

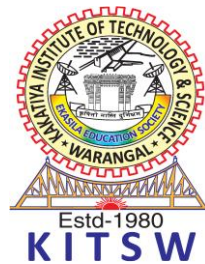
B.TECH. CURRICULUM

ACADEMIC YEAR: 2024-25

DEPARTMENT OF COMPUTER SCIENCE & 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 with
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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History:

PROGRAM	DESCRIPTION	
	INTAKE	NBA ACCREDITATION
UG in B.Tech. COMPUTER SCIENCE & ENGINEERING	<ul style="list-style-type: none"> • Started with 60 seats in 1994 • Intake increased to 120 in 2002 • Intake increased to 180 in 2015 	<ul style="list-style-type: none"> • First time accreditation: 2008 • Reaccreditation-1: 2014 • Reaccreditation-2: 2016 • Reaccreditation-2: 2018 • Reaccreditation-2: 2020 • Reaccreditation-2: 2022

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 COMPUTER SCIENCE AND ENGINEERING: VISION AND MISSION

VISION

Attaining center of excellence status in various fields of Computer Science and Engineering by offering worth full education, training and research to improve quality of software services for ever growing needs of the industry and society.

MISSION

M1:	Practice qualitative approach and standards to provide students better understanding and profound knowledge in the fundamentals and concepts of computer science with its allied disciplines
M2:	Motivate students in continuous learning to enhance their technical, communicational, and managerial skills to make them competent and cope with the latest trends, technologies, and improvements in computer science to have a successful career with professional ethics.
M3	Involve students to analyze, design and experiment with contemporary research problems in computer science to impact socio-economic, political and environmental aspects of the globe.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1:	Escalate the technical skills within and across disciplines of Computer Science Engineering for productive career by maintaining professional ethics
PEO2:	Develop and exercise their capabilities to demonstrate their creativity in engineering practice and team work with increasing responsibility and leadership
PEO3:	Refine their knowledge and skills to attain professional competence through lifelong learning such as higher education, advanced degrees and professional activities

PEO TO MISSION MAPPING

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

PEO Statements	Mission Statements	Mapping Level	Justification
PEO1	M1	3	A strong foundation in M1 principles is crucial for developing effective and transformational software solutions, which directly aligns with PEO1's objective of applying fundamental knowledge to real-world problems.
	M2	3	Technical expertise requires staying updated with new technologies and methodologies, aligning perfectly with PEO1's goal of leveraging updated knowledge for software development
	M3	2	While M3 is more focused on engaging students in contemporary research challenges and innovative solutions, it still supports the development of technical expertise by exposing students to real-world problems and interdisciplinary applications.
PEO2	M1	3	A Good understanding of core principles in Computer Science is mandatory for a successful career. Mastery of these principles ensures that graduates are well-prepared for various professional roles, higher education, or entrepreneurial endeavors.
	M2	2	Continuous learning and skill enhancement are vital for career success. M2's focus on fostering technical, communication, and managerial skills ensures that students are well-rounded and adaptable, which is crucial for thriving in a dynamic and evolving field.
	M3	3	To address contemporary research challenges and contributing to innovative solutions prepare students for high-impact careers. The ability to solve global issues using advanced technologies of computer science and engineering not only makes students highly employable but also positions them as leaders in their fields, directly supporting the objective of a successful career.
PEO3	M1	2	Understanding core principles also indirectly supports the development of professional ethics and effective communication. This foundational knowledge is essential for team work and problem-solving in professional settings.
	M2	2	The focus on professional ethics and embracing new technologies supports life-long learning and the development of soft skills nCSEssary for effective teamwork and social innovation.
	M3	3	Engaging students in real-world research challenges and encouraging them to address global issues inherently requires teamwork, effective communication, and ethical considerations. This mission strongly supports the development of soft skills and fosters a commitment to life-long learning.

PROGRAM SPECIFIC OBJECTIVES

PSO1: (Software Development and Quality assurance)	Transform various legacy or manual systems into computer automated systems using modern programming languages, integrated development environments and apply testing tools for efficient verification and validation of this software systems.
PSO2: (Immediate professional practice)	Work as software practitioner or continue higher education by adopting advanced technologies in various fields of Computer Science and Engineering.

PO/PSO TO PEO MAPPING

PO's		PEO1	PEO2	PEO3
PO1	Engineering Knowledge	3	2	3
PO2	Problem Analysis	3	3	3
PO3	Design/Development of solutions	3	3	3
PO4	Conduct investigations of complex problems	3	3	3
PO5	Modern tool usage	3	3	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	3	3	2
PO12	Lifelong Learning	3	3	3
PSO1	Transform various legacy or manual systems into computer automated systems using modern programming languages, integrated development environments and apply testing tools for efficient verification and validation of this software systems.	3	2	3
PSO2	Work as software practitioner or continue higher education by adopting advanced technologies in various fields of Computer Science and Engineering.	3	3	2

DESIGN OF CURRICULUM

Salient Features

- The URR24 regulations are inline with the National Education Policy 2020 (NEP2020) 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 4 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.

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 EDC may be

1. Standalone Rectifier with Filter
2. A Zener Diode based Regulator
3. Development of DC Power Adopter
4. A Small Audio Amplifier
5. A Calp Switch
6. Electronic Bell

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 fifteen 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 four 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.

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. The approach across all undergraduate programs, including those in professional, technical, and vocational disciplines would be leading to holistic education, in the long run.

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 NEP2020.

(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 exit (MEME) options. The maximum duration for a student for completing 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 CSE; UG Diploma in CSE after the study of two academic years (four semesters); and B. Voc in CSE degree after the completion of three academic years (six semesters). The successful completion of four years undergraduate programme would lead to B. Tech in CSE 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 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 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 6 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 7 (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, minor project, 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 where ever 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) Wadhavani 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

10.1 MULTIPLE EXIT OPTIONS

Sl. No.	Exit Description	Exit Point	Degree/Certificate offered	Goal
1.	First Exit	After completion of First year.	UG Certificate in CSE	The student should be employable as Technical Assistant (CSE) in any industry/organization.
2.	Second Exit	After completion of Second year.	UG Diploma in CSE	The student should be employable as Technician (CSE) in any industry/organization.
3.	Third Exit	After completion of Third year.	B. Voc in CSE	The student should be employable as Technical Supervisor (CSE) in any industry/organization.
4.	Normal Exit	After completion of Fourth year.	B.Tech in CSE	The student should be employable as an Engineer (CSE) 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 program	The successful completion of first year with UG certificate in CSE from our institute.
3.	Third Entry	V-Sem. Of the program	The successful completion of UG Diploma in CSE from our institute.
4.	Fourth Entry	VII-Sem. Of The program	The successful completion of B. Voc in CSE 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 172 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): 172+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): 172+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) : 172+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 break after 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 break after 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 Journal indexed 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	21	24	24	23	22	21	15	172
B. Tech with Minor	22	21	24	24	23+5*	22+5*	21+4*	15+4*	172+18*
B. Tech with Honours	22	21	24	24	23+5*	22+5*	21+4*	15+4*	172+18*
B. Tech. Honours with Research	22	21	24	24	23+5*	22	21+5* +4*	15+4*	172+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	Percentile	Points	8 Points
		Above 98	8	
		Above 95	6	
		Above 90	4	
		Qualified	2	
2	Research Publication indexed by SCI / SCOPUS / Web of Science*	SCI Journal: 8 Points		8 Points
		SCOPUS / Web of Science Journal: 4 Points		
		Patent: 4 Points		
3	Winning Prestigious Technical Competition at National Level#	Rank	Points	6 Points
		1	4	
		2	3	
		3	2	
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 12.3 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 Courses (HSMC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	HSMC	U24MH205	English Communication and Report Writing	II	2
2.	HSMC	U24MB505	Management Course Basket*	V	3
3.	HSMC	U24MH508	Technical English	V	1
Total Credits					6

(For Example: (sample Courses)

(i) English for Technical Writing

(ii) Universal Human Value

(iii) Management / Economics / Accounting / Taxation)

(ii) Basic Science Courses (BSC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	BSC	U24MH101	Differential Calculus and Ordinary Differential Equations	I	3
2.	BSC	U24PY102C	Physics for Computer Science Engineering	I	4
3.	BSC	U24MH201	Differential Calculus and Ordinary Differential Equations	II	3
4.	BSC	U24CY202C	Chemistry for Computer Science Engineering	II	4
5.	BSC	U24MH301D	Discreet Mathematics and Probability, Statistics	III	3
Total Credits					17

(iii) Engineering Science Courses (ESC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	ESC	U24CS104	Programming for Problem Solving with C	I	4
2.	ESC	U24EE105	Basic Electrical & Electronics Engineering	I	4
3.	ESC	U24CS204	Data Structures through C	II	4
4.	ESC	U24ME207	Engineering Graphics Through CAD*	II	1
5.	ESC	U24CN604	Internet of Things	V	4
Total Credits					17

(iv) Program Core Courses (PCC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	PCC	U24CS103	Computer Organization & Architecture	I	3
2.	PCC	U24CS203	Operating System	II	3
3.	PCC	U24CS302	Theory of Computation	III	3
4.	PCC	U24CS303	Advanced Data Structures	III	4
5.	PCC	U24CS304	Computer Networks	III	3
6.	PCC	U24CS305	OOP through Java	III	4
7.	PCC	U24CS401	Database Management Systems Design	IV	4
8.	PCC	U24CS402	Web programming	IV	4
9.	PCC	U24CS403	Software Engineering	IV	3
10.	PCC	U24CS404	Artificial Intelligence	IV	3
11.	PCC	U24CS405	Python Programming	IV	4
12.	PCC	U24CS502	Machine Learning	IV	4
13.	PCC	U24CS503	Design and Analysis of Algorithms	V	4
14.	PCC	U24CS504	Compiler Design	V	4
15.	PCC	U24CS602	Cryptography & Network Security	VI	3
16.	PCC	U24CS603	Full Stack Development		4
17.	PCC	U24CS703	Cloud Computing	VII	4
18.	PCC	U24CS704	Deep Learning	VII	3
19.	PCC	U24CS705	Block Chain Technologies	VII	3
Total Credits					67

(v) Program Elective Courses (PEC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	PEC	U24CS601	Program Elective -I/ MOOCs-I	VI	3
2.	PEC	U24CS702	Program Elective - II/ MOOCs-II	VII	3
3.	PEC	U24CS802	Program Elective - III /MOOCs-IV	VIII	3
4.	PEC	U24CS803	Program Elective - IV /MOOCs-V	VIII	3
Total Credits					12

(vi) Experiential Learning Courses (ELC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	ELC	U24EL108	Practicum-1	I	1
2.	ELC	U24EL209	Practicum-2	II	1
3.	ELC	U24EL308	Practicum-3	III	1
4.	ELC	U24EL408	Practicum-4	IV	1
5.	ELC	U24CS509	Seminar	V	1
6.	ELC	U24CS608	Mini Project	VI	1
7.	ELC	U24CS706	Internship Evaluation*	VII	1
8.	ELC	U24CS707	Major Project, Phase-1 / Industrial Internship - 1	VII	4
9.	ELC	U24CS804	Major Project, Phase - 2 / Industrial Internship - 2	VIII	6
Total Credits					17

(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	-
2.	IKSC 02	U24VA506A	EITK	V	2
3.	IKSC 03	U24VC606B	UHV-II	VI	2
Total Credits					4

(viii) Multidisciplinary Open Electives Courses (MOPEC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	MOPEC	U24OE501XX	MOPEC Elective -I	V	3
2.	MOPEC	U24OE701XX	MOPEC Elective -II	VII	3
3.	MOPEC	U24OE801XX	MOPEC Elective -III	VIII	3
Total Credits					9

(ix) Value Added Courses (VAC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	VAC	U24CY106	Environmental Studies	I	--
2.	VAC	U24VA109	SEA - I/ SAA-1	I	1
3.	VAC	U24VA206	Sports & Yoga	II	--
	VAC	U24VA210	SEA-2/ SAA -2	II	1
4.	VAC	U24VA306	QALR	III	2
5.	VAC	U24VA309	SEA-3/ SAA -3	III	1
6.	VAC	U24VA406	Soft & Interpersonal Skills	IV	2
7.	VAC	U24VA409	SEA - 4/ SAA - 4	IV	1
8.	VAC*	U24CH411*	Environmental Sciences*	IV	3
Total Credits					11

(x) Skill Enhancement Courses (SEC)

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

(xi) Ability Enhancement Courses (AEC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	AEC	U24AE107	IDEA Lab Makerspace	I	1
2.	AEC	U24AE110	Expert Talk Series-1	I	1
3.	AEC	U24AE211	Expert Talk Series-2	II	1
4.	AEC	U24AE310	Expert Talk Series-3	III	1
5.	AEC	U24AE410	Expert Talk Series-4	IV	1
6.	AEC	U24AE510	Expert Talk Series-5	V	1
7.	AEC	U24AE609	Expert Talk Series-6	VI	1
Total Credits					7

