01ITF	Java Full stack development
7	U24OEX01ITG	DevOps
8	U24OEX01ITH	NET Programming
9	U24OEX01ITI	Software Testing and Quality Assurance
10	U24OEX01CSZ	Any other course approved by BoS Chair and Dean AA

(VII) ELECTRICAL ENGINEERING: EE-MOPEC BASKET

The following Courses will be offered by EEE Department under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01EEA	Linear Control Systems
2	U24OEX01EEB	Introduction to Electric Vehicles
3	U24OEX01EEC	Renewable Energy Systems
4	U24OEX01EED	Smart Electric Grid
5	U24OEX01EEE	Generation & Utilization of Electric Energy
6	U24OEX01EEF	Energy Auditing
7	U24OEX01EEG	Network Analysis and Synthesis
8	U24OEX01EEH	Power Electronics
9	U24OEX01EEZ	Any other course approved by BoS Chair and Dean AA

(VIII) CSE (DATA SCIENCE): DS-MOPEC BASKET

The following Courses will be offered by CSE(D) Department under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01DSA	Exploratory Data Analysis with R Programming
2	U24OEX01DSB	Predictive Analytics and Data Mining
3	U24OEX01DSC	Big data Analytics
4	U24OEX01DSD	Machine Learning
5	U24OEX01DSE	Deep Learning
6	U24OEX01DSF	Data Visualization
7	U24OEX01DSG	Social and Information Network Analysis
8	U24OEX01DSH	Web Scraping with Python
9	U24OEX01DSI	Introduction to MLOps
10	U24OEX01DSZ	Any other course approved by BoS Chair and Dean AA

(IX) CSE (AM&ML) : AI-MOPEC BASKET

The following Courses will be offered by the CSE(AM&ML) Department under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01AIA	Artificial Intelligence
2	U24OEX01AIB	Machine Learning
3	U24OEX01AIC	Deep Learning
4	U24OEX01AID	Computer Vision and Image Processing
5	U24OEX01AIE	Natural Language Processing
6	U24OEX01AIF	Exploratory Data Analysis with Python

7	U24OEX01AIG	Robotic Process Automation
8	U24OEX01AIH	Prompt Engineering for Generative AI
9	U24OEX01AII	MLOps Architecture for LLMs
10	U24OEX01AIZ	Any other course approved by BoS Chair and Dean AA

(X) CSE (NETWORKS): CN-MOPEC BASKET

The following Courses will be offered by CSE(N) Department under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01CNA	Computer Networks
2	U24OEX01CNB	Cloud Computing
3	U24OEX01CNC	Block Chain Technologies
4	U24OEX01CND	Internetworks and Virtualization
5	U24OEX01CNE	Network Automation
6	U24OEX01CNF	Platforms and System Security
7	U24OEX01CNG	Data Centre Networking
8	U24OEX01CNH	Fundamentals of Cyber Security & Tools
9	U24OEX01CNI	SDN for real networks
10	U24OEX01CNZ	Any other course approved by BoS Chair and Dean AA

(XI) CSE (IOT) : IN-MOPEC BASKET

The following Courses will be offered by CSE(IOT) Department under MOPEC basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01INA	Programming with IoT boards
2	U24OEX01INB	Python for IoT
3	U24OEX01INC	IoT Architecture and Protocols
4	U24OEX01IND	Artificial IoT
5	U24OEX01INE	IoT frameworks
6	U24OEX01INF	IIoT
7	U24OEX01ING	Cyber Physical Systems
8	U24OEX01INH	Privacy & Security for IoT
9	U24OEX01INI	Edge and fog computing
10	U24OEX01INZ	Any other course approved by BoS Chair and Dean AA

(XII) MATHEMATICS: MT-MOPEC BASKET

The following Courses will be offered by M&H Department under MOPEC basket to the students of all branches:

V/VII/VIII SEMESTER		
1	U24OEX01MTA	Operations Research
2	U24OEX01MTB	Computational Number Theory
3	U24OEX01MTC	Integral Equations & Integral Transforms
4	U24OEX01MTD	Fuzzy Set Theory and Its Applications
5	U24OEX01MTE	Complex Analysis and Applications
6	U24OEX01MTF	Discrete Mathematics and Graph Theory

7	U24OEX01MTA	Partial Differential Equations and Applications
8	U24OEX01MTB	Probability Theory and Stochastic Processes
9	U24OEX01MTC	Descriptive Statistics with R software
10	U24OEX01MTD	Numerical Linear Algebra
11	U24OEX01MTE	Applied Linear Algebra in AI and ML
12	U24OEX01MTF	Matrix Computation and Applications
13	U24OEX01MTA	Reliability Theory
14	U24OEX01MTB	Numerical Methods for Partial Differential Equations
15	U24OEX01MTZ	Any other course approved by BoS Chair and Dean AA

(XIII) ENGLISH : EN-MOPEC BASKET

The following Courses will be offered by M&H Department under MOPEC basket to the students of all branches:

V/VII/VIII SEMESTER		
1	U24OEX01ENA	Creative Writing
2	U24OEX01ENB	Public Speaking
3	U24OEX01ENC	Conversational English
4	U24OEX01END	Exam Skills
5	U24OEX01ENE	English for Competitive Examinations
6	U24OEX01ENF	Comprehensive Reading
7	U24OEX01ENG	Corporate Writing
8	U24OEX01ENH	Scientific English
9	U24OEX01ENI	Foundation for IELTS/TOEFL
10	U24OEX01ENJ	Narrative Skills
11	U24OEX01ENK	Professional Writing
12	U24OEX01ENL	English Language Enhancement
13	U24OEX01ENZ	Any other course approved by BoS Chair and Dean AA

(XIV) PHYSICS: PY-MOPEC BASKET

The following Courses will be offered by PS Department under MOPEC basket to the students of all branches:

V/VII/VIII SEMESTER		
1	U24OEX01PYA	Science and Technology of Non-Conventional Energy
2	U24OEX01PYB	Laser Systems for Industrial and Engineering Applications
3	U24OEX01PYC	Optical Fiber Communication
4	U24OEX01PYD	Nanomaterials
5	U24OEX01PYE	Fundamentals of Electromagnetism
6	U24OEX01PYF	Solid State Physics
7	U24OEX01PYG	Modern Materials
8	U24OEX01PYH	Experimental Physics
9	U24OEX01PYI	Thermodynamics
10	U24OEX01PYZ	Any other course approved by BoS Chair and Dean AA

(XV) CHEMISTRY: CY-MOPEC BASKET

The following Courses will be offered by PS Department under MOPEC basket to the students of all branches:

V/VII/VIII SEMESTER		
1	U24OEX01CYA	Nano Bio-Technology
2	U24OEX01CYB	Computational Chemistry
3	U24OEX01CYC	Biosensors and Applications
4	U24OEX01CYD	Fundamentals of Quantum Chemistry
5	U24OEX01CYE	Stereochemistry
6	U24OEX01CYF	Advanced Polymer Chemistry
7	U24OEX01CYG	Principles and Applications of NMR Spectroscopy
8	U24OEX01CYH	Organic Reaction Mechanisms
9	U24OEX01CYI	Basic Organic Chemistry
10	U24OEX01CHZ	Any other course approved by BoS Chair and Dean AA

(XVI) COMMERCE & MANAGEMENT : CM-MOPEC BASKET

The following Courses will be offered by MBA Department under MOPEC basket to the students of all branches:

V/VII/VIII SEMESTER		
1	U24OEX01CMA	Principles of Accountancy
2	U24OEX01CMB	Finance for Engineers
3	U24OEX01CMC	Management Principles
4	U24OEX01CMD	Organizational Behavior
5	U24OEX01CME	Project Management
6	U24OEX01CMF	Operations Management
7	U24OEX01CMG	Consumer Psychology
8	U24OEX01CMH	Principles of Marketing Management
9	U24OEX01CMZ	Any other course approved by BoS Chair and Dean AA

(XVII) LIBERAL ARTS* : LI-MOPEC BASKET

Students opting Liberal Art courses under MOPEC shall complete the courses through SWAYAM / NPTEL or any other MOOCS platform:

V/VII/VIII SEMESTER		
1	U24OEX01LIA	Indian Language-I
2	U24OEX01LIB	Indian Language-II
3	U24OEX01LIC	Psychology for Well-Being
4	U24OEX01LID	Foreign Language-I
5	U24OEX01LIE	Foreign Language-II
6	U24OEX01LIF	Introduction to Indian Art -An Appreciation
7	U24OEX01LIG	Drama Appreciation
8	U24OEX01LIH	Cultural Studies
9	U24OEX01LII	Film Appreciation
10	U24OEX01LIJ	Ethics in Engineering Practice
11	U24OEX01LIZ	Any other course approved by BoS Chair and Dean AA

* Through MOOCS only

(XVIII) ARTS*: AR-MOPEC BASKET

Students opting Arts courses under MOPEC shall complete the courses through SWAYAM / NPTEL or any other MOOCS platform:

V/VII/VIII SEMESTER		
1	U24OEX01ARA	Anthropolgy
2	U24OEX01ARB	Ancient India
3	U24OEX01ARC	Constitution of INDIA
4	U24OEX01ARD	Medieval India
5	U24OEX01ARE	Geography
6	U24OEX01ARF	Modern India
7	U24OEX01ARG	Indian Polity
8	U24OEX01ARH	Indian Economy
9	U24OEX01ARZ	Any other course approved by BoS Chair and Dean AA

* Through MOOCS only

(XIX) LAW*: LW-MOPEC BASKET

Students opting Laws courses under MOPEC shall complete the courses through SWAYAM / NPTEL or any other MOOCs platform:

V/VII/VIII SEMESTER		
1	U24OEX01LWA	Law for Engineers
2	U24OEX01LWB	Environmental Law
3	U24OEX01LWC	Labour Law
4	U24OEX01LWD	IPR and Patent Law
5	U24OEX01LWE	Industrial Law
6	U24OEX01LWF	Company Law
7	U24OEX01LWG	Administrative Law
8	U24OEX01LWH	Alternative Dispute Resolution
9	U24OEX01LWZ	Any other course approved by BoS Chair and Dean AA

(XX) I²RE : IE-MOPEC BASKET

Students opting I²RE courses under MOPEC shall complete the courses through SWAYAM / NPTEL or any other MOOCS platform:

V/VII/VIII SEMESTER		
1	U24OEX01IEA	Understanding Incubation & Entrepreneurship
2	U24OEX01IEB	Innovation, Business Models & Entrepreneurship
3	U24OEX01IEC	Innovation & Startup Policy
4	U24OEX01IED	Entrepreneurship & IP Strategies
5	U24OEX01IEE	Digital Marketing Strategies
6	U24OEX01IEF	Leadership, Innovation and Entrepreneurship
7	U24OEX01IEG	Economics of Innovation
8	U24OEX01IEH	Strategic Management
9	U24OEX01IEI	Social Innovation in Industry 4.0
10	U24OEX01IEJ	Design, Technology & Innovation
11	U24OEX01IEZ	Any other course approved by BoS Chair and Dean AA

Department of Civil Engineering

PROGRAM ELECTIVE COURSES (PEC)

There are four slots allotted to Program Elective Courses (PECs). An example for CE is given below: Each major specialization of the B. Tech Programme is treated as a vertical.

VERTICAL/ PE	PE1	PE2	PE3	PE4
Vertical 1: Structural Engineering	U24CE602A: Advanced Analysis of Structures	U24 CE 702A: Advanced Concrete Technology	U24CE 802A: Repair & Rehabilitation of Structures	U24CE 803A: Finite Element Method
	(OR) <i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
Vertical 2: Transportation Engineering	U24CE602B: PavementDesign	U24CE702B: Traffic Engineering& Management	U24CE802B: Railway Engineering	U24CE803B: Pavement Material Characterization
	(OR) <i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
Vertical 3: Geotechnical Engineering	U24CE602C: Foundation Engineering	U24CE702C: Ground Improvement Techniques	U24CE802C: Earth Retaining Structures	U24CE803C: Soil Dynamics and Machine Foundation
	(OR) <i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
Vertical 4: Water & Environmental Engineering	U24CE602D: Life Cycle Assessment	U24CE702D: Hydraulic Structures	U24CE802D: Remote Sensing& Geographical Information Systems	U24CE803D: Watershed Management
	(OR) <i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
Vertical 5:Design of Special Structures	U24CE602E: Advanced StructuralDesign	U24CE702 E: Pre-stressed Concrete	U24CE802E : Structural Dynamics & Earthquake Engineering.	U24CE803E : Bridge Engineering
	(OR) <i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
Vertical 6: Advances inCivil Engineering	U24CE602F: AI & ML Applications in Civil Engineering	U24CE702F: IoT Applications for Civil Engineering	U24CE802F: Health Monitoring ofStructures	U24CE803F: Forensics inCivil Engineering
	(OR) <i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			

I SEMESTER**Stream - I**

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	C
U24SK100 AICTE Mandated Student Induction Programme (Universal Human Values - I)									
1	BSC	U24MH101	Differential Calculus and Ordinary Differential Equations.	2	1	-	6	9	3
2	BSC	U24PY102A	Engineering Physics	2	1	2	5	10	4
3	PCC	U24CE103	PCC 01 Engineering Mechanics	2	1	-	4	7	3
4	ESC	U24CE104	Programming for Problem Solving with C	2	1	2	5	10	4
5	ESC	U24EE105A	Basic Electrical & Electronics Engineering	2	1	2	5	10	4
6	VAC	U24CY106	Environmental Studies	2	-	-	2	5	-
7	AEC	U24AE107	IDEA Lab Makerspace	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-1	-	-	-	4	4	1
9	VAC	U24VA109	SEA - I / SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
Total:				12	5	8	36	62	22
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

DIFFERENTIAL CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS

Class: B.Tech. I -Semester		Branch: Common to all branches	
Course Code:	U24MH101	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-6-9	CIE:	60 (%)
Total Number of Teaching Hours:	36 Hrs	ESE:	40 (%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: convergence of an infinite series and differential calculus			
LO2: partial differentiation and its applications			
LO3: differential equations of first order and first degree along with certain applications			
LO4: higher order linear differential equations and applications			
UNIT-I			9 Hrs
<p>Infinite Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests-Limit form, Integral test, D'Alembert's Ratio test, Cauchy's root test</p> <p>Differential Calculus and its applications: Fundamental theorems-Rolle's theorem (Geometrical interpretation), Lagrange's mean value theorem (Geometrical interpretation), Cauchy's mean value theorem, Taylor's theorem (Generalized mean value theorem), Expansions of functions- Maclaurin's series, Taylor's series, Maxima and Minima-Conditions, Practical problems (rectangle, right circular cylinder, cone)</p> <p><i>Self-Learning Topics (SLTs): Review of basic concepts of limit, continuity and differentiability [Reference 1: topic (3.1,3.2,3.5,4.1)]</i></p> <p><i>Alternating series [(Text 1: topic 9.12, Solved problems: 9.16,9.17, Practice problems: exercise 9.7(1, 7)]</i></p> <p><i>Additional problems on fundamental theorems [(Text 1: topic 4.3, Solved problems: 4.13(i),4.14,4.17, Practice problems: exercise 4.4 (1(i),1(ii), 3(ii), 10(i), 10(ii))]</i></p> <p><i>Additional problems on Maclaurin's series [(Text 1: topic 4.4, Solved problems: 4.20, Practice problems: exercise 4.5 (3, 5)]</i></p>			
UNIT-II			9 Hrs
<p>Partial differentiation and its applications: Functions of two or more variables, Partial derivatives, Total derivative, Change of variables, Jacobians, Functional relationship, Geometrical Interpretation-Tangentplane and Normal to a surface, Taylor's theorem for function of two variables (without proof), Errors and approximations, Total differential, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers, Differentiation under the integral sign</p> <p><i>Self-Learning Topics (SLTs):</i></p> <p><i>Leibnitz rule of Differentiation under the integral sign for variable limits [(Text 1: topic 5.13(2)), Solved problems: 5.54, Practice problems: exercise 5.11 (1)]</i></p> <p><i>Additional problems on maxima and minima of function of two variables [(Text 1: topic 5.11 (1), Solved problems: 5.42, 5.43, Practice problems: exercise 5.10 (1(i),1(ii),1(iii))].</i></p> <p><i>Additional problems on Lagrange's methods of undetermined multipliers [(Text 1: topic (5.12), Solved problems: 5.45, 5.48, Practice problems: exercise 5.10 (3(i) ,3(ii))]</i></p>			

UNIT-III	9 Hrs
<p>Differential equations of first order (DE): Reorientation of differential equation of first order and first degree (Formation a differential equation, variables separable method, homogeneous equations, Linear equations), Exact differential equations, Equations reducible to exact equations,</p> <p>Applications of differential equations of first order: Orthogonal trajectories - Orthogonal trajectories of the family of curves $f(x, y, c)=0$, Physical applications-Motion of a boat across a stream, Resisted motion, Velocity of escape from the earth, Simple electric circuits - RL series circuit, Newton's law of cooling, Rate of decay of Radio-active materials, Rate of growth of population</p> <p><i>Self-Learning Topics (SLTs):</i> Review of DEs of first order (Text 1: topic 11.1, 11.2, 11.3, 11.4,11.5) Solutions of Non-exact DEs by Inspection Method [(Text 1: topic 11.12(1), Solved Problems: 11.30, Practice problems: exercise 11.8 (1,3)]</p> <p>Additional problems on Non-exact DEs [(Text 1: topic 11.12(2,3,4,5), Solved problems: 11.33,11.35,11.36, Practice problems: exercise 11.8 (9,15)]</p> <p>Orthogonal Trajectories of family of curves in polar coordinates [(Text 1: topic 12.3(3), Solved problems :12.7,12.8 , Practice problems: exercise 12.2(9,10)]</p>	
UNIT-IV	9 Hrs
<p>Linear differential equations: Linear differential equations with constant coefficients, Rules for finding complementary function, Inverse operator, Rules for finding the particular integral ($Q=e^{ax}$, $\sin(ax+b)$ or $\cos(ax+b)$, x^m and $e^{ax}V(x)$), Method of variation of parameters, Linear dependence of solutions</p> <p>Applications of linear differential equations: Simple harmonic motion, Simple pendulum, Oscillations of spring, Oscillatory electrical circuit-LCR circuit, Electro-mechanical analog</p> <p><i>Self-Learning Topics (SLTs):</i></p> <p>Finding the particular integral of $Q(x) =x^mV(x)$ [(Text 1: topic 13.7, Solved problems: 13.16,13.17,13.19, Practice problems: exercise 13.2 (21,22)].</p> <p>Additional problems on method of variation of parameters [(Text 1: topic 13.8(1), Solved problems: 13.25, 13.26, Practice problems: exercise 13.3(1,5)]</p> <p>Cauchy's homogeneous linear differential equation [(Text 1: topic 13.9(1), Solved problems: 13.31,13.34, Practice problems: exercise 13.4(3,6,9)]</p>	
<p>Course Learning Outcomes (COs): After completion of this course, the students should be able to...</p> <p>CO1: examine the convergence of a series and interpret mean value theorems.</p> <p>CO2: apply partial differentiation to functions of several variables in solving various engineering problems.</p> <p>CO3: apply appropriate methods of differential equations of first order and first degree to solve real life engineering problems.</p> <p>CO4: analyze the solutions of higher order linear differential equation with constant coefficients</p>	

Textbook(s):

1. Grewal, B.S., *Higher Engineering Mathematics*, Khanna Publishers, Delhi, 44th edition, 2017.

Reference Book(s):

1. Shanti Narayan, Dr. Mittal P.K, *Differential Calculus*, S. Chand & Co., New Delhi, 1st edition, Reprint 2014
2. Kreyszig E, *Advanced Engineering Mathematics*, Inc, U.K, John Wiley & sons, 10th edition, 2020
3. S.S. Sastry, *Engineering Mathematics, Vol.II*, Prentice Hall of India, 3rd edition, 2014.

Web and Video link(s):

1. <https://youtu.be/4EYko9rdF7g?si=WUu12> NPTEL Video Lecture on Infinite series by Prof. S.K.Ray, Professor of Mathematics, IITK Kanpur.
2. https://youtu.be/0apMXhWG_W8?si=M-abw2Gq3buX5HLM NPTEL Video Lecture on Fundamental mean value theorems by Prof. Jithendra Kumar, Professor of Mathematics, IITK Kharagpur.
3. <https://youtu.be/6r5jfT8xrXM?si=ryLXYVJr4-iUkdIV>; NPTEL Video Lecture on Exact Differential Equations, Prof. Jithendra Kumar, Professor of Mathematics, IIT Kharagpur.
4. https://youtu.be/kbGhrqV9AOM?si=yGyK_V7kJKGa3OaR NPTEL Video Lecture on Orthogonal Trajectories of family of curves by Prof. Aditya Sharma, Professor of Physics, IISE Bhopal.
5. <https://youtu.be/btOCUmjkrrg?si=zq3nB00kplm7b5se>; NPTEL Video Lecture on Higher Order Linear Differential Equations, Prof. Jithendra Kumar, Professor of Mathematics, IIT Kharagpur.

