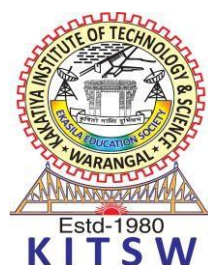


B.TECH.CURRICULUM
ACADEMIC YEAR: 2024-25

**DEPARTMENT OF COMPUTER SCIENCE AND
ENGINEERING (INTERNET OF THINGS)**

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

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



KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL-506015 TELANGANA
(UGC Autonomous Institute Under Kakatiya University, Warangal)

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (INTERNET OF THINGS)

History:

PROGRAM	DESCRIPTION	
	INTAKE	NBA ACCREDITATION
UG in B.Tech. Computer Science and Engineering (Internet of Things)	- Started with 60 seats in 2020 - Intake increased to 120 in 2022 - Intake decreased to 60 in 2024	NA

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 (IOT): VISION AND MISSION

VISION

Develop the department into a full-fledged center of learning in various fields of Computer Science and Engineering (Internet of Things) in pursuit of excellence in Education, Research, Entrepreneurship and Technological services to the society.

MISSION

M1:	Imparting quality education to develop innovative and entrepreneurial professionals fit for globally competitive environment
M2:	To nurture the students in the field of Computer Science and Engineering (Internet of Things) with an overall back-ground suitable for attaining a successful career in higher education, research and industry.

M3:	Encourage students to analyze, design, and experiment with contemporary research problems fostering a sense of unity and national integrity while addressing global socio-economic, political, and environmental challenges.
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PROGRAM EDUCATIONAL OBJECTIVES

- Technical Competence:**
- PEO1:** Apply the fundamental knowledge of the core courses of computer science & Engineering and Internet of Things (IoT) for developing the effective software and smart applications.
- Successful Career**
- PEO2:** Excel in profession, higher education and entrepreneurship with updated technologies in software, Internet of things and industrial based domains.
- Soft Skills and Life-long Learning**
- PEO3:** Exhibit professional ethics, effective communication, and teamwork in solving engineering problems by adapting contemporary research towards sustainable development of society.

PEO TO MISSION MAPPING

	M1	M2	M3
PEO1	3	3	2
PEO2	2	2	3
PEO3	3	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. Therefore, it contributes to PEO1.

PEO Statements	Mission Statements	Mapping Level	Justification
PEO2	M1	2	A deep understanding of core principles in IoT is foundational for a successful career. Mastery of these principles ensures that graduates are well-prepared for various professional roles, higher education, 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	Addressing contemporary research challenges and contributing to innovative solutions prepare students for high-impact careers. The ability to solve global issues using IoT 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	3	While M1 primarily focuses on technical knowledge, understanding core principles also indirectly supports the development of professional ethics and effective communication. This foundational knowledge is essential for teamwork and problem-solving in professional settings.
	M2	2	M2's emphasis on continuous learning, communication, and managerial skills is directly relevant to PEO3. The focus on professional ethics and embracing new technologies supports life-long learning and the development of soft skills necessary for effective teamwork and social innovation.
	M3	3	Engaging students in real-world research challenges and encouraging them to address global issues inherently require teamwork, effective communication, and ethical considerations. This mission strongly supports the development of soft skills and fosters a commitment to life-long learning, making it highly relevant to PEO3.

PROGRAM SPECIFIC OBJECTIVES

PS01: Software Development, Quality assurance and	Apply fundamental knowledge of computer science and engineering to develop effective software solutions for real-world complex engineering problems, utilizing advanced technologies and designing Internet of Things (IoT) based smart
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Maintenance	applicationswithcontemporaryhardwareandsoftwaretools.
PS02: Immediate professionalpractice	Design and implement industrial IoT-based solutions to improve operational efficiency by investigating existing industrial environments.

PO/PSOTOPEOMAPPING

PO's		PE01	PE02	PE03
P01	EngineeringKnowledge	3	1	3
P02	ProblemAnalysis	3	1	3
P03	Design/Developmentofsolutions	3	2	3
P04	Conductinvestigationsofcomplex problems	3	1	3
P05	Engineeringtoolusage	3	2	3
P06	TheengineerandTheWorld	1	3	1
P07	Ethics	2	3	3
P08	IndividualandCollaborativeTeamwork	3	3	2
P09	Communication	2	3	3
P010	ProjectmanagementandFinance	1	2	2
P011	Life-LongLearning	3	2	3
PS01	Apply fundamental knowledge of computer science and engineering to develop effective software solutions for real-world complex engineering problems, utilizing advanced technologies and designing Internet of Things (IoT) based smart applications with contemporary hardware and software tools.	3	3	2
PS02	Design and implement industrial IoT-based solutions to improve operational efficiency by investigating existing industrial environments.	3	3	2

DESIGN OF CURRICULUM

Salient Features

- The URR24 regulations are in line with the National Education Policy 2020 (NEP 2020) and the AICTE model curriculum to provide multidisciplinary holistic education to produce well-rounded engineering graduates.
- Multiple Entry Multiple Exit (MEME) option.
- Multidisciplinary four year UG programme with award of following degrees
 - B.Tech
 - B.Tech with "Minor"
 - B.Tech "Honours"
 - B.Tech "Honours with Research"
- 170+ Credit Liberal Engineering Education.
- A strong program core of 19 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, ensure strong science, mathematics foundation and program core, develop expertise in domain vertical through sequel of electives, ensure significant exposure of additional discipline through "Minor" programme, challenge good learners through "Honours" programme and 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 classwork (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, offer 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 three 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 studied in a corresponding semester. The experiential learning is continued in the form of a Seminar in fifth semester, a mini project in sixth semester, major project in seventh & eight semesters and mandatory 6-8 week internship during summer breaks.

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

Example: The project work under PRACTICUM for the course PPSC may be

1. Cricket Score Board
2. Phone Book
3. Quiz Game
4. Stock Management system
5. Dice Rolling Simulator
6. Word guessing game

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

ProgramCoreCourses(PCC)

The curriculum offers nineteen 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.

ProgramElectiveCourses(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.

(Note to HoDs: For example, the CSE(IOT) programme shall offer verticals in “Cloud Computing”, “Cybersecurity”, “Machine Learning” and “Data Science”)

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 mini courses 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 features of the NEP 2020

“The need of the 21st century requires 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, ethics of personal and social engagement. Activity based liberal learning courses covering life, literature, and culture are added. Every learner is expected to take one such course in the first four semesters. We strongly believe that these four liberal learning modules will expose the learners to holistic education as envisaged in NEP 2020.

(END OF THE SALIENT FEATURES OF URR24)

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

1. Title:

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

2. Scope:

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

3. Duration of Programmes:

The undergraduate degree should be of four years duration, with multiple entry and multiple 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(IOT); UG Diploma in CSE(IOT) after the study of two academic years (four semesters); and B. Voc in CSE(IOT) 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(IOT) degree with optional Minor/Honours/ Honours with Research.