(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 Credits					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. **Swachh 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 Samrudha 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: Swachh 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	C-i ² RE	SE301	Innovation, Business Model & Entrepreneurship
		SE302	Product Development and Prototyping

Group-3: Samruddha Bharat		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: Sanskrit 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.	ABBREVIATION	COURSE COMPONENT	TOTAL COURSE	TOTAL CREDITS	CURRICULUM CONTENT (%OF CREDITS)
1	HSMC	Humanity Sciences and Management Courses	3	6	3.48
2	BSC	Basic Science Course	5	17	9.88
3	ESC	Engineering Science Course	5	17	9.88
4	PCC	Program Core Course	19	67	38.90
5	PEC	Program Elective Course	4	12	6.97
6	MOPEC	Multidisciplinary Open Elective Course	3	9	5.23
7	ELC	Experiential Learning	9	17	9.88
9	VAC	Value Added Course	8	11	4.65
10	SEC	Skill Enhancement Course	5	5	2.9
11	AEC	Ability Enhancement Course	7	7	4.06
12	IKS	Indian Knowledge Systems	2	4	2.32
13	STE		1	3	1.74
Total				172	100

14. SEMESTER WISE COURSE/ CREDIT DISTRIBUTION

Semester	Number of Courses / Number of Credits (<i>Course Category wise</i>)												
	BSC	ESC	HSMC	PCC	MOPEC	PEC	SEC	VAC	ELC	AEC	IKC	STE	TOTAL
I	2/7	2/8		1/3				2/1	1/1	2/2			10/22
II	2/7	2/5	1/2	1/3			1/1	2/1	1/1	1/1			11/21
III	1/3			4/14			1/1	2/3	1/1	1/1			10/23
IV				5/18			1/1	2/3	1/1	1/1			10/24
V			1/1	3/12	1/3		1/1		1/1	1/1	1/2	1/3	10/24
VI		1/4	1/3	2/7		1/3	1/1		1/1	1/1	1/2		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	4/17	3/6	19/67	3/9	4/12	5/5	8/8	9*/17	7/7	2/4	1/3	71/172
% Weightage of Course Category	9.88% (17/172)	9.88% (17/172)	3.48 % (6/172)	38.90% (67/172)	5.23% (9/172)	6.97 % (12/172)	2.90 % (5/172)	4.65% (8/172)	9.88% (17/172)	4.06% (7/172)	2.32% (4/172)	1.74% (3/172)	100 % (172/172)

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

B. Tech (CSE) - 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	
-	IKSC	U24IK100	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	U24PY102C	Engineering Physics (for CSE)	2	1	2	5	10	4
3	PCC	U24CS103	Computer Organization & Architecture	2	1	-	4	7	3
4	ESC	U24CS104	Programming for Problem Solving with C	2	1	2	5	10	4
5	ESC	U24EE105C	Basic Electrical 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 XXXXX	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)				-Nil-					

Pool - I (Physics)

S. 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)

S. No.	Course Code	Course Title
1.	U24EE105A	Basic Electrical and Electronics Engineering (for Civil Engineering)
2.	U24EE105B	Basic Electrical Engineering (Common to ECE and ECI)
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	U24CY202C	Engineering Chemistry (for CSE)	2	1	2	5	10	4
3	PCC	U24CS203	Operating Systems	2	1	-	4	7	3
4	ESC	U24CS204	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	U24ME207	Engineering Graphics Through CAD*	-	-	2	2	4	1
8	SEC	U24SE208	Programming Skill Development (PSD) Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210 XXXXX	SEA-2/ SAA -2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
Total:				10	4	10	36	60	21
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)				Unix shell programming (Supports Computer Network and Compiler Design courses)					1

* 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).

Pool - III (Chemistry)		
S. No.	Course Code	Course Title
1.	U24CY202A	Engineering Chemistry (for Civil Engineering)
2.	U24CY202B	Engineering Chemistry (for ECIE)
3.	U24CY202C	Engineering Chemistry (for CSE)
4.	U24CY202D	Engineering Chemistry (for EEE)
5.	U24CY202E	Engineering Chemistry (for ECE)

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

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

(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 CSE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CS211X	Java Programming	2	-	2	-	4	3
2	PCC	U24CS212X	Database Management	2	-	2	-	4	3
3	PCC	U24CS213X	Fundamental of Python Programming	2	-	2	-	4	3
4	PCC	U24CS214X	Computer Aided Software Engineering	2	-	2	-	4	3
5	PCC	U24CS215X	Web Designing	2	-	2	-	4	3
6	PCC	U24CS216X	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 CSE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE211XCS	Advanced Excel (NSIC Course)	-	-	6	-	6	3
2	SEC	U24SE212XCS	Web Development (NSIC course)	-	-	6	-	6	3
3	SEC	U24SE213XCS	Linux (NSIC course)	-	-	6	-	6	3
4	SEC	U24SE214XCS	Oracle SQL/PLSQL Programming (NSIC course)	-	-	6	-	6	3
5	SEC	U24SE215XCS	CCNA: Computer Networks Essentials	-	-	6	-	6	3
6	SEC	U24SE216XCS	Power BI (NASSCOM futureskills course)	-	-	6	-	6	3
7	SEC	U24SE217XCS	Foundational Course in Cyber Security (NASSCOM futureskills course)	-	-	6	-	6	3
8	SEC	U24SE218XCS	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	U24MH301D	Discreet Mathematics and Probability, Statistics	2	1	-	6	9	3
2	PCC	U24CS302	Theory of Computation	2	1	-	4	7	3
3	PCC	U24CS303	Advanced Data Structures	2	1	2	5	10	4
4	PCC	U24CS304	Computer Networks	2	1	-	4	7	3
5	PCC	U24CS305	Object Oriented Programming through JAVA	2	1	2	5	10	4
6	VAC	U24VA306A	Quantitative Aptitude and Logical Reasoning@	2		-	2	4	2
7	SEC	U24SE307	Programming Skill Development Lab - 2	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309 XXXXX	SEA-3 / SAA -3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
Total:				12	5	6	35	58	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)				Data Structures through C* (Supports Lateral Entry students in Advance data structures & DAA course)					1*

*For Lateral Entry Students Only

Branch Specific Mathematics (Pool-4)		
S. No.	Course Code	Course Title
1.	U24MH301A	Numerical and Statistical Methods (for Civil Engineering)
2.	U24MH301B	Applied Mathematics (for Mechanical Engineering)
3.	U24MH301C	Applied Mathematics (Common to ECI, EEE & ECE)
4.	U24MH301D	Discrete Mathematics and Probability Statistics (Common to CSE, CSN, CSO & IT)
5.	U24MH301E	Essential Mathematics and Statistics for Machine learning (for CSM)
6.	U24MH301F	Essential Mathematics and Statistics for Data science (for CSD)

IV SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	PCC	U24CS401	Database Management Systems	2	1	2	5	10	4
2	PCC	U24CS402	Web programming	2	1	2	5	10	4
3	PCC	U24CS403	Software Engineering	2	1	-	4	7	3
4	PCC	U24CS404	Artificial Intelligence	2	1	-	4	7	3
5	PCC	U24CS405	Python Programming	2	1	2	5	10	4
6	VAC	U24VA406B	Soft and Interpersonal Skills®	2	-	-	2	4	2
7	SEC	U24SE407	Programming Skill Development Lab - 3	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409 XXXXX	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*	3*
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)				Mobile Application Development <i>(Supports Major and Minor Project works)</i>					1

**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 CSE)

(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 CSE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24EC411X	Data Analytics	2	-	2	-	4	3
2	PCC	U24EC412X	Machine Learning Fundamentals	2	-	2	-	4	3
3	PCC	U24EC413X	Essentials of Network security	2	-	2	-	4	3
4	PCC	U24EC414X	Introduction to Internet of Things	2	-	2	-	4	3
5	PCC	U24EC415X	Compiler Design Fundamentals	2	-	2	-	4	3
	PCC	U24CS214X	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 CSE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE416XCS	Software Testing with Selenium (NSIC Course)	-	-	6	-	6	3
2	SEC	U24SE417XCS	Dot Net Programming (NSIC Course)	-	-	6	-	6	3
3	SEC	U24SE418XCS	Android App Development (NSIC Course)	-	-	6	-	6	3
4	SEC	U24SE419XCS	CCNA: Switching Routing and Wireless essentials	-	-	6	-	6	3
5	SEC	U24SE420XCS	Tableau: Data Analytics (NASSCOM futureskills course)	-	-	6	-	6	3
6	SEC	U24SE421XCS	IoT Foundation (NASSCOM futureskills course)	-	-	6	-	6	3
7	SEC	U24SE422XCS	Any other course approved by BoS Chair and Dean AA	-	-	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.

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	MOPEC	U24OE501YYX	MOPEC Elective -I#	2	1	-	3	6	3
2	PCC	U24CS502	Machine Learning	2	1	2	5	10	4
3	PCC	U24CS503	Design and Analysis of Algorithms	2	1	2	5	10	4
4	PCC	U24CS504	Compiler Design	2	1	2	5	10	4
5	STE	U24ST505X	S&E Basket *	2	1	-	2	5	3
6	IKSC	U24IK506A	Essence of Indian Traditional Knowledge	2	-	-	2	4	2
7	SEC	U24SE507	Programming Skill Development Lab - 4	-	-	2	2	4	1
8	HSMC	U24MH508	Technical English	-	-	2	2	4	1
9	ELC	U24CS509	Seminar	-	-	-	2	2	1
10	AEC	U24AE510	Expert Talk Series-5	-	-	-	1	1	1
Total:				12	5	10	29	56	24
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)				-NiL-					

#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, Management Course Basket, 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	Design Thinking
2.	U24ST505B	Innovative Product Design and Development
3.	U24ST505C	Entrepreneurship
4.	U24ST505D	Design Studio
5.	U24ST505Z	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	U24CS601	Program Elective -I/ MOOCs-I	2	1	-	4	7	3
2	PCC	U24CS602	Cryptography & Network Security	2	1	-	4	7	3
3	PCC	U24CS603	Full Stack Development	2	1	2	5	10	4
4	ESC	U24IN604	Internet of Things	2	1	2	5	10	4
5	HSMC	U24MB605X	Management Course Basket	2	1	-	2	5	3
6	IKSC	U24IK606B	UHV-II	2	-	-	2	4	2
7	SEC	U24SE607	PSD Lab-05	-	-	2	2	4	1
8	ELC	U24CS608	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)				Digital Image Processing <i>(Supports Deep learning, Minor/Major Projects)</i>					1

#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.

Management Courses Basket		
Sr. No.	Course Code	Course Title
1.	U24MBA605A	Management Economics and Accountancy
2.	U24MBA605B	Industrial Psychology
3.	U24MBA605C	E-Commerce and Digital Marketing
4.	U24MBA605D	Organizational Behaviour
5.	U24MBA605Z	Any other course approved by BoS Chair and Dean AA

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. Tech (Vocational) in CSE)

(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 CSE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CS610X	Cloud computing Essentials	2	-	2	-	4	3
2	PCC	U24CS611X	Data Visualization with R programming	2	-	2	-	4	3
3	PCC	U24CS612X	Industrial IoT	2	-	2	-	4	3
4	PCC	U24CS613X	DevOps Development						
4	PCC	U24CS614X	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 CSE Degree.

Exit Option to Qualify B. Voc in CSE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE614XCS	Data Analytics using R Language (NSIC Course)	-	-	6	-	6	3
2	SEC	U24SE615XCS	AMAZON Web Services (NSIC Course)	-	-	6	-	6	3
3	SEC	U24SE616XCS	Augmented & Virtual Reality (NSIC Course)	-	-	6	-	6	3
4	SEC	U24SE617XCS	CCNA: Enterprise networking, security & automation	-	-	6	-	6	3
5	SEC	U24SE618XCS	Block Chain Application Developer (NASSCOM Future skills course)	-	-	6	-	6	3
6	SEC	U24SE619XCS	Any other course approved by BoS Chair and Dean AA	-	-	6	-	6	3

(Note to HoDs on PCC: Under PCC the departments shall plan appropriate courses upto 6th semester covering GATE syllabus).