Course Articulation Matrix (CAM):		U24MH101: Differential Calculus and Ordinary Differential Equations													
C	O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24MH101.1	2	2	1	1	-	-	-	1	1	1	1	1	1	1
CO2	U24MH101.2	2	2	1	1	-	-	-	1	1	1	1	1	1	1
CO3	U24MH101.3	2	2	1	1	-	-	-	1	1	1	1	1	1	1
CO4	U24MH101.4	2	2	1	1	-	-	-	1	1	1	1	1	1	1
U24MH101		2	2	1	1	-	-	-	1	1	1	-	1	1	1
3 - HIGH, 2 - MEDIUM, 1 LOW															

ENGINEERING PHYSICS (for Civil Engineering)			
Class: B.Tech. I- Semester		Branch: CE	
Course Code:	U24PY102A	Credits:	4
Hours/Week (L-T-P-O-E):	2-1-2-5-10	CIE Marks:	60 (%)
Total Number of Teaching Hours:	60 Hrs	ESE Marks:	40 (%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: properties of ultrasonics and applications of non-destructive testing (NDT) methods			
LO2: basic principles, operation of lasers and optical fibers			
LO3: fundamentals of crystallography and materials characterization techniques			
LO4: principles of building acoustics, properties of magnetic and superconducting materials			
THEORY COMPONENT			
UNIT-I		9 Hrs	
Ultrasonics: Properties, Production of ultrasonics- Piezo-electric method; Determination of velocity in liquids using ultrasonic interferometer, Determination of velocity in solids- measurement of elastic constants in solids, Applications- Marine, Industrial and medical fields			
NDT applications to Civil Engineering: Introduction, Advantages and limitations of non- destructive testing (NDT), Methods of NDT- Visual inspection of distressed structures, Magnetic particle testing, Eddy current testing and Ultrasonic testing of concrete- Normal beam Pulse echo testing, Normal beam pulse through transmission testing, Angle beam pulse echo testing			
<i>Self Learning Topics (SLTs): fundamentals of ultrasound (Text1: topics 14.1, 14.2), Solved problems (Text1: Prob 14.3, 14.5). Practice problems (Text2: Prob 5.1, 5.3, 5.4, 5.5).</i>			
UNIT-II		9 Hrs	
Applied Optics and Lasers: Principles of interference, Diffraction phenomena and their applications (qualitative), Difference between conventional light and laser, Basic principles and characteristics of lasers, Absorption, Spontaneous and stimulated emission, Population inversion, Pumping methods, Optical resonator, Types of lasers- Ruby laser, He-Ne Laser, Diode laser; Applications of lasers- Determination of particle size of fly ash and slags using lasers			
Fiber Optics: Introduction, Total internal reflection, Optical fiber construction, Numerical aperture and acceptance angle; Types of optical fibers - Step index and graded index, Single and multimode, V-number; Power losses in optical fibers- Attenuation, Dispersion, Bending; Fiber optic communication system, Applications of optical fibers- Endoscopy, Fiber optic sensors (temperature and displacement)			
<i>Self Learning Topics (SLTs): concept of wave and basic concepts- amplitude, wavelength, frequency, phase, phase angle and general wave equation (Text1: topic 1.9), types of waves (Text1: topic 1.10), reflection laws (Text1: topic 1.11).</i>			
UNIT-III		9 Hrs	
Crystallography: Bonding in crystals, Classification of solids, Space lattice, Crystal structure, Unit cell, Bravais lattices, Lattice plane, Miller indices, Interplanar spacing in a cubic lattice, Atomic packing fraction (SC, BCC, FCC), Bragg's law, Classification of defects- Point defects, Line defects, Surface defects (qualitative)			

Material Characterization Techniques: Principles for determination of materials structure by using Bragg's X-ray diffraction spectrometer (XRD); Study of morphology, Microstructure, Microfractures using scanning electron microscope (SEM) and transmission electron microscope (TEM) for civil engineering materials

Self Learning Topics (SLTs): Summary of unit cell characteristics (Text1: topic 34.4), Solved problems (Text1: Prob 34.15.2, Prob 34.5, Prob 34.6, Prob 34.7).

UNIT-IV

9 Hrs

Acoustics of Buildings: Introduction, Classification of sound, Characteristics of sound, Sound pressure level, Intensity, Absorption coefficient, Determination of absorption coefficient of civil engineering materials, Reverberation, Sabine's formula, Factors affecting acoustics of buildings and their remedies, Noise and its measurements, Sound proofing applications in civil engineering

Magnetic and Superconducting Materials: Introduction, Permeability, Magnetization, Susceptibility, Origin of magnetism, Bohr magneton, Ferro, Antiferro and ferri magnetic materials, Hysteresis, Soft and hard magnetic materials, Applications of magnetic materials; Superconductivity, Meissner effect, Transition temperature, Isotope effect, Type-I and type- II superconductors, High T_c superconductors, Applications of superconductors

Self Learning Topics (SLTs): basic magnetism concepts (magnetic dipoles, B, H, I parameters) (Text1: topic 41.2, 41.3, Text2: topic 20.2), types of magnetic materials (Text2: topic 20.4), Solved problems: (Text1- Prob 41.1, Prob 42.1, Prob 42.2, Prob 42.3, Prob 42.5, Prob 42.11, Prob 42.13).

LABORATORY COMPONENT

List of Experiments

1. Linear Measurements by using Vernier callipers and screw gauge
2. Determination of (a) rigidity modulus of a given wire (b) moment of inertia of a ring using torsional pendulum
3. Determination of velocity of ultrasonic waves in liquid using ultrasonic interferometer
4. Determination of thickness of thin sheet using air-wedge method
5. Determination of slit width using He-Ne laser
6. Determination of wavelength of He-Ne laser using reflection and transmission diffraction grating
7. Determination of particle size of fly ash or slag cement powders using laser
8. Numerical aperture and acceptance angle of a given optical fiber
9. Preparation and study of body centred cubic and face centred cubic crystal models
10. Structural analysis of given X-ray diffraction spectra for a given concrete material
11. Determination of absorption coefficient of sound of given materials
12. Magnetic hysteresis- B-H curve tracing using CRO

Textbook(s):

1. M.N. Avadhanulu, P.G. Khirsagar and T.V.S Arun Murthy, *A Textbook of Engineering Physics*, S Chand Publishing, New Delhi, 11th edition, 2018.
2. V. Rajendran, *Engineering Physics*, McGraw Hill Education, New Delhi, 2nd edition, 2021.

Reference Book(s):

1. B. P. Singh and Devaraj Singh, *Building Science: Lighting and Acoustics*, Dhanpat Rai Publications (P) Ltd., New Delhi, 2nd edition, 2021.
2. P.K Mitra *Characterization of Materials*, PHL Learning Pvt Ltd., New Delhi, 2nd edition, 2021.
3. R.K. Gaur and S.L.Gupta, *Engineering Physics*, Dhanpath Rai and Sons, New Delhi, 8th edition, 2020.
4. David Halliday, Robert Resnick and S Krane, *Physics Volume I&II*, Wiley India Limited, 5th edition, 2014.

Web and Video link(s):

1. <https://nptel.ac.in/courses/113106070>, NPTEL Video Lecture on Theory and Practice of Non Destructive Testing, Dr. Ranjit Bauri, IIT Madras
2. <https://nptel.ac.in/courses/113/105/113105101/> NPTEL Video Lecture on Techniques of materials characterization, Prof. Shibayan Roy, Materials Science Centre, IIT Kharagpur
3. <https://nptel.ac.in/courses/113/104/113104081/> , NPTEL Video Lecture on Defects in crystalline solids (Part-1), Prof. Shashank Shekar, Dept. of Materials Science and Engineering, IIT Khanpur
4. https://onlinecourses.nptel.ac.in/noc24_mm28/preview NPTEL Video Lecture on Defects in Crystalline Solids (Part - I), Prof. Shashank Shekhar, IIT Kanpur

Laboratory Manual (for laboratory component):

1. *Engineering Physics Laboratory Manual & Record Book*, Department of PS, KITSW
2. A.K.Katiyar, C.K.Pandey, *Engineering Physics Theory and Practical*, Wiley India Pvt. Ltd, 2nd edition, 2017.

Course Learning Outcomes (COs):

*After completion of this course, the students should be able to,
(based on cognitive skills acquired from theory component)*

CO1: determine the ultrasonic velocity, elastic constants and defects/cracks in solids using non-destructive testing methods

CO2: evaluate properties of lasers and optical fibre parameters

CO3: examine the crystal structures and defects in civil engineering materials using crystallography principles and material characterization techniques

CO4: calculate reverberation time in buildings and absorption coefficient of civil engineering materials; determine properties of the magnetic and superconducting materials

(based on psychomotor skills acquired from laboratory component)

CO5: measure diameter of wire and hollow tubes using Vernier calipers and screw gauge; determine the rigidity modulus and velocity of ultrasonic waves

CO6: determine the thickness of thin sheet, particle size of given fly ash, numerical aperture of an optical fiber, width of a narrow slit and wavelength of laser

CO7: calculate atomic packing fractions by constructing crystal models (BCC and FCC); analyse X-ray diffraction spectra of civil engineering materials

CO8: determine the sound absorption coefficient of civil engineering materials and B-H curve tracing using CRO

Course Articulation Matrix (CAM):		U24PY102A- ENGINEERING PHYSICS (for Civil Engineering)													
C O		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2
CO1	U24PY102A.1	2	1	-	-	-	1	-	1	1	1	-	1	1	1
CO2	U24PY102A.2	2	1	-	-	-	1	-	1	1	1	-	1	1	1
CO3	U24PY102A.3	2	1	-	-	-	1	-	1	1	1	-	1	1	1
CO4	U24PY102A.4	2	1	-	-	-	1	-	1	1	1	-	1	1	1
CO5	U24PY102A.5	2	1	-	-	1	1	-	1	1	2	-	1	1	1
CO6	U24PY102A.6	2	1	-	-	1	1	-	1	1	2	-	1	1	1
CO7	U24PY102A.7	2	1	-	-	1	1	-	1	1	2	-	1	1	1
CO8	U24PY102A.8	2	1	-	-	1	1	-	1	1	2	-	1	1	1
U24PY102A		2	1	-	-	1	1	-	1	1	1.5	-	1	-	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

ENGINEERING MECHANICS			
Class: B.Tech. I -Semester		Branch: Civil Engineering	
Course Code:	U24 CE103	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-4-7	CIE :	60(%)
Total Number of Teaching Hours:	36 Hrs	ESE :	40(%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: force systems and their applications			
LO2: concepts and application of friction, analysis of plane trusses			
LO3: centroid and moment of inertia of geometric and composite areas			
LO4: shear force and bending moment for determinate beams			
UNIT-I			9 Hrs
Laws of Mechanics: Parallelogram law of forces, triangle law of forces, Newton's law of gravitation, law of superposition and transmissibility of forces.			
Force Systems: Types of forces, co-planar, concurrent and parallel forces, moment and couple, free body diagram, resultant of force systems, resolution of forces, composition of forces, equilibrium equations of forces, Lami's theorem, Varignon's theorem, moment equilibrium equations.			
<i>Self Learning Topics (SLTs): Newton's law of gravitation (Text 1: topics 1.4), Principle of Transmissibility (Text 1: topics 1.4), Resultant of several concurrent coplanar forces (Text 1: topics 2.5), Method of projections (Text 1: topics 2.7), Practice Problems (Text1: Prob 2.1,2.2,2.3,2.4,2.5,2.6,2.7) Solved Problems (Text 1, Prob. 2.17,02.18)</i>			
UNIT-II			9 Hrs
General Equilibrium: Types of supports, beams and loadings, statically determinate structures, resultant and equilibrium of general force system.			
Plane Trusses: Rigid truss, stability and determinacy conditions, basic assumptions for a perfect truss, analysis of trusses by method of joints and method of sections of a cantilever and simply supported statically determinate pin-jointed trusses			
<i>Self Learning Topics (SLTs): Types of Supports and Support reactions (Text 1: topics 2.10), Practice Problems(Text1: Prob 2.11,2.12,2.13, 2.14, 2.15, 2.16, 2.17)Solved Problems(Text1: Prob 2.15,2.16,2.17), Rigid and Perfect Trusses, Axial forces in members(Text1: Topic 9.2, 9.3) Practice Problems(Text1: Prob.9.1, 9.2, 9.3, 9.4) Solved Problems(Tewxt1: Prob.9.1, 9.2)</i>			
UNIT-III			9 Hrs
Centroid: Centroid of one-dimensional figures, centroid of simple figures from first principles, centroid of composite sections.			
Moment of Inertia: Moment of inertia of plane sections from first principles, theorems of moment of inertia – parallel axis theorem and perpendicular axis theorem, moment of inertia of standard sections and composite sections.			
<i>Self Learning Topics (SLTs): Determination of Centroid by method of Integration (Text1: Topics 4.5) Solved Problems(Text1: Prob.4.1, 4.2, 4.3) Practise Problems(Text1: Prob: 4.1, 4.2, 4.3), Determination of Centroid by method of Moments (Text1: Topics 4.2,4.3,4.4) Solved Problems(Text1: Prob.4.8, 4.9, 4.10, 4.11, 4.12) Solved Problems(Text1: Problems 4.8, 4.9), Parallel Axis Theorem (Text1: Topic 12.5) Practice Problems(Text1: Prob 12.14, 12.15), Solved Problems (Text1: Prob.12.9, 12.10)</i>			
UNIT-IV			9 Hrs

Shear force: Concept of shear force, shear force diagram for simply supported, cantilever and overhanging beams, loading from shear force diagram.

Bending moment: Concept of bending moment, bending moment diagram for simply

supported, cantilever and overhanging beams, loading from bending moment diagram.

Self Learning Topics (SLTs): Classification of beam, Shear force and Bending Moment(Text2: Topic 4.3), Determination of shear force and bending moment for cantilevers(Text2: topics4.4, 4.5, 4.6) Solved Problems(Text2:, Prob. 4.3, 4.4, 4.5) Practise Problems(Text2: Prob.1,2,3), Shear force and bending moments for simply supported beams (Text2: Topic 4.4, 4.13) Solved Problems(Text 2:Prob. 4.13, 4.14, 4.15) Practise Problems(Text 2: Prob. 4, 5, 6, 7) Point of Contra flexure (Text2:, Topics 4.18, 4.19) Solved Problems(Text2:, Prob. 4.14, 4.15) Practice Problems(Text2, Prob.12,13,14,15)

Course Learning Outcomes (COs):

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

CO1: distinguish various force systems and their applications.

CO2: analyze plane trusses

CO3: evaluate centroid and moment of inertia of geometric and composite areas

CO4: construct shear force and bending moment diagrams

Textbook(s):

1. Tayal A.K., *Engineering Mechanics: Statics and Dynamics*, Umesh Publishers, New Delhi, 15th edition, 2020.
2. Rajput R.K., *Strength of Materials*, S. Chand and Company, New Delhi, 8th edition.2021.

Reference Book(s):

1. Timoshenko S., Young D.H., Rao J.V., and Sukumar Pati, *Engineering Mechanics in SI units*, McGraw Hill Education Pvt. Ltd., New Delhi, 6th edition, 2021.
2. Bhavikatti S.S., *Engineering Mechanics*, New Age International, New Delhi, 5th edition,2013 (reprint).
3. Basudeb Bhattacharyya, *Engineering Mechanics*, Oxford University Press, New Delhi10th edition, 2020.
4. Subramanian R., *Strength of Materials*, Oxford University Press, New Delhi, 4th edition, 2021.
5. Ramamrutham S., *Strength of Materials*, Dhanpat Rai & Sons, New Delhi, 3rd edition, 2017.

Web and Video link(s):

1. <https://youtu.be/nGfVTNfNwnk?si=F7BEBuhGhrhvf71> NPTEL Video Lecture on Introduction to Engineering Mechanics by Prof.K Ramesh, Professor , Applied Mechanics, IIT Madras.
2. https://youtu.be/6u_rjLjv-MY?si=lu9zL13Nnungo4In NPTEL Video Lecture on Forces And Force Systems by Prof.K Ramesh, Professor, Applied Mechanics, IIT Madras.
3. <https://youtu.be/ljDIIMvx-eg?si=RTFveUSwBfju9Mqy> NPTEL Video Lecture on Equilibrium of Rigid Bodies by Prof.K Ramesh, Professor , Applied Mechanics, IIT Madras.
4. <https://youtu.be/lheoBL2OaqU?si=XFq5Xn6NrdxYgsT3> NPTEL Video Lecture on Analysis of Trusse by Prof.K Ramesh, Professor , Applied Mechanics, IIT Madras.
5. <https://youtu.be/z95UW4wwzSc?si=8oQeghkeSwS7GOMO> NPTEL Video Lecture on Analysis of Beams by Prof.K Ramesh, Professor , Applied Mechanics, IIT Madras.
6. https://youtu.be/l_xTyy4wqtw?si=vOkD1Cc73rfzSspW NPTEL Video Lecture on Shear Force and Bending Moment by Prof.M.S.Siva Kumar , Department of Applied Mechanics ,IIT Madras.
7. https://youtu.be/MX43g-DD8pU?si=sc-InkO_8scFVxFO NPTEL Video Lecture on Centroid and Moment of Inertia by Prof. Manoj K Harbola, Professor, Dept. of Physics, IIT Kanpur.

Course Articulation Matrix (CAM):		U24CE103 ENGINEERING MECHANICS													
C	O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24CE103.1	3	2	1	-	-	1	-	1	1	1	1	1	2	1
CO2	U24CE103.2	3	2	1	-	-	1	-	1	1	1	1	1	2	1
CO3	U24CE103.3	3	2	1	-	-	1	-	1	1	1	1	1	2	1
CO4	U24CE103.4	3	2	1	-	-	1	-	1	1	1	1	1	2	1
U24MH101		3	2	1	-	-	1	-	1	1	1	1	1	2	1

3 – HIGH, 2 – MEDIUM, 1 - LOW

PROGRAMMING FOR PROBLEM SOLVING WITH C

Class: B.Tech. I -Semester		Branch: Common to all branches	
Course Code:	U24CS104	Credits:	4
Hours/Week (L-T-P-O-E):	2-1-2-5-10	CIE:	60(%)
Total Number of Teaching Hours:	60 Hrs	ESE:	40(%)

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: algorithms, flow charts and develop programs with basic constructs

LO2: control structures and array operations

LO3: string operations and modular programming concepts with functions and recursion

LO4: structures, unions, pointers and files in C programming

THEORY COMPONENT

UNIT-I

9 Hrs

Introduction to Programming: Art of programming through algorithms and flowcharts

Overview of C: History of C, Importance of C, Basic structure of C programs

Constants, Variables and Data Types: Character set, C tokens, Declaration of variables, Defining symbolic constants

Managing Input and Output Operations: Reading a character, Writing a character, Formatted input, Formatted output

Operators and Expressions: Arithmetic, Relational, Increment, Decrement, Conditional, Logical, Bit-wise, Special operators, Arithmetic expressions, Evaluation of expressions, Operator precedence and associativity

Self Learning Topics (SLTs): Components of a computer, concept of hardware and software (Text1: chapter 1), Executing a C program (Text1: chapter 2), Type conversions in expression (Text1: chapter 4) Solved problems (Text1: chapter 2 to chapter 5), Review questions, debugging exercises, programming exercises, interview questions (Text1: chapter 2 to chapter 5)

UNIT-II

9 Hrs

Decision Making and Branching: Simple if statement, if-else statement, Nesting of if-else statements, else if ladder, switch statement, Conditional operator, goto statement

Decision Making and Looping: while statement, do-while statement, for statement, Nested loops, Jumps in loops

Arrays: One-dimensional arrays, Declaration of one-dimensional arrays, Initialization of one-dimensional arrays, Linear search, Two-dimensional arrays, Initializing two dimensional arrays, Multi-dimensional arrays

Self Learning Topics (SLTs): Concise test expressions (Text1: chapter 7) Dynamic arrays (Text1: chapter 8), Solved problems (Text1: chapter 6 to chapter 8), Review questions, debugging exercises, programming exercises, interview questions (Text1: chapter 6 to chapter 8)

UNIT-III

9 Hrs

Character Arrays and Strings: Declaring and initializing string variable, Reading strings from terminal, Writing strings to screen, String handling functions, Table of strings

Modular Programming with User Defined Functions: Need for user-defined functions, Elements of user-defined functions, Definition of functions, Return values and their types, Function calls, Function declaration, Category of functions, Recursion, The scope, visibility and lifetime of variables (storage classes)

Self Learning Topics (SLTs): Arithmetic operations on characters, comparison of strings (Text1: chapter 9), Nesting of functions, (Text1: chapter 10), Solved problems (Text1: chapter 9 & chapter 10), Review questions, debugging exercises, programming exercises, interview questions (Text1: chapter 9 & chapter 10).