4. Credit Requirements:

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

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

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

5. Commencement:

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

NHEQF Level	Programme	From Academic Year
Undergraduate Programme		
Level 4.5	Undergraduate Certificate (One year or two semesters)	2024-25
Level 5	Undergraduate Diploma (Two years or four semesters)	2025-26
Level 5.5	Bachelor's Degree (Three years or six semesters)	2026-27

Level6	Bachelor'sDegreewithHonours/Research(Four yearsoreightsemesters)	2027-28
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6. Eligibility Criteria:

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

7. Academic Bank of Credits (ABC):

The Academic Bank of Credits (ABC), a National-level facility promotes the flexibility of curriculum framework and interdisciplinary/ multidisciplinary academic mobility of students across the higher educational institutes (HEIs) in the country with appropriate “credit transfer” mechanism. It is a 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.

Operationalization of ABC:

Institute 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 credit 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 credit 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 shelflife, 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

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 teacher 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 way 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 experience.
- (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 background.
- (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, mini-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 classroom 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 NEP 2020

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(IOT)	The student should be employable as Technical Assistant (CSE(IOT)) in any industry/organization.
2.	Second Exit	After completion of Second year.	UG Diploma in CSE(IOT)	The student should be employable as Technician (CSE(IOT)) in any industry/organization.
3.	Third Exit	After completion of Third year.	B.Voc in CSE(IOT)	The student should be employable as Technical Supervisor (CSE(IOT)) in any industry/organization.
4.	Normal Exit	After completion of Fourth year.	B.Tech in CSE(IOT)	The student should be employable as an Engineer (CSE(IOT)) in any relevant industry/organization.

MULTIPLE ENTRY OPTIONS

Sl. No.	Entry Descriptions	Entry Point	Eligibility
1.	Normal (First) Entry	I-Sem. Of the program	As per the TGCH E 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(IOT) from our institute.
3.	Third Entry	V-Sem. Of the program	The successful completion of UG Diploma in CSE(IOT) from our institute.
4.	Fourth Entry	VII-Sem. Of the program	The successful completion of B. Voc in CSE(IOT) from our institute.

- (i) **No.ofmaximumexits:**asperNEP2020/UGC/AICTEguidelinesonMEME
- (ii) **No.ofmaximumentry:**asperNEP2020/UGC/AICTEguidelinesonMEME
- (iii) **Maximumgapbetweenexitandentry:**as per NEP2020/UGC/AICTE guidelines onMEME
- (iv) **AcademicBankofCreditsshallbemaintained**

11. OptionsforDegreeCertificate

(i). Learners who earn a minimum of total 168 credits will be **awarded “B.Tech”degree whichconfirms to NEP2020 requirements of multidisciplinary holistic education.**

(ii). FastLearnerswillhavethefollowingoptionstoearn**B.TechdegreewithHonours/Minor.**

a) B.Techwith“Minor”degree(withadditional18credits):168+18 Credits

Students opting forMinordegree in identified cutting-edge technologies offeredby other departments, have to successfully complete four theory courses (each of 4 credits)andtwolabcourses(eachof1credit)duringthesemesterbreak.Onetheory &One lab course have to completed during 5thand 6thsemesters. During 7thand 8thsemestersonetheorycourseistobecompleted.Allfourtheorycourseswillhaveto be completed through MOOCS and lab courses will be offered by respective department offering the Minor Degree.

b) B.Techwith“Honours” degree(withadditional18credits):168+18 Credits

Students opting for Honours degree have to successfully complete four theory courses(eachof4credits)andtwolabcourses(eachof1credit)asperthespecified list of subjects by their own department. One theory&One lab course have to completed during 5thand 6thsemesters. During 7thand 8thsemesters one theory coursetoisbecompleted.Allfourtheorycourseswillhavetobecompletedthrough MOOCS and lab courses will be offered by respective department offering the Honours Degree.

c) B.Tech–“HonourswithResearch”degree(withadditional18creditsbyresearch): 168+18 credits

Studentsareexpectedtocomplete2-monthsresearchinternshipinsummerafter 2ndyear(5credits),3rdyear(5credits)andworktowardsindividualresearch based project during 4thyear. They have to complete one course on“Research Methodology” through MOOCS an complete a one week FDP on “Research Methodology”,during7thsemester(4credits)andfinallypublisharesearchpaper inajournalindexedbySCI/SCOPUS/WEBOFSCIENCE(4credits).

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

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

	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech	21	23	23	24	23	22	21	15	172
B.Tech with Minor	21	23	23	24	23+5*	22+5*	21+4*	15+4*	172+18*
B.Tech with Honours	21	23	23	24	23+5*	22+5*	21+4*	15+4*	172+18*
B.Tech Honours with Research	21	23	23	24	23+5*	22+5*	21+5*+4*	15+4*	172+18*

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

Options for earning of "Additional Points" for Honours certification

S.No.	Activity	Pointsearned		MaximumLimit
1	SuccessintheGATEExam	Percentile	Points	8Points
		Above98	8	
		Above95	6	
		Above90	4	
		Qualified	2	
2	ResearchPublicationindexedby SCI/SCOPUS/WebofScience*	SCIJournal:8Points		8Points
		SCOPUS / Web of Science Journal: 4 Points		
		Patent:4Points		
3	WinningPrestigiousTechnical Competition at National Level#	Rank	Points	6Points
		1	4	
		2	3	
		3	2	
4	CompletionofPGlevelMOOCS	Percentile	Points	6Points
		Above95	6	
		Above90	5	
		Above80	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 (HSMC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	HSM01	U24MH105	English Communication and Report Writing	I	2
2.	HSSM-02	U24MH508	Technical English	V	1
3.	HSMC03	U24MB505X	Management Course Basket	VI	3

For Example: (sample Courses)

(i) English for Technical Writing

(ii) Management/Economics/Accounting/Taxation)

(ii) Basic Science Courses (BSC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	BSC01	U24MH101	Differential Calculus and Ordinary Differential Equations	I	3
2.	BSC02	U24CY102B	Engineering Chemistry	I	4
3.	BSC03	U24MH201	Matrix Theory and Vector Calculus	II	3
4.	BSC04	U24PY202B	Engineering Physics	II	4
5.	BSC05	U24MH301C	Probability, Statistics and Discrete Mathematics	III	3

For Example: (sample Courses)

BSC 01: Physics (Mechanics & Mechanics of Solids)

Branch specific, Ex: Civil Engineering-

BSC 02: Mathematics-I

BSC 03: Chemistry -I

BSC04: Mathematics-II

BSC05: Biology for Engineers

BSC 06: Mathematics for _____ Engineering

(iii) Engineering Science Courses (ESC)