VII SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	MOPEC	U24OE701XX	MOPEC Elective -II	2	1	-	3	6	3
2	PEC	U24CS702	Program Elective - II/ MOOCs-II	2	1	-	4	7	3
3	PCC	U24CS703	Cloud Computing	2	1	2	5	10	4
4	PCC	U24CS704	Deep Learning	2	1	-	4	7	3
5	PCC	U24CS705	Blockchain Technologies	2	1	-	4	7	3
6	ELC	U24CS706	Internship Evaluation*	-	-	2	-	2	1
7	ELC	U24CS707	Major Project, Phase-1 / Industrial Internship - 1	-	-	8	6	14	4
Total:				10	5	12	26	53	21
Additional Learning@: Maximum credits allowed for Honours/Minor				-	-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	-	25

#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 on the 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	U24OE801XX	MOPEC Elective -III	2	1	-	3	6	3
2	PEC	U24CS802	Program Elective - III / MOOCs-IV	2	1	-	4	7	3
3	PEC	U24CS803	Program Elective - IV / MOOCs-V	2	1	-	4	7	3
4	ELC	U24CS804	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	VII	VIII	TOTAL
CREDITS	22	21	23	24	24	22	21	15	172

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 19 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 (5/7/8)	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 Department 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 Testing Methodologies
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	U24OEX01ICSZ	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 & Utilisation 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 (AI&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 COMPUTER SCIENCE AND ENGINEERING

PROGRAM ELECTIVE COURSES (PEC)

VERTICAL/ PE	PE1	PE2	PE3	PE4
VERTICAL 1: Artificial Intelligence	U24CS601A: Natural Language Processing	U24CS702A: Robotic Process Automation	U24CS802A: Computer Vision	U24CS803A: Augmented Reality
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
VERTICAL 2: Data Science	U24CS601B: Data Mining	U24CS702B: Big Data Analytics	U24CS802B: Data Visualization	U24CS803B: Social Network Analysis
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
VERTICAL 3: Cloud Computing	U24CS601C: Parallel Computing Algorithms	U24CS702C: Edge & Fog Computing High	U24CS802C: DevOps Engineering	U24CS803C: Quantum Computing
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
VERTICAL 4: Cyber Security	U24CS601D: Cyber Security Essentials	U24CS702D: Ethical Hacking	U24CS802D: Cybercrime investigation & Digital Forensics	U24CS803D: Web & Database Security
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
VERTICAL 5: Internet of Things	U24CS601E: IoT Architecture & Protocols	U24CS702E: Industrial IoT	U24CS802E: Privacy & Security in IoT	U24CS803E: IoT Cloud Processing and Analytics
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			

**KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE**

Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.

కాకతీయ ప్రేక్షోగికీ ం విజ్ఞాన సంస్థాన, వరంగల్ - 506 015 తెలంగాణ, భారత
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - 506 015 తెలంగాణ, భారతదేశము

(An Autonomous Institute under Kakatiya University, Warangal)

(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)

URR24: SYLLABI FOR I & II SEMESTERS
of
B.TECH COMPUTER SCIENCE & ENGINEERING
w.e.f. A.Y. 2024-25

I SEMESTER, B.TECH CSE (W.E.F. A.Y. 2024-25)

Stream – I

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
-	IKSC	U24IK100	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	U24PY102C	Engineering Physics (for CSE)	2	1	2	5	10	4
3	PCC	U24CS103	Computer Organization & Architecture	2	1	-	4	7	3
4	ESC	U24CS104	Programming for Problem Solving with C	2	1	2	5	10	4
5	ESC	U24EE105C	Basic Electrical 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	U24VA109X XXXX	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)				-NiL-					

Pool - I (Physics)		
S. 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)		
S. No.	Course Code	Course Title
1.	U24EE105A	Basic Electrical and Electronics Engineering (for Civil Engineering)
2.	U24EE105B	Basic Electrical Engineering (Common to ECE and ECI)
3.	U24EE105C	Basic Electrical Engineering (for CSE)
4.	U24EE105D	Basic Electrical Engineering (for EEE)

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	
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			
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)			
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>Alternating series [(Text 1: topic 9.12, Solved problems: 9.16,9.17, Practice problems: exercise 9.7(1, 7)]</i>			
<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>			
<i>Additional problems on Maclaurin's series [(Text 1: topic 4.4, Solved problems: 4.20, Practice problems: exercise 4.5 (3, 5)]</i>			
UNIT-II		9 Hrs	
Partial differentiation and its applications: Functions of two or more variables, Partial derivatives, Total derivative, Change of variables, Jacobians, Functional relationship, Geometrical Interpretation-Tangent plane 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			
Self-Learning Topics (SLTs):			
<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>			
<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>			
<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>			

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>Self-Learning Topics (SLTs): 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)] 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)] 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>Self-Learning Topics (SLTs): Finding the particular integral of $Q(X) = X^m V(X)$ [(Text 1: topic 13.7, Solved problems: 13.16,13.17,13.19, Practice problems: exercise 13.2 (21,22)]. 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)] 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>	
<p>Textbook(s): 1. Grewal, B.S., <i>Higher Engineering Mathematics</i>, Khanna Publishers, Delhi, 44th edition, 2017</p>	
<p>Reference Book(s):</p> <ol style="list-style-type: none"> Shanti Narayan, Dr. Mittal P.K, <i>Differential Calculus</i>, S. Chand & Co., New Delhi, 1st edition, Reprint 2014 Kreyszig E, <i>Advanced Engineering Mathematics</i>, Inc, U.K, John wiely & sons, 10th edition, 2020 S.S. Sastry, <i>Engineering Mathematics, Vol.II</i>, 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													
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	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	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

ENGINEERING PHYSICS (for CSE)			
Class: B.Tech. I- Semester		Branch: CSE	
Course Code:	U24PY102C	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: basic principles, operation of lasers and optical fibers			
LO2: fundamental laws of electrostatics and magnetostatics, properties of magnetic and superconducting materials			
LO3: basic concepts of quantum mechanics and quantum computing			
LO4: semiconductor materials, semiconductor diodes and bipolar junction transistors (BJTs)			
THEORY COMPONENT			
UNIT-I		9 Hrs	
<p>Applied Optics and Lasers: Principles of interference, Diffraction phenomena and 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</p> <p>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)</p> <p>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).</p>			
UNIT-II		9 Hrs	
<p>Electrostatics and Magnetostatics: Electric charges, Coulomb's law, Electric field, Electrostatic potential, Computation of electric field and electrostatic potential due to point and line charges; Magnetic field, Magnetic flux density, Biot-Savart's law, Ampere's law, Faraday's law and Lenz's law</p> <p>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 and their applications; superconductivity, Meissner effect, Transition temperature, Isotope effect, Type-I and type-II superconductors, High T_c superconductors, Applications of superconductors</p> <p>Self Learning Topics (SLTs): magnetisation, susceptibility & their relations (Text1: topic 41.2), London penetration depth (Text1: topics 42.4.7), Solved problems (Text1: Prob 42.9 to 42.14).</p>			
UNIT-III		9 Hrs	
<p>Elements of Quantum Mechanics: Wave-particle duality, de-Broglie wavelength, Physical significance of wave function, Schrodinger time-dependent wave equation, Schrodinger time-independent wave equation, Particle in an infinite potential well (one dimension)</p> <p>Introduction to Quantum Computing: Observables and operators, Expectation values, Expectation values in operator notation, Dirac Bra-Ket notation, Superposition principle, Concept of Quantum bits, Classical versus Quantum computing, Quantum parallelism and Quantum entanglement, Applications of quantum computing</p> <p>Self Learning Topics (SLTs): Heisenberg's uncertainty principle (Text1: topics 27.2), Observables and operators (Text1: topics 27.19), Solved problems (Text1: Prob 27.13, Prob 27.17).</p>			

UNIT-IV	9 Hrs
<p>Semiconductor Physics: Classification of solids based on energy band theory- Conductors, Semiconductors and insulators, Intrinsic semiconductor- carrier generation and recombination; Extrinsic semiconductors - n-type and p-type (qualitative)</p> <p>Semiconductor Diodes and Bipolar Junction Transistors (BJTs): Formation of a PN junction, Forward and reverse bias, PN junction diode, Diode current equation, Zener diode, Zener diode as voltage regulator and their V-I characteristics, Light emitting diode (LED), Transistor structure, Representation of NPN and PNP transistors, Transistor action, Transistor configurations- Common base(CB), Common emitter(CE) and Common collector(CC); Corresponding α, β, γ parameters and their relations and transistor as an amplifier</p> <p>Self Learning Topics (SLTs): <i>drift & diffusion current (Text2: topic 4.9), diode current equation (Text2: topic 4.15), Solved problems (Text2: Prob 4.17 to 4.21).</i></p>	
LABORATORY COMPONENT	
List of Experiments	
<ol style="list-style-type: none"> 1. Linear Measurements using Vernier callipers and screw gauge 2. Determination of slit width using He-Ne laser 3. Determination of wavelength of He-Ne laser using reflection and transmission diffraction grating 4. Determination of dielectric constant of materials using parallel plate capacitor 5. Magnetic hysteresis- B-H curve tracing using CRO 6. Numerical aperture and acceptance angle of an optical fiber 7. Study of V-I characteristics of PN junction diode 8. Study of V-I characteristics of LED 9. Study of common emitter characteristics of NPN transistor 10. Energy band gap of a semiconductor material 11. Determination of thickness of thin sheet using air-wedge method 12. Determination of Planck's constant 	
Textbook(s):	
<ol style="list-style-type: none"> 4. M. Avadhanulu and Kshirsagar, TVS Arun Murthy, <i>A Text Book of Engineering Physics</i>, S. Chand & Company Ltd, 11th Edn., 2018 5. S Salivahanan, N Suresh Kumar, <i>Electronic devices and circuits</i>, Mc Graw Hill Edn., 2017 6. Michael Nielsen and Isaac Chuang, <i>Quantum Computation and Quantum Information</i>, Cambridge University Press, 2010 	
Reference Book(s):	
<ol style="list-style-type: none"> 1. Neil Gershenfeld, <i>Physics of Information Technology</i>, Cambridge University Press, 1st Edn., 2000 2. V. Rajendran, <i>Engineering Physics</i>, Mc Graw Hill Edn., 2013 3. Eleanor Rieffel and Wolfgang Polak, <i>Quantum Computing: A Gentle Introduction</i>, The MIT Press Cambridge, Massachusetts London, England, 2011 4. R.K. Gaur and S.L.Gupta, <i>Engineering Physics</i>, Dhanpath Rai and Sons, 2013 5. David Halliday, Robert Resnick and S Krane, <i>Physics Volume I&II</i>, Wiley India Limited, 5th Edn., 2014 	
Web and Video link(s):	
<ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc24_ph28/preview; NPTEL video lecture on Concepts in Magnetism and Superconductivity by Prof. Arghya Taraphder IIT Kharagpur 2. https://onlinecourses.nptel.ac.in/noc24_lw07/preview; NPTEL video lecture on Introduction to Law on Electricity by Prof. Uday Shankar, IIT Kharagpur 3. https://onlinecourses.nptel.ac.in/noc24_ph45/preview; NPTEL Video Lecture on Introduction to LASER - Course by Prof. M. R. Shenoy, IIT Delhi 4. https://onlinecourses.nptel.ac.in/noc20_ee77/preview; NPTEL Video Lecture on Semiconductor Devices and Circuits By Prof. Sanjiv Sambandan, IISc Bangalore 	

5. <https://nptel.ac.in/courses/106106232>; NPTEL Video Lecture on Introduction to Quantum Computing: Quantum Algorithms and Qiskit by Prof. Prabha Mandayam, Prof. Anupama Ray, Prof. Sheshashayee Raghunathan, IIT Madras

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 Edn., 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: evaluate properties of lasers and optical fibre parameters

CO2: calculate the electric field, electric potential, magnetic field and flux density; determine properties of magnetic and superconducting materials

CO3: evaluate the energy values of a particle in an infinite potential well and apply the quantum principles in quantum computing

CO4: analyze V-I characteristics of semiconductor diodes and suggest their applications; determine resistances of transistor biasing circuits (based on psychomotor skills acquired from laboratory component)

CO5: measure diameter of wire and hollow tubes using Vernier callipers and screw gauge

CO6: determine the width of a narrow slit and wavelength of laser using diffraction phenomenon and numerical aperture of an optical fiber

CO7: calculate the dielectric constant of a material and plot the hysteresis curve of ferromagnetic material

CO8: determine forward voltage and currents from V-I characteristics of semiconductor diodes; identify cut-off, saturation and active regions of NPN transistor