UNIT- IV

9 Hrs

Structures and Unions: Defining a structure, Declaring and initializing structure variables, Accessing structure members, Array of structures, Structures within structures, Unions **Pointers:** Understanding pointers, Declaring and initializing pointer variables, Pointer expressions, Pointers and arrays, Pointers and character strings, Pointers to functions, Pointers and structures

File Management in C: Defining and opening a file, Closing a file, Input and output operations on sequential text files

Self Learning Topics (SLTs): Operations on individual members (Text1: chapter 11), Chain of pointers, array of pointers (Text1: chapter 12), Random access to files, Command line arguments (Text1: chapter 13). Solved problems (Text1: chapter 11 to chapter 13), Review questions, debugging exercises, programming exercises, interview questions (Text1: chapter 11 to chapter 13).

LABORATORY COMPONENT

List of Experiments

1. Programs using input output functions, operators (arithmetic, relational and conditional)
2. Programs using operators (bit-wise, logical, increment and decrement)
3. Programs using conditional control structures: if, if-else, nested if
4. Programs using else if ladder, switch and goto statements
5. Programs using loop control structures: while
6. Programs using loop control structures: do-while and for
7. Programs on one dimensional array and two-dimensional arrays
8. Programs on String operations and string handling functions
9. Programs on different types of functions, parameter passing using call-by-value & call-by-address, recursion and storage classes
10. Programs using structures, unions, pointers to arrays and pointers to strings
11. Programs using array of pointers and pointers to structures
12. Programs on File operations and file handling functions for sequential text files

Textbook(s):

1. Balagurusamy.E, *Programming in ANSI C*, McGraw Hill, 9th edition, 2024.

Reference Book(s):

1. Paul Deitel, Harvey Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, Pearson Education Limited, 9th edition, 2022
2. Brian W. Kernighan and Dennis Ritchie, *The C Programming Language*, Pearson Education India, 2nd edition, 2015
3. Reema Thareja, *Programming in C*, Oxford University Press, 3rd edition, 2023
4. Yashavant Kanetkar, *Let Us C*, BPB Publications, 19th edition, 2022
5. A.K.Sharma, *Computer Fundamentals and Programming in C*, Universities Press, 2nd edition, 2018.

Web and Video link(s):

<https://nptel.ac.in/courses/106105171> NPTEL Video Lecture on Problem Solving through Programming in C by Prof. Anupam Basu, Professor of CSE, IIT Kharagpur.

<https://nptel.ac.in/courses/106104128> NPTEL Video Lecture on Introduction to Programming in C by Prof. Satyadev Nandakumar, Professor of CSE, IIT Kanpur

Laboratory Manual (for laboratory component):

1. Programming for Problem Solving with C Laboratory Manual and Record Book, Department of CSE, KITSW.

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

CO1: enumerate programming development steps, design an algorithm and draw a flowchart for a given application

CO2: apply logical skills for problem solving using control structures and arrays

CO3: develop string operations and modular programming with functions

CO4: analyse and implement structures, unions, pointers and files in C programming

(based on psychomotor skills acquired from laboratory component)

CO5: develop programs using operators and decision making statements

CO6: apply loops and arrays to develop a program of an application

CO7: implement string operations and develop modular programs using user-defined functions, recursion, and storage classes.

CO8: develop programs using structures, unions, pointers and files

Course Articulation Matrix (CAM):				U24CS104: PROGRAMMING FOR PROBLEM SOLVING WITH C											
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24CS104.1	2	1	1	1	-	-	-	1	-	1	-	2	1	2
CO2	U24CS104.2	2	2	2	1	-	-	-	1	-	1	-	2	2	2
CO3	U24CS104.3	2	2	3	1	-	-	-	1	-	1	-	2	2	2
CO4	U24CS104.4	2	2	3	2	-	-	-	1	-	1	-	2	2	2
CO5	U24CS104.5	1	1	1	1	1	-	-	1	1	1	-	2	1	2
CO6	U24CS104.6	1	2	2	2	1	-	-	1	1	1	-	2	2	2
CO7	U24CS104.7	1	2	3	2	1	-	-	1	1	1	-	2	2	2
CO8	U24CS104.8	1	2	3	2	1	-	-	1	1	1	-	2	2	2
U24CS104		1.5	1.75	2.25	1.5	1	-	-	1	1	1	-	2	1.75	2
3 - HIGH, 2 - MEDIUM, 1 - LOW															

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Class: B.Tech. I -Semester / II -Semester		Branch: Common to CE & ME	
Course Code:	U24EE105B / U24EE205B	Credits:	4
Hours/Week (L-T-P-O-E):	2-1-2-5-10	CIE :	60 (%)
Total Number of Teaching Hours:	60 Hrs	ESE :	40 (%)
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in /on...</i>			
LO1: network elements and DC circuits LO2: 1- \emptyset AC and 3- \emptyset AC circuits LO3: construction, operating principles & applications of DC & AC machines and renewable energy sources LO4: concepts of diodes, rectifiers and transistors			
THEORY COMPONENT			
UNIT-I		9 Hrs	
<p>DC circuits: Network elements, Linear & non-linear elements, Active & passive elements, Unilateral & bilateral elements, Ohm's law, Power, Energy, Kirchhoff's laws, Resistances connected in series and parallel, Voltage divider rule & Current divider rule.</p> <p>DC Circuit analysis: Source transformation, Mesh analysis & Nodal analysis.</p> <p><i>Self-Learning Topics (SLTs):</i> Definitions of charge, current, & voltage (Text1: Topics1.2.), Solved problems (Text1: Prob 3.10, 3.11 & 3.12), Practice problems (Text1: Chap-3, Prob 4,5,7&8).</p>			
UNIT-II		9 Hrs	
<p>1-\emptyset AC circuits: R.M.S value, Average value, Peak factor and form factor of a sine wave, Concept of phasor, Phase and phase difference, Rectangular and polar form representation, Sinusoidal steady state analysis of R, L, C, Series RL, RC, RLC circuits, Concept of reactance, Impedance, Complex power, Real power, Reactive power and Power factor.</p> <p>3- \emptyset AC circuits: Generation of 3- \emptyset voltages, Advantages, Disadvantages, Applications of three phase system, Voltage & Current relationships of line and phase values for balanced star and delta connections.</p> <p><i>Self-Learning Topics (SLTs):</i> Expression for RMS & Average value (Text1: Topic, 4.4 & 4.5) Solved problems (Text1: Prob 4.10, 4.12, 4.13 & 4.14), Practice problems (Text1: Chap-4, Prob 8,9,10 & 12).</p>			
UNIT-III		9 Hrs	
<p>Electrical Machines and Renewable Energy Sources (Qualitative treatment): Construction, Principle of operation, characteristics & applications of 1- \emptyset transformer, 3- \emptyset induction motor, 1- \emptyset induction motor, DC motor, Stepper motor, and BLDC motor</p> <p>Renewable Energy Sources: Solar Photovoltaic, Wind, Waste to energy & Bioenergy</p> <p><i>Self-Learning Topics (SLTs):</i> EMF equation of a Transformer (Text1: Part-II Topic, 4.4.2) Solved problems (Text1: Part-II Prob 4.5, 4.6 & 4.7), Practice problems (Text1: Part-II Prob 5.2, 5.3 & 5.4), Practice problems (Text1: Part-II Prob 6, 7 & 8)</p>			
UNIT-IV		9 Hrs	

Electronic Devices and Circuits:

P-N Junction diode, volt-amp characteristics, Zener diode, volt-amp characteristics, Half-wave rectifier and Full-wave rectifier (centre tapped), Bi-polar Junction Transistor- symbol, Construction and operation of N-P-N and P-N-P transistors, Characteristics of BJT (CE, CB & CC configurations), Applications of diodes and transistors for civil and mechanical engineers.

Self-Learning Topics (SLTs): *Classification of Semiconductors (Text2: topics 1.2), Solved problems (Text2: Prob 1.2), Zener diode Applications (Text2: 1.15), Solved problems (Text2: Prob 2.1 & 2.4), Types of transistors (Text2: topics 3.5)*

LABORATORY COMPONENT**List of Experiments**

1. Verification of voltage divider rule and current divider rule
2. Verification of Mesh Analysis
3. Verification of Nodal Analysis
4. Determination of internal parameters of a choke coil
5. Impedance calculations and phasor representation of RL series circuit
6. Impedance calculations and phasor representation of RC series circuit
7. Load test on 1-phase transformer
8. Single phase bridge rectifier using R load
9. Zener diode as voltage regulator
10. Input and output characteristics of BJT
11. Verification of Kirchoff's laws using PSPICE/MATLAB
12. Interfacing Sensors with Arduino using TINKER CAD
 - i. LED blinking
 - ii. IR Sensor
 - iii. Ultrasonic Sensor
 - iv. Voltage Sensor
 - v. Current Sensor
 - vi. Speed Sensor

Textbook(s):

1. K. Uma Rao, *Basic Electrical Engineering*, Pearson Education, New Delhi, 2nd edition, 2022. (Unit-I, II & III)
2. S Salivahanan & N Suresh Kumar, *Electronic Devices and Circuits*, Tata McGraw-Hill Publication, New Delhi, 4th edition, 2022. (Unit -IV)

Reference Book(s):

1. B.L. Thereja, A.K. Thereja, *Electrical Technology (Vol. I & II)*, S. Chand & Company Ltd, New Delhi, 7th edition, 2020.
2. Edward Hughes, *Electrical & Electronics Technology*, Pearson Education, New Delhi, 12th edition, 2022.
3. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, New Delhi, 4th edition, 2020.
4. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, Tata McGraw Hill Ltd, New Delhi, 2nd edition, 2020.

Web and Video link(s):

<https://nptel.ac.in/courses/108/105/108105112/>; NPTEL Video Lecture on Fundamentals of Electrical Engineering by Prof. Debapriya Das, Professor of EED, IITK Kharagpur.

Laboratory Manual (for laboratory component):

1. *Basic Electrical & Electronics Engineering Laboratory Manual and Record Book*, Department of EEE, KITSW.

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from the theory component)

CO1: determine voltage, current & power in electrical circuits using network reduction techniques

CO2: determine impedance, voltage, current, and power in 1- ϕ AC circuits & determine line and phase quantities in 3- ϕ AC circuits

CO3: select a suitable electrical machine for the given applications

CO4: determine the voltage and current characteristics of diodes and transistors

(based on psychomotor skills acquired from laboratory component)

CO5: validate mesh and nodal analysis

CO6: determine the impedance of series RL & RC circuits

CO7: determine the efficiency of a transformer by conducting a load test and verify

Kirchhoff's laws using PSPICE

CO8: determine the characteristics of BJT and determine the parameters of a rectifier circuit

Course Articulation Matrix (CAM):		U24EE105B: Basic Electrical & Electronics Engineering													
C	O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24EE105B.1	2	1	-	-	-	-	-	1	1	1	1	1	2	1
CO2	U24EE105B.2	2	2	-	-	-	-	-	1	1	1	1	1	2	1
CO3	U24EE105B.3	3	3	1	1	1		1	1	1	1	1	1	2	1
CO4	U24EE105B.4	3	3	1	1	1	1	1	1	1	1	1	1	2	1
CO5	U24EE105B.5	2	1	-	-	-	-	-	1	1	1	1	1	2	1
CO6	U24EE105B.6	2	2	-	-	-	-	-	1	1	1	1	1	2	1
CO7	U24EE105B.7	3	3	1	1	1		1	1	1	1	1	1	2	1
CO8	U24EE105B.8	3	3	1	1	1	1	1	1	1	1	1	1	2	1
U24EE105B		2.5	2.25	1	1	1	1	1	1	1	1	1	1	2	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

ENVIRONMENTAL STUDIES			
Class: B.Tech. I Semester		Branch: Common to CE, EEE, ECIE, ECE & CSE	
Course Code:	U24CY106	Credits:	0
Hours/Week (L-T-P-O-E):	2-0-0-5-7	CIE:	60 (%)
Total Number of Teaching Hours:	24 Hrs	ESE:	40 (%)
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in /on...</i>			
LO1: natural resources and their usage more equitably			
LO2: ecosystem and the importance of biodiversity conservation			
LO3: environmental pollution and it's control measures			
LO4: environmental legislation and green methodology			
UNIT-I			6 Hrs
The Multidisciplinary Nature of Environmental Studies: Definition, Scope and importance Natural Resources: Forest Resources-Use and over exploitation of forests, Deforestation, Timber extraction, Mining, Dams and their effects on forests and tribal people; Water Resources-Use and over-utilization of surface and ground water, Floods, Drought, Conflicts over water; Mineral Resources-Environmental effects of extracting and using mineral resources; Energy Resources-Renewable and non-renewable energy sources, Use of alternate energy sources <i>Self Learning Topics (SLTs): Use and over-utilization of surface and ground water (Text1: unit 2, topic: 2.2.2) world food problems (Text1: unit 2, topic 2.2.2)</i>			
UNIT-II			6 Hrs
Ecosystem and Biodiversity: Ecosystem: Concepts of an ecosystem, Food chain, Food webs, Ecological pyramids, Energy flow in the ecosystem and ecological succession Biodiversity and its Conservation: Introduction, Definition, Genetic, Species and ecosystem diversity, Value of biodiversity, Biodiversity in India, Hot spots of biodiversity, Man-wildlife conflicts, Endangered and endemic species of India; In-situ and Ex-situ conservation <i>Self Learning Topics (SLTs): Introduction and definition of biodiversity (Text1: unit 4, topic 4.1)</i>			
UNIT-III			6 Hrs
Environmental Pollution: Global issues-Global climatic change, Greenhouse gases, Effects of global warming, Ozone layer depletion International Conventions/Protocols: Earth summit, Kyoto protocol, Montreal protocol Environmental Pollution-Causes and effects of air, Water, Soil, Marine and noise pollution with case studies Solid and Hazardous Waste Management: Introduction, Types, Effects of urban industrial and nuclear waste Natural Disaster Management: Introduction to disaster, Management of disaster, Disaster management of flood, earthquake, cyclone and landslides Role of information technology in environment and human health <i>Self Learning Topics (SLTs): Role of individual in prevention of pollution (Text1: unit 5, topic 5.10)</i>			
UNIT-IV			6 Hrs

Social Issues and the Environment: Role of Individual and Society, Water conservation, Rain water harvesting

Environmental Protection/Control Acts: Air (prevention and control of pollution) act 1981, Forest conservation act (1980 and 1992), Wildlife protection act 1972, Environment protection act 1986, Issues involved in enforcement of environmental legislations

Green Methodology: Principles of green chemistry, Green methods in electronic production, Impact of electronic waste on public health and environment; United nations goals of sustainable development

Self Learning Topics (SLTs): Water (prevention and control of pollution) act 1974 (Text1: unit 6, topics 6.10), Water pollution cess act 1977 (Text1: unit 6, topics 6.11)

Course Learning Outcomes (COs):

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

- CO1:** identify the natural resources and practice their usage more equitably
- CO2:** develop an action plan for sustainable alternatives and conserving biodiversity
- CO3:** examine and perceive the solutions for the environmental pollution
- CO4:** adapt issues involved in enforcement of environmental legislation and green methodology

Textbook(s):

1. Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Courses*, universities Press (India) Pvt. Ltd, Hyderabad, 3rd edition, 2021.

Reference Book(s):

1. Y. Anjaneyulu, *Introduction to Environmental Science*, B.S. Publications, Hyderabad, 1st edition, 2020 (reprint).
2. Gilbert M. Masters, *Introduction to Environmental Engineering & Science*, Prentice Hall of India, 3rd edition, 2023.
3. Anubha Kaushik, C.P. Kaushik, *Environmental Studies*, New Age International Publishers, New Delhi, 5th edition, 2021.
4. R. Rajagopalan, *Environmental Studies from crisis to cure*, Oxford University Press, New Delhi, 3rd edition, 2018.

Web and Video link(s):

1. https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ch27/video_lecture_on_renewable_energy_resources_by_Prof._Vaibhav._V._Goud_and_Dr._R._Anandalakshmi,_Dept._Of_Chemical_Engineering,_Guwahati

Course Articulation Matrix (CAM):		U24CY106: Environmental Studies													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24CY106.1	2	1	2	1	-	2	1	-	1	-	-	-	-	-
CO2	U24CY106.2	-	-	2	-	-	1	2	-	1	-	-	-	-	-
CO3	U24CY106.3	1	2	1	-	-	1	1	1	1	-	-	-	-	-
CO4	U24CY106.4	-	-	1	-	-	1	2	-	1	-	-	-	-	-
U24CY106		1.50	1.50	1.50	1	-	1.25	1.50	1.00	1.00	-	-	-	-	-

3 - HIGH, 2 - MEDIUM, 1 - LOW

PRACTICUM-1

Class: B.Tech. I/II/III/IV -Semester	Branch: Common to all branches		
Course Code:	U24EL108	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-4-4	CIE:	100%
Total Number of Teaching Hours:	-	ESE:	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: literature review and identifying research gaps

LO2: implementing a project independently by applying knowledge to practice

LO3: preparing well-documented report and informative PPT

LO4: effective technical presentation and creating video pitch

Practicum is an independent project carried out by the student during the course period, under the supervision of allotted course faculty. It helps to reinforce the students' theoretical knowledge and develop their ability to apply this knowledge to the solution of practical problems. Practicums also prepare them for their MINI and MAJOR PROJECTs and for independent work in their chosen field that promotes creative abilities. Besides they provide Higher Order Cognitive Abilities (HOCAs).

- (i). Practicum is a mandatory semester project work.
- (ii). Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters)
- (iii). Allotment of Practicum topics for students:
 - **Practicum matrix:**
 - In week (-1), the class teacher, in consultation with HoD, shall prepare the practicum matrix of the section. The practicum matrix is the allotment of group of students to the different course faculty of the section, as shown below.

Course	U24MH101	U24PS102	U24EC103	U24CS104	U24EE105	U24CH106
Students allotted to different courses	B24XX001	B24XX011	B24XX021	B24XX031	B24XX041	B24XX051
	B24XX002	B24XX012	B24XX022	B24XX032	B24XX042	B24XX052
	B24XX003	B24XX013	B24XX023	B24XX033	B24XX043	B24XX053
	B24XX004	B24XX014	B24XX024	B24XX034	B24XX044	B24XX054
	B24XX005	B24XX015	B24XX025	B24XX035	B24XX045	B24XX055
	B24XX006	B24XX016	B24XX026	B24XX036	B24XX046	B24XX056
	B24XX007	B24XX017	B24XX027	B24XX037	B24XX047	B24XX057
	B24XX008	B24XX018	B24XX028	B24XX038	B24XX048	B24XX058
	B24XX009	B24XX019	B24XX029	B24XX039	B24XX049	B24XX059
	B24XX010	B24XX020	B24XX030	B24XX040	B24XX050	B24XX060

- In week (-1), the class teacher of a section shall collect 10-12 topics for practicum from each of the course teachers of that section.
- The class teacher, in consultation with HoD shall allot the practicum topics to the students of that section in the following format.

CIRCULAR

Allotment of Practicum topics to students Section :

Number of the student	Practicum topic allotted	Practicum under the course	Course faculty

Note:

1. The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
2. To complete the Practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the classwork timetable and also outside the class work hours during weekdays.
3. The course faculty are advised to guide the allotted students for practicum during the semester course work.

(Signature of class teacher)

- (iv). *To complete the practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the classwork timetable and outside the class work hours during weekdays.*
- (v). There shall be only continuous Internal Evaluation (CIE) for practicum for a maximum of 100 marks.
- (vi). The practicum course faculty shall evaluate & submit the final marks of the allotted students in week (N+1) to the respective class teacher.
- (vii). The class teacher shall collect the final marks of practicum of the students allotted to each course teacher and submit them to the CoE.

viii). Course faculty shall follow his/her own rubrics for practicum evaluation. Focus shall be on knowledge, skills & qualities acquired by the student during the practicum course

(ix). A sample rubrics for assessment and evaluation of practicum is as follows:

Literature survey & Identification of research gaps	10 marks
Working model / process / software package / system developed	30 marks
Report writing (subjected to max of 30% plagiarism)	20 marks
Oral presentation with PPT and viva-voce	20 marks
Video pitch	20 marks
Total	100 marks

Note: It is mandatory for the student to appear for oral presentation and viva-voce to qualify for course evaluation of Practicum.