Sr.No.	Course Type	Course Code	Course Name	Semester	Credits
1.	ESC01	U24CI111	Digital Logic Design	I	3
2.	ESC02	U24CS104	Programming for Problem Solving with C	I	4
3.	ESC03	U24ME107	Engg. Graphics & CAD*	I	1
4.	ESC04	U24IN204	Data Structures through C	II	4
5.	ESC05	U24EE205B	Basic Electrical Engineering	II	4

(iv) ProgramCoreCourses(PCC)

Sr.No.	Course Type	Course Code	CourseName	Semester	Credits
1.	PCC01	U24IN203	ComputerArchitectureand Organisation	II	3
2.	PCC02	U24IN301	FundamentalsofIoT	III	4
3.	PCC03	U24IN302	OperatingSystems	III	3
	PCC04	U24IN303	AdvancedDataStructures	III	4
4.	PCC05	U24IN304	ComputerNetworks	III	3
5.	PCC06	U24CS305	Object oriented programming through java	III	4
7.	PCC07	U24IN402	WebTechnologies	IV	4
8.	PCC08	U24IN403	DatabaseManagementSystems	IV	4
9.	PCC09	U24IN404	IoTArchitecturesandProtocols	IV	3
10.	PCC10	U24IN405	PythonProgrammingforIoT	IV	4
11.	PCC11	U24IN502	ArtificialInternetofThings	V	4
12.	PCC12	U24IN503	AutomataTheoryand Compiler Design	V	3
13	PCC13	U24IN504	DesignandAnalysisof Algorithms	V	4
14.	PCC14	U24IN602	IoTFrameworks	VI	4
15.	PCC15	U24IN603	Devops	VI	3
16.	PCC16	U24IN604	IndustrialIoT	VI	4
17.	PCC17	U24IN703	ComputerAidedSoftware Engineering	VII	4
18.	PCC18	U24IN704	PrivacyandSecurityin IoT	VII	3
19.	PCC19	U24IN705	CyberPhysicalSystems	VII	3

(v) ProgramElectiveCourses(PEC)

Sr.No.	Course Type	Course Code	CourseName	Semester	Credits
1.	PEC01	U24EC601	ProgramElective-I/MOOCs-I	VI	3
2.	PEC02	U24IN702	ProgramElective-II/MOOCs-II	VII	3
3.	PEC03	U24IN802	ProgramElective-III/MOOCs-III	VIII	3
4.	PEC04	U24IN803	ProgramElective-IV/MOOCs-IV	VIII	3

PEC01:FromVerticalsofPEC

PEC02:FromVerticalsofPEC

PEC03:FromVerticalsofPEC

PEC04:FromVerticalsofPEC

(vi) ExperientialLearningCourses(ELC)

Sr.No.	Course Type	Course Code	CourseName	Semester	Credits
1.	ELC01	U24EL108	Practicum-1	I	1
2.	ELC02	U24EL209	Practicum-2	II	1
3.	ELC03	U24EL308	Practicum-3	III	1
4.	ELC04	U24EL408	Practicum-4	IV	1
5.	ELC05	U24IN509	Seminar	V	1
6.	ELC06	U24IN608	MiniProject	VI	1

Sr.No.	Course Type	Course Code	CourseName	Semester	Credits
7.	ELC07	U24IN706	InternshipEvaluation*	VII	1
8.	ELC08	U24IN707	MajorProject,Phase-1/Industrial Internship-1	VII	4
9.	ELC09	U24IN804	MajorProject,Phase-2/IndustrialInternship-2	VIII	6

(vii) IndianKnowledgeSystemCourses(IKSC)

Sr.No.	Course Type	CourseCode	CourseName	Semester	Credits
1.	IKSC	U24IK100	AICTE Mandated Student Induction Programme (Universal HumanValues -I)	Student Induction Programme	-
2.	IKSC	U24IK506B	UHV-II	5	2
3	IKSC	U24IK606A	EITK	6	2

(viii) MultidisciplinaryOpenElectivesCourses(MOPEC)

Sr.No.	Course Type	CourseCode	CourseName	Semester	Credits
1.	MOPEC01	U24OE501YYX	MOPECElective-I#	V	3
2.	MOPEC02	U24OE701YYX	MOPECElective-II	VII	3
3.	MOPEC03	U24OE801YYX	MOPECElective-III	VIII	3

MOPEC 01: From Baskets of MOPEC

MOPEC 02: From Baskets of MOPEC

MOPEC 03: From Baskets ofMOPEC

(ix) ValueAddedCourses (VAC)

Sr.No.	Course Type	CourseCode	CourseName	Semester	Credits
1.	VAC01	U24VA106	Sports&Yoga	I	1
2.	VAC02	U24VA109XXXXX	SEA-I/SAA-I	I	1
3.	VAC03	U24CY206	EnvironmentalStudies	II	-
4.	VAC04	U24VA210XXXXX	SEA-2/SAA-2	II	1
5.	VAC05	U24VA309XXXXX	SEA-3/SAA-3	III	1
6.	VAC06	U24VA306B	Soft and Interpersonal Skills@	III	1
7.	VAC07	U24VA406A	QALR@	IV	2
8.	VAC08	U24VA409XXXXX	SEA-4/SAA-4	IV	1

(x) SkillEnhancementCourses(SEC)

Sr.No.	Course Type	CourseCode	CourseName	Semester	Credits
1.	SEC01	U24SE208	Programming Skill Development(PSD) Lab-1	II	1
2.	SEC02	U24SE307	PSDLab-02	III	1
3.	SEC03	U24SE407	PSDLab-03	IV	1
4.	SEC04	U24SE507	JavaFullStack	V	1

Sr.No.	Course Type	CurseCode	CourseName	Semester	Credits
			(PSDLab-04)		
5.	SEC05	U24IN607	DevOpsLaboratory (PSDLab-5)	VI	1

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

Sr.No.	Course Type	CurseCode	CourseName	Semester	Credits
1.	AEC01	U24AE110	ExpertTalkSeries-1	I	1
2.	AEC02	U24AE207	IdeaLabMakersSpace	II	1
3.	AEC03	U24AE211	ExpertTalkSeries-2	II	1
4.	AEC04	U24AE310	ExpertTalkSeries-3	III	1
5.	AEC05	U24AE410	ExpertTalkSeries-4	IV	1
6.	AEC06	U24AE510	ExpertTalkSeries-5	V	1
7.	AEC07	U24AE609	ExpertTalkSeries-6	VI	1

(xii) **Startups and Entrepreneurship Courses (SEC)/STE**

Sr.No.	Course Type	CurseCode	CourseName	Semester	Credits
1.	STE01	U24ST605X	S&EBasket*	VI	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
 - Swachh Bharat** (Clean India)

The aim of activities under Swachh Bharat is to promote cleanliness, hygiene, and sanitation across India.

2. **ShikshitBharat**(EducatedIndia)

The aim of activities under Shikshit Bharat is to ensure inclusive and equitable quality education for all, promoting lifelong learning opportunities.