Course Articulation Matrix (CAM):				U24PY102C- ENGINEERING PHYSICS (for CSE)											
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	U24PY102C.1	2	1	-	-	-	1	-	1	1	1	1	1	1	1
CO2	U24PY102C.2	2	1	-	-	-	1	-	1	1	1	1	1	1	1
CO3	U24PY102C.3	2	1	-	-	-	1	-	1	1	1	1	1	1	1
CO4	U24PY102C.4	2	1	-	-	-	1	-	1	1	1	1	1	1	1
CO5	U24PY102C.5	2	1	-	-	1	1	-	1	1	2	1	1	1	1
CO6	U24PY102C.6	2	1	-	-	1	1	-	1	1	2	1	1	1	1
CO7	U24PY102C.7	2	1	-	-	1	1	-	1	1	2	1	1	1	1
CO8	U24PY102C.8	2	1	-	-	1	1	-	1	1	2	1	1	1	1
U24PY102C		2	1	-	-	1	1	-	1	1	1.5	1	1	1	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

COMPUTER ORGANIZATION AND ARCHITECTURE

Class: B.Tech. I -Semester		Branch: CSE	
Course Code:	U24CS103	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: digital computer operations, logic circuits and data representation methods			
LO2: the instruction set architecture and basic processing unit concepts			
LO3: computation of arithmetic operations and various types of memories			
LO4: input-output organization and pipeline processing in computer systems			
UNIT-I			9 Hrs
Digital Computers: Introduction to computers, Functional units, Basic operational concepts of a computer, Performance			
Data Representation: Binary number system, Octal and hexadecimal numbers, Decimal representation, Alphanumeric representation			
Digital Logic Circuits: Logic gates-symbols and truth tables, Map simplification, Flip flops, Registers			
<i>Self Learning Topics (SLTs): Computer types (Text1: topics 1.1), Historical perspective (Text1: topics 1.7), Practice problems (Text2: Prob 4.5, Prob 4.7, Prob 4.10), Universal logic gates (Text2: topics 2.3), Don't care conditions (Text2: topics 2.4), Practice problems (Text2: Prob 2.4, Prob 2.8, Prob 2.9),</i>			
UNIT-II			9 Hrs
Instruction Set Architecture: Memory locations and addresses, Memory operations, Instructions and instruction sequencing, Addressing modes			
Basic Processing Unit: Fundamental concepts, Instruction execution, Hardware components, Instruction fetch and execution steps, Control signals			
<i>Self Learning Topics (SLTs): Indexing and Arrays (Text1: topics 2.4.3), Solved problems(Text 1: Prob 2.1, Prob 2.2, Prob 2.3), Data path(Text 1: 5.3.3), Practice problems(Text 1: Prob 5.2, Prob 5.4, Prob 5.5),</i>			
UNIT-III			9 Hrs
Arithmetic: Addition and subtraction of signed numbers, Multiplication of numbers, Integer division			
The Memory System: Basic concepts, Semiconductor RAM memories- Internal organization of memory chips, Static memories, Dynamic RAMs; Read-only memories, Memory hierarchy, Cache memories, Direct memory access, Performance considerations			
<i>Self Learning Topics (SLTs): Sequential circuit multiplier (Text1: topics 9.3.2), Practice problems(Text1: Prob 9.1, Prob 9.4, Prob 9.5, Prob 9.9), Caches on the processor chip (Text1: topics 8.7.2), Solved problem (Text1: Prob 8.2, Prob 8.3)</i>			
UNIT-IV			9 Hrs
Input-Output Organization: Input-output interface- I/O bus and interface modules, I/O versus memory bus, Isolated versus memory-mapped I/O, Asynchronous data transfer- Strobe control, Handshaking			
Pipeline Processing: Pipelining, Arithmetic pipeline, Instruction pipeline			
<i>Self Learning Topics (SLTs): Asynchronous serial transfer (Text2: topics 12.3), Practice problems (Text2: Prob 12.1, Prob 12.8, Prob 12.10, Prob 12.29), Pipeline hazards(Text 2: topics:10.4), Practice</i>			

problems (Text2: Prob 10.3, Prob 10.9, Prob 10.11)

Course Learning Outcomes (COs):

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

- CO1:** examine the study of the basic structure and operation of a digital computer operations and performance, data representation methods, and digital logic circuit analysis.
- CO2:** analyze instruction execution, addressing modes, hardware components, and control mechanisms in processors.
- CO3:** apply ALU operations on positive and negative numbers and analyze the features of various types of memory.
- CO4:** analyze I/O interfaces, bus systems, data transfer methods, and pipeline processing concepts.

Textbook(s):

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", McGraw-Hill Education, 6th Edition, ISBN-9789355323729, 2023.(ChapterNos.1,2,5,7,8,9)
2. M. Morris Mano, "Computer System Architecture", Revised Third Edition, Pearson Education, ISBN: 978-93-325-8560-7, 2019. (ChapterNos.9,10,11,12,14)

Reference Book(s):

1. B Ram, Sanjay Kumar, "Computer Fundamentals: Architecture and Organization", New Age International Publishers, 5th Edition, ISBN: 978-81-224-3610-5,2018.
2. W. Stallings, "Computer Organization and Architecture - Designing for Performance", 7th Edition, Pearson Education, ISBN 978-81-7758-993-1,2009.

Web and Video link(s):

1. <https://youtu.be/Kn5ipjXJvpQ?si=qs19paRizepEmRZ5>; NPTEL Video Lecture on Fast Addition , Multiplication by Prof. Anshul Kumar, Professor of CSE ,IIT Delhi
2. <https://youtu.be/CSkN0wj0zZU?si=suwgssCvwwvTIytn>; NPTEL Video Lecture on DMA transfer by Prof. Jatindra Kumar Deka, Professor of CSE, IIT Guwahati.

Course Articulation Matrix (CAM):		U24CS103 COMPUTER ORGANIZATION AND ARCHITECTURE													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U24CS103.1	2	2	2	1	-	1	-	1	1	1	1	1	1	2
CO2	U24CS103.2	2	2	2	1	-	1	-	1	1	1	1	1	1	2
CO3	U24CS103.3	2	2	2	1	-	1	-	1	1	1	1	1	1	2
CO4	U24CS103.4	2	2	1	1	-	1	-	1	1	1	1	1	1	2
U24CS103		2	2	1.75	1	-	1	-	1	1	1	1	1	1	2
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):			
<i>This course will develop students' knowledge in /on...</i>			
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			
<i>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)</i>			
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			
<i>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)</i>			
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

13. Programs using input output functions, operators (arithmetic, relational and conditional)
14. Programs using operators (bit-wise, logical, increment and decrement)
15. Programs using conditional control structures: if, if-else, nested if
16. Programs using else if ladder, switch and goto statements
17. Programs using loop control structures: while
18. Programs using loop control structures: do-while and for
19. Programs on one dimensional array and two-dimensional arrays
20. Programs on String operations and string handling functions
21. Programs on different types of functions, parameter passing using call-by-value & call-by-address, recursion and storage classes
22. Programs using structures, unions, pointers to arrays and pointers to strings
23. Programs using array of pointers and pointers to structures
24. Programs on File operations and file handling functions for sequential text files

Textbook(s):

1. Balagurusamy.E, *Programming in ANSI C*, McGraw Hill, 8th edition, 2022

Reference Book(s):

3. Paul Deitel, Harvey Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, Pearson Education Limited, 9th edition, 2022
4. Brian W. Kernighan and Dennis Ritchie, *The C Programming Language*, Pearson Education India, 2nd edition, 2015
5. Reema Thareja, *Programming in C*, Oxford University Press, 3rd edition, 2023
6. Yashavant Kanetkar, *Let Us C*, BPB Publications, 19th edition, 2022
7. 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):

3. 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 flow chart 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	1	1	2	1	2
CO2	U24CS104.2	2	2	2	1	-	-	-	1	1	1	1	2	2	2
CO3	U24CS104.3	2	2	3	1	-	-	-	1	1	1	1	2	2	2
CO4	U24CS104.4	2	2	3	2	-	-	-	1	1	1	1	2	2	2
CO5	U24CS104.5	1	1	1	1	1	-	-	1	1	1	1	2	1	2
CO6	U24CS104.6	1	2	2	2	1	-	-	1	1	1	1	2	2	2
CO7	U24CS104.7	1	2	3	2	1	-	-	1	1	1	1	2	2	2
CO8	U24CS104.8	1	2	3	2	1	-	-	1	1	1	1	2	2	2
U24CS104		1.5	1.75	2.25	1.5	1	-	-	1	1	1	1	2	1.75	2

BASIC ELECTRICAL ENGINEERING			
Class: B.Tech. I -Semester		Branch: CSE	
Course Code:	U24EE105 C	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: DC network theorems			
LO3: 1- Ø AC and 3-Ø AC circuits			
LO4: construction, principles and applications of DC & AC machines and concept of Lighting sources			
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, Star-Delta conversion, Mesh analysis & Nodal analysis (T & π networks only).</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>DC network theorems (Independent sources only): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (T & π networks only).</p> <p><i>Self-Learning Topics (SLTs):</i> Condition for maximum power transfer (Text1: Topics3.9), Solved problems (Text1: Prob 3.15, 3.18, 3.23 & 3.25), Practice problems (Text1: Chap-3, Prob 9,10,13 & 14).</p>			
UNIT-III		9 Hrs	
<p>1-Ø 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- Ø AC circuits: Generation of 3- Ø voltages, Advantages, Disadvantages, Applications of a 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 8,9,12&12).</p>			
UNIT-IV		9 Hrs	
<p>Electrical Machines & Electrical Lighting (Qualitative treatment): Construction, Principle of operation, Characteristics & applications of 1- Ø transformer, 3- Ø induction motor, 1- Ø induction motor and DC motor and Types of DC motor.</p> <p>Electrical lighting sources and Energy calculations: Lighting sources-incandescent, Fluorescent, CFL & LED lamps, Elementary calculations for energy consumption.</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),</p>			

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. Verification of Superposition Theorem
5. Verification of Thevenin's Theorem
6. Verification of Maximum power transfer Theorem
7. Determination of internal parameters of a choke coil
8. Impedance calculations and phasor representation of RL series circuit
9. Impedance calculations and phasor representation of RC series circuit
10. Load test on 1-phase transformer
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):

2. K. Uma Rao, *Basic Electrical Engineering*, Pearson Education, Edition, 2011

Reference Book(s):

8. B.L. Thereja, A.K. Thereja, *Electrical Technology Vol. I & II*, S.Chand & Company Ltd, Edition, 2005.
9. Edward Hughes, *Electrical & Electronics Technology*, Pearson Education, 10th Edition., 2010.
10. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, Edition, 2010.
11. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, Tata McGraw Hill Ltd, Edition, 2009.

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):

4. *Basic Electrical 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 theory component)

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

CO2: apply suitable network theorems to analyze DC circuits

CO3: determine impedance, voltage, current, and power in 1- Ø AC circuits & determine line and phase quantities in 3- Ø AC circuits

CO4 : select a suitable electrical machine for given applications and determine the energy consumed by a lighting load.

(based on psychomotor skills acquired from laboratory component)

CO5: validate mesh and nodal analysis

CO6: validate network theorems

CO7: determine the impedance of series RL & RC circuits at various operating frequencies

CO8: determine the efficiency of a transformer by conducting a load test

Course Articulation Matrix (CAM):		U24EE105C : BASIC ELECTRICAL 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	U24EE105C.1	2	1	-		-	-	-	1	1	1	1	1	1	1
CO2	U24EE105C.2	2	2	-	-	-	-	-	1	1	1	1	1	1	1
CO3	U24EE105C.3	3	3	1	1	1		1	1	1	1	1	1	1	1
CO4	U24EE105C.4	3	3	1	1	1	1	1	1	1	1	1	1	1	1
CO5	U24EE105C.5	2	1	-	-	-	-	-	1	1	1	1	1	1	1
CO6	U24EE105C.6	2	2	-	-	-	-	-	1	1	1	1	1	1	1
CO7	U24EE105C.7	3	3	1	1	1		1	1	1	1	1	1	1	1
CO8	U24EE105C.8	3	3	1	1	1	1	1	1	1	1	1	1	1	1
U24EE105C		2.5	2.25	1	1	1	1	1	1	1	1	1	1	1	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

IDEA Lab Makerspace

Class: B.Tech. I & II -Semester		Branch: Common to all branches	
Course Code:	U24AE107 / U24AE207	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-2-2-4	CIE :	100%
Total Number of Lab Hours:	36 Hrs	ESE :	-

Course Learning Objectives (LOs):

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

LO1: carpentry and CNC wood router

LO2: mould for sand casting and arc welding joints

LO3: laser engraving, 3D printing and robots in manufacturing

LO4: Printed Circuit Board (PCB) and Internet of Things (IoT)

LABORATORY COMPONENT

S. No.	Creative Fabrication Technology	List of Experiments
1.	Carpentry	Prepare a half lap dovetail joint
2.	CNC Wood Router	Perform wood carving using CNC Wood Router
3.	Foundry	Prepare a sand mould using single piece pattern
4.	Welding	Prepare a single V-butt joint on mild steel plates using AC arc welding machine
5.	Injection Moulding	Prepare a plastic product using Injection moulding machine
6.	Laser Engraving	Perform key chain by using CO ₂ laser cutting machine
7.	3D Printing	Prepare a key chain on 3D printer with the given dimensions
8.		Prepare a Spur Gear on 3D printer with the given dimensions
9.	Robotics	Perform basic pick-and-place operation using robot
10.	Printed Circuit Board (PCB)	Design and fabricate a PCB for a given application
11.	Internet of Things (IoT)	Measure the temperature and humidity by using DHT11 sensor and Arduino UNO
12.		Create a smart plant watering system using IoT
Course Project		<ul style="list-style-type: none"> Students are required to create an affordable prototype as their course project, based on the knowledge and skills acquired during the course. Students have to present and submit their prototypes to demonstrate their ability to apply classroom learning practically, showcasing their creativity and technical aptitude.