- (a) **Practicum Topic:** Each student shall be allotted a topic for practicum by the course faculty member attached to him/her. Interested students can work on their own title for practicum, but with due approval from course faculty.
- (b) **Working Model:** Each student is required to develop a prototype / process / system/simulation model on the given practicum topic and demonstrate/present, during the allotted time, before the course teacher.
- (c) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and ppt presentation.
- What was the objective of the practicum assigned?
 - What are the main responsibilities and tasks for practicum?
 - What knowledge and skills from the coursework are applied in the practicum?
 - What new knowledge and skills are acquired during the practicum?
 - In what ways, can the practicum be helpful for the professional career?
 - What gaps are identified in your practicum work?
 - What improvements or changes you suggest for addressing the identified gaps for future work?
- (d) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

- (e) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the course teacher as per the schedule notified by the department
- (f) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her Practicum. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include evidence like videos & pics at the time of implementing the practicum and also key points about his / her business idea / plan (*if any*) and social impact
- (g) The student has to register for the Practicum as a supplementary examination in the following cases:
- i) he/she is absent for oral presentation and viva-voce
 - ii) he/she fails to submit the report in prescribed format
 - iii) he/she fails to fulfill the requirements of Practicum evaluation as per specified guidelines

Course Learning Outcomes (COs):

After completion of this course, the students should be able to...

CO1: synthesize literature survey, identify research gaps and define objective & scope of practicum problem

CO2: apply knowledge to design & conduct experiments, utilize modern tools for solution of practicum problem and develop working model/ process/ system

CO3: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through practicum

CO4: create a video pitch on practicum and make an effective oral presentation using PPTs

Course Articulation Matrix (CAM):		U24EL108 PRACTICUM-1													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24EL108.1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO2	U24EL108.2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	U24EL108.3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	U24EL108.4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
U24EL108		2	2	2	2	2	2	2	2	2	2	2	2	2	2
3 - HIGH, 2 - MEDIUM, 1 - LOW															

**SOCIAL EMPOWERMENT ACTIVITY -1 / SELF ACCOMPLISHMENT
ACTIVITY - 1 (SEA -1/SAA-1)**

Class: B.Tech. I-Semesters	Branch: Common to all branches		
Course Code:	U24VA109	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-2-2	CIE:	100%
Total Number of Teaching Hours:	-	ESE:	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: holistic development through activity-based learning to gain real-life experience which effectively help individuals deal appropriately with problems/challenges

LO2: positive mindset by actively adopting optimism, acceptance, resilience, gratitude, mindfulness, and integrity and handling rejection in life

LO3: skills for effective fieldwork practice, which include ethics, observation, communication, interviewing, problem solving, time management, organisation and documentation

LO4: making a well-documented report and an effective oral presentation through PPTs portraying knowledge, skills, qualities acquired and social impact of the activity

Activity Based Liberal Learning about Life, Literature and Culture (ABLL@LLC) is introduced for building **generic competencies** in students. ABLL is aimed at all dimensional holistic growth of the learner. The holistic development includes the **physical, emotional, cognitive, spiritual and social aspects**. This is an area which opens the decision-making process, helps the student to develop creativity, an analytical mind, and builds resilience, confidence, hope, well-being and success. This will help student face the world with a greater degree of maturity, stoic and become a wholesome person in the society.

It is more than just learning from books to lead a successful life. These activity-based liberal learning courses, which help students to expand their social roles later in life, are offered under two sequels namely **SEA** (Social Empowerment Activities) and **SAA** (Self Accomplishment Activities)

These SEA/SAA courses also focus on building positive mindset: adopting optimism, acceptance, resilience, gratitude, mindfulness, and integrity in your life will help student develop and maintain a positive mindset.

- (a) Each SEA/SAA activity is treated as one credit course
- (b) Student must select one activity per semester, through first 04 semesters, from the courses listed under SEA/ SAA, before commencement of the semester.
- (c) Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA

- (d) To complete these activities student shall work outside the class work hours, during weekends, holidays, semester breaks, etc.,
- (e) If a student is not able to attend/ fulfil performance requirements, he/she shall be dropped from the course and shall have to enrol in the forthcoming semesters.

Monitoring SEA/SAA:

- (a) **Nodal units:** The Student Activity Centre (SAC) and Centre for Innovation Incubation Research and Entrepreneurship (C-i²RE) shall act as nodal units for activities listed under SEA/SAA.
- (b) During the semester period, the student has to **acquire requisite knowledge, conduct fieldwork**, acquire skills and propose unique solutions to the real-life problems
- (c) **Knowledge Acquisition & Skilling:**
 - i. Students have to identify goals, acquire and accumulate knowledge on the chosen SEA/SAA activity
 - ii. For the activities related to social awareness/issues/challenges that affect society, use the knowledge base, apply relevant skills to analyse the issue and propose unique possible solutions to the social issues/challenges. Practice to acquire necessary skills to seek new opportunities in their personal and professional life.
 - iii. For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions under supervision of expert/guru are to be planned and executed to acquire the benchmark skills to be demonstrated.
- (d) **Fieldwork:** Fieldwork is an essential component of learning for gaining real-life experiences. In addition to knowledge acquisition & skilling, student has to take up fieldwork on the chosen activity, as part of SEA/SAA course.
 - i. This student-driven Fieldwork allow students to interact with the 'real world'. It is an autonomous learning (self-learning) situation that students are more actively involved during the activity and develop a deeper understanding and develop a more positive attitude.
 - ii. Fieldwork consists of three phases: preparation, the actual activity and feedback
 - iii. **As part of fieldwork, student has to interact with at least two eminent personalities/achievers/renowned persons/inspiring and great personalities related to the activity chosen.**
 - iv. Fieldwork will benefit students for any careers where they need to work with communities of people or which involves analysis of complex processes, especially social and cultural.
 - v. Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more
 - vi. Other skills important for fieldwork practice include the ability to act in a crisis, to plan, set priorities, mobilize resources, and implement the plan effectively. These skills used in an integrated manner help students solve their problems and to develop one's own leadership style based on the need and culture of the place.

- vii. **Eminent personalities/achievers/renowned persons/inspiring and great personalities**
Eminent personalities/ Achievers / Renowned personalities:
(a). **In case of socially relevant problems/ activities of SEA/SAA:** Eminent personalities/ achievers include district administrative officers, Eminent Social workers / NGOs, other inspiring and great personalities
(b). **In case of Sports / Games and Cultural activities of SEA/SAA:** Eminent coaches/ trainers/gurus, achievers who represented/won state level/national level /international level competitions, other inspiring and great personalities.
- viii. **For appointment to interact eminent personalities:** Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes for getting appointment and time for interaction
- ix. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
- x. **Ethics of fieldwork:** Fieldwork is an educational process with commitment to positive values. All fieldwork should be planned and conducted in a way that is ethical, responsible and safe, for people, students, visited communities, if any, and all other stakeholders. Student is expected to maintain integrity and honesty. Avoid bias and deception. Protect the rights and well-being of people involved in fieldwork. The privacy, confidentiality and respect for the eminent people interacted should be maintained and their time, inputs & guidance are to be acknowledged
- xi. Student is expected to take care of health and Safety practices for fieldwork and travel
- xii. Student should remember that contrary to a *field trip or company visit*, **the emphasis in fieldwork is on acquiring skills**, and not on casually presenting theory and assessing.
- xiii. For the fieldwork, student shall go with a scientifically designed questionnaire and record the responses during interaction. These response sheets, along with geo-tagged pic of fieldwork (at the time of interaction & practise sessions, if any) shall be appended as annexures in the report to be submitted for course evaluation.
- xiv. **Feedback:** The learnings the student made out of interaction with eminent achievers shall be presented in the report as one of the chapters.
 - During feedback, the central focus is on the elaboration of the students' experience during fieldwork. Therefore, the student should create an end product, such as a demonstration/presentation and report in which they demonstrate a link between their experiences during fieldwork and the underlying theoretical concepts and ideas.
- (e) **Demonstration / Presentation and Report:** Student after presentation/ demonstration of his/her achievements/work, shall get a certificate from the concerned nodal unit

and submit a report, in the prescribed format, to the faculty counsellor for award of grade.

(f) **Flow process for completion of SEA/SAA course:**

- i. **Faculty counsellor approval:** In week (-1), in consultation with faculty counsellor, every student shall, identifies minimum of 4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student
- ii. **Identification of goals and preparation of action plan:** In week (1), the respective faculty coordinator(s) of nodal centres shall address the students allotted to them to educate them on fixing goals, plan of action for completion and evaluation. In consultation with nodal centre, based on the workflow of the allotted activity, every student shall identify the goals (of activity) & eminent personalities (to be visited during the field trip) and prepare action plan (oriented workflow) for attaining the identified goals.
- iii. **Field work:** Under the guidance of nodal centre, student shall complete the field work, based on the action plan, with the progress continuously monitored by the faculty counsellor and the nodal centre.
- iv. **Demonstration/ Presentation:** After completion of field work, student shall demonstrate/present his achievements (knowledge/skills gained during the activity) at the nodal centre in the presence of external experts/senior practitioners of the activity. After successful demonstration/presentation, the nodal centre shall provide a certificate of completion indicating that the student has completed the activity in the stipulated time.
- v. **Report writing:** After successful demonstration/presentation, student shall write a 2-3-page report and submit the same to the faculty counsellor. The report shall emphasize knowledge, skills and qualities acquired through the SEA/SAA activities. It shall also include the influence of these activities on enhancing confidence, positive change in life, decision making, transforming choices into desired actions/outcomes.

- (g) **Assessment & Evaluation:** There shall be *only Continuous Internal Evaluation (CIE)* for SEA/SAA. The SEA/SAA activities shall be evaluated at the end of the semester through respective evaluation processes, which shall include field work, presentation/ demonstration, submission of reports on the gathered data/information/ surveys, the details of which have been shown in below table. The department level SEA/SAA coordinator shall collect marks from the nodal centres and faculty counsellors, consolidate them, and submit the final grades to the examination branch, within one week of the last day of instruction. Evaluation of SEA/SAA activities shall be completed as and when students are ready, but not later than week (N+1).

The CIE for SEA/SAA is as follows:

Assessment	Maximum marks	Marks to be awarded by
Goal setting, Planning & Knowledge Acquisition	20	Nodal centre
Field work	40	Nodal centre
Demonstration/Presentation	20	Nodal centre
Report submission	20	Faculty counsellor
Total	100	-

Note:

- (a) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.
 - The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.
- (b) **Report:** Each student is required to submit a well-documented report on the chosen SEA/SAA topic as per the format specified by *department level SEA/SAA coordinator*.
- (c) **Anti-Plagiarism Check:** The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.
- (d) **Requirements for passing the course:** A student is deemed to have passed SEA/SAA if he/she
 - a. successfully demonstrates/presents the skills attained at the end of course as per the schedule notified by the nodal centre, **and**
 - b. scores a minimum of 40 marks in the CIE of the course
- (e) **Supplementary examination:** If a student fails in SEA/SAA activity of a particular semester, he must complete the same by enrolling it in the next higher semesters.

Course Learning Outcomes (COs):

After completion of this course, the students should be able to...

CO1: integrate the five dimensions of physical, emotional, cognitive, spiritual and social aspects in life for holistic development and demonstrate social sensitivity

CO2: interact effectively through written, oral and nonverbal communication with external world in a professional, sensitive and culturally relevant manner

CO3: analyse the issues related to social empowerment / self-accomplishment, demonstrate problem-solving skills, articulate solutions and demonstrate social sensitivity

CO4: demonstrate the generic competencies in making a well-documented report and an effective oral presentation with PPTs portraying knowledge, skills, qualities acquired through fieldwork/practice sessions and social impact of the course learning

Text / Reference book(s):

For knowledge acquisition, students shall refer to textbooks and web resources relevant to the course selected. Plan for fieldwork/practice sessions in coordination with SEA/SAA coordinator

Course Articulation Matrix (CAM):		U24VA109ZZ SEA-1/ SAA-1													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U24VA109.1	-	-	-	-	-	2	2	2	2	2	2	2	-	-
CO2	U24VA109.2	-	-	-	-	-	2	2	2	2	2	2	2	-	-
CO3	U24VA109.3	-	-	-	-	-	2	2	2	2	2	2	2	-	-
CO4	U24VA109.4	-	-	-	-	-	2	2	2	2	2	2	2	-	-
U24VA109		-	-	-	-	-	2	2	2	2	2	2	2	-	-

3 - HIGH, 2 - MEDIUM, 1 - LOW

Course Code: U24VAXYY(SE/SA)ZZZ

X represents semester; YY represents SEA/SAA course serial number in that semester; SE- represents SEA activity or SA - represents SAA activity; ZZZ represents activity code from SEA/SAA baskets

Ex: If A student selects a SEA/SAA course as below:	Ex: If A student selects a SEA/SAA course as below:
<i>Semester: 1 SEA/SAA course serial number: 09 SEA/SAA category: SEA course number: 302</i> The course code will be U24VA109SE302	<i>Semester: 4 SEA/SAA course serial number: 10 SEA/SAA category: SAA course number: 206</i> The course code will be U24VA410SA206

EXPERT TALK SERIES-1

Class: B.Tech. I -Semester	Branch: Common to all branches		
Course Code:	U24AE110	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-1-1	CIE:	100%
Total Number of Teaching Hours:	-	ESE :	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: 21st century skills needed for industry, current industry trends, challenges and innovations

LO2: latest technology in practice and applying knowledge to solve real-world problems

LO3: smart work, soft skills, professional etiquette, networking abilities

LO4: making a well-documented report portraying the knowledge, skills, qualities acquired and the impact of the learning

In the 21st century, for successful career, degree alone won't suffice. Competencies are much more important.

- (a) You need to be aware of the real-world problems, industry working style, need to be confident and smart and you also need to know the tricks of the trade.
- (b) Learning from industry experts with real-world examples, is important to enhance your educational experience.
- (c) Enhanced graduate employability benefits all stakeholders. To effectively enhance employability and the immediacy of adding value to company/project, it is important that you are aware of what you are learning and its use in the workplace. The cognitive abilities viz., remember, understand, recall, and application of knowledge and other skills acquired in higher education can be maximised if you are clear on the purpose of your developed competencies and how to apply them in a range of complex situations.
- (d) Graduate employability could be enhanced through fostering lifelong learning, the development of a range of employability-related competencies and increased confidence and capacity in "reflecting on and articulating these capabilities and attributes in a range of recruitment situations".

But how would you know all this without venturing into the industry?

- (e) The answer is Industry **Expert Talk Series (ETS)**. Through ETS, we invite industry experts in different fields to deliver talks and interact with students.
- (f) Through Industry expert talks students get to know so much more that textbooks don't explain.
- (g) Students have the opportunity to learn from professionals who have achieved success in their respective fields. These speakers often share their personal experiences, case

studies, and anecdotes, providing students with real-world examples and perspectives that go beyond theoretical concepts.

- (h) Our competency-focussed curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses
- (i) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.
- (j) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability enhancement category of courses**.
- (k) Through ETS sessions, students get the chance to interact with industry regularly which helps them focus on the needs and requirements of current industry. This will not only enthuse the students with new ideas but also motivate them to understand what kind of 21st century skills are needed in industry and how they need to groom themselves.
- (l) Through ETS sessions, another benefit is that students learn the importance of soft skills like communication, presentation, email etiquettes, corporate grooming and dressing styles. Conversing with successful people is the biggest motivation and students gain in more ways than one through ETS sessions.
- (m) ETS enhances your learning in many ways for global opportunities for your career.
- (n) All in all, learning from industry experts, is a wonderful opportunity for student to getting acquainted with professional etiquette, acquiring professional knowledge, and getting to know the internal workings of an organization.
- (o) Salient features of ETS are hereunder:
 - (i) ETS is offered from I semester to VI semester.
 - (ii) ETS, in any given semester, is treated as one credit course
 - (iii) Students are required to earn six credits (from I to VI semester)
 - (iv) **Head, Centre for i²RE** shall be the **institute level ETS coordinator**
 - (v) Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode** by the parent department / Centre for i²RE.
 - (vi) Each expert talk shall be for a minimum duration of 45 minutes (*but not exceeding 90 minutes*) followed by **online quiz/test** for 10 marks (10 MCQs/FiBs ; *duration: 10-15 mins*), on the contents covered in the expert talk.
 - (vii) **The Head C-i²RE** shall share the marks obtained by the students in each of the quizzes / tests to the respective **department ETS coordinators**.
 - (viii) Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.
 - (ix) **Report on ETS:** At the end of semester, the student shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.
 - (x) **Evaluation:** There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks

(xi) The department ETS coordinator shall, in coordination with institute level ETS coordinator, submit the final scores to the CoE in week (N+1).

(p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

Quiz score (sum of best 6 quiz scores out of 10 quizzes. Each quiz evaluated for 10 marks)	60 marks
Attendance (out of 10 quizzes)	20 marks
Report in prescribed format (max 30% plagiarism)	20 marks
Total	100 marks

i. **Attendance:** Maximum of 20 marks shall be awarded based on the attendance maintained by the student over a maximum of 10 lectures.

$$\text{Marks for attendance} = \frac{\text{Number of expert talks attended fully}}{10} * 20$$

ii. **Supplementary Exam:**

- (a) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE
- (b) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks (MCQs/FiBs ; duration: 2Hrs) on the content covered in ETS lectures.
- (c) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE
- (d) Exam material/resources for supplementary: Recorded videos of ETS arranged for that semester, which shall be made available on ETS webpage of institute website

Course Learning Outcomes (COs):

After completion of this course, the students should be able to...

- CO1:** identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology
- CO2:** identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement
- CO3:** interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects
- CO4:** demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

Course Articulation Matrix (CAM):		U24AE110 EXPERT TALK SERIES-1													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U24AE110.1	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO2	U24AE110.2	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO3	U24AE110.3	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO4	U24AE110.4	1	1	1	1	1	1	1	2	1	2	1	2	1	1
U24AE110		1	1	1	1	1	1	1	2	1	2	1	2	1	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

II SEMESTER

Stream-I

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	C
1	BSC	U24MH201	Matrix Theory and Vector Calculus	2	1	-	6	9	3
2	BSC	U24CH202A	Engineering Chemistry	2	1	2	5	10	4
3	PCC	U24CE203	PCC 02 Strength of Materials	2	1	-	4	7	3
4	ESC	U24CE204	Data Structures through C	2	1	2	5	10	4
5	HSMC	U24MH205	English Communication and Report Writing	2	-	-	3	5	2
6	VAC	U24VA206	Sports & Yoga	-	-	2	2	4	-
7	ESC	U24CE207	Engg. Graphics through CAD*	1	-	4	2	7	3
8	SEC	U24SE208	Programming Skill Development(PSD) Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210	SEA-2 / SAA -2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
Total:				11	4	12	36	63	23
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

Exit Option to Qualify UG Certificate in CE : Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CE212X	Fundamentals of Surveying	2	-	2	-	4	3
2	PCC	U24CE213X	Civil Engineering Materials	2	-	2	-	4	3
3	PCC	U24CE214X	Construction Practices	2	-	2	-	4	3
4	PCC	U24CE215X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

MATRIX THEORY AND VECTOR CALCULUS

Class: B.Tech. II -Semester		Branch: Common to all branches	
Course Code:	U24MH201	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-6-9	CIE:	60(%)
Total Number of Teaching Hours:	36 Hrs	ESE:	40(%)

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: various methods of solving system of linear equations and eigen value problems

LO2: double integral, triple integral and their applications

LO3: vector differential calculus and applications

LO4: integration of vector valued functions and applications

UNIT-I

9 Hrs

Matrices:

Rank of a Matrix, Elementary transformations of a matrix, Gauss Jordan method of finding the inverse, Normal form of a matrix, Consistency of linear system of equations, System of linear homogeneous equations, Eigen values, Eigen vectors, Properties of Eigen values, Cayley-Hamilton's theorem, Reduction to diagonal form, Factorization method (LU Decomposition) Applications of Eigen value problems: Stretching of an elastic membrane, Eigen value problems arising from Markov processes, Eigen value problems arising from population models, Leslie model

Self-Learning Topics (SLTs): Review of Matrices [Text 1: topics 2.1,2.2,2.3,2.4,2.5]

PAQ –Normal form [Text 1, topic 2.7(7), Solved problems: 2.26, Practice problems: exercise 2.4 (9,10)]

Additional problems on System of homogeneous and non-homogeneous equations [Text 1: topic 2.18, Solved problems: 2.52, Practice problems: exercise 2.10 (13,14)]

Additional problems on Eigen values and Eigen vectors [Text 2: topic 8.1, Solved problems: 8.1(1,2), Practice problems: exercise 8.1(4,6)]

Nature of Quadratic form [Text 1: topic 2.18, Solved problems: 2.52, Practice problems: exercise 2.10 (13,14)]

UNIT-II

9 Hrs

Multiple Integrals and Beta, Gamma functions:

Double Integrals, change of order of integration, Double Integrals in polar coordinates, Area enclosed by plane curves, Triple integrals, Volumes of solids, Calculation of Mass for a plane lamina, Beta function, Gamma function, Relation between Beta and Gamma functions (without proof).