3. **SamruddhaBharat**(ProsperousIndia)

The aim of activities under Samrudha Bharat is to promote economic growth, self-reliance, and prosperity for all citizens.

4. **SurakshitBharat**(SafeIndia)

TheaimofactivitiesunderSurakshitBharatistoensurethesafety,security, and well-being of all citizens.

Self-AccomplishmentActivities-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.
- Thesearecategorizedunderfourgroupsnamely

1. **SochoBharat**(ThinkIndia)

The aim of activities under Socho Bharat is to foster critical thinking, innovation, and intellectual development among citizens.

2. **SanskaritBharat**(CulturedIndia)

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. **SakshamBharat**(EmpoweredIndia)

The aim of activities under Saksham Bharat is to empower individuals and communitieswiththeskills,resources,andopportunitiesneededtoachieve self-reliance and economic independence by fostering physical fitness, discipline, teamwork leadership and mental resilience.

4. **SunderBharat** (Beautiful India)

The aim of activities under Sunder Bharat is to enhance the aesthetic and environmental beauty of India, making it a visually pleasing and environmentally sustainable country by emphasizing the importance of culture and heritage.

Table:SEA

Group	Guiding club/ center	Code of activity (U24VAYYY)*	Title of activity
SEA Group-1: Swacch Bharat	NSS	SE101	Clean India—Green India (River/Beach/Mohalla/School/Campus/Govt offices Cleaning)
		SE102	Waste Management/Waste Segregation Surveys
		SE103	Village Empowerment/NSS camp in village for a week
		SE104	Healthy habits-happy schools/Medical camps in schools/peer health
		SE105	Life saving skills/school clinics/First Aid training for a week
		SE106	Sustainable living/Surveys and Estimation for rooftops
		SE110	Any other activity approved by Dean Academic Affairs
SEA Group-2: Shikshit Bharat	Humanity Club	SE201	Peer mentoring/Mentoring of School Children
		SE202	Rural digital revolution /Digital Literacy for yielders & Participation in “Teach-for-India” movement
		SE203	Empowering learners–schools/Value addition for deprived schools
		SE204	Peer Mentoring/Mentoring junior (first year) students at KITSW
		SE205	Learning by Teaching/Teaching Assistantship at KITSW/Teaching AIDE
		SE206	Enriching Education/Development of learning material for schools/ITIs
		SE210	Any other activity approved by Dean Academic Affairs
SEA Group-3: Samruddha Bharat	C-i2RE	SE301	Great Grass Root Innovations
		SE302	Innovation and Creativity/ Critical Thinking and Problem solving
		SE303	Teamwork and collaboration
		SE304	Leadership & Entrepreneurship
		SE305	Design Thinking
		SE306	Work with START-UP at KITSW

Group	Guiding club/ center	Code of activity (U24VAYYY)*	Title of activity
		SE310	Any other activity approved by Dean Academic Affairs
SEA Group-4: Surakshit Bharat	NCC	SE401	NCC participation/National Integrity
		SE402	Basic 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 Group 1 Swachh 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

Group	Guiding club/ center	Code of activity (U24VAYYY)*	Title of activity
			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 (7 days), Cycling
		SA302	Sports – Representation of Institute at University level/Intercollege 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, BAH A etc
		SA305	Participation in National level or State level bodies in professional bodies like ISTE/IEEE/CSI/IETE 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
SA402			Dance (Bharatanatyam/Kathak/Lavani /Western Dance). Only for beginners
SA403			Music composition / Learning musical instrument (Any type). Only for beginners.
SA404			Film Appreciation/Dramatics/Seeing through Painting
SA405			Making short film/Photography
SA406			Sculptures (focusing on themes of unity, peace and environmental conservation)
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 Group 1 Socho Bharat)

13. SUMMARY OF CURRICULUM COMPONENTS

S.NO.	CATEGORY	COURSE COMPONENT	TOTAL COURSES	TOTAL CREDITS	CURRICULUM CONTENT (% OF CREDITS)
1	HSMC	Humanity, Social Sciences and Management Courses	3	6	3.48
2	BSC	Basic Science Courses	5	17	9.88
3	ESC	Engineering Science Courses	5	16	9.30
4	PCC	Program Core Courses	19	68	39.53
5	PEC	Program Elective Courses	4	12	6.97
6	MOPEC	Multidisciplinary Open Elective Courses	3	09	5.23
7	ELC	Experiential Learning Courses	9	17	9.88
8	IKSC	Indian Knowledge System Courses	2	4	2.32
9	VAC	Value Added Courses	9	8	4.65
10	SEC	Skill Enhancement Courses	5	5	2.90
11	AEC	Ability Enhancement Courses	7	7	4.06
12	STE	Startups and Entrepreneurship Courses	1	3	1.74
Total			72	172	100

14. SEMESTERWISE COURSE/CREDIT DISTRIBUTION

Semester	Number of Courses/Number of Credits (Course Category wise)												TOTAL
	BSC	ESC	HSMC	PCC	MOPEC	PEC	SEC	VAC	ELC	AEC	IKSC	STE	
I	2/7	3/8	1/2					2/2	1/1	1/1			10/21
II	2/7	2/8		1/3			1/1	2/1	1/1	2/2			11/23
III				5/18			1/1	2/2	1/1	1/1			10/23
IV	1/3			4/15			1/1	3/3	1/1	1/1			11/24
V			2/4	3/11	1/3		1/1		1/1	1/1	1/2		10/23
VI				3/11		1/3	1/1		1/1	1/1	1/2	1/3	9/22
VII				3/10	1/3	1/3			2/5				7/21
VIII					1/3	2/6			1/6				4/15
Total	5/17	5/16	3/6	19/68	3/9	4/12	5/5	9/8	9*/17	7/7	2/4	1/3	72/172
% Weightage of Course Category	9.88% (17/172)	9.30% (16/172)	3.48% (6/172)	39.53% (68/172)	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-1C, Mini Project-1C, Internship Evaluation-1C, Major Project : 4+6

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

Abbreviations

L	LectureHours	O	OutsidetheClassWork(SelfStudy)Hours
T	TutorialHours	E	TotalEngagementinHours
P	PracticalHours	C	CreditAssigned

I SEMESTER

Stream-II

S.No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
-	IKSC	U24IK100	AICTEMandatedStudentInductionProgramme (UniversalHumanValues-I)						-
1	BSC	U24MH101	Differential Calculus and Ordinary Differential Equations	2	1	-	6	9	3
2	BSC	U24CY102B	EngineeringChemistry	2	1	2	5	10	4
3	ESC	U24CI111	DigitalLogic Design	2	1	-	4	7	3
4	ESC	U24IN104	ProgrammingforProblem SolvingwithC	2	1	2	5	10	4
5	HSMC	U24MH105	EnglishCommunication andReportWriting	2	-	-	3	5	2
6	VAC	U24VA106	Sports&Yoga	-	-	2	2	4	1
7	ESC	U24ME107	Engg.Graphics&CAD*	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-I	-	-	-	4	4	1
9	VAC	U24VA109XXXXX	SEA-I/SAA-I	-	-	-	2	2	1
10	AEC	U24AE110	ExpertTalkSeries-1	-	-	-	1	1	1
Total:				10	4	8	34	56	21
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA): 1 weekto10days:1credittoeachBridgecourseunderadditionallearning (willbeprintedongradesheet)									