Laboratory Manual:

- IDEA Lab Makerspace Laboratory Manual & Record Book (LMRB) prepared by the faculty of department of Mechanical Engineering, KITSW, Revised version 4, August-2024.*

Text/ Reference Book(s):

3. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy., "Elements of Workshop Technology", Media Promoters and publishers Pvt. Ltd, India, Vol-I-2008 & Vol-II-2010.
4. Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani, "Additive Manufacturing Technologies- 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing" Springer Nature, 2nd Edition 2021.
5. R.S. Khandpur, "Printed Circuit Boards: Design, Fabrication, Assembly and Testing", New Delhi Tata Mc Graw Hill-2008.
6. Sudeep Mishra, Anandarupmukherjee and Arijit Roy, "Introduction to IoT", New Delhi: University Cambridge Press, 2021.

Course Learning Outcomes (COs):

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

(based on psychomotor skills acquired from laboratory component)

CO1: produce wooden joints and intricate articles using carpentry and CNC wood router respectively

CO2: implement procedures to prepare the mould cavity for sand casting and arc welding joints

CO3: produce innovative prototypes using laser engraving and 3D printing

CO4: design and develop systems based on PCB and IoT for given applications

Course Articulation Matrix (CAM):		IDEA Lab Makerspace													
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	U24AE107.1/ U24AE207.1	2	2	1	1	2	1	-	1	2	2	1	1	1	1
CO2	U24AE107.2/ U24AE207.2	2	2	1	1	2	1	-	1	2	2	1	1	1	1
CO3	U24AE107.3/ U24AE207.3	2	2	1	1	2	1	-	1	2	2	1	1	1	1
CO4	U24AE107.4/ U24AE207.4	2	2	1	1	2	1	-	1	2	2	1	1	1	1
U24AE107/U24AE207		2	2	1	1	2	1	-	1	2	2	1	1	1	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

PRACTICUM-1

Class: B.Tech. I-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:
 - 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 :

No.	Roll 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: analyze 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):		U24VA109 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:
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-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 B.TECH CSE (W.E.F. A.Y. 2024-25)

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	U24CY202C	Engineering Chemistry <i>(for CSE)</i>	2	1	2	5	10	4
3	PCC	U24CS203	Operating Systems	2	1	-	4	7	3
4	ESC	U24CS204	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	U24ME207	Engineering Graphics Through CAD*	-	-	2	2	4	1
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:				10	4	10	36	60	21
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)				Unix shell programming <i>(Supports Computer Network and Compiler Design courses)</i>					1

* 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).

Pool - III (Chemistry)		
S. No.	Course Code	Course Title
1.	U24CY202A	Engineering Chemistry <i>(for Civil Engineering)</i>
2.	U24CY202B	Engineering Chemistry <i>(for ECIE)</i>
3.	U24CY202C	Engineering Chemistry <i>(for CSE)</i>
4.	U24CY202D	Engineering Chemistry <i>(for EEE)</i>
5.	U24CY202E	Engineering Chemistry <i>(for ECE)</i>

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): <i>This course will develop students' knowledge in /on...</i>			
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 homogenous 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
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			

Self-Learning Topics (SLTs): 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)]

UNIT-IV

9 Hrs

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

Self-Learning Topics (SLTs): 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)]

Course Learning Outcomes (COs):

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

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

Textbook(s):

- Grewal, B.S., *Higher Engineering Mathematics*, Khanna Publishers, Delhi, 44th edition, 2017 (Chapters 2,7,8)
- Kreyszig E, *Advanced Engineering Mathematics*, Inc, U.K, John Wiley & sons, 10th edition, 2020 (Chapter 8(8.2))

Reference Book(s):

- Spiegel M, *Vector Analysis -Schaum's Series*, McGraw Hill, 2nd edition, 2017
- S.S. Sastry, *Engineering Mathematics, Vol.II*, Prentice Hall of India, 3rd edition, 2014.
- Gilbert Strang, *Introduction to Linear Algebra*, Wellesley-Cambridge Press, 5th edition

Web and Video link(s):

- <https://youtu.be/L4crGhtEX14?si=hyjAPgDheJOhXtYZ> : NPTEL Video Lecture on Matrix Analysis with Applications/Dr.S.K.Gupta and Dr.Sanjeev Kumar/IIT Roorkee
- 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													
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	U24MH201.1	2	2	1	1	-	-	-	1	1	1	1	1	1	1
CO2	U24MH201.2	2	2	1	1	-	-	-	1	1	1	1	1	1	1
CO3	U24MH201.3	2	2	1	1	-	-	-	1	1	1	1	1	1	1
CO4	U24MH201.4	2	2	1	1	-	-	-	1	1	1	1	1	1	1
U24MH201		2	2	1	1	-	-	-	1	1	1	1	1	1	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

ENGINEERING CHEMISTRY (for CSE)

Class: B.Tech. II-Semester		Branches: CSE	
Course Code:	U24CY202C	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: engineering materials and spectroscopic techniques of chemical analysis			
LO4: polymers, principles of green chemistry 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, Weak acid vs weak base, Advantages of conductometric titrations; Galvanic cell, Electrode potential, Electrochemical series, Nernst equation; Potentiometric titrations-Acid base titrations and advantages of potentiometric titrations</p> <p>Batteries: Classification, Lead-acid battery, Li-ion battery</p> <p>Fuel cells: Hydrogen-oxygen fuel cell</p> <p><i>Self Learning Topics (SLTs): Types of conductors (Text 1: Jain & Jain: chapter 5 topic 1), Ohms law (Text 1: Jain & Jain: chapter 5 topic 5)</i></p>			
UNIT-II		9 Hrs	
<p>Applied Chemistry:</p> <p>Water Technology: 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 methods-Ion exchange method, Desalination processes, Reverse osmosis; Quality parameters of potable water (BIS and 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): Units of hardness (Text 1: Jain & Jain chapter 1 topic 5), Introduction to corrosion (Text 1: Jain & Jain: chapter 7 topic 1)</i></p>			
UNIT-III		9 Hrs	
<p>Engineering Materials: Nanomaterials-Introduction, Synthesis of nanomaterials-Top down and bottom-up approaches, Synthesis by sol-gel method; Nanoscale materials-Fullerenes, Carbon nanotubes and Graphene, Properties and applications, Biosensors</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): Introduction to nanotechnology (Text 1: Jain & Jain: chapter 37 topic 1), Electromagnetic spectrum (Text 1: Jain & Jain; chapter 35 topic 1)</i></p>			
UNIT-IV		9 Hrs	
<p>Polymers: Introduction, Monomer, Polymer, Types of polymerization reactions-Addition and condensation; Preparation, Properties and Applications-Polythene, Polyvinyl cyanide, Polyvinyl chloride, Bakelite, Nylon 6:6; Thermosetting resins and thermoplastic resins; Conducting polymers and their applications</p> <p>Green Chemistry: Principles of green chemistry, Synthesis of adipic acid by traditional pathway and green pathway; Green methods in electronic production, Impact of electronic waste on environment and public health</p> <p><i>Self Learning Topics (SLTs): Mechanism of addition polymerization (Text 1: Jain & Jain: chapter 3, topic 6); Alternative solvents for green synthesis ((Text 2: Jain & Jain: chapter 36, topic 5)</i></p>			

LABORATORY COMPONENT

List of Experiments

1. Estimation of hydroxide ion by acidimetry using standard sodium carbonate solution
2. Estimation of alkalinity of water sample containing (i) carbonate; (ii) carbonate & bi carbonate 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 (CH₃COOH) 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 ferrous (Fe²⁺) 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, 17th Edn., 2019 (chapters 1, 3, 5, 6, 7, 35, 36, 37)
2. Dornfeld, D.A., *Green manufacturing: fundamentals and applications*, Springer Science & Business Media, 2012 (chapters 5, 8, 9)

Reference Book(s):

1. J.C. Kuriacose and J. Rajaram, *Chemistry in Engineering and Technology* (vol. I), Tata Mc. Graw-Hills Education Pvt. Ltd., 2010
2. Shashi Chawla, *Text book of Engineering Chemistry*, 3rd Edn., Dhanpat Rai Publishers, 2003
3. S.S. Dara, S.S. Umare, *A Text book of Engineering Chemistry*, 12th Edn., S. Chand & Company Ltd., 2010

Web and Video link(s):

<https://learn.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: apprise manufacturing of engineering materials and spectroscopic techniques of chemical analysis

CO4: apprise the synthesis, applications of engineering materials and principles of green chemistry (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):		U24CY202C-ENGINEERING CHEMISTRY (for CSE)													
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	U24CY202C.1	2	-	-	-	1	1	1	1	1	1	1	1	1	1
CO2	U24CY202C.2	2	-	-	-	1	1	1	1	1	1	1	1	1	1
CO3	U24CY202C.3	2	-	-	-	1	1	-	1	1	1	1	1	1	1
CO4	U24CY202C.4	2	-	-	-	1	2	2	1	1	1	1	1	1	1
CO5	U24CY202C.5	2	1	-	-	-	1	-	1	1	1	1	1	1	1
CO6	U24CY202C.6	2	1	-	-	2	1	-	1	1	1	1	1	1	1
CO7	U24CY202C.7	2	1	-	-	-	1	-	1	1	1	1	1	1	1
CO8	U24CY202C.8	2	1	-	-	-	1	-	1	1	1	1	1	1	1
U24CY202C		2.00	1.00	-	-	1.20	1.12	1.33	1	1	1	1	1	1	1
3 - HIGH, 2 - MEDIUM, 1 - LOW															

OPERATING SYSTEMS

Class: B.Tech. II -Semester		Branch: CSE	
Course Code:	U24CS203	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: operating system services and its structure			
LO2: scheduling and process synchronization techniques			
LO3: deadlocks, memory management and virtual memory techniques			
LO4: file system organization , disk management and protection techniques			
UNIT-I			9 Hrs
Introduction: What operating systems do, Operating-system operations, Process management, Computing environments			
System Structures: Operating-system services, System calls, Types of system calls, System programs, Operating-system structure, System boot			
Process Concept: Process concept, Interprocess communication			
<i>Self Learning Topics (SLTs): Dual mode and multi mode operation (Text1: topics 1.5.1), Mobile computing and distributed systems (Text1: topics 1.11.2,1.11. 3), File management and device management (Text1: topics 2.4.2,2.4.3), Hybrid systems (Text1: topics 2.7.5), Threads (Text1: topics 3.1.4), Message-passing systems (Text1: topic 3.4.2)</i>			
UNIT-II			9 Hrs
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms – first- come first serve, Shortest-job-first, Priority, Round-robin			
Synchronization: Background, The critical-section problem, Peterson's solution, Synchronization hardware, Mutex locks, Semaphores, Monitors			
<i>Self Learning Topics (SLTs): Practice problems (Text1: Prob 6.3, 6.16, 6.17), Deadlocks and starvation and priority inversion (Text1: topics 5.6.3, 5.6.4), Implementing a monitor using semaphores (Text1: topic 5.8.3)</i>			
UNIT-III			9 Hrs
Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock			
Memory Management: Background, Swapping, Contiguous memory allocation, Segmentation, Paging, Structure of page table-hierarchical paging, Hashed page tables, Inverted pagetables			
Virtual-Memory Management: Background, Demand paging, Page replacement, Allocation of frames, Thrashing.			
<i>Self Learning Topics (SLTs): No preemption and circular wait (Text1: topics 7.4.3, 7.4.4), Detection-algorithm usage (Text1: topics 7.6.3), Resource preemption (Text1: topics 7.7.2), Dynamic loading and dynamic linking and shared libraries (Text1: topics 8.1.4, 8.1.5), Practice problems (Text1: Prob 7.3, 7.8, 7.9, 7.22, 7.23), Practice problems (Text1: Prob 9.8, 9.21, 9.30).</i>			
UNIT-IV			9 Hrs
File System: File concept, Access methods, Directory structure, Implementing file systems - Allocation methods, Free space management.			
Mass Storage Structure: Overview of mass storage structure, Disk structure, Disk scheduling, Disk management, Swap-space management.			
System Protection: Goals of protection, Principles of protection, Domain of protection.			
<i>Self Learning Topics (SLTs): Solid state disks and magnetic tapes (Text1: topics 10.1.2, 10.1.3), File types and file structure (Text1: topics 11.1.3, 11.1.4), Practice problems (Text1: Prob 10.11), An Example: UNIX, An example: MULTICS (Text1: topics 14.3.2, 14.3.3)</i>			

Course Learning Outcomes (COs):

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

CO1: build the operating system services and system calls

CO2: analyze CPU scheduling and synchronization algorithms

CO3: assess the deadlock related problems and memory management issues

CO4: develop the file, disk and system protection techniques

Textbook(s):

3. Abraham Silberschatz , Peter B Galvin, Gerg Gagne, "Operating System Concepts", Wiley , 10thEdition, ISBN-978-1-119-32091-3, 2018.