Self-Learning Topics (SLTs): Review of integrals [Text 1: topic Appendix VII (1)]

Additional problems on change of order of integration [Text 1: topic 7.2, Solved problems: 7.4,7.6, Practice problems: exercise 7.1 (9,14)]

Centre of gravity of a plane lamina [Text 1: topic 7.10, Solved problems 7.34,7.35, Practice problems: exercise 7.6 (9,10)]

Moment of Inertia of plane lamina [Text 1: topic 7.12(1,2), Solved problems: 7.37,7.38, Practice problems: exercise 7.7 (1,4)]

Additional problems on Volume of solids [Text 1: topic 7.6, Solved problem: 7.21, Practice problems: exercise 7.4 (12,25)]

UNIT-III	9 Hrs
<p>Vector Calculus and its applications: - Vector Space, Linear dependent and independent vectors, Differentiation of vectors, Curves in space, Tangent, Principal normal, Binormal, Curvature, Torsion, Velocity and acceleration, Scalar and vector point functions, Del applied to scalar point functions - Gradient, Geometrical interpretation, Directional derivative, Del applied to vector point functions -Divergence, Curl, Physical interpretation of divergence, Physical interpretation of curl, Del applied twice to point functions, Del applied to products of point functions, Decomposition of vector valued functions</p> <p><i>Self-Learning Topics (SLTs):</i> Review of vectors [Text 2: topics 9.1, 9.2, 9.3] Vector identities [Text 1: topic 8.9, Solved problems: 8.22, 8.23, Practice problems: exercise 8.4 (13,14)] Additional problems on Directional derivatives [Text 1: topic 8.5(3), Solved problems: 8.13,8.14, Practice problems: exercise 8.3 (4,6,8,9)]</p>	
UNIT-IV	9 Hrs
<p>Integration of vectors: Line integral, Surfaces-Surface integral, flux across a surface, Green's theorem in the plane (without proof), Stoke's theorem (Relation between line and surface integrals) (without proof), Volume integral, Gauss divergence theorem (Relation between surface and volume integrals) (without proof), irrotational fields, solenoidal fields</p> <p><i>Self-Learning Topics (SLTs):</i> Additional problems on Green's theorem [Text 1: topic 8.13, Solved problems: 8.33,8.35, Practice problems: exercise 8.8 (1,2,4)] Additional problems on Stoke's theorem [Text 1: topics 8.14, Solved problems: 8.39, 8.40, Practice problems: exercise 8.9 (1,2)] Additional problems on Gauss Divergence theorem [Text 1: topic 8.16, Solved problems: 8.44,8.46, Practice problems: exercise 8.10 (1,2)]</p>	
<p>Course Learning Outcomes (COs): After completion of this course, the students should be able to...</p> <p>CO1: analyze eigen value problems using matrix theory CO2: apply basic concepts of multiple integrals in evaluating physical quantities of real-life engineering problems CO3: apply differential operators on vector and scalar point functions CO4: solve line, surface, volume integrals and correlate these with applications of Green, Stoke and Gauss divergence theorems</p>	
<p>Textbook(s):</p> <ol style="list-style-type: none"> Grewal, B.S., <i>Higher Engineering Mathematics</i>, Khanna Publishers, Delhi, 46th edition, 2023. (Chapters 2,7,8) Kreyszig E, <i>Advanced Engineering Mathematics</i>, Inc, U.K, John Wiley & sons, 11th edition, 2023. (Chapter 8(8.2)) 	
<p>Reference Book(s):</p> <ol style="list-style-type: none"> Spiegel M, <i>Vector Analysis</i> -Schaum's Series, McGraw Hill, 4th edition, 2021. S.S. Sastry, <i>Engineering Mathematics, Vol.II</i>, Prentice Hall of India, 4th edition, 2021 . Gilbert Strang, <i>Introduction to Linear Algebra</i>, Wellesley-Cambridge Press, 6th edition, 2022. 	

Web and Video link(s):

1. <https://youtu.be/L4crGhtEX14?si=hyjAPgDheJOhXtYZ> : NPTEL Video Lecture on Matrix Analysis with Applications/Dr.S.K.Gupta and Dr.Sanjeev Kumar/IIT Roorkee
2. https://youtu.be/ksS_yOK1vtk?si=CNNA58OIuszubPiX : NPTEL Video Lecture on Integral and Vector Calculus./Prof.Hari Shankar Mahato / IIT Kharagpur

Course Articulation Matrix (CAM):		U24MH201 MATRIX THEORY AND VECTOR CALCULUS													
C O		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24MH201.1	2	2	1	1	-	-	-	1	-	1	-	1		
CO2	U24MH201.2	2	2	1	1	-	-	-	1	-	1	-	1		
CO3	U24MH201.3	2	2	1	1	-	-	-	1	-	1	-	1		
CO4	U24MH201.4	2	2	1	1	-	-	-	1	-	1	-	1		
U24MH201		2	2	1	1	-	-	-	1	-	1	-	1		
3 - HIGH, 2 - MEDIUM, 1 - LOW															

ENGINEERING CHEMISTRY (for Civil Engineering)

Class: B.Tech. II -Semester		Branch: CE	
Course Code:	U24CY202A	Credits:	4
Hours/Week (L-T-P-O-E):	2-1-2-5-10	CIE:	60(%)
Total Number of Teaching Hours:	60 Hrs	ESE:	40(%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in/on...</i>			
LO1: electrochemical energy systems, batteries and fuel cells			
LO2: water analysis and corrosion with its preventive methods			
LO3: polymers and spectroscopic techniques for chemical analysis			
LO4: cement, polymer concrete, nanomaterials and their applications			
THEORY COMPONENT			
UNIT-I		9 Hrs	
<p>Electrochemical Technology and Engineering: Introduction, Specific conductance, Equivalent conductance, Effect of dilution, Conductometric titrations; Acid base titrations (Strong acid vs strong base, Strong acid vs weak base, Weak acid vs strong base and weak acid vs weak base), Advantages of conductometric titration, Galvanic cell, Electrode potential, Electrochemical series, Nernst equation, Potentiometric titrations; Acid - base titrations, Advantages of potentiometric titrations, Biosensors, Batteries; Classification, Lead-acid battery, Fuel cells; Hydrogen-oxygen fuel cell</p> <p><i>Self Learning Topics (SLTs):</i> Types of conductors (Text 1: chapter 5 topic 1), Ohms law (Text1: chapter 5 topic 5)</p>			
UNIT-II		9 Hrs	
<p>Water Technology and Corrosion: Introduction, Hardness of water, Estimation of hardness of water by complexometry, Alkalinity, Determination of alkalinity, Numerical problems, Determination of dissolved oxygen (DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Softening method; Ion-exchange method, Desalination processes; Reverse osmosis, Quality parameters of potable water (BIS, WHO)</p> <p>Corrosion: Introduction, Dry corrosion, Pilling-Bedworth rule, Wet corrosion, Factors effecting corrosion; purity of the metal, Relative areas of anodic and cathodic parts, Nature of surface film, Humidity, pH and temperature, Prevention methods of corrosion; Cathodic protection, Impressed current cathodic protection, Sacrificial anodic protection</p> <p><i>Self Learning Topics (SLTs):</i> Units of hardness (Text1: chapter 1 topic 5), Introduction to corrosion (Text1: chapter 7 topic 1), galvanic series (Text1: chapter 7 topic 12)</p>			
UNIT-III		9 Hrs	
<p>Polymer Chemistry and Characterization of Materials using Spectroscopic Methods</p> <p>Polymers: Introduction, Monomer, Polymer, Types of polymerization; Addition and condensation, Preparation, Properties and applications of Polythene, Polyvinyl cyanide, Polyvinyl chloride, Bakelite, Nylon 6:6, Thermosetting resins and thermoplastic resins, Conducting polymers and their applications</p> <p>Spectroscopy: Introduction to spectroscopy, Microwave spectroscopy; Principle, Selection rules, Applications, Infra-red spectroscopy; Principle, Selection rules, Applications, UV spectroscopy; Lambert-Beer's law and its applications</p> <p><i>Self Learning Topics (SLTs):</i> Mechanism of addition polymerization (Text1: chapter 3 topic 6), Electromagnetic spectrum (Text1: chapter 35 topic 1)</p>			
UNIT-IV		9 Hrs	
<p>Engineering Materials</p> <p>Cement: Introduction, Cement, Manufacture of portland cement, Chemical constitution of portland cement, Setting and hardening of portland cement, Heat of hydration of cement, concrete, Polymer concrete, Polymer Impregnated concrete, Glasses and</p>			

ceramics, Glassfibre reinforced cement (GRC)

Nanomaterials: Introduction, Synthesis of nanomaterials; Top down and bottom-up approaches, Synthesis by sol-gel method, Nanoscale materials; Fullerenes, Carbon nanotubes, Graphene; Properties and applications

Self Learning Topics (SLTs): Classification of cement (Text1: chapter 11 topic 12), Introduction to nanotechnology (Text1: chapter 37 topic 1)

LABORATORY COMPONENT

List of Experiments

1. Estimation of hydroxide ion $[\text{OH}^-]$ by Acidimetry using standard sodium carbonate solution
2. Estimation of alkalinity of water sample containing (i) carbonate; (ii) carbonate & bicarbonate in Ground water
3. Estimation of alkalinity of water sample containing (i) bicarbonate; (ii) carbonate & hydroxide in potable water
4. Determination of hardness of water by complexometric method
5. Determination of dissolved oxygen in a sample of water
6. Standardization of sodium hydroxide (NaOH) by conductometry using standard hydrochloric acid (HCl)
7. Standardization of acetic acid (CH_3COOH) by conductometry using standard sodium hydroxide (NaOH)
8. Standardization of strong acid hydrochloric acid (HCl) by potentiometry using standard sodium hydroxide (NaOH)
9. Colorimetric analysis-verification of Lambert-Beer's law
10. Estimation of (Fe^{2+}) ion in the given solution using potassium permanganate
11. Preparation of nanoparticles of cadmium sulphide (CdS)
12. Synthesis of polymer (phenol-formaldehyde)

Text Book(s):

1. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, New Delhi, 19th edition, 2023.
2. M.S. Shetty, *Concrete Technology Theory and Practice*, S. Chand & Company Ltd., New Delhi, 17th edition, 2021.

Reference Book(s):

1. J. C. Kuriacose and J. Rajaram, *Chemistry in Engineering and Technology (volume I & II)*, Tata Mc. Graw-Hills Education Pvt. Ltd., New Delhi, 10th edition, 2022.
2. Shashi Chawla, *Text book of Engineering Chemistry*, Dhanpat Rai Publishers, New Delhi, 5th edition, 2021.
3. S.S. Dara, S.S. Umare, *A Text book of Engineering Chemistry*, S.Chand & Company Ltd., 14th edition, 2022.

Web and Video link(s):

1. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/battery-cell-technology-materials-and-industrial-applications/?v=c86ee0d9d7ed> NPTEL Video Lecture on Battery technology by Dr. Kothandaraman, Professor of Chemistry, IIT Madras & Dr. Raghunathan, Professor of Chemical engineering, IIT Madras

Laboratory Manual (for laboratory component):

1. *Engineering Chemistry laboratory manual*, Department of PS, KITSW

Course Learning Outcomes (COs)

After completion of this course, the students should be able to, (based on cognitive skills acquired from theory component)

CO1: apply the concepts of electrochemical energy systems for batteries and fuel cells

CO2: interpret suitable techniques of water analysis and corrosion treatment of solid materials

CO3: appraise the spectroscopic techniques of chemical analysis and applications of polymers

CO4: summarize the synthesis and applications of engineering materials

(based on psychomotor skills acquired from laboratory component)

CO5: determine water quality parameters - alkalinity, hardness

CO6: make use of analytical instruments for chemical analysis

CO7: determine metals present in their ores

CO8: design the synthesis of nanomaterial and polymer

Course Articulation Matrix (CAM):		ENGINEERING CHEMISTRY (for Civil Engineering)													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24CY202A.1	2	-	-	-	1	1	1	1	-	1	-	1	1	1
CO2	U24CY202A.2	2	-	-	-	1	1	1	1	-	1	-	1	1	1
CO3	U24CY202A.3	2	-	-	-	1	1	-	1	-	1	-	1	1	1
CO4	U24CY202A.4	2	-	-	-	1	1	-	1	-	1	-	1	1	1
CO5	U24CY202A.5	2	1	-	-	-	1	-	1	-	1	-	1	1	1
CO6	U24CY202A.6	2	1	-	-	2	1	-	1	-	1	-	1	1	1
CO7	U24CY202A.7	2	1	-	-	-	1	-	1	-	1	-	1	1	1
CO8	U24CY202A.8	2	1	-	-	-	1	-	1	-	1	-	1	1	1
U24CY202A		2.00	1.00	-	-	1.20	1.00	1.00	1.00	-	1.00	-	1.00	1.00	1.00
3 - HIGH, 2 - MEDIUM, 1 - LOW															

STRENGTH OF MATERIALS			
Class: B.Tech. II -Semester		Branch: Civil Engineering	
Course Code:	U24 CE203	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-4-7	CIE :	60(%)
Total Number of Teaching Hours:	36 Hrs	ESE :	40(%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: types of stresses, strains and elastic moduli			
LO2: : bending and shearing stresses in beams subjected to flexure			
LO3: torsional behaviour of circular shafts and compression springs			
LO4: behaviour of thin cylinders and Principal stresses			
UNIT-I		9 Hrs	
Simple stresses and strains: Types of stresses, strains, stress-strain diagram, elastic limit, Hooke's law, bars of varying sections, uniformly tapering circular and rectangular sections, elongation of bars due to self-weight.			
Elastic Moduli: Elastic constants, longitudinal strain, lateral strain, Poisson's ratio, complimentary shear stress, state of simple shear, modulus of elasticity (E), modulus of rigidity (N), bulk modulus (K), relation between E, N & K, strain energy, resilience.			
<i>Self-Learning Topics (SLTs): Derivations of stress and elongation of uniform cross-section bar, taper rod, and conical bar due to self-weight (Text1: topics 1.5, 1.8, 1.9), relation between the elastic constants (Text1: 1.11.1, 1.11.2), stresses due to different types of loads (Text1: topics: 15.3).</i>			
UNIT-II		9 Hrs	
Bending stresses in beams: Assumptions, theory of simple bending, application of bending equation and calculation of bending stresses in beams of homogeneous and flitched beam material, beams of uniform strength.			
Shearing stresses in beams: Shearing stress due to bending, variation of flexural shear stress distribution across rectangular, triangular, circular, flanged section, shear resilience.			
<i>Self-Learning Topics (SLTs): Derivation of bending equation (Text1: topics 5.1), Solved problems (Text1: Prob 5.22, 5.23), Practice problems (Text1: prob 19, 20), Derivation of shearing stress equation (Text1: topics 7.2), Solved problems (Text1: topics 7.13, 7.14, 7.16), Practice problems (5 & 6).</i>			
UNIT-III		9 Hrs	
Torsion of Circular shafts: Theory of pure torsion in solid and hollow circular shafts, shear stresses, angle of twist, power transmitted by shaft.			
Springs in compression: Types of springs, functions of springs, closed-coiled and open-coiled helical spring subjected to axial load and axial twist, springs in series and parallel.			
<i>Self-Learning Topics (SLTs): Derivation of torsion equation (Text1: topics 13.3), comparison of solid and hollow shafts (Text1: topic 13.9), Shafts in series and parallel (Text1: topics 13.10, 13.11), derivation for deflection, stiffness & energy stored in closed coil helical spring equations (Text1: topics 14.3.1), Energy stored in flat spiral spring (Text1: topics 14.7).</i>			
UNIT-IV		9 Hrs	
Thin Cylinders: Analysis of thin-walled pressure vessels, hoop stress, longitudinal stress.			
Principal stresses: Definition, normal and shear stress, principal stresses, principal planes, and their graphical representation by Mohr's circle.			
<i>Self-Learning Topics (SLTs): Circumferential and longitudinal stress equations of thin cylinders (Text1: topics 10.2.1, 10.2.2), Cylindrical shell with hemi spherical ends (Text1: topic 10.2.5), two mutual perpendicular direct stresses (Text1: topic 2.3), solved problems (Text1: topic 2.9, 210).</i>			

Course Learning Outcomes (COs):

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

CO1: relate various types of stresses, strains and elastic moduli

CO2: evaluate the bending and shear stresses for beams in flexure

CO3: analyze the behavior of springs and circular shafts subjected to pure torsion

CO4: estimate stresses in thin cylinders and locate principal planes by Mohr's circle

Textbook(s):

1. Er. R. K. Rajput, *Strength of Materials*, S. Chand Publishers, Delhi, 7th edition, 2022.
2. Gunneswara Rao T. D., Mudimby Andal *Strength of Materials*, Cambridge University Press, 1st edition 2018.

Reference Book(s):

1. Timoshenko and Gere, *Mechanics of Materials*, Mc Graw Hill International publishers, 8th edition 2014.
2. Punmia B.C., Arun K. Jain, Ashok K. Jain, *Mechanics of Materials*, Laxmi Publications, New Delhi, 2nd edition, 2012.
3. Subramanian R., *Strength of Materials*, Oxford University Press, 3rd edition 2016.
4. Ramamrutham S., *Strength of Materials*, Dhanpat Rai & Sons publications, New Delhi, 18th edition, 2014.

Web and Video link(s):

1. <https://nptel.ac.in/courses/112107146> NPTEL Video Lecture on Strength of Materials by Dr. Satish C Sharma, IIT Roorkee.
2. <https://archive.nptel.ac.in/courses/105/105/105105108/> NPTEL Video Lecture on Strength of Materials by Prof. Sriman KumarBhattacharya, IIT Kharagpur.
3. https://onlinecourses.nptel.ac.in/noc23_me140/preview NPTEL Video Lecture on Strength of Materials by Prof. K. Ramesh, IIT Madras.