* For CE and ME, it will be a three (03) credit (1-0-4) course on Engineering Graphics & Design (Pedagogy:SessionswithconventionaldrafterandCAD).(ForCE:U24CE107/U24CE207andfor ME: U24ME107A/U24ME207A)

Pool-III(Chemistry)		
S.No.	CourseCode	CourseTitle
1.	U24CY102A	EngineeringChemistry (forMechanicalEngineering)
2.	U24CY102B	EngineeringChemistry (Common to CSM, CSD, CSN, CSO & IT)

II SEMESTER**Stream-II**

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	BSC	U24MH201	MatrixTheoryandVector Calculus	2	1	-	6	9	3
2	BSC	U24PY202B	EngineeringPhysics	2	1	2	5	10	4
3	PCC	U24IN203	ComputerArchitectureand Organisation	2	1	-	4	7	3
4	ESC	U24IN204	DataStructuresthroughC	2	1	2	5	10	4
5	ESC	U24EE205B	BasicElectricalEngineering	2	1	2	5	10	4
6	VAC	U24CY206	EnvironmentalStudies	2	-	-	2	4	-
7	AEC	U24AE207	IdeaLabMakerspace	-	-	2	2	4	1
8	SEC	U24SE208	Programmingskill Development(PSD)Lab-1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210XXXXX	SEA-2/SAA-2	-	-	-	2	2	1
11	AEC	U24AE211	ExpertTalkSeries-2	-	-	-	1	1	1
Total:				12	5	10	38	65	23
Summer/ Inter-semBridgeCourses(Approved byBoS and Dean,AA):1 weekto10days:1credittoeachBridgecourseunderadditionallearning (will be printed on grade sheet)									

Pool-I(Physics)		
S.No.	CourseCode	CourseTitle
1.	U24PY202A	EngineeringPhysics (forMechanicalEngineering)
2.	U24PY202B	EngineeringPhysics (Common to CSM, CSD, CSN, CSO & IT)

Pool-II(BasicElectrical&ElectronicsEngineering)		
S.No.	CourseCode	CourseTitle
1.	U24EE205A	BasicElectricalandElectronicsEngineering (forMechanicalEngineering)
2.	U24EE205B	BasicElectricalEngineering (Common to CSM, CSD, CSN, CSO & IT)

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 (IoT))

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

Exit Options to Qualify for UG Certificate in CSE (IoT) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IN211X	Arduino Programming	2	-	2	-	4	3
2	PCC	U24IN212X	Web Development	2	-	2	-	4	3
3	PCC	U24IN213X	Raspberry Pi Programming	2	-	2	-	4	3

(OR)

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

Exit Options to Qualify for UG Certificate in CSE (IoT) : Any Two (02) Skill-based Courses:-									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE212X	Programming with C++ Reference: https://trainings.internshala.com/c-plus-plus-course	-	-	6	-	6	3
2	SEC	U24SE213X	Advance Excel https://trainings.internshala.com/excel-course	-	-	6	-	6	3
3	SEC	U24SE214X	CISCO: IT Essentials Reference: Offered by CISCO CoE, KITSW	-	-	6	-	6	3
4	SEC	U24SE215X	CISCO: Introduction to Networks Reference: Offered by CISCO CoE, KITSW	-	-	6	-	6	3

III SEMESTER

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	PCC	U24IN301	Fundamentals of IoT	2	1	2	5	10	4
2	PCC	U24IN302	Operating Systems	2	1	-	4	7	3
3	PCC	U24IN303	Advanced Data Structures	2	1	2	5	10	4
4	PCC	U24IN304	Computer Networks	2	1	-	4	7	3
5	PCC	U24IN305	Object oriented programming through java	2	1	2	5	10	4
6	VAC	U24VA306B	Soft and Interpersonal Skills	-	-	2	2	4	1
7	SEC	U24SE307	PSD Lab-02	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309XXXXX	SEA-3/SAA-3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
Total:				10	5	10	34	59	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)									

@ Dean AA will allot the courses QALR (Stream-I), Soft & Interpersonal Skills (Stream-II), to the branches as per Stream-I and Stream-II.

IV SEMESTER

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	BSC	U24MH401D	DiscreteMathematicsand Probability,Statistics	2	1	-	6	9	3
2	PCC	U24IN402	WebTechnologies	2	1	2	5	10	4
3	PCC	U24IN403	DatabaseManagement Systems	2	1	2	5	10	4
4	PCC	U24IN404	IoTArchitecturesand Protocols	2	1	-	4	7	3
5	PCC	U24IN405	PythonProgrammingfor IoT	2	1	2	5	5	4
6	VAC	U24VA406A	QALR@	2	-	-	2	4	2
7	SEC	U24SE407	PSDLab-03	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409XXXXX	SEA-4/SAA-4	-	-	-	2	2	1
10	AEC	U24AE410	ExpertTalkSeries-4	-	-	-	1	1	1
11	VAC*	U24CH411*	EnvironmentalScience*	2*	-	-	3	5	-
Total:				14	5	8	39	61	24
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA):1weekto10days:1credittoeachBridgecourseunder additional learning (will be printed on grade sheet)									

**ForLateralEntryStudentsOnly*

** BranchSpecificMathematics:*

BranchSpecificMathematics(Pool-4)			
S. No.	CourseCode	CourseTitle	Common to
1.	U24MH401A	NumericalandStatisticalMethods	CE
2.	U24MH401B	AppliedMathematicsforMechanicalEngineering	ME
3.	U24MH401C	AppliedMathematics	EEE,ECE,ECI
4.	U24MH401D	DiscreteMathematicsandProbability,Statistics	CSE, IT,CSN,CSO
5.	U24MH401E	EssentialMathematicsandStatisticsforMachine learning	CSM
6.	U24MH401F	EssentialMathematicsandStatisticsforDatascience	CSD
7.	U24MH401X	AnyotherCourseapproved byBoSchairand DeanAA	-

@DeanAAwillallotthecoursesQALR(Stream-I),SoftandInterpersonalSkills(Stream-II), to the branches as per Stream-I and Stream-II.