Reference Book(s):

1. Ekta Walia, "Operating System Concepts", Khanna Publishers, Delhi, 2nd Edition, ISBN-10: 9789380016658, ISBN-13: 978-9380016658,2019.
2. Dhananjay M. Dhamdhare, "Operating Systems A Concept-Based Approach", McGraw Hill Education, ISBN-10: 0072957697 ISBN-13: 978-0072957693,2008
3. William Stalling, "Operating Systems", Maxwell, McMillan International Editions, ISBN 81-203-1187-6, 1992.

Web and Video link(s):

1. <https://www.youtube.com/watch?v=jciGIvn7UfM&list=PLyqSpQzTE6M9SYI5RqwFYtFYab94gJpWk;>
NPTEL Video Lecture on Introduction to Operating Systems By Prof. Chester Rebeiro, IIT Madras.

Course Articulation Matrix (CAM):			U24CS203 OPERATING SYSTEMS												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U24CS203.1	2	1	2	1	-	-	-	1	1	1	1	2	2	2
CO2	U24CS203.2	3	2	2	2	-	-	-	1	1	1	1	2	2	2
CO3	U24CS203.3	3	2	2	2	2	-	-	1	1	1	1	2	2	2
CO4	U24CS203.4	2	2	2	1	2	1	-	1	1	1	1	1	2	2
U24CS203		2.5	1.7 5	2	1.5	2	1	-	1	1	1	1	1.75	2	2
3 - HIGH, 2 - MEDIUM, 1 - LOW															

DATA STRUCTURES THROUGH C

Class: B.Tech. II -Semester		Branch: CSE	
Course Code:	U24CS204	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/skiplist/), 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> <p><i>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)</i></p>			

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

<p>26. Program to implement insertion sort</p> <p>Experiment-XII</p> <p>27. Program to implement shell sort</p> <p>28. Program to implement radix sort</p> <p>29. Program to implement hash table.</p>
<p>Textbook(s):</p> <p>1. Debasis Samanta, <i>Classic Data Structures</i>, Prentice Hall India, 2nd edition, 2009</p>
<p>Reference Book(s):</p> <p>1. Reema Thareja, <i>Data Structures Using C</i>, Oxford University Press, 2nd edition, 2014</p> <p>2. Balagurusamy E, <i>Data Structure Using C</i>, McGraw Hill Education, 1st edition, 2017</p> <p>3. Richard F. Gilberg and Behrouz A. Forouzan, <i>Data Structures: A Pseudocode Approach with C</i>, Cengage Learning, 2nd Edition, 2007</p>
<p>Web and Video link(s):</p> <p>https://nptel.ac.in/courses/106106130; NPTEL Video Lecture on Programming and Data Structures Dr. N. S. Narayana Swamy, CSE, IIT Madras.</p>
<p>Laboratory Manual (for laboratory component):</p> <p>5. <i>Data Structures through C Laboratory Manual and Record Book</i>, Department of CSE, KITSW.</p>
<p>Course Learning Outcomes (COs):</p> <p><i>After completion of this course, the students should be able to,</i></p> <p><i>(based on cognitive skills acquired from theory component)</i></p> <p>CO1: analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities</p> <p>CO2: analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities</p> <p>CO3: analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities</p> <p>CO4: develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies</p> <p><i>(based on psychomotor skills acquired from laboratory component)</i></p>
<p>CO5: develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity</p> <p>CO6: apply the linear data structures such as stacks and queues and perform various operations using LIFO or FIFO order respectively</p> <p>CO7: solve problems using various linked list representations for efficiently storing and retrieving the data</p> <p>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</p>

Course Articulation Matrix (CAM):				U24CS204 DATA STRUCTURES THROUGH 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	U24CS204.1	2	2	2	1	-	-	-	1	-	1	1	1	2	1
CO2	U24CS204.2	2	2	2	2	-	-	-	1	-	1	1	2	2	2
CO3	U24CS204.3	2	2	2	2	-	-	-	1	-	1	1	2	2	2
CO4	U24CS204.4	2	2	2	2	-	-	-	1	-	1	1	2	2	2
CO5	U24CS204.5	2	2	2	1	-	-	-	1	1	1	1	1	2	1
CO6	U24CS204.6	2	2	2	2	-	-	-	1	1	1	1	2	2	2
CO7	U24CS204.7	2	2	2	2	-	-	-	1	1	1	1	2	2	2
CO8	U24CS204.8	2	2	2	2	-	-	-	1	1	1	1	2	2	2
U24CS204		2	2	2	1.75	-	-	-	1	1	1	1	1.75	2	1.75

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>			
LO1: basic grammar principles, reading speed, forming new words, making coherent paragraphs and also promoting ethical values for meaningful life.			
LO2: speaking or writing correct sentences, writing effective letters and improving their self-worth.			
LO3: critical reading ability, writing conclusive reports and additionally inculcating positive thinking.			
LO4: abridging varieties of lengthy texts and maintaining emotional balance.			
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-I), 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):			
<i>This course will develop students' knowledge in /on...</i>			
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
<u>Textbook(s):</u>			
B.K.Chaturvedi, <i>Rules and Skills of Games and Sports</i> , Publisher - Goodwill Publishing House, B-9, Rattan Jyoti, 18 Rajendra Place, New Delhi.			
<u>ReferenceBook(s):</u>			
Dr.Sakure Girish Madhaorao, <i>Foundation of Physical Education and Sports</i> , Sports Publication, New Delhi.			
<u>Web and Video link(s):</u>			
Badminton game Video Link: https://www.youtube.com/watch?v=HucIqi8Lw3E&t=22s			
Basketball game Video Link: https://www.youtube.com/watch?v=-tkE2lJoR58			
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 THROUGH CAD

Class: B. Tech. II –Semester		Branch: Common to all (except CE & ME)	
Course Code:	U24ME207	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-2-2-4	CIE :	100 %
Total Number of Teaching Hours:	36 Hrs	ESE :	-

Course Learning Objectives (LOs):

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

- LO1: AutoCAD commands, projections of points and straight line inclined to one plane
- LO2: projections of oblique planes
- LO3: projections of solids and sections of solids
- LO4: conversion of isometric, orthographic projections and simple circuits diagrams

LABORATORY COMPONENT

List of Experiments

1. Importance of Engineering Drawing, principles of engineering drawing, dimensioning; introduction to AutoCAD software-GUI, settings, standard toolbar, toolbars - draw, modify, dimension, properties, design centre and tool palettes
2. Introduction to orthographic projections-Vertical Plane, Horizontal plane; Views-Front view, Top view, and Side view and draw the Projection of points in different quadrants.
3. Draw the Projection of straight lines
4. Draw the Projection of planes
5. Draw the Projection of solids- Simple position(Axis perpendicular to HP or VP)
6. Draw the projections of solids inclined to both the planes
7. Draw the Sections of solids
8. Draw the Orthographic projections of given objects
9. Conversion of isometric view to orthographic projections
10. Draw the Isometric view from the given orthographic views
11. Draw the pictorial view (3D) from the given Isometric view
12. AutoCAD application in Electrical and Electronics circuits

Textbook(s):

1. Bhatt N.D., *Elementary Engineering Drawing*, Charotar Publishing House, Anand, India, 2017.
2. Kulkarni D. M., Rastogi A. P., and Sarkar A., *Engineering Graphics with AutoCAD*, PHI publisher, revised edition, July 2010.

Reference Book(s):

1. Dhananjay A Jolhe, *Engineering Drawing*, Tata Mc Graw- Hill, 2008.
2. Venugopal K. *Engineering Graphics with Auto CAD*, New Age International Publishers Ltd., Hyderabad, 2012.
3. Luzadder W.J and Duff J.M, *Fundamentals of Engineering Drawing*, Prentice-Hall of India, 1995.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc20_me79/preview NPTEL video link for *Engineering drawing and computer graphics* By Prof. Rajaram Lakkaraju, IIT Kharagpur.

Laboratory Manual (for laboratory component):

1. *Engineering Graphics through CAD Laboratory Manual & Record Book*, Dept. of ME, KITSW.

Course Learning Outcomes (COs)

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

CO1: draw projections of points and straight lines inclined to one plane with Auto CAD.

CO2: develop the projections of planes using Auto CAD

CO3: construct the projections of solids and sections of solids using Auto CAD

CO4: create orthographic and isometric projections and develop the simple electrical and electronic circuit using Auto CAD

Course Articulation Matrix (CAM): U24ME207 ENGINEERING GRAPHICS THROUGH CAD

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U24ME207.1	2	1	1	-	2	-	-	1	1	2	1	1	1	1
CO2	U24ME207.2	2	1	1	-	2	-	-	1	1	2	1	1	1	1
CO3	U24ME207.3	2	1	1	-	2	-	-	1	1	2	1	1	1	1
CO4	U24ME207.4	2	1	1	-	2	-	-	1	1	2	1	1	1	1
U24ME207		2	1	1	-	2	-	-	1	1	1	1	1	1	1

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:
 - **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 :

S.No.	Roll 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

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	U24EL209.1	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-2/ SELF ACCOMPLISHMENT ACTIVITY-2 (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 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:**
- 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 the external world in a professional, sensitive and culturally relevant manner

CO3: analyze 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 the 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 <i>(sum of best 6 quiz scores out of 10 quizzes. Each quiz evaluated for 10 marks)</i>	60 marks
Attendance <i>(out of 10 quizzes)</i>	20 marks
Report in prescribed format <i>(max 30% plagiarism)</i>	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:

- (e) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE
- (f) 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.
- (g) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE
- (h) 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															

Courses for exit after B.Tech I Year

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 CSE)

(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 CSE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CS211X	Java Programming	2	-	2	-	4	3
2	PCC	U24CS212X	Database Management	2	-	2	-	4	3
3	PCC	U24CS213X	Fundamental of Python Programming	2	-	2	-	4	3
4	PCC	U24CS214X	Computer Aided Software Engineering	2	-	2	-	4	3
5	PCC	U24CS215X	Web Designing	2	-	2	-	4	3
6	PCC	U24CS216X	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 CSE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE211XCS	Advanced Excel (NSIC Course)	-	-	6	-	6	3
2	SEC	U24SE212XCS	Web Development (NSIC course)	-	-	6	-	6	3
3	SEC	U24SE213XCS	Linux (NSIC course)	-	-	6	-	6	3
4	SEC	U24SE214XCS	Oracle SQL/PLSQL Programming (NSIC course)	-	-	6	-	6	3
5	SEC	U24SE215XCS	CCNA: Computer Networks Essentials	-	-	6	-	6	3
6	SEC	U24SE216XCS	Power BI (NASSCOM futureskills course)	-	-	6	-	6	3
7	SEC	U24SE217XCS	Foundational Course in Cyber Security (NASSCOM futureskills course)	-	-	6	-	6	3
8	SEC	U24SE218XCS	Any other skill-based course approved by BoS Chair and Dean AA	-	-	6	-	6	3