Course Articulation Matrix (CAM):		U24CE203 Strength of Materials													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24CE203.1	3	2	1	-	-	-	-	1	1	1	-	1	2	1
CO2	U24CE203.2	3	2	1	-	-	-	-	1	1	1	-	1	2	1
CO3	U24CE203.3	3	2	1	-	-	-	-	1	1	1	-	1	2	1
CO4	U24CE203.4	3	2	1	-	-	-	-	1	1	1	-	1	2	1
U24CE203		3	2	1	-	-	-	-	1	1	1	-	1	2	1

3 - HIGH, 2 - MEDIUM, 1 - LOW

DATA STRUCTURES THROUGH C

Class: B.Tech. II -Semester		Branch: Common to all branches	
Course Code:	U24AI204	Credits:	4
Hours/Week (L-T-P-O-E):	2-1-2-5-10	CIE:	60 (%)
Total Number of Teaching Hours:	60 Hrs	ESE:	40 (%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: time complexity, space complexity, array operations, and dynamic memory allocation			
LO2: stacks and various forms of queues			
LO3: various types of linked lists			
LO4: various sorting techniques and hashing techniques			
THEORY COMPONENT			
UNIT-I		9 Hrs	
<p>Data Structures: Basic terminology, Classification of data structures, Applications and operations on data structures, Time and space complexity</p> <p>Arrays: Operations on arrays-traversing an array, Inserting an element in an array, Deleting an element from an array, Searching an element using binary search and their complexities,</p> <p>Dynamic Memory Allocation: Memory allocation functions, Dynamic memory allocation for single and two dimensional arrays</p> <p><i>Self Learning Topics (SLTs): Three dimensional and n-dimensional arrays (Text1: topics 2.4.3), passing arrays to functions and pointers (Reference1: topics 3.6, 3.7), Practice problems (Text1: Prob 2.3, Reference1: Prob 1, Prob 2, Prob 3, Prob 4)</i></p>			
UNIT-II		9 Hrs	
<p>Stacks: stacks, Array representation of stacks, Operations on a stack-push and pop; Multiple stacks, Applications of stacks- recursion, Fibonacci series, tower of Hanoi, evaluation of expressions (infix to postfix conversion, evaluation of postfix expression)</p> <p>Queues: queues, Array representation of queues, Double ended queues, Circular queues</p> <p><i>Self Learning Topics (SLTs): Infix to prefix (Reference1: topics 7.7.3), priority Queue(Reference1: 8.4.3), Solved problems (Reference1: Prob 7.7.1, Prob 7.7.2), Practice problems (Text1: Prob 4.5, Prob 4.11, Prob 5.7, Prob 5.9)</i></p>			
UNIT-III		9 Hrs	
<p>Linked Lists: Basic terminologies, Linked list versus arrays, Memory allocation and de-allocation for a linked list, Singly linked list, Circular linked list, Doubly linked list, Circular doubly linked list (linked list operations- traversing, searching, inserting, deleting), Representing stack and queue using linked list</p> <p><i>Self Learning Topics (SLTs): Merging (Text1: topics 3.3), Skiplist (weblink: https://www.geeksforgeeks.org/skip-list/), Deallocation strategy(Text1: topic 3.9), Solved problems (Text1: Prob 3.6.1, Prob 3.6.2), Practice problems (Reference1: Prob 5.5, Prob 5.7, Prob 5.9)</i></p>			
UNIT-IV		9 Hrs	
<p>Sorting Techniques: Selection sort, Insertion Sort, Shell sort and radix sort, Time complexities of sorting</p> <p>Hashing: Hashing techniques, Collision resolution techniques, Closed hashing, Open hashing, Comparison of collision resolution techniques</p>			

Self Learning Topics (SLTs): Two way insertion sort (*Text1: topics 10.3.4*), Comparison of sorting techniques(*Reference1: topics 14.16*) Solved problems (*Reference1: Prob 15.5, Prob 15.6, Prob 15.7*), Practice problems (*Text1: Prob 6.4*)

LABORATORY COMPONENT

List of Experiments

Experiment-I

1. Program to implement initialization of array and perform traversal operations in both the directions
2. Program to implement searching operation on array using Linear Search
3. Program to display the count of occurrences of every number in an array

Experiment-II

4. Program to implement searching operation on array using Binary Search
5. Program to implement insertion operation on array
6. Program to implement deletion operations on array

Experiment-III

7. Program to implement initialization of arrays and traversal operation with DMA
8. Program to implement matrix addition and subtraction with DMA

Experiment-IV

9. Program to implement matrix multiplication with DMA
10. Program to implement stack operations
11. Program to convert infix expression into postfix

Experiment-V

12. Program to evaluate given postfix expression
13. Program to define recursive function to solve tower of hanoi puzzle
14. Program to display the Fibonacci series with the help of recursive function
15. Program to implement MultiStack

Experiment-VI

16. Program to implement queue operations using arrays
17. Program to implement circular queue operations using arrays
18. Program to implement double ended queue operations using arrays

Experiment-VII

19. Program to create single linked list and implement its operations
Note:- Linked list Operations: i) traversing ii) inserting iii) deleting iv) searching v) reversing vi) concatenation

Experiment-VIII

20. Program to create circular linked list and implement its operations
21. Program to create double linked list and implement its operations

Experiment-IX

22. Program to create circular double linked list and implement its operations

Experiment-X

23. Program to implement stack operations using linked list
24. Program to implement queue operations using linked list

Experiment-XI

25. Program to implement selection sort
26. Program to implement insertion sort

Experiment-XII

27. Program to implement shell sort
28. Program to implement radix sort
29. Program to implement hash table.

Textbook(s):

1. Debasis Samanta, *Classic Data Structures*, Prentice Hall India, 2nd edition, 2009

Reference Book(s):

1. Reema Thareja, *Data Structures Using C*, Oxford University Press, 2nd edition, 2014
2. Balagurusamy E, *Data Structure Using C*, McGraw Hill Education, 1st edition, 2017
3. Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudocode Approach with C*, Cengage Learning, 2nd Edition, 2007

Web and Video link(s):

<https://nptel.ac.in/courses/106106130>; NPTEL Video Lecture on Programming and Data Structures Dr. N. S. Narayana Swamy, CSE, IIT Madras.

Laboratory Manual (for laboratory component):

1. *Data Structures through C Laboratory Manual and Record Book*, Department of CSE (AI &ML), KITSW.

Course Learning Outcomes (COs):

*After completion of this course, the students should be able to,
(based on cognitive skills acquired from theory component)*

CO1: analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities

CO2: analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities

CO3: analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities

CO4: develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies

(based on psychomotor skills acquired from laboratory component)

CO5: develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity

CO6: apply the linear data structures such as stacks and queues and perform various operations using LIFO or FIFO order respectively

CO7: solve problems using various linked list representations for efficiently storing and retrieving the data

CO8: apply different sorting techniques on unsorted data and sort them in an order, able to store the data using hashing techniques to retrieve the data very effectively

Course Articulation Matrix (CAM):		U24AI204 DATA STRUCTURES THROUGH C													
C	O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24AI204.1	2	2	2	1	-	-	-	1	-	1	-	1	2	1
CO2	U24AI204.2	2	2	2	2	-	-	-	1	-	1	-	2	2	2
CO3	U24AI204.3	2	2	2	2	-	-	-	1	-	1	-	2	2	2
CO4	U24AI204.4	2	2	2	2	-	-	-	1	-	1	-	2	2	2
CO5	U24AI204.5	2	2	2	1	-	-	-	1	1	1	-	1	2	1
CO6	U24AI204.6	2	2	2	2	-	-	-	1	1	1	-	2	2	2
CO7	U24AI204.7	2	2	2	2	-	-	-	1	1	1	-	2	2	2
CO8	U24AI204.8	2	2	2	2	-	-	-	1	1	1	-	2	2	2
U24AI204		2	2	2	1.75	-	-	-	1	1	1	-	1.75	2	1.75
3 - HIGH, 2 - MEDIUM, 1 - LOW															

ENGLISH COMMUNICATION AND REPORT WRITING

Class: B.Tech. II -Semester		Branch: Common to all branches	
Course Code:	U24MH205	Credits:	2
Hours/Week (L-T-P-O-E):	2-0-0-3-5	CIE:	60 %
Total Number of Teaching Hours:	24 Hrs	ESE:	40 %
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
<p>LO1: basic grammar principles, reading speed, forming new words, making coherent paragraphs and also promoting ethical values for meaningful life.</p> <p>LO2: speaking or writing correct sentences, writing effective letters and improving their self-worth.</p> <p>LO3: critical reading ability, writing conclusive reports and additionally inculcating positive thinking.</p> <p>LO4: abridging varieties of lengthy texts and maintaining emotional balance.</p>			
UNIT-I			6 Hrs
GRAMMAR			
<ul style="list-style-type: none"> • Tenses-Structures-usage-examples-exercises for practice • Sentence Correction-Correct use of Tenses, Verb forms, Punctuation. 			
VOCABULARY			
<ul style="list-style-type: none"> • Word formation: Prefixes-Suffixes-Sentence Formation with newly formed words 			
READING SKILL			
<ul style="list-style-type: none"> • Definition-Sub skills of Reading-Emphasis on Skimming-Purpose- How to skim through the text-Examples, Exercises for practice 			
WRITING PRACTICES			
<ul style="list-style-type: none"> • Paragraph Writing- Definition-Organizing Principles of paragraphs -Making a paragraph through hints/ graphs and pictures-Coherence-Linking Devices-Systematic Development of Ideas • Paraphrasing-Précising lengthy expressions for clarity and brevity 			
LIFE SKILLS: Ethical Values and Humanity			
The Last Leaf: A Short Story by O. Henry			
Self Learning Topics (SLTs):			
<i>Articles-(Text 2,Unit-II), English Vocabulary (Text 2,Unit-I, Unit-II, Unit-III)</i>			
<i>Verb Forms (Reference book 1,Topic :31), Tenses (Reference book 1,Topics: 16,17,18,19)</i>			
<i>Reported Speech (Reference book 2, Exercises for Practice, Topics : 161-167)</i>			
UNIT-II			6 Hrs

GRAMMAR

- Tenses-Revision-Exercises for practice
- Subject-Verb Agreement
- Reported Speech-Transformation
- Sentence Correction -Emphasis Concord ,Report Speech, Sentence Structures

VOCABULARY

- Synonyms-Antonyms-Single Word Substitutes-Popular Abbreviations

READING STRATEGY

- Emphasis on Scanning the Text-Purpose-Advantages-Examples, Exercises and Practice through Teamwork
- **WRITING PRACTICES**
- Letter Writing- Effective Letter Writing Techniques-Information Seeking Letters-Job Application Letters- Apology Letters-Explanation to Memos- E-mails-Cover Letters- Resume

LIFE SKILLS: Determination

- How I Became a Public Speaker: An essay by George Bernard Shaw

Self Learning Topics (SLTs): English Vocabulary (Text 2,Unit-I,Unit-II,Unit-III),Tenses (Reference book 3,Topic-30, Exercises,30.1,30.2,30.3)

UNIT-III**6 Hrs****GRAMMAR**

- Tenses-Revision- Exercises for Practice
- Nouns- Prepositions-Adverbs-Adjectives
- Sentence Correction: Correct Use of tenses, nouns, prepositions, adverbs and adjectives

VOCABULARY

- Phrasal Verbs-Technical Words-Latin Words

READING STRATEGY

- Intensive Reading-purpose-Types of Comprehension Questions-Examples, Exercises and Practice through Teamwork

WRITING PRACTICES

- Report Writing-Definition-Purpose-Qualities of a Good Report- Formal and Informal Reports-Report Format-Sample Reports-Exercises
- Emphasis on Technical Reports

LIFE SKILLS: Positive Attitude

- Be the Best of Whatever You Are: A Poem by Douglas Malloch

Self Learning Topics (SLTs):

Parts of Speech (Text book 1, Unit-1), Tenses (Reference book 1, Topics-16,17,18,19) Phrasal Verbs (Reference book 3)

UNIT-IV

6 Hrs

GRAMMAR

- Tenses-Revision-Exercises for Practice
- Clauses- Conjunctions-Transformation of Sentences
- Sentence Correction (Based on Parts of Speech)- Clauses- Tenses

VOCABULARY

- Appropriate Use of Words in Communication-Commonly Confused Words

ACTIVE READING and NOTE-MAKING

- Note-Making-Definition-Purpose-Effectiveness

WRITING PRACTICES

- Précis Writing- Definition-Purpose-Uses-Examples and Exercises-Practice through Teamwork
- Preparing Statement of Purpose (SoP)

LIFE SKILLS: Emotional Balance A Poison Tree: Poem by William Blake

Self-Learning Topics (SLTs):

Tenses (Reference book 2, Topics: 152-157))

Course Learning Outcomes (COs):

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

CO1: apply basic grammar principles in speech and writing, read fast, form new words, make coherent paragraphs and adapt the real value of life.

CO2: create effective letters, e-mails, reply to Memos and do the given tasks with confidence.

CO3: analyze the given texts and write clear and unambiguous reports.

CO4: deduct the superfluous information from lengthy text, prepare SoP (Statement of Purpose) effectively and solve critical problems in life with emotional balance.

Textbook(s):

1. Sanjay Kumar & Pushp Lata, " *English Language and Communication Skills for Engineers*", Oxford University Press, 1st edition 2018
2. " *Language and Life: A Skill's Approach*" Based on the latest AICTE model curriculum Orient Blackswan Private Limited 2nd Edition 2019.

Reference Book(s):

1. Thomson A.J. , Martinet A.V., " *A Practical English Grammar*", Oxford University Press 3rd Edition 1997
2. Thomson A.J. , Martinet A.V., " *A Practical English Grammar*" Exercise 2 , Oxford University Press 3rd Edition 1997
3. Standard Allen W. , " *Living English Structure*", Pearson India Education Pvt Ltd. 5th Edition 2009

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc20_hs56/preview Technical English for Engineers by Aisha Icbal, IIT Madars
2. https://onlinecourses.swayam2.ac.in/cec21_lg13/preview Indian Writing in English by Dr.Bindu Ann Philip, St Mary's College Trissur

Course Articulation Matrix (CAM):				U24MH205: ENGLISH COMMUNICATION &REPORT WRITING											
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24MH205.1	-	-	-	-	-	1	-	2	2	2	-	2	1	1
CO2	U24MH205.2	-	-	-	-	-	1	-	2	2	2	-	2	1	1
CO3	U24MH205.3	-	-	-	-	-	1	-	2	2	2	-	2	1	1
CO4	U24MH205.4	-	-	-	-	-	1	-	2	2	2	-	2	1	1
U24MH205		-	-	-	-	-	1		2	2	2	-	2	1	1

SPORTS and YOGA

Class: B.Tech. II-Semester **Branch:** Common to all branches

Course Code: U24VA206 **Credits:** 0

Hours/Week(L-T-P-O-E): 0-0-2-2-4 **CIE:** 60 %

Total Number of Teaching Hours: 24Hrs **ESE:** 40 %

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: yoga and Benefits

LO2: various Sports & Games

LO3: sportsman spirit

LO4: all round development

Sports and Games

List of Sports and Games

Sl.No.	Game	Sl.No	Game
1	Badminton	7	Volleyball
2	Basketball	8	Cricket
3	Chess	9	Hand Ball
4	Carrom	10	Kabaddi
5	Foot Ball	11	Kho-Kho
6	Table Tennis	12	Yoga Aasanas

Textbook(s):

B.K.Chaturvedi, *Rules and Skills of Games and Sports*, Publisher - Goodwill Publishing House, B-9, Rattan Jyoti, 18 Rajendra Place, New Delhi.

ReferenceBook(s):

Dr.Sakure Girish Madhaorao, *Foundation of Physical Education and Sports*, Sports Publication, New Delhi.

Web and Video link(s):

Badminton game Video Link:

<https://www.youtube.com/watch?v=Huclqi8Lw3E&t=22s>

Basketball game Video Link:

<https://www.youtube.com/watch?v=-tkE2IJoR58>

Chess Video Link:

<https://www.youtube.com/watch?v=mDw7lgM8ePo>

Carrom game Video Link:

<https://www.youtube.com/watch?v=z8vvJpNceeg>

Football game Video Link:

<https://www.youtube.com/watch?v=mXjW78AgGu4>

Table Tennis game Video Link:

<https://www.youtube.com/watch?v=bLrJGWvWI4U>

Volleyball game Video Link:

<https://www.youtube.com/watch?v=BJJb3-O0Q1U>

Cricket game Video Link:

https://www.youtube.com/watch?v=87hO_Vs3-wQ

Handball game Video Link:

https://www.youtube.com/watch?v=VCa_0USaq8k

Kabaddi game Video Link:

<https://www.youtube.com/watch?v=ai1m7ARNyNI>

Kho-Kho game Video Link:

https://www.youtube.com/watch?v=P3_z3LKdLdg

Yoga Aasanas Video Link :

<https://www.youtube.com/watch?v=e0Q88DUOXjk>

<https://www.youtube.com/watch?v=JoDKbXEurvQ>

Course Learning Outcomes (COs):

After completion of this course, the student should be able to demonstrate ...

CO1: demonstrate physical fitness by performing yoga aasanas

CO2: demonstrate physical fitness through various games & sports events with defined benchmarks

CO3: demonstrate sportsman spirit and ethics

CO4: demonstrate physical, psychological, social and emotional balance

Course Articulation Matrix (CAM):		U24VA206 Sports and Yoga for Common to all branches													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2
CO1	U24VA206.1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	U24VA206.2	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO3	U24VA206.3	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	U24VA206.4	-	-	-	-	-	-	-	-	-	1	-	1	-	-
U24VA206		-	-	-	-	-	-	-	2	1	1	-	1	-	-

3 - HIGH, 2 - MEDIUM, 1 - LOW

ENGINEERING GRAPHICS & CAD			
Class: B.Tech. II -Semester		Branch: Civil Engineering	
Course Code:	U24CE207	Credits:	3
Hours/Week (L-T-P-O-E):	1-0-4-2-7	CIE:	60 (%)
Total Number of Teaching Hours:	60 Hrs	ESE:	40 (%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: functional planning of building and conventional signs			
LO2: different types of doors, windows and stair cases			
LO3: developing plan, section and elevation of buildings using AutoCAD			
LO4: develop a 3D plan from floor plan			
THEORY COMPONENT			
UNIT-I		9 Hrs	
Basic Provisions of NBC 2016			
Key Plan, Site Plan, Subdivision/Layout Plan, Building Plan and Details, Services Plans and Specifications			
Layout of Drawings			
Title Block, Size of Title Block, North Point, Scale Indications, Lines of Drawings-Centre Lines, Hidden Outlines, Dimension, Extension and Hatching Lines, Lettering, Size of letters and numerals for drawings, Dimensioning, Units of Dimensioning.			
Introduction to AutoCAD: Practice drawing and modify commands in AutoCAD, Building Planning as per NBC recommendations, Drawing Conventional signs in AutoCAD, Description of Building components as per NBC recommendation			
<i>Self Learning Topics (SLTs): NBC 2016 Part 2 Administration and Part 3 Development Control Rules and General Building Requirements</i>			
UNIT-II		9 Hrs	
Building Planning			
General Building Requirements, Space Requirement for Different Parts of Building, Other General Requirements- Kitchen, Bathroom and W. C., Minimum Width Provisions for Stairways, Minimum Width Provisions for Passageway/Corridors, Doorways, Lighting and Ventilation of Rooms, Height Limit, Exit Requirements, Land use classifications, Permissible Setbacks and Heights.			
Building Bye-Laws			
Floor Area Ratio (F.A.R.), Building Line, Open Space around Buildings, Built up Area for Residential Buildings, Minimum Recommended Floor area and Height of rooms of Residential Buildings.			
<ol style="list-style-type: none"> 1. Planning of space from Line diagram and development of plan, section and elevation 2. Drawings of Various types of doors, windows 3. Plan and Section of Dog-Legged staircase, Open Well Staircase and Spiral Staircase using AutoCAD 			
<i>Self Learning Topics (SLTs): NBC 2016 Part 3 Development Control Rules and General Building Requirements</i>			

UNIT-III	9 Hrs
<p>Building Components Understanding Plan, Elevation and Section of a Building, Definitions of Items used in Building Construction: Balcony, Basement/Cellar, building height, Building line, Canopy, Carpet area, Courtyard, Covered area, Damp Proof Course, Mezzanine floor, Room height, Verandah.</p> <p>Structural Components Foundation, Damp Proof Course, Plinth beam, Lintel beam, floors, walls, beams, columns, roof, stair, parapet and others</p> <ol style="list-style-type: none"> 1. Plan, section and elevation of a residential building with restricted/unrestricted plinth area 2. Plan, section and elevation of a school building 3. Plan, section and elevation of a primary health centre <p><i>Self Learning Topics (SLTs): NBC 2016 Part 3 Development Control Rules and General Building Requirements.</i></p>	
UNIT-IV	9 Hrs
<p>Principles of Planning a building Planning a House- Orientation, Ventilation, Lighting, Arrangement for Light and Ventilation, Acoustics</p> <p>Functional aspects of a building Drawing or Living Room, Bed Rooms, Guest Room, Verandah, Office Room, Dining room, Kitchen, store room, Bath and W.C, Garage.</p> <ol style="list-style-type: none"> 1. Development of site layout with restricted area for required amenities Plan of a Dream house/Duplex house <p><i>Self Learning Topics (SLTs): NBC 2016 Part 3 Development Control Rules and General Building Requirements</i></p>	
<p>Text Book(s):</p> <ol style="list-style-type: none"> 1. Bureau of Indian Standards, National Building Code of India, 2nd revision, New Delhi: BIS, 2016. 	
<p>Reference Book(s):</p> <ol style="list-style-type: none"> 1. M. G. Shah, C. M. Kale, S. Y. Patki, <i>Building Drawing: With an Integrated Approach to Built Environment</i>, Tata McGraw Hill Book Company Limited, New Delhi, 6th edition, 2020. 2. T. Jeyapooan, <i>Engineering Drawing and Graphics Using AutoCAD</i>, Vikas Publishing, New Delhi, 4th edition, 2020. 3. AutoCAD users guide 2016 Autodesk, Inc. 	
<p>Web and Video link(s):</p> <p>https://onlinecourses.nptel.ac.in/noc21_me125/preview ; NPTEL Video Lecture on Engineering Drawing and Computer Graphics by Prof. Rajaram Lakkaraju, Professor of Mechanical Engineering, IITK Kharagpur.</p>	

Course Learning Outcomes (COs):

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

(based on psychomotor skills acquired from laboratory component)

CO1: illustrate conventional signs and functional planning of buildings

CO2: distinguish types of doors, windows and staircases

CO3: create plan, section and elevation of buildings using AutoCAD

CO4: develop floor plan into 3D building plan

Course Articulation Matrix (CAM):		U24CE207 ENGINEERING GRAPHICS AND CAD													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24CE207.1	3	-	-	-	1	-	-	1	-	1	-	1	2	1
CO2	U24CE207.2	3	-	-	-	2	-	-	1	-	1	-	1	2	1
CO3	U24CE207.3	3	-	1	-	1	1	1	1	-	1	-	1	2	1
CO4	U24CE207.4	3	-	1	-	1	1	1	1	-	1	-	1	2	1
U24CE207		3	-	1	-	1.25	1	1	1	-	1	1	1	2	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

PRACTICUM-2

Class: B.Tech. II-Semester	Branch: Common to all branches		
Course Code:	U24EL209	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-4-4	CIE:	100%
Total Number of Teaching Hours:	-	ESE :	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: literature review and identifying research gaps

LO2: implementing a project independently by applying knowledge to practice

LO3: preparing well-documented report and informative PPT

LO4: effective technical presentation and creating video pitch

Practicum is an independent project carried out by the student during the course period, under the supervision of allotted course faculty. It helps to reinforce the students' theoretical knowledge and develop their ability to apply this knowledge to the solution of practical problems. Practicums also prepare them for their MINI and MAJOR PROJECTs and for independent work in their chosen field that promotes creative abilities. Besides they provide Higher Order Cognitive Abilities (HOCAs).