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(IOT))

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

Exit Options to Qualify for UG Diploma in CSE(IOT) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IN412X	Fundamentals of Algorithms	2	-	2	-	4	3
2	PCC	U24IN413X	Machine Learning for IoT	2	-	2	-	4	3
3	PCC	U24IN414X	Fundamentals of DevOps	2	-	2	-	4	3

(OR)

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

Exit Options to Qualify for UG Diploma in CSE(IOT) : Any Two (02) Skill-based Courses:-									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE412X	Drone Pilot Reference: https://agnipathvayu.cdac.in	-	-	6	-	6	3
2	SEC	U24SE413X	CISCO: Switching Routing and Wireless Essentials Reference: Offered by CISCO CoE, KITSW	-	-	6	-	6	3
3	SEC	U24SE414X	Graphic Design Reference: https://trainings.internshala.com/graphic-design-course	-	-	6	-	6	3
4	SEC	U24SE415X	Android App Development Reference: https://trainings.internshala.com/android-course/	-	-	6	-	6	3

B. Tech Honours with Research:

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

V SEMESTER

S. No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
1	MOPEC	U24OE501XX	MOPECElective-I#	2	1	-	3	6	3
2	PCC	U24IN502	Artificial InternetofThings	2	1	2	5	10	4
3	PCC	U24IN503	AutomataTheoryand Compiler Design	2	1	-	4	7	3
4	PCC	U24IN504	DesignandAnalysisof Algorithms	2	1	2	5	10	4
5	HSMC	U24ST505X	ManagementBasket*	2	1	-	2	5	3
6	IKSC	U24IK506B	UHV-II	2	-	-	2	4	2
7	SEC	U24IN507	FullStack Development Laboratory (PSDLab-04)	-	-	2	2	4	1
8	HSSM	U24MH508	TechnicalEnglish	-	-	2	2	4	1
9	ELC	U24IN509	Seminar	-	-	-	2	2	1
10	AEC	U24AE510	ExpertTalkSeries-5	-	-	-	1	1	1
Total:				12	5	8	28	53	23
AdditionalLearning@:Maximumcreditsallowedfor Honours/Minor				-	-	-	-	-	5
TotalcreditsforHonours/Minorstudents:				-	-	-	-	-	29
Summer/ Inter-semBridge 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)									

#MULTIDISCIPLINARYOPENELECTIVES:Studenthastoselectonecourseas multidisciplinary open elective from any of the MOPEC Basket of courses offered by other departments.

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

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

ManagementCoursesBasket		
S.No.	CourseCode	CourseTitle
1.	U24MB505A/U24MB605A	ManagerialEconomicsandAccountancy
2.	U24MB505B/U24MB605B	IndustrialPsychology
3.	U24MB505C/U24MB605C	E-CommerceandDigitalMarketing
4.	U24MB505D/U24MB605D	OrganizationalBehaviour
5.	U24MB505E/U24MB605Z	AnyothercourseapprovedbyBoSChairandDeanAA

VI SEMESTER

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	PEC	U24IN601X	Program Elective-I/ MOOCs-I	2	1	-	4	7	3
2	PCC	U24IN602	IoT Frameworks	2	1	2	4	9	4
3	PCC	U24IN603	Devops	2	1	-	4	7	3
4	PCC	U24IN604	Industrial IoT	2	1	2	5	10	4
5	STEC	U24MB605X	S&E Basket	2	1	-	2	5	3
6	IKSC	U24IK606A	EITK	2	-	-	2	4	2
7	SEC	U24IN607	Devops Laboratory (PSDLab-5)	-	-	2	2	4	1
8	ELC	U24IN608	Mini Project	-	-	2	2	4	1
9	AEC	U24AE609	Expert Talk Series-6	-	-	-	1	1	1
Total:				12	5	8	26	51	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)									

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

B. Tech Honours with Research:

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

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

Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute OR
Successful completion of two suitable skill based courses (external) to qualify for Certification

C. After Third Year: (B.Voc.in CSE(IOT))

(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 for B.Voc.in CSE(IOT) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IN610X	Software Engineering	2	-	2	-	4	3
2	PCC	U24IN611X	Introduction to Cyber Security	2	-	2	-	4	3
3	PCC	U24IN612X	IoT Security	2	-	2	-	4	3

(OR)

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

Exit Option to Qualify for B.Voc.in CSE(IOT) : Any Two (02) Skill based Courses:-									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE610X	Software Testing Tools and Selenium Reference: https://www.careerpedia.co/softwa-re-testing-course-hyderabad	-	-	6	-	6	3
2	SEC	U24SE611X	Digital Marketing Reference: https://trainings.internshala.com/digital-marketing-course	-	-	6	-	6	3
3	SEC	U24SE612X	CISCO: Enterprise Networking, Security & Automation Reference: Offered by CISCOCoe, KITSW	-	-	6	-	6	3
4	SEC	U24SE613X	Business Analytics Reference: https://trainings.internshala.com/business-analytics-course	-	-	6	-	6	3

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

VII SEMESTER

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	MOPEC	U24OE701YYX	MOPECElective-II	2	1	-	3	6	3
2	PEC	U24IN702	Program Elective - II/ MOOCs-II	2	1	-	4	7	3
3	PCC	U24IN703	ComputerAidedSoftware Engineering	2	1	2	4	9	4
4	PCC	U24IN704	Privacyand SecurityinIoT	2	1	-	4	7	3
5	PCC	U24IN705	CyberPhysicalSystems	2	1	-	4	7	3
6	ELC	U24IN706	InternshipEvaluation*	-	-	2	-	2	1
7	ELC	U24IN707	MajorProject,Phase-1/ IndustrialInternship-1	-	-	8	6	14	4
Total:				10	5	12	25	52	21
AdditionalLearning@:Maximumcreditsallowedfor Honours/Minor				-	-	-	-	-	4
TotalcreditsforHonours/Minorstudents:				-	-	-	-	-	24

#MULTIDISCIPLINARYOPENELECTIVES: 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.TechHonourswithResearch

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

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	MOPEC	U24OE801YYX	MOPECElective-III	2	1	-	3	6	3
2	PEC	U24IN802	ProgramElective-III/ MOOCs-IV	2	1	-	4	7	3
3	PEC	U24IN803	ProgramElective-IV/ MOOCs-V	2	1	-	4	7	3
4	ELC	U24IN804	MajorProject,Phase-2/ IndustrialInternship-2	-	-	12	4	16	6
Total:				6	3	12	15	36	15
AdditionalLearning@:Maximumcreditsallowedfor Honours/Minor				-	-	-	-	-	4
TotalcreditsforHonours/Minorstudents:				-	-	-	-	-	19

#MULTIDISCIPLINARYOPENELECTIVES: 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.TechHonourswithResearch

Students opting for B.TechHonourswithResearch, 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	21	23	23	24	23	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, web programming, Computer Networking, and 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 CSE(IoT) 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-MOPECBASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01MEA	3D Printing Technologies
2	U24OEX01MEB	Joy of Mechanical Engineering
3	U24OEX01MEC	Introduction to Engineering Design
4	U24OEX01MED	Research Methodology
5	U24OEX01MEE	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-MOPECBASKET