JAVA PROGRAMMING

Class: B.Tech. I Yr- (Exit Course)		Branch: CSE	
Course Code:	U24CS211X	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>			
LO5: java programming data types, operators, control statements, classes and objects			
LO6: java methods, constructors and strings			
LO7: types of inheritances and interfaces			
LO8: packages, streams (I/O), exceptional handling			
THEORY COMPONENT			
UNIT-I		4 Hrs	
Java Basics: History and evolution of java, An overview of java, Data types, Variables and arrays, Operators, Control statements.			
Introducing Classes: Class fundamentals, Objects, Methods, Object reference variables			
UNIT-II		4 Hrs	
Classes and Methods: Overloading methods, <i>this</i> keyword, Passing and returning objects, Recursion, Variable length arguments, Constructors, Overloading constructors, Garbage collection, <i>static</i> variables, <i>static</i> blocks and <i>static</i> methods, Nested and inner classes, Command line arguments, Wrapper classes.			
Strings: Exploring String, StringBuffer, StringBuilder, and StringTokenizer classes.			
UNIT-III		4 Hrs	
Inheritance: Inheritance basics, Types of inheritance, <i>super</i> keyword, Method overriding, Order of constructors calling, Dynamic method dispatch, Abstract classes, <i>final</i> with inheritance, Object class.			
Interfaces: Defining an interface, Implementing interfaces, Nested interfaces, Interfaces can be extended.			
UNIT-IV		4 Hrs	
Packages: Packages, Access protection, Importing packages.			
Using I/O: I/O basics, Reading, Writing and copying files using byte and character streams. Exception Handling: Fundamentals, Exception types, Uncaught exceptions, Using <i>try</i> and <i>catch</i> , Multiple catch clauses, Nested <i>try</i> statements, <i>throw</i> , <i>throws</i> , <i>finally</i> .			
LABORATORY COMPONENT			
List of Experiments			
13. Write programs to demonstrate different operators, control structures , switch statement, one dimensional and two-dimensional arrays in java.			
14. Develop programs to demonstrate class and object concepts, inner classes, garbage collection and static keyword.			
15. Write programs on command line arguments and wrapper classes			
16. Write programs on String, StringBuffer and StringTokenizer classes			
17. Develop programs on different types of inheritances			
18. Develop programs on abstract classes			
19. Write programs to implement interfaces			
20. Write programs to implement packages			
21. Develop programs on Exception handling			
22. Develop programs on files			
Textbook(s):			

1. Herbert Schildt, *Java The Complete Reference*, McGraw-Hill Education India Pvt. Ltd, 9th edition, 2014

Reference Book(S):

4. Kathy Sierra, Bert Bates, *Head First Java*, O'Reilly Publications, 2nd Edition, 2013

5. Uttam Roy K., *Advanced JAVA Programming*, Oxford Publications; 1st edition, 2013

Laboratory Manual (for laboratory component):

2. *Object Oriented Programming through Java laboratory manual and Record Book* Department of CSE

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 java object-oriented concepts in problem solving

CO2: develop java methods, constructors, and strings

CO3: apply reusability concepts like inheritance, dynamic method dispatch, and interfaces

CO4: develop packages, apply streams (I/O) and exception handling

(based on psychomotor skills acquired from laboratory component)

CO5 : implement java object-oriented concepts

CO6 : implement java methods, constructors, and strings

CO7 : apply reusability concepts like inheritance, dynamic method dispatch, and interfaces

CO8 : implement packages, apply streams (I/O) and exception handling

Course Articulation Matrix (CAM):								U18CS211X Java Programming						
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
U18CS211X.1	1	1	1	1	-	-	-	1	1	1	1	-	1	1
U18CS211X.2	2	2	2	1	-	-	-	1	1	1	1	2	2	1
U18CS211X.3	2	2	2	1	-	-	-	1	1	1	1	2	2	1
U18CS211X.4	2	2	2	1	-	-	-	1	1	1	1	2	2	1
U18CS211X.5	2	2	2	1	-	-	-	1	1	1	1	-	2	2
U18CS211X.6	2	2	2	1	-	-	-	1	1	1	1	2	2	2
U18CS211X.7	2	2	2	1	-	-	-	1	1	1	1	2	2	2
U18CS211X.8	2	2	2	1	-	-	-	1	1	1	1	2	2	2
U18CS211X	1.87	1.87	1.87	1	-	-	-	1	1	1	1	2	1.87	1.62

3 - HIGH, 2 - MEDIUM, 1 - LOW

DATABASE MANAGEMENT

Class: B.Tech. I Yr- (Exit Course)		Branch: CSE	
Course Code:	U24CS212X	Credits:	4
Hours/Week (L-T-P-O-E):	3-0-0-0-3	CIE:	60
Total Number of Teaching Hours:	32 Hrs	ESE:	40

Course Learning Objectives (LOs):

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

- LO1: SQL queries involved in the design and implementation of a database management system
- LO2: physical and logical database designs, database modelling and different database models
- LO3: distinct normalization techniques on database systems and query optimization technique
- LO4: database structure and build up essential DBMS concepts like database security, data integrity and concurrency control

THEORY COMPONENT

UNIT-I

4 Hrs

Databases and Database Users: Introduction, Characteristics of the database approach, Actors on the scene, Workers behind the scene, Advantages of using a DBMS, when not to use a DBMS.

Basic SQL: SQL Data Definition and Data Types, Specifying constraints in SQL, Basic retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL

UNIT-II

4 Hrs

Data modelling using the Entity-Relationship Model: Using high-level conceptual data models for database design, Entity types, Entity sets, Attributes and Keys, Relationships, Types, Relationship sets, Roles and structural constraints, Weak entity types, ER diagrams.

Relational Database Design by ER-and EER-to-Relational Mapping: Relational database design using ER-to-Relational mapping, Mapping EER model constructs to relations.

UNIT-III

4 Hrs

Database Design Theory and Normalization: Informal design guidelines for relation schemas, Functional dependencies, Normal forms based on primary keys, General definitions of second and third normal forms, Boyce-Codd normal form, Algorithms for relational database schema design, Multivalued dependency and fourth normal form, Join dependencies and fifth normal form.

Query Processing and Optimization: Translating SQL queries into relational algebra, Using heuristics in query optimization.

UNIT-IV

4 Hrs

Introduction to Transaction Processing Concepts and Theory: Introduction to transaction processing, Transaction and system concepts, Desirable properties of transactions, Characterizing Schedules Based, Characterizing Schedules Based on Serializability.

Concurrency Control Techniques: Two-Phase Locking techniques for concurrency control, Concurrency control based on Timestamp Ordering.

LABORATORY COMPONENT

List of Experiments

23. Queries using DDL, DML, TCL and DCL commands.
24. Queries on column level and table level constraints.
25. Queries using built-in functions of NUMBER, CHARACTER, DATE Datatypes.
26. Queries on Data type conversion functions, single row functions and operators.
27. Queries on aggregate functions.
28. Queries on joins and nested queries.
29. Write sample PL/SQL programs using conditional, iterative statements and cursors.
30. Write PL/SQL programs to handle exceptions.
31. Write PL/SQL programs using stored procedures and functions.

32. Write PL/SQL programs for creating packages and triggers.

Textbook(s):

1. Ramez Elmasri and Shamkanth B. Navathe, "Fundamentals of Database Systems", Pearson Education, 6th Edition, ISBN-13: 978-0-136-08620-8, 2010.

Reference Book(S):

1. Raghuram Ramakrishnan and Johannes Gehrke, "Database Management Systems ", McGraw-Hill Education, 3rd Edition, ISBN-13: 978-0072465631, 2002.
2. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 3rd Edition, ISBN: 0-07-114810-8, 1997.
3. Thomas Connolly and Carolyn Begg, "Database Systems", Pearson Education, 3rd Edition, ISBN: 81-7808-861-4, 2003.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc22_cs91/preview; NPTEL Video Lecture on Database Management System by Prof. Partha Pratim Das, Prof. Samiran Chattopadhyay | IIT Kharagpur

Laboratory Manual (for laboratory component):

3. Database Management Systems Laboratory Manual, Prepared by the faculty of Department of CSE.

Course Learning Outcomes (COs)

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

CO1: design the database management system effectively

CO2: design the databases, which includes Enhanced Entity Relationship model.

CO3: optimize the database by using normalization and query optimization techniques to avoid redundancy and maintain the performance of database.

CO4: manage multi-level security, correctness of data and control over access on database.

(based on pragmatic skills acquired from laboratory component)

CO5: execute SQL queries using DDL/DML/TCL/DCL commands to create and manipulate data in database by enforcing constraints

CO6: implement various database objects using SQL queries

CO7: implement block structured programming with cursors to enable traversal over the records of the database

CO8: implement pre-compiled stored programs, run-time errors checking, database objects collection in PL/SQL packages and high-level security using triggers

Course Articulation Matrix (CAM):			U24CS212 DATABASE MANAGEMENT													
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	PSO 3
CO1	U24CS212X.1	2	2	2	2	1	-	-	1	-	1	1	2	1	2	2
CO2	U24CS212X.2	2	2	2	2	1	-	-	1	-	1	1	3	1	3	3
CO3	U24CS212X.3	2	2	2	2	1	-	-	1	-	1	1	2	1	2	2
CO4	U24CS212X.4	2	2	2	2	1	-	-	1	-	1	1	3	1	2	2
CO5	U24CS212X.5	2	2	2	2	2			1	1	1	1	2	2	1	2
CO6	U24CS212X.6	2	2	2	2	2			1	1	1	1	2	2	1	2
CO7	U24CS212X.7	2	2	2	2	2			1	1	1	1	2	2	1	3
CO8	U24CS212X.8	2	2	2	2	2			1	1	1	1	2	3	1	3
U24CS212		2	2	2	2	1.5	-	-	1	0.5	1	1	2.2	2.6	2.6	2.35
3 - HIGH, 2 - MEDIUM, 1 - LOW																

FUNDAMENTALS OF PYTHON PROGRAMMING

Class: B.Tech. I Yr- (Exit Course)		Branch: CSE	
Course Code:	U24CS213X	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>			
LO9: python programming operators, control statements & functions			
LO10: namespaces, modules, string handling methods & collections			
LO11: object oriented programming, files & database			
LO12: Numpy and Pandas			
THEORY COMPONENT			
UNIT-I			4 Hrs
<p>Python Preliminaries: Literal constants, Variables and identifiers, Data types, Input operation, Comments, Reserved words, Indentation, Operators, Expressions in Python, Type conversion</p> <p>Decision Control Statements: Selection/Conditional branching statements, Loop structures/iterative statements, Nested loop, The continue statement, The pass statement, The else statement used with loops</p> <p>Functions: Function definition, Function call, Variable scope and lifetime, The return statement, Advances in defining in functions, Lambda functions, Recursive functions</p>			
UNIT-II			4 Hrs
<p>Modules and Name Spaces: The from...import statement, Naming module, The dir() function, Packages in Python, Standard library modules, globals(), locals(), and reload(), Function redefinition</p> <p>Python Strings: String operations, String formatting operator, Built-in string methods and functions, slice operation, ord() and chr() Functions, in and not in operators, Comparing strings, Regular expressions</p>			
UNIT-III			4 Hrs
<p>Data Structures: Sequences, Lists, Tuple, Sets, Dictionaries</p> <p>Files: Opening and closing files, Reading and writing files, File positions, Renaming and deleting files, Directory methods</p> <p>Database Connectivity: Database browser for SQLite, creating a database table, Insert and retrieve data from database</p>			
UNIT-IV			4 Hrs
<p>NumPy: The basics of NumPy arrays, Array indexing, Array slicing, Reshaping of array, Concatenation and splitting arrays, Introducing UFuncs</p> <p>Data Manipulation with Pandas: Installing and using Pandas, Introducing Pandas objects, data indexing and selection, Handling missing data, Combining datasets, Merge and join, Aggregation and grouping</p>			

LABORATORY COMPONENT

List of Experiments

33. Python installation, path verification and running python script on command prompt
34. Python programs on control statements and iterative statements
35. Python programs on functions, variable arguments and lambda functions
36. Python programs on implementing modules and namespaces
37. Python programs on collections: Strings and Regular expressions
38. Python programs on collections: List, Tuples, Sets and Dictionaries
39. Python programs on implementing object-oriented programming
40. Python programs on File operations and exception handling
41. Python programs to implement database connectivity
42. Python programs to demonstrate Numpy Package and related operations

Textbook(s):

2. Reema Thareja, *Python Programming using problem solving approach*, New Delhi: Oxford University Press, 2017.
3. Jake VanderPlas, *Python Data Science Handbook- Essential Tools for Working with Data*, California: O'Reilly Media Inc., 2016. (Chapter 2 to 4)

Reference Book(S):

4. Dr. Charles R. Severance, *Python for Everybody-Exploring Data Using Python*, open book, 2016.
5. David Beazley, *Python Cookbook*, 3rd ed. California: O'Reilly Media, Inc., 2013.
6. Caleb Hattingh, *20 Python Libraries You Aren't Using (But Should)*, 2nd ed. California: O'Reilly Media, Inc., 2016.
7. Magnus Lie Hetland, *Beginning: From Novice to Professional*, New York City: Apress, 2005

Web and Video link(s):

[ps://onlinecourses.nptel.ac.in/noc24_cs113/preview](https://onlinecourses.nptel.ac.in/noc24_cs113/preview): NPTEL Video Lecture on The Joy of Computing using Python by Prof. Sudarshan Iyengar, Professor of CSE, IIT Ropar.