- (i). Practicum is a mandatory semester project work.
- (ii). Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters)
- (iii). Allotment of Practicum topics for students:
 - o **Practicum matrix:** In week (-1), the class teacher, in consultation with HoD, shall prepare the practicum matrix of the section. The practicum matrix is the allotment of group of students to the different course faculty of the section, as shown below.

Course	U24MH101	U24PS102	U24EC103	U24CS104	U24EE105	U24CH106
Students allotted to different courses	B24XX001	B24XX011	B24XX021	B24XX031	B24XX041	B24XX051
	B24XX002	B24XX012	B24XX022	B24XX032	B24XX042	B24XX052
	B24XX003	B24XX013	B24XX023	B24XX033	B24XX043	B24XX053
	B24XX004	B24XX014	B24XX024	B24XX034	B24XX044	B24XX054
	B24XX005	B24XX015	B24XX025	B24XX035	B24XX045	B24XX055
	B24XX006	B24XX016	B24XX026	B24XX036	B24XX046	B24XX056
	B24XX007	B24XX017	B24XX027	B24XX037	B24XX047	B24XX057
	B24XX008	B24XX018	B24XX028	B24XX038	B24XX048	B24XX058
	B24XX009	B24XX019	B24XX029	B24XX039	B24XX049	B24XX059
	B24XX010	B24XX020	B24XX030	B24XX040	B24XX050	B24XX060

- o In week (-1), the class teacher of a section shall collect 10-12 topics for practicum from each of the course teachers of that section.
- o The class teacher, in consultation with HoD shall allot the practicum topics to the students of that section in the following format.

CIRCULAR

Allotment of Practicum topics to students

Section :

S.No.	Roll number of the student	Practicum topic allotted	Practicum under the course	Course faculty

Note:

1. The students should meet immediately with the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
2. To complete the Practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the classwork timetable and also outside the class work hours during weekdays.
3. The course faculty are advised to guide the allotted students for practicum during the semester course work.

(Signature of class teacher)

- (iv). *To complete the practicum, the student shall work in laboratories under supervision of the allotted course faculty, in the allotted hours in the classwork timetable and outside the class work hours during weekdays.*
- (v). There shall be only continuous Internal Evaluation (CIE) for practicum for a maximum of 100 marks.
- (vi). The practicum course faculty shall evaluate & submit the final marks of the allotted students in week (N+1) to the respective class teacher.
- (vii). The class teacher shall collect the final marks of practicum of the students allotted to each course teacher and submit them to the CoE.
- (viii). The course faculty shall follow his/her own rubrics for practicum evaluation. Focus shall be on knowledge, skills & qualities acquired by the student during the practicum course
- (ix). A sample rubrics for assessment and evaluation of practicum is as follows:

Literature survey & Identification of research gaps	10 marks
Working model / process / software package / system developed	30 marks
Report writing (subjected to max of 30% plagiarism)	20 marks
Oral presentation with PPT and viva-voce	20 marks
Video pitch	20 marks
Total	100 marks

Note: It is mandatory for the student to appear for oral presentation and viva-voce to qualify for course evaluation of Practicum.

- (h) **Practicum Topic:** Each student shall be allotted a topic for practicum by the course faculty member attached to him/her. Interested students can work on their own title for practicum, but with due approval from course faculty.

- (i) **Working Model:** Each student is required to develop a prototype / process / system/simulation model on the given practicum topic and demonstrate/present, during the allotted time, before the course teacher.
- (j) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and ppt presentation.
 - What was the objective of the practicum assigned?
 - What are the main responsibilities and tasks for practicum?
 - What knowledge and skills from the coursework are applied in the practicum?
 - What new knowledge and skills are acquired during the practicum?
 - In what ways, can the practicum be helpful for the professional career?
 - What gaps are identified in your practicum work?
 - What improvements or changes you suggest for addressing the identified gaps for future work?
- (k) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute
- (l) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the course teacher as per the schedule notified by the department
- (m) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her Practicum. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include evidence like videos & pics at the time of implementing the practicum and also key points about his / her business idea / plan (*if any*) and social impact
- (n) The student has to register for the Practicum as a supplementary examination in the following cases:
 - iv) he/she is absent for oral presentation and viva-voce
 - v) he/she fails to submit the report in prescribed format
 - vi) he/she fails to fulfill the requirements of Practicum evaluation as per specified guidelines

Course Learning Outcomes (COs):

After completion of this course, the students should be able to...

CO1: synthesize literature survey, identify research gaps and define objective & scope of practicum problem

CO2: apply knowledge to design & conduct experiments, utilize modern tools for solution of practicum problem and develop working model/ process/ system

CO3: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through practicum

CO4: create a video pitch on practicum and make an effective oral presentation using PPTs

Course Articulation Matrix (CAM):		U24EL209 PRACTICUM													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24EL2098.1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO2	U24EL209.2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	U24EL209.3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	U24EL209.4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
U24EL209		2	2	2	2	2	2	2	2	2	2	2	2	2	2
3 - HIGH, 2 - MEDIUM, 1 - LOW															

**SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY
(SEA-2/SAA-2)**

Class: B.Tech. II -Semesters	Branch: Common to all branches		
Course Code:	U24V210	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-2-2	CIE:	100%
Total Number of Teaching Hours:	-	ESE :	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: holistic development through activity-based learning to gain real-life experience which effectively help individuals deal appropriately with problems/challenges

LO2: positive mindset by actively adopting optimism, acceptance, resilience, gratitude, mindfulness, and integrity and handling rejection in life

LO3: skills for effective fieldwork practice, which include ethics, observation, communication, interviewing, problem solving, time management, organisation and documentation

LO4: making a well-documented report and an effective oral presentation through PPTs portraying knowledge, skills, qualities acquired and social impact of the activity

Activity Based Liberal Learning about Life, Literature and Culture (ABLL@LLC) is introduced for building **generic competencies** in students. ABLL is aimed at all dimensional holistic growth of the learner. The holistic development includes the **physical, emotional, cognitive, spiritual and social aspects**. This is an area which opens the decision-making process, helps the student to develop creativity, an analytical mind, and builds resilience, confidence, hope, well-being and success. This will help student face the world with a greater degree of maturity, stoic and become a wholesome person in the society.

It is more than just learning from books to lead a successful life. These activity-based liberal learning courses, which help students to expand their social roles later in life, are offered under two sequels namely **SEA** (Social Empowerment Activities) and **SAA** (Self Accomplishment Activities)

These SEA/SAA courses also focus on building positive mindset: adopting optimism, acceptance, resilience, gratitude, mindfulness, and integrity in your life will help student develop and maintain a positive mindset.

- (a) Each SEA/SAA activity is treated as one credit course
- (b) Student must select one activity per semester, through first 04 semesters, from the courses listed under SEA/ SAA, before commencement of the semester.
- (c) Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA
- (d) To complete these activities student shall work outside the class work hours, during weekends, holidays, semester breaks, etc.,
- (e) If a student is not able to attend/ fulfil performance requirements, he/she shall be dropped

from the course and shall have to enrol in the forthcoming semesters.

Monitoring SEA/SAA:

- (a) **Nodal units:** The Student Activity Centre (SAC) and Centre for Innovation Incubation Research and Entrepreneurship (C-i²RE) shall act as nodal units for activities listed under SEA/SAA.
- (b) During the semester period, the student has to **acquire requisite knowledge, conduct fieldwork**, acquire skills and propose unique solutions to the real-life problems
- (c) **Knowledge Acquisition & Skilling:**
 - i. Students have to identify goals, acquire and accumulate knowledge on the chosen SEA/SAA activity
 - ii. For the activities related to social awareness/issues/challenges that affect society, use the knowledge base, apply relevant skills to analyse the issue and propose unique possible solutions to the social issues/challenges. Practice to acquire necessary skills to seek new opportunities in their personal and professional life.
 - iii. For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions under supervision of expert/guru are to be planned and executed to acquire benchmark skills to be demonstrated.
- (d) **Fieldwork:** Fieldwork is an essential component of learning for gaining real-life experiences. In addition to knowledge acquisition & skilling, student has to take up fieldwork on the chosen activity, as part of SEA/SAA course.
 - i. This student-driven Fieldwork allow students to interact with the 'real world'. It is an autonomous learning (self-learning) situation that students are more actively involved during the activity and develop a deeper understanding and develop a more positive attitude.
 - ii. Fieldwork consists of three phases: preparation, the actual activity and feedback
 - iii. **As part of fieldwork, student has to interact with at least two eminent personalities/achievers/renowned persons/inspiring and great personalities related to the chosen activity.**
 - iv. Fieldwork will benefit students for any careers where they need to work with communities of people or which involves analysis of complex processes, especially social and cultural.
 - v. Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more
 - vi. Other skills important for fieldwork practice include the ability to act in a crisis, to plan, set priorities, mobilize resources, and implement the plan effectively. These skills used in an integrated manner help students solve their problems and to develop one's own leadership style based on the need and culture of the place.
 - vii. **Eminent personalities/achievers/renowned persons/inspiring and great personalities**
Eminent personalities/ Achievers / Renowned personalities:
 - (a). **In case of socially relevant problems/ activities of SEA/SAA:** Eminent personalities/ achievers include district administrative officers, Eminent Social workers / NGOs, other inspiring and great personalities

- (b). **In case of Sports / Games and Cultural activities of SEA/SAA:** Eminent coaches/trainers/gurus, achievers who represented/won state level/national level /international level competitions, other inspiring and great personalities.
- viii. **For appointment to interact eminent personalities:** Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes for getting appointment and time for interaction
- ix. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
- x. **Ethics of fieldwork:** Fieldwork is an educational process with commitment to positive values. All fieldwork should be planned and conducted in a way that is ethical, responsible and safe, for people, students, visited communities, if any, and all other stakeholders. Student is expected to maintain integrity and honesty. Avoid bias and deception. Protect the rights and well-being of people involved in fieldwork. The privacy, confidentiality and respect for the eminent people interacted should be maintained and their time, inputs & guidance are to be acknowledged
- xi. Student is expected to take care of health and Safety practices for fieldwork and travel
- xii. Student should remember that contrary to a *field trip or company visit*, **the emphasis in fieldwork is on acquiring skills**, and not on casually presenting theory and assessing.
- xiii. For the fieldwork, student shall go with a scientifically designed questionnaire and record the responses during interaction. These response sheets, along with geo-tagged pic of fieldwork (at the time of interaction & practise sessions, if any) shall be appended as annexures in the report to be submitted for course evaluation.
- xiv. **Feedback:** The learnings the student made out of interaction with eminent achievers shall be presented in the report as one of the chapters.
- During feedback, the central focus is on the elaboration of the students' experience during fieldwork. Therefore, the student should create an end product, such as a demonstration/presentation and report in which they demonstrate a link between their experiences during fieldwork and the underlying theoretical concepts and ideas.
- (e) **Demonstration / Presentation and Report:** Student after presentation/demonstration of his/her achievements/work, shall get a certificate from the concerned nodal unit and submit a report, in the prescribed format, to the faculty counsellor for award of grade.
- (f) **Flow process for completion of SEA/SAA course:**
- vi. **Faculty counsellor approval:** In week (-1), in consultation with faculty counsellor, every student shall, identifies minimum of 4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student

- vii. **Identification of goals and preparation of action plan:** In week (1), the respective faculty coordinator(s) of nodal centres shall address the students allotted to them to educate them on fixing goals, plan of action for completion and evaluation. In consultation with nodal centre, based on the workflow of the allotted activity, every student shall identify the goals (of activity) & eminent personalities (to be visited during the field trip) and prepare action plan (oriented workflow) for attaining the identified goals.
- viii. **Field work:** Under the guidance of nodal centre, student shall complete the field work, based on the action plan, with the progress continuously monitored by the faculty counsellor and the nodal centre.
- ix. **Demonstration/ Presentation:** After completion of field work, student shall demonstrate/present his achievements (knowledge/skills gained during the activity) at the nodal centre in the presence of external experts/senior practitioners of the activity. After successful demonstration/presentation, the nodal centre shall provide a certificate of completion indicating that the student has completed the activity in the stipulated time.
- x. **Report writing:** After successful demonstration/presentation, student shall write a 2–3-page report and submit the same to the faculty counsellor. The report shall emphasize knowledge, skills and qualities acquired through the SEA/SAA activities. It shall also include the influence of these activities on enhancing confidence, positive change in life, decision making, transforming choices into desired actions/outcomes.
- (g) **Assessment & Evaluation:** There shall be *only Continuous Internal Evaluation (CIE) for SEA/SAA*. The SEA/SAA activities shall be evaluated at the end of the semester through respective evaluation processes, which shall include field work, presentation/ demonstration, submission of reports on the gathered data/information/ surveys, the details of which have been shown in below table. The department level SEA/SAA coordinator shall collect marks from the nodal centres and faculty counsellors, consolidate them, and submit the final grades to the examination branch, within one week of the last day of instruction. Evaluation of SEA/SAA activities shall be completed as and when students are ready, but not later than week (N+1).

The CIE for SEA/SAA is as follows:

Assessment	Maximum marks	Marks to be awarded by
Goal setting, Planning & Knowledge Acquisition	20	Nodal centre
Field work	40	Nodal centre
Demonstration/Presentation	20	Nodal centre
Report submission	20	Faculty counsellor
Total	100	-

Note:

- (a) **Presentation/ Demonstration:** It is mandatory for the student to appear for a demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.
- The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.
- (b) **Report:** Each student is required to submit a well-documented report on the chosen SEA/SAA topic as per the format specified by *department level SEA/SAA coordinator*.
- (c) **Anti-Plagiarism Check:** The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.
- (d) **Requirements for passing the course:** A student is deemed to have passed SEA/SAA if he/she
- a. successfully demonstrates/presents the skills attained at the end of course as per the schedule notified by the nodal centre, **and**
 - b. scores a minimum of 40 marks in the CIE of the course
- (e) **Supplementary examination:** If a student fails in SEA/SAA activity of a particular semester, he must complete the same by enrolling it in the next higher semesters.

Course Learning Outcomes (COs):

After completion of this course, the students should be able to...

CO1: integrate the five dimensions of physical, emotional, cognitive, spiritual and social aspects in life for holistic development and demonstrate social sensitivity

CO2: interact effectively through written, oral and nonverbal communication with external world in a professional, sensitive and culturally relevant manner

CO3: analyse the issues related to social empowerment / self-accomplishment, demonstrate problem-solving skills, articulate solutions and demonstrate social sensitivity

CO4: demonstrate the generic competencies in making a well-documented report and an effective oral presentation with PPTs portraying knowledge, skills, qualities acquired through fieldwork/practice sessions and social impact of the course learning

Text / Reference book(s):

For knowledge acquisition, students shall refer to textbooks and web resources relevant to the course selected. Plan for fieldwork/practice sessions in coordination with SEA/SAA coordinator

Course Articulation Matrix (CAM):		U24VA210- SEA-2/ SAA-2													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U24VA210.1	-	-	-	-	-	2	2	2	2	2	2	2	-	-
CO2	U24VA210.2	-	-	-	-	-	2	2	2	2	2	2	2	-	-
CO3	U24VA210.3	-	-	-	-	-	2	2	2	2	2	2	2	-	-
CO4	U24VA210.4	-	-	-	-	-	2	2	2	2	2	2	2	-	-
U24VA210		-	-	-	-	-	2	2	2	2	2	2	2	-	-
3 - HIGH, 2 - MEDIUM, 1 - LOW															

Course Code: U24VA XYY(SE/SA)ZZZ

X represents semester; YY represents SEA/SAA course serial number in that semester; SE- represents SEA activity or SA - represents SAA activity; ZZZ represents activity code from SEA/SAA baskets

Ex: If A student selects a SEA/SAA course as below:	Ex: If A student selects a SEA/SAA course as below:
Semester: 1 SEA/SAA course serial number: 09 SEA/SAA category: SEA course number: 302 The course code will be U24VA109SE302	Semester: 4 SEA/SAA course serial number: 10 SEA/SAA category: SAA course number: 206 The course code will be U24VA410SA206

EXPERT TALK SERIES-2

Class: B.Tech. II -Semester	Branch: Common to all branches		
Course Code:	U24AE211	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-1-1	CIE:	100%
Total Number of Teaching Hours:	-	ESE :	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on...

LO1: 21st century skills needed for industry, current industry trends, challenges and innovations

LO2: latest technology in practice and applying knowledge to solve real-world problems

LO3: smart work, soft skills, professional etiquette, networking abilities

LO4: making a well-documented report portraying the knowledge, skills, qualities acquired and the impact of the learning

In the 21st century, for successful career, degree alone won't suffice. Competencies are much more important.

- (a) You need to be aware of the real-world problems, industry working style, need to be confident and smart and you also need to know the tricks of the trade.
- (b) Learning from industry experts with real-world examples, is important to enhance your educational experience.
- (c) Enhanced graduate employability benefits all stakeholders. To effectively enhance employability and the immediacy of adding value to company/project, it is important that you are aware of what you are learning and its use in the workplace. The cognitive abilities viz., remember, understand, recall, and application of knowledge and other skills acquired in higher education can be maximised if you are clear on the purpose of your developed competencies and how to apply them in a range of complex situations.
- (d) Graduate employability could be enhanced through fostering lifelong learning, the development of a range of employability-related competencies and increased confidence and capacity in "reflecting on and articulating these capabilities and attributes in a range of recruitment situations".

But how would you know all this without venturing into the industry?

- (e) The answer is Industry **Expert Talk Series (ETS)**. Through ETS, we invite industry experts in different fields to deliver talks and interact with students.
- (f) Through Industry expert talks students get to know so much more that textbooks don't explain.
- (g) Students have the opportunity to learn from professionals who have achieved success in their respective fields. These speakers often share their personal experiences, case studies, and anecdotes, providing students with real-world examples and perspectives that go beyond theoretical concepts.
- (h) Our competency-focussed curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses

- (i) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.
- (j) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability enhancement category of courses**.
- (k) Through ETS sessions, students get the chance to interact with industry regularly which helps them focus on the needs and requirements of current industry. This will not only enthuse the students with new ideas but also motivate them to understand what kind of 21st century skills are needed in industry and how they need to groom themselves.
- (l) Through ETS sessions, another benefit is that students learn the importance of soft skills like communication, presentation, email etiquettes, corporate grooming and dressing styles. Conversing with successful people is the biggest motivation and students gain in more ways than one through ETS sessions.
- (m) ETS enhances your learning in many ways for global opportunities for your career.
- (n) All in all, learning from industry experts, is a wonderful opportunity for student to getting acquainted with professional etiquette, acquiring professional knowledge, and getting to know the internal workings of an organization.
- (o) Salient features of ETS are hereunder:
 - (i) ETS is offered from I semester to VI semester.
 - (ii) ETS, in any given semester, is treated as one credit course
 - (iii) Students are required to earn six credits (from I to VI semester)
 - (iv) **Head, Centre for i²RE shall be the institute level ETS coordinator**
 - (v) Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode** by the parent department / Centre for i²RE.
 - (vi) Each expert talk shall be for a minimum duration of 45 minutes (*but not exceeding 90 minutes*) followed by **online quiz/test** for 10 marks (10 MCQs/ FiBs ; *duration: 10-15 mins*), on the contents covered in the expert talk.
 - (vii) **The Head C-i²RE shall share the marks obtained by the students in each of the quizzes / tests to the respective department ETS coordinators.**
 - (viii) Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.
 - (ix) **Report on ETS:** At the end of semester, the student shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.
 - (x) **Evaluation:** There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks
 - (xi) The department ETS coordinator shall, in coordination with institute level ETS coordinator, submit the final scores to the CoE in week (N+1).
- (p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

Quiz score (sum of best 6 quiz scores out of 10 quizzes. Each quiz evaluated for 10 marks)	60 marks
Attendance (out of 10 quizzes)	20 marks
Report in prescribed format (max 30% plagiarism)	20 marks
Total	100 marks

- ii. **Attendance:** Maximum of 20 marks shall be awarded based on the attendance maintained by the student over a maximum of 10 lectures.

$$\text{Marks for attendance} = \frac{\text{Number of expert talks attended fully}}{10} * 20$$

iii. **Supplementary Exam:**

- (a) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE
- (b) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks (MCQs/FiBs ; duration: 2Hrs) on the content covered in ETS lectures.
- (c) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE
- (d) Exam material/ resources for supplementary: Recorded videos of ETS arranged for that semester, which shall be made available on ETS webpage of institute website

Course Learning Outcomes (COs):

After completion of this course, the students should be able to...