The following Courses will be offered by ECE and EC 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	WirelessSensorNetworks
17	U24OEX01ECQ	MicrowaveCommunications
18	U24OEX01ECR	IntroductiontoNanotechnology
19	U24OEX01ELZ	AnyothercourseapprovedbyBoSChairandDeanAA

(IV) ECI:CI-MOPECBASKET

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-MOPECBASKET

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

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

(VI) ITENGINEERING:IT-MOPECBASKET

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

(VII) ELECTRICAL ENGINEERING:EE-MOPECBASKET

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(DATASCIENCE):DS-MOPECBASKET

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

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

(IX) CSE(AM&ML):AI-MOPECBASKET

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-MOPECBASKET

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	Blockchain Technologies
4	U24OEX01CND	Internet Networks 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-MOPECBASKET

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	Fundamentals of IoT
2	U24OEX01INB	Python for IoT
3	U24OEX01INC	IoT Architecture and Protocols
4	U24OEX01IND	Artificial IoT
5	U24OEX01INE	IoT frameworks
6	U24OEX01INF	Industrial IoT
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-MOPECBASKET

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-MOPECBASKET

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-MOPECBASKET

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-MOPECBASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01CYA	NanoBio-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	BasicOrganicChemistry
10	U24OEX01CHZ	Any othercourseapprovedbyBoSChairandDeanAA

(XVI) COMMERCE&MANAGEMENT:CM-MOPECBASKET

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

V/VII/VIIISEMESTER		
1	U24OEX01CMA	PrinciplesofAccountancy
2	U24OEX01CMB	FinanceforEngineers
3	U24OEX01CMC	ManagementPrinciples
4	U24OEX01CMD	OrganizationalBehavior
5	U24OEX01CME	ProjectManagement
6	U24OEX01CMF	OperationsManagement
7	U24OEX01CMG	ConsumerPsychology
8	U24OEX01CMH	PrinciplesofMarketingManagement
9	U24OEX01CMZ	Any othercourseapprovedbyBoSChairandDeanAA

(XVII) LIBERALARTS*:LI-MOPECBASKET

Students opting LiberalArt courses under MOPEC shall complete the courses through SWAYAM/NPTELoranyotherMOOCSplatform:

V/VII/VIIISEMESTER		
1	U24OEX01LIA	IndianLanguage-I
2	U24OEX01LIB	IndianLanguage-II
3	U24OEX01LIC	PsychologyforWell-Being
4	U24OEX01LID	ForeignLanguage-I
5	U24OEX01LIE	ForeignLanguage-II
6	U24OEX01LIF	IntroductiontoIndian Art-An Aprreciation
7	U24OEX01LIG	DramaAppreciation
8	U24OEX01LIH	CulturalStudies
9	U24OEX01LII	FilmAppreciation
10	U24OEX01LIJ	EthicsinEngineeringPractice
11	U24OEX01LIZ	Any othercourseapprovedbyBoSChairandDeanAA

*ThroughMOOCSonly

(XVIII) ARTS*:AR-MOPECBASKET

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

V/VII/VIIISEMESTER		
1	U24OEX01ARA	Anthropolgy
2	U24OEX01ARB	AncientIndia
3	U24OEX01ARC	ConstitutionofINDIA
4	U24OEX01ARD	MedievalIndia
5	U24OEX01ARE	Geography
6	U24OEX01ARF	ModernIndia

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	IP 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 (IoT)

PROGRAM ELECTIVE COURSES (PEC)

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

VERTICAL/PE	PE1	PE2	PE3	PE4
VERTICAL1: Cloud Computing	U24IN602A: Principles of Cloud Computing	U24IN702A: High Performance Computing	U24IN802A: Fog and Edge Computing	U24IN803A: Cloud Security
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
VERTICAL2: Cyber Security	U24IN602B: Fundamentals of Cyber Security and Tools	U24IN702B: Platforms and Systems Security	U24IN802B: Blockchain Security	U24IN803B: Ethical Hacking
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
VERTICAL3: Machine Learning	U24IN602C: Computer Vision and Image Processing	U24IN702C: Deep Learning	U24IN802C: Natural Language Processing	U24IN803C: Introduction to Generative AI Models
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			
VERTICAL4: Data Science	U24IN602D: Statistical Fundamentals	U24IN702D: Principles of Data Science	U24IN802D: Data Mining & Mo deling	U24IN803D: Data Analysis & Visualization
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			

I SEMESTER**Stream-II**

S.No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
-	IKSC	U24IK100	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	U24CY102B	Engineering Chemistry	2	1	2	5	10	4
3	ESC	U24CI103	Digital Logic Design	2	1	-	4	7	3
4	ESC	U24IN104	Programming for Problem Solving with C	2	1	2	5	10	4
5	HSMC	U24MH105	English Communication and Report Writing	2	-	-	3	5	2
6	VAC	U24VA106	Sports & Yoga	-	-	2	2	4	1
7	ESC	U24ME107	Engg. Graphics & CAD*	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-I	-	-	-	4	4	1
9	VAC	U24VA109XXXXX	SEA-I/SAA-I	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
Total:				10	4	8	34	56	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)									

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

Pool-III (Chemistry)		
S.No.	CourseCode	CourseTitle
1.	U24CY102A	Engineering Chemistry (for Mechanical Engineering)
2.	U24CY102B	Engineering Chemistry (Common to CSM, CSD, CSN, CSO & IT)

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			9Hrs
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), Expansion 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)] Alternating series [(Text 1: topic 9.12, Solved problems: 9.16, 9.17, Practice problems: exercise 9.7 (1, 7))] 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))] Additional problems on Maclaurin's series [(Text 1: topic 4.4, Solved problems: 4.20, Practice problems: exercise 4.5 (3, 5))]			
UNIT-II			9Hrs
Partial differentiation and its applications: Functions of two or more variables, Partial derivatives, Total derivative, Change of variables, Jacobians, n-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): 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)] 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))]. Additional problems on Lagrange's method of undetermined multipliers [(Text 1: topic (5.12), Solved problems: 5.45, 5.48, Practice problems: exercise 5.10 (3 (i), 3 (ii))].			
UNIT-III			9Hrs
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, 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

Self-Learning Topics (SLTs): Review of DEs of first order (Text 1: topic 11.1, 11.2, 11.3, 11.4, 11.5)
 Solution 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))]

UNIT-IV

9Hrs

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

Applications of linear differential equations: Simple harmonic motion, Simple pendulum, Oscillations of spring, Oscillatory electrical circuit-LCR circuit, Electro-mechanical analog

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))]

Course Learning Outcomes (COs):

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

CO1: examine the convergence of a series and interpret mean value theorems.

CO2: apply partial differentiation to functions of several variables in solving various engineering problems.

CO3: apply appropriate methods of differential equations of first order and first degree to solve real life engineering problems.