Laboratory Manual (for laboratory component):

4. *Python Programming laboratory manual*, 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: apply python control statements, operators and functions for problem solving

CO2: develop programs using collections, namespaces, packages & strings

CO3: analyse object-oriented programming principles, files & databases

CO4: apply packages like Numpy or Pandas for statistical analysis & data handling

(based on psychomotor skills acquired from laboratory component)

CO5: develop python programs using operators, control statements & functions

CO6: implement packages, string handling methods and collections

CO7: build new classes, create objects, perform operations on files and databases

CO8: develop statistical & data handling applications using packages Numpy and Pandas

Course Articulation Matrix (CAM):															
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	U24CS213X.1	2	2	1	1	2	1	-	1	-	1	1	-	2	1
CO2	U24CS213X.2	2	2	2	1	2	1	-	1	-	1	1	-	2	1
CO3	U24CS213X.3	2	2	2	2	2	1	-	1	-	1	1	2	3	2
CO4	U24CS213X.4	2	2	2	2	3	1	-	1	1	1	1	2	2	2
CO5	U24CS213X.5	2	2	2	2	2	-	-	1	1	1	1	-	2	2
CO6	U24CS213X.6	2	2	2	2	2	-	-	1	1	1	1	-	2	2
CO7	U24CS213X.7	2	2	2	2	2	-	-	1	2	1	1	1	3	3
CO8	U24CS213X.8	3	2	2	2	3	-	-	1	2	1	1	2	2	3
U24CS213X		2.1	2	1.8	1.75	2.25	0.5	-	1	0.875	1	1	0.87	2.25	2
3 - HIGH, 2 - MEDIUM, 1 - LOW															

COMPUTER AIDED SOFTWARE ENGINEERING

Class: B.Tech. I-Yr (Exit Course) **Branch:**CSE

Course Code:	U24CS214X	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):

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

- LO13:** software and software process models
- LO14:** software requirement, design concepts and patterns
- LO15:** software design principles and test strategies
- LO16:** software quality and risk management

THEORY COMPONENT

UNIT-I	4 Hrs
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Software Engineering Concepts: The changing nature of software, Software application domains, Legacy software, Software myths, Software engineering layered technology, A process framework, The capability maturity model integration (CMMI), Agile software

Process Models -Prescriptive process models, RAD model, Specialized process models, Unified process model, Personal and team process models

Agile Development: Agility and the cost of change, Agile process, Extreme programming, Other agile process models

Software Engineering Practices: Communication principles, Planning principles, Modeling principles, Construction principles, Deployment principles

UNIT-II	4 Hrs
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Requirements Engineering Tasks:Requirements analysis and modeling strategies, User requirement, System requirement, Software requirements document

Design Engineering: Design within the context of software engineering, Design process, Design concepts, The design model

Architectural Design:Creating an architectural design - Software architecture, Architectural genres, Architectural styles, Architectural design, Assessing alternative architectural designs.

UNIT-III	4 Hrs
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User Interface Design: The golden rules, User interface analysis and design, Interface analysis, Interface design steps, WebApp and mobile interface design

Testing Strategies: Software testing fundamentals, Test strategies for conventional software, Test strategies for object-oriented software, Validation testing, System testing, The art of Debugging, White box testing, Basis path testing, Control structure testing, Black box testing

Testing Web Applications:Testing concepts, The testing process, Content testing, User interface testing, Component-level testing, Navigation testing, Configuration testing, Security testing, Performance testing

UNIT-IV	4 Hrs
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Product Metrics: Measures, Metrics and indicators, Metrics for the requirements model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance

Process and Project Metrics: Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software process, The W5HHI principle

Risk Management: Reactive versus Proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, RMMM plan

LABORATORY COMPONENT

List of Experiments

Experiment-I

- Project scheduling using Microsoft project management tool
- Project estimation using Microsoft project management tool

Experiment-II

Construct Use case and Class diagrams for the following

- Online shopping
- Banking system
- Cab dispatching system

Experiment-III

Construct Collaboration and Sequence diagrams for the following

- Librarian issues books to student
- Mobile phone

Experiment-IV

Construct Activity and State chart diagrams for the following.

- ATM transaction
- Ticket machine
- Credit card processing

Experiment-V

- Case study: Develop class diagram of Unified library application and model it in different views i.e. logic view, component view, deployment view, database design and perform forward & reverse Engineering

Experiment-VI

- Manual testing: Take any system (e.g. ATM system) and study its system specifications and report the various bugs

Experiment-VII

- Introduction to Selenium Testing Tool
- Exploring Features of Selenium

Experiment-VIII

- Test a web application using Selenium in NetBeans IDE

Experiment-VIII

- Test a web application using Selenium in Net

Experiment-IX

- Working with Selenium Integrated Environment-Execution of IDE Commands
- Selenium IDE locating strategies (validation of GUI components)

Experiment-X

- Selenium IDE test case execution
- Implement GUI tests (a web application's User Interface) using Selenium IDE

Textbook(s):

4. Roger S.Pressman and Bruce R.Maxim, "Software Engineering: A Practitioner's Approach" , 9th ed., NewDelhi: McGraw Hill, 2020

Reference Book(S):

1. Ian Sommerville, "Software Engineering", 10th ed., Delhi:Pearson Education, 2020
2. Deepak Jain, "Software Engineering: Principles and Practices", 3rd ed., Delhi: Oxford University Press, 2008
3. PankajJalote, "Software Engineering: A Precise Approach", NewDelhi:Wiley India, 2010
4. Waman S. Jawadekar, "Software Engineering: A Primer", NewDelhi:TataMcgraw Hill, 2008

Web and Video link(s):

[ps://onlinecourses.nptel.ac.in/noc24_cs119/announcements?force=true](https://onlinecourses.nptel.ac.in/noc24_cs119/announcements?force=true); NPTEL Video Lecture on Software Engineering by Prof. Rajib Mall is Professor, Department of Computer Science and Engineering,

Laboratory Manual (for laboratory component):

5. CASE Tools Laboratory Manual, 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: design the appropriate software model for a given application

CO2: develop different types of software designs & patterns

CO3: apply an appropriate testing method for a software application

CO4: asses the quality of software and analyze the risk management in project scheduling

(based on psychomotor skills acquired from laboratory component)

CO5: create schedule, cost estimation of the software project using Microsoft project management tool, and construct analysis model using unified modelling approach

CO6: design a software system using unified modelling approach

CO7: test with Selenium tool to improve the quality of the project/product being developed

CO8: apply Test director and Test Link testing tools for traceability and test management

Course Articulation Matrix (CAM):		U24CS214X SOFTWARE ENGINEERING													
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U24CS214X.1	1	1	1	1	-	-	-	-	1	1	2	1	2	1
CO2	U24CS214X.2	1	1	1	1	-	-	-	-	1	1	2	1	1	1
CO3	U24CS214X.3	2	2	1	1	-	1	1	-	1	1	2	1	2	1
CO4	U24CS214X.4	2	2	2	2	-	1	1	-	1	1	2	1	2	1
CO5	U24CS214X.5	2	2	2	2	-	-	-	1	1	1	1	1	2	1
CO6	U24CS214X.6	2	2	2	2	2	-	-	1	1	1	1	1	2	2
CO7	U24CS214X.7	2	1	2	2	2	-	-	1	1	1	1	1	2	1
CO8	U24CS214X.8	1	2	2	2	2	-	-	1	1	1	1	1	2	2
U24CS214X		1.6	1.6	1.6	1.6	2.0	1.0	1.0	1.0	1.0	1.0	1.5	1.0	1.9	1.3
3 - HIGH, 2 - MEDIUM, 1 - LOW															

WEB DESIGNING

Class: B.Tech. I Yr (Exit Course)		Branch: CSE	
Course Code:	U24CS215X	Credits:	3
Hours/Week (L-T-P-O-E):	2-0-2-0-4	CIE Marks (%):	50
Total Number of Teaching Hours:	32 Hrs	ESE Marks (%):	50

Course Learning Objectives (LOs):

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

LO17: HTML Tags and CSS properties for designing a static webpage

LO18: JavaScript to design a dynamic webpage

LO19: PHP to develop server-side scripts for web applications

LO20: interoperation of PHP and MYSQL to build web applications

THEORY COMPONENT

UNIT-I

4 Hrs

HTML: Document structure, Basic tags, Creating headings, Working with links, Creating paragraph, Working with images, Tables, Frames. Introduction to forms and controls: Creating HTML form, Specifying action URL and method to send the form, Using HTML controls.

CSS: CSS (Cascading style sheet) rules and properties, Types: Inline, External and internal style sheets, Style classes, Multiple styles.

UNIT-II

4 Hrs

JAVASCRIPT: JavaScript syntax, Embedding JavaScript in HTML page. Usage of variables, Working with operators, Control-flow statements, Functions and array, Creating objects, Handling events.

UNIT-III

4 Hrs

Introduction to PHP: Overview of PHP, Advantages of PHP over scripting languages, Creating and running a PHP script, handling errors. Working with variables and constants: Variables, Data types and operators. Controlling program flow: Conditional statements, Looping statements, Break, Continue and exit statements. Working with functions, Arrays.

UNIT-IV

4 Hrs

Database using PHP: Exploring relational database model, records and primary keys. Working with sql statements. Using PHP and MySql: Checking configuration, connecting to database, Selecting a database, Adding and altering a table in a database, Inserting and modifying data in a Table, Retrieving data from a table.

Working with Forms: Web forms and form elements, processing a web form, validating a web form.

LABORATORY COMPONENT

List of Experiments

43. Design the following static web pages with the following attributes:
 - a. BasicTags., b. HeadingTags., c.List (Ordered andUn-Ordered),d. Textbox,Buttons.
44. Design the following static web pages required for an online book store web site.
 HOMEPAGE, LOGINPAGE
45. The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

A. Snap shot of Cover Page. B. Author Name and Publisher.

46. Design a registration form and validate its field by using JavaScript.
47. To design the scientific calculator and make event for each button using JavaScript.
48. JavaScript program to validate username and password
49. Write a HTML file to create a simple form with 5 input fields (Name, Password, Email, Pin code, Phone No. and a Submit button) and demonstrate required field validations to validate that all input fields are required and display error messages if the above validations do not hold.
50. Design a server side script with functions and arrays in PHP
51. Design a PHP program to elicit different ways to connect to MySQL
52. Create a Create, Read, Update, Delete operations for PHP Page using MySQL

Textbook(s):

5. Kogent, "Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML", 1st Edition, Dreamtech Press (Black Book), ISBN-13:9789351192510,2013.

Reference Book(S):

8. Ivan Bayross, "Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP", 4th Edition, BPB Publications, ISBN-13: 978-8183330084, 2009,
9. Uttam K. Roy, "Web Technologies", 7th Edition, Oxford Higher Education, ISBN-10: 0-19-806622-8, ISBN-13: 978-0-19-806622-4, 2010
10. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 3rd Edition, Sams Publications, ISBN: 0-672-32672-8, 2005

Web and Video link(s):

Laboratory Manual (for laboratory component):

6. *Web Designing laboratory manual*, 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: design a static web pages using HTML Tags and CSS properties

CO2: design a dynamic web pages using JavaScript.

CO3: develop web server side applications using PHP concepts

CO4: develop enterprise databases for web-based applications using PHP and MySQL. *(based on psychomotor skills acquired from laboratory component)*

CO5 : implementing HTML Tags and CSS for creating static web pages

CO6: design dynamic web page for web applications using JavaScript

CO7: design a web base application in PHP.

CO8 : creating different web applications using PHP and MySQL

Course Articulation Matrix (CAM):		U24CS215X Web Designing													
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	U24CS215X.1	2	2	2	1	2	1	-	1	2	1	2	1	2	2
CO2	U24CS215X.2	2	2	2	1	2	1	-	1	2	1	2	1	2	2
CO3	U24CS215X.3	2	2	2	1	2	1	-	1	2	1	2	1	2	2
CO4	U24CS215X.4	2	2	2	1	2	1	1	1	2	1	2	1	2	2
CO5	U24CS215X.5	2	2	2	1	2	1	-	1	2	1	2	1	2	2
CO6	U24CS215X.6	2	2	2	1	2	1	-	1	2	1	2	1	2	2
CO7	U24CS215X.7	2	2	2	1	2	1	-	1	2	1	2	1	2	2
CO8	U24CS215X.8	2	2	2	1	2	1	1	1	2	1	2	1	2	2
U24CS215X		2	2	2	1	2	1	0.25	1	2	1	2	1	2	2
3 - HIGH, 2 - MEDIUM, 1 - LOW															