- CO1:** identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology
- CO2:** identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement
- CO3:** interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects
- CO4:** demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

Course Articulation Matrix (CAM):		U24AE210 EXPERT TALK SERIES-2													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U24AE210.1	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO2	U24AE210.2	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO3	U24AE210.3	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO4	U24AE210.4	1	1	1	1	1	1	1	2	1	2	1	2	1	1
U24AE210		1	1	1	1	1	1	1	2	1	2	1	2	1	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

FUNDAMENTALS OF SURVEYING			
Class: B.Tech. II -Semester (Exit)		Branch: Civil Engineering	
Course Code:	U24CE212X	Credits:	3
Hours/Week (L-T-P-O-E):	2-0-2-0-4	CIE:	60 (%)
Total Number of Teaching Hours:	32 Hrs	ESE:	40 (%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: basic principles of surveying and linear measurements			
LO2: compass and theodolite surveying			
LO3: concepts of levelling			
LO4: total station surveying			
THEORY COMPONENT			
UNIT-I		4 Hrs	
Chain surveying: Principles of surveying, Types of Chain and Tape, Error due to incorrect chain, Errors in chaining, Tape corrections, Chaining and Ranging on level ground and sloping ground.			
UNIT-II		4 Hrs	
Compass and Theodolite Surveying: Types of compass, bearings, Magnetic declination, Local Attraction, Temporary and permanent adjustments of theodolite, Measurement of angles, Fundamental lines and relations, Traverse methods and computations.			
UNIT-III		4 Hrs	
Levelling: instruments for levelling, Principle and classification of levelling, Readings and booking of levels, field work in levelling, longitudinal section and cross section, plotting the profile, Height (level) computations			
UNIT-IV		4 Hrs	
Total station Surveying: Introduction and features of total station, Setting up and orienting, Capabilities and advantages of total station, Uses, applications.			
LABORATORY COMPONENT			
List of Experiments			
1. Chain surveying: use of optical square or cross staff, check line, tie line			
2. Horizontal angle measurement by repetition and re-iteration methods			
3. Measuring the distance between two inaccessible points using theodolite			
4. Theodolite traversing- closed traverse			
5. Fly levelling using auto level			
6. Profile levelling using auto level			
7. Determine area of given a terrain using total station.			
8. Determine the elevation of the remote object using total station.			
Textbook(s):			
1. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, <i>Surveying (Volumes I, II, and III)</i> , Laxmi Publications, Delhi, 18 th edition, 2020.			
2. S. K. Duggal, <i>Surveying (Volume I and II)</i> , McGraw Hill Education (India) Pvt. Ltd., 4 th edition, 2022.			
Reference Book(S):			
1. Dr. K.R. Arora, <i>Surveying (Volume I and II)</i> , Standard Book House, Delhi, 16 th edition, 2022.			
2. T.P. Kanetker and S.V. Kulkarni, <i>Surveying and Levelling (Volume I and II)</i> , Vidyarthi Griha Prakashan, Pune, 26 th edition, 2017.			
3. R. Subramanian, <i>Surveying and Leveling</i> , Oxford University Press, New Delhi, 2 nd edition, 2014.			

4. S.K.Roy, *Fundamentals of Surveying*, PHI Learning Private Limited, New Delhi, 2nd edition, 2010.

Web and Video link(s):

1. <https://nptel.ac.in/courses/105107122> NPTEL Video Lecture on Introduction to Surveying by Prof. J. K. Ghosh, *Surveying*, IIT Roorkee.
2. <https://archive.nptel.ac.in/courses/105/103/105103176/> NPTEL Video Lecture on Higher Surveying by Dr. Ajay Dashora, *Civil Engineering*, IIT Guwahati.
3. <https://archive.nptel.ac.in/courses/105/107/105107157/> NPTEL Video Lecture on GPS Surveying, Prof. J. K. Ghosh, IIT Roorkee.
4. <https://nptel.ac.in/courses/105104100> NPTEL Video Lecture on Modern Surveying Techniques by Dr. Onkar Dikshit, *Civil Engineering*, IIT Kanpur.

Laboratory Manual and Record Book (for laboratory component):

1. *Surveying fieldwork laboratory manual and record book*, prepared by Faculty, Department of Civil Engineering.

Course Learning Outcomes (COs)

After completion of this course, the students should be able to, (based on cognitive skills acquired from theory component)

CO1: measure linear distances using chain and tape.

CO2: build a traverse using theodolite.

CO3: interpret elevations using levelling instrument

CO4: determine area and elevations using total station.

(based on psychomotor skills acquired from laboratory component)

CO5 : measure distances and angle using tape and theodolite

CO6 : determine distance between inaccessible points using theodolite

CO7 : estimate elevations using levelling instrument

CO8: estimate area and elevations using total station.

Course Articulation Matrix (CAM):		U24CE212X Fundamentals of Surveying													
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U24CE212X.1	3	2	-	-	-	-	-	1	1	1	1	1	2	1
CO2	U24CE212X.2	3	2	-	-	-	-	-	1	1	1	1	1	2	1
CO3	U24CE212X.3	3	2	-	-	-	-	-	1	1	1	1	1	2	1
CO4	U24CE212X.4	3	2	-	-	-	-	-	1	1	1	1	1	2	1
CO5	U24CE212X.5	3	2	-	-	-	-	-	1	1	1	1	1	2	1
CO6	U24CE212X.6	3	2	-	-	-	-	-	1	1	1	1	1	2	1
CO7	U24CE212X.7	3	2	-	-	-	-	-	1	1	1	1	1	2	1
CO8	U24CE212X.8	3	2	-	-	-	-	-	1	1	1	1	1	2	1
U24CE212X		3	2	-	-	-	-	-	1	1	1	1	1	2	1

3 - HIGH, 2 - MEDIUM, 1 - LOW

CIVIL ENGINEERING MATERIALS			
Class: B.Tech. II -Semester (Exit)		Branch: CE	
Course Code:	U24CE213X	Credits:	3
Hours/Week (L-T-P-O-E):	2-0-2-0-4	CIE :	60(%)
Total Number of Teaching Hours:	32 Hrs	ESE :	40(%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: Civil engineering materials and their classification.			
LO2: Manufacturing, using and testing of bricks and tiles.			
LO3: Types of aggregates and their uses in construction.			
LO4: Concrete and concrete making materials & other construction materials.			
THEORY COMPONENT			
UNIT-I		4 Hrs	
Introduction: Introduction to building materials, classification of materials, properties of good building materials, Indian standard codes.			
Stones: Classification of rocks, Characteristics of good building stone, Quarrying, Quarry sap, Common varieties of stones-granite, marble, Kadapa slab, Shahabad stones, Dressing of stones - purpose, tools used.			
UNIT-II		4 Hrs	
Bricks and Tiles : Method of manufacture of bricks - continuous kiln process, ISI specification for bricks IS-1077-1971, Characteristics of good bricks, Testing of bricks as per IS-3495-1966 - tests on water absorption and compressive strength of bricks, Refractory bricks, AAC, CLC and Fly ash bricks & their uses, Tiles -Types of tiles roofing tiles, floor tiles, Ceramic tiles, Vitrified tiles, Morbonite, Characteristics of good tiles, Porcelain - glazed tiles (uses only), Stone ware pipes and their uses.			
UNIT-III		4 Hrs	
Aggregates: Fine and coarse aggregates, Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, Fineness modulus, various grading and grading requirements, sampling & testing as per Indian Standards.			
Steel: Structural steel and its properties, various tests on steel as per Indian standard code.			
UNIT-IV		4 Hrs	
Cement and concrete: Chemical composition, hydration, heat of hydration, various types of cement, testing of cement as per Indian standard, Admixtures, types, uses, concrete making materials, mixing, transportation, placing, workability, compaction, segregation and bleeding, precautions, Hardened concrete properties, compressive strength, split tensile strength.			
Other Materials: Surface protective materials, paints, plastics, asbestos, timber, glass.			
LABORATORY COMPONENT			
List of Experiments			
9. Determination of compressive strength of stone blocks.			
10. Determination of compressive strength of burnt clay bricks.			
11. Determination of water absorption and efflorescence of burnt clay bricks.			
12. Determination of fineness modulus of fine and coarse aggregates.			
13. Determination of Specific gravity, bulk density, voids ratio and porosity of Fine Aggregate.			
14. Determination of Specific gravity, bulk density, voids ratio and porosity of Fine Aggregate.			
15. Determination of Bulking of Fine Aggregate.			
16. Determination of Workability of Fresh concrete.			

17. Determination of Modulus of elasticity of steel by conducting tension test.
18. Determination of the Brinell's hardness numbers for steel, brass and aluminium.
19. Bend and re-bend test on steel specimen used in RCC.
20. Impact test on metal specimens using Charpy and Izod test.
21. Determination of compressive strength and split tensile of concrete

Textbook(s):

3. S. K. Duggal, "*Building materials*", New Age international Pvt., Ltd., New Delhi
4. N. L. Arora and B. L. Gupta, "*Building construction*", Satya prakshan publications, New Delhi.
5. C. Rangwala, K .S. Rangwala and P. S. Rangwala, "*Engineering materials*", Charotar Publishers
6. M. L .Gambhir, "*Concrete Technology*", Tata Mc Graw-Hill, New Delhi, 5th edn., 2013.

Reference Book(S):

5. M. S. Shetty, "Concrete Technology (Theory and Practice)", S. Chand Company, New Delhi, 7th edn., 2010.
6. A. M. Neville, "Properties of Concrete", Mc Graw Hill Publications, New Delhi, 5th edn., 2012.
7. B. C. Punmia, "Building construction", Laxmi Publications Pvt., Ltd., New Delhi, 19th Edn., 2005
8. "Civil Engineering Materials Laboratory Manual", prepared by faculty of Department of Civil Engineering.

Web and Video link(s):

5. <https://youtu.be/ULt4aEst4mM?si=hrv1Jn-6GhDHjaNUe> NPTEL Video Lecture on Introduction to Construction Materials by Prof. Manu Santhanam, IIT Madras..
6. <https://youtu.be/SLPPFykORjA?si=Duu5wHRsfnNMMuwr> NPTEL Video Lecture on Stone Bricks and Mortar by Prof. Manu Santhanam, IIT Madras..
7. <https://youtu.be/4tgkRcLvQFc?si=4kOualIs5P0fslJq> NPTEL Video Lecture on Cement and Concrete by Prof. Manu Santhanam, IIT Madras.
8. <https://youtu.be/kBjJKrEMFj0?si=IJFuFgne0-ly4lkH> NPTEL Video Lecture on Metals by Prof. Manu Santhanam, IIT Madras.
9. <https://youtu.be/CHs83nfkTy8?si=sCs9d-RZmJHobp9g> NPTEL Video Lecture on Cement Properties and tests by Prof. B.Bhattacharjee, IIT Delhi.
10. https://youtu.be/9PSuiuGic3w?si=A_DOI8MOE6XiDZ41 NPTEL Video Lecture on Aggregate shapes, sizes and tests by Prof. B.Bhattacharjee, IIT Delhi.
11. <https://youtu.be/8Fk1H-sOhoo?si=q3i7mbv5wWlay-7I> NPTEL Video Lecture on Workability of Concrete by Prof. B.Bhattacharjee, IIT Delhi.
12. <https://youtu.be/DGhQYSIzTUw?si=rvYP3RD6G5GB6t8> NPTEL Video Lecture on Factors affecting strength of concrete by Prof. B.Bhattacharjee, IIT Delhi.
13. <https://youtu.be/CaDyeLe6J80?si=-k2tUrQYOvdLW9-1> NPTEL Video Lecture on Strength of Concrete: Factors Affecting Test Results by Prof. B.Bhattacharjee, IIT Delhi.

Laboratory Manual (for laboratory component):

2. "Civil Engineering Materials Laboratory Manual", prepared by faculty of Department of Civil Engineering.

Course Learning Outcomes (COs)

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

(based on cognitive skills acquired from theory component)

CO1: classify and demonstrate the occurrence and existence of stone.

CO2: portray the manufacturing of lime, cement and tiles.

CO3: Classify Aggregates and steel used in construction.

CO4: summarize constituent materials, properties and tests on fresh and hardened concrete.

(based on psychomotor skills acquired from laboratory component)

CO5 : correlate theory with the testing of engineering material.

CO6 : establish the mechanical properties of civil engineering materials.

CO7: appraise the behavior of civil engineering materials when tested under various loads.

CO8 : realize the specifications recommended by various codes to civil engineering materials.

Course Articulation Matrix (CAM):		U24CI212X :Civil Engineering Materials													
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
CO1	U24CE213X.1	1	-	-	-	-	1	2	1	-	1	-	2	1	1
CO2	U24CE213X.2	1	-	-	-	-	1	2	1	-	1	-	2	1	1
CO3	U24CE213X.3	1	-	-	1	-	1	2	1	-	1	-	2	1	1
CO4	U24CE213X.4	1	-	-	1	-	1	2	1	-	1	-	2	1	1
CO5	U24CE213X.5	3	2	2	3	2	1	1	3	3	2	-	2	2	2
CO6	U24CE213X.6	3	2	2	3	2	1	1	3	3	2	-	2	2	2
CO7	U24CE213X.7	3	2	2	3	2	1	1	3	3	2	-	2	2	2
CO8	U24CE213X.8	3	2	2	3	2	1	1	3	3	2	-	2	2	2
U24CI212X		2	2	2	1.75	2	1	1.5	2	3	1.5	-	2	1.5	1.5

CONSTRUCTION PRACTICES			
Class: B.Tech. II -Semester (Exit)		Branch: Civil Engineering	
Course Code:	U24CE214X	Credits:	3
Hours/Week (L-T-P-O-E):	2-0-2-0-4	CIE:	60(%)
Total Number of Teaching Hours:	32 Hrs	ESE:	40(%)
Course Learning Objectives (LOs):			
<i>This course will develop students' knowledge in /on...</i>			
LO1: construction of different building components as per building specifications			
LO2: substructure and superstructure of building.			
LO3: erection and removal of different temporary structures			
LO4: protection of buildings and essential services			
THEORY COMPONENT			
UNIT-I		4 Hrs	
Components of Building and Building Specifications: Basic requirements of building, building line, set back line, covered area, plinth area, floor area, carpet area, building height, room height, habitable rooms, bathroom, water closet, Balcony. Building components and their functions - substructure and super structure; Orientation of Building; Construction sequence of residential building.			
Site Preparation and Setting Out of works: Site layout, site clearing, enclosing the site, water and electrical supply for construction at site, setting out of buildings, methods to determine depth of excavation.			
UNIT-II		4 Hrs	
Construction of substructure and superstructure: Types and functions of foundations, procedure for excavation for foundation. Brick masonry-Bonds in brickwork; Stone masonry - types of stone masonry.			
Flooring: Functions of a floor, Details of construction of subbase and base, selection of floor; planning for the layout of tiled floors. General principles of laying concrete floor. Types of flooring			
UNIT-III		4 Hrs	
Formwork and Scaffolding: Formwork, requirements of formwork, types of formworks for concreting, Scaffolding-components of scaffolding, requirements of scaffolding.			
Framed Structures: Principles of framed structures; components of framed structures- beams, columns, and slab. Advantages of framed structures.			
UNIT-IV		4 Hrs	
Finishing and Protection of Buildings: Plastering, plastering techniques, Pointing- methods of pointing, types of pointing, Painting, Varnishing; Anti-termite treatment, Damp prevention, Fire protection-general safety requirements against fire.			
Essential and Special services in buildings: Plumbing services- principles of plumbing services in buildings, water supply fittings and fixtures, sanitary fittings and appliances, layout of building drainage.			
LABORATORY COMPONENT			
List of Experiments			
22. Layout plan and marking of a building			
23. Setting out of a building Foundation marking as per the given plan.			
24. Construction of a wall height of 50cm and wall thickness of 1" and 1.5" brick walls in English Bond without cement mortar-corner portion-length of side walls 60cm			

25. Construction of 1" and 1.5" thick brick pillar using cement mortar or Brick piers in English Bond and Flemish Bond
26. Construction of base coat and laying of tile flooring of one square meter.
27. Plastering and finishing of wall.
28. Pipe joints and plumbing fixtures like tap, T-Joint, Bend, Elbow.
29. Demonstration on formwork and scaffolding detailing, erection and removal for different structural members

Textbook(s):

7. P. Purushothama Raj, *Building Construction Materials and Techniques*, Pearson India Education Services Pvt. Ltd., Noida, 2nd edition, 2018.
8. P. C. Varghese, *Building Construction*, PHI Learning Private Limited, New Delhi, 2nd edition 2018.

Reference Book(S):

9. Dr. Anil Kumar Misra, *Building Materials and Construction*, S Chand and Company Limited, New Delhi, 6th edition, 2021.
10. SP 62 (S & T): 1997 Bureau of Indian Standards, *Handbook on Building Construction Practices (Excluding Electrical Work)*, New Delhi.

Web and Video link(s):

14. <https://www.youtube.com/watch?v=NnIE2mDAmHE> NPTEL Video Lecture on Introduction to lean construction by Prof. N. Raghavan and Prof. Koshy Varghese, Department of Civil Engineering, IIT Madras.
15. <https://www.youtube.com/watch?v=btajjXi0q9s> NPTEL Video Lecture on Building Materials and construction by Dr. B. Bhattacharjee, Department of Civil Engineering, IIT Delhi.
16. <https://www.youtube.com/watch?v=KZGNmzH7IdA> NPTEL Video Lecture on Masonry by Dr. B. Bhattacharjee, Department of Civil Engineering, IIT Delhi.

Laboratory Manual and Record Book(for laboratory component):

3. "Construction Practice Laboratory Manual and Record Book", prepared by faculty of Department of Civil Engineering.

Course Learning Outcomes (COs)

*After completion of this course, the students should be able to,
(based on cognitive skills acquired from theory component)*

CO1: identify the different building components and their specifications

CO2: distinguish substructure and superstructure of a building.

CO3: recommend various types of temporary structures for construction and maintenance of building .

CO4: prioritize the essential services to be provided to a building.

(based on psychomotor skills acquired from laboratory component)

CO5: create a layout plan and marking for building.

CO6: construct brick wall and brick pier.

CO7: create a layout plan for tile flooring.

CO8: propose different types of temporary structures and various building services.

Course Articulation Matrix (CAM):		U24CI214X: CONSTRUCTION PRACTICES													
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
CO1	U24CE214X.1	3	2	-	-	-	-	-	1	1	1	1	1	2	2
CO2	U24CE214X.2	3	2	-	-	-	-	-	1	1	1	1	1	2	2
CO3	U24CE214X.3	3	2	-	-	-	-	-	1	1	1	1	1	2	2
CO4	U24CE214X.4	3	2	-	-	-	-	-	1	1	1	1	1	2	2
CO5	U24CE214X.5	3	2	-	-	-	-	-	1	1	1	1	1	2	2
CO6	U24CE214X.6	3	2	-	-	-	-	-	1	1	1	1	1	2	2
CO7	U24CE214X.7	3	2	-	-	-	-	-	1	1	1	1	1	2	2
CO8	U24CE214X.8	3	2	-	-	-	-	-	1	1	1	1	1	2	2
U24CI214X		3	2	-	-	-	-	-	1	1	1	1	1	2	2