CO4: analyze the solutions of higher order linear differential equation with constant coefficients

Textbook(s):

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

Reference Book(s):

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

Web and Video link(s):

1. <https://youtu.be/4EYko9rdF7g?si=WUu12NPTELVideoLectureonInfiniteseriesbyProf.S.K.Ray>, Professor of Mathematics, IIT 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, IIT 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	PSO 1	PSO 2
CO1	U24MH101.1	2	2	1	1	-	-	-	1	1		1		
CO2	U24MH101.2	2	2	1	1	-	-	-	1	1		1		
CO3	U24MH101.3	2	2	1	1	-	-	-	1	1		1		
CO4	U24MH101.4	2	2	1	1	-	-	-	1	1		1		
U24MH101		2	2	1	1	-	-	-	1	1		1		
3-HIGH, 2-MEDIUM, 1-LOW														

ENGINEERINGCHEMISTRY (Common toCSM,CSD,CSN,CSO&IT)			
Class:B.Tech.ISemester		Branches:CSM,CSD,CSN,CSO&IT	
CourseCode:	U24CY102B	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
TotalNumberofTeachingHours:	60Hrs	ESE:	40%
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents'knowledgein/on...			
LO1: electrochemicalenergysystems,batteriesandfuelcells			
LO2: wateranalysisandcorrosionwithitspreventivemethods			
LO3: engineeringmaterialsandspectroscopictechniquesofchemicalanalysis			
LO4: polymers,principles ofgreenchemistryandtheirapplications			
THEORYCOMPONENT			
UNIT-I		9Hrs	
•Electrochemical Technology and Engineering: Introduction, Specific conductance, Equivalentconductance,Effectofdilution;Conductometricitrations-Acidbase titrations-Strongacidvsstrongbase,Strongacidvsweakbase,Weakacidvsstrong base, Weak acid vs weak base, Advantages of conductometric titrations; Galvanic cell, Electrode potential, Electrochemical series, Nernst equation; Potentiometric titrations-Acid base titrations and advantagesof potentiometric titrations			
Batteries:Classification,Lead-acidbattery,Li-ionbattery			
Fuelcells:Hydrogen-oxygenfuelcell			
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)			
UNIT-II		9Hrs	
AppliedChemistry:			
WaterTechnology:Introduction,Hardness ofwater, Estimationofhardnessofwaterby complexometry, Alkalinity, Determination of alkalinity, Numerical problems. Determinationof dissolved oxygen(DO), Biochemical oxygen demand(BOD), Chemical oxygendemand(COD),Softeningmethods-Ionexchangemethod,Desalination processes, Reverse osmosis; Quality parameters of potable water (BIS and WHO)			
Corrosion:Introduction,Drycorrosion,Pilling-Bedworthrule,Wetcorrosion;Factors effectingcorrosion-Purityofthemetals,Relativeareasofanodicandcathodicparts, Natureofsurfacefilm,Humidity,pHandTemperature;Preventionmethodsof corrosion-Cathodic protection-Impressed current cathodic protection,Sacrificial anodic protection			
SelfLearningTopics(SLTs):Unitsofhardness(Text1:Jain&Jainchapter1topic5),Introduction tocorrosion (Text 1: Jain &Jain: chapter7 topic 1)			
UNIT-III		9Hrs	
EngineeringMaterials:Nanomaterials-Introduction,Synthesisofnanomaterials-Top downandbottom-upapproaches,Synthesisbysol-gelmethode;Nanoscalematerials-Fullerenes, Carbon nanotubes and Graphene, Properties and applications, Biosensors			
Spectroscopy: Introduction to spectroscopy, Microwave spectroscopy-Principle, Selection rules, Applications; Infra-red spectroscopy-Principle, Selection rules, Applications;UVSpectroscopy-Lambert-Beer'slawanditsapplications			

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)

UNIT-IV

9Hrs

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

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

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)

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

Text Book(s):

1. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, 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, *Textbook of Engineering Chemistry*, 3rd Edn., Dhanpat Rai Publishers, 2003
3. S.S. Dara, S.S. Umare, *A Textbook of Engineering Chemistry*, 12th Edn., S. Chand &

Company Ltd., 2010
Web and Video link(s): https://elearn.nptel.ac.in/shop/iit-workshops/completed/battery-cell-technology-materials-and-industrial-applications/?v=c86ee0d9d7ed NPTEL Video Lecture on Battery technology by Dr. Kothandaraman, Professor of Chemistry, IIT Madras & Dr. Raghunathan, Professor of Chemical engineering, IIT Madras
Laboratory Manual (for laboratory component): 1. Engineering Chemistry Laboratory manual, Department of PS, KITSW
Course Learning Outcomes (COs) After completion of this course, the student should be able to, <i>(based on cognitive skills acquired from theory component)</i> 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 <i>(based on psychomotor skills acquired from laboratory component)</i> 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):		U24CY102B ENGINEERING CHEMISTRY (Common to CSM, CSD, CSN, CSO & IT)												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24CY102B.1	2	-	-	-	1	1	1	-	1	-	1	-	-
CO2	U24CY102B.2	2	-	-	-	1	1	1	-	1	-	1	-	-
CO3	U24CY102B.3	2	-	-	-	1	1	1	-	1	-	1	-	-
CO4	U24CY102B.4	2	-	-	-	1	2	1	-	1	-	1	-	-
CO5	U24CY102B.5	2	1	-	-	-	1	1	-	1	-	1	-	-
CO6	U24CY102B.6	2	1	-	-	2	1	1	-	1	-	1	-	-
CO7	U24CY102B.7	2	1	-	-	-	1	1	-	1	-	1	-	-
CO8	U24CY102B.8	2	1	-	-	-	1	1	-	1	-	1	-	-
U24CY102B		2.00	1.00	-	-	1.20	1.12	1.00	-	1.00	-	1.00	-	-

DIGITAL LOGIC DESIGN			
Class: B.Tech.I-Semester		Branch: Computer Science & Engineering (IoT)	
Course Code:	U24CI103	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-4-7	CIEMarks(%):	60
Total Number of Teaching Hours:	36Hrs	ESEMarks(%):	40
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: switching algebra and minimization techniques LO2: design of combinational circuits LO3: design of sequential circuits LO4: structure & programming of PROMs, PLAs, PALs			
UNIT-I			9Hrs
Number Systems and Codes: Representation of number systems, conversion of numbers from one radix to other, Binary arithmetic, 1's and 2's complement subtraction, Binary weighted and non-weighted codes – BCD, Self complementing, Gray Codes. Boolean Algebra and Minimization: Postulates and theorems; logic gates – symbols and truth tables, realization of switching functions - AOI, NAND-NAND and NOR-NOR realizations; minimization of switching functions - using theorems, standard SOP & POS forms, Karnaugh map. Self Learning Topics (SLTs): r 's and $(r-1)$'s complements, (Text1: topic 1.5), Excess-3 Code (Text1: topics 1.7), Solved problems on Five Variable K-maps (Text1: topic 3.4)			
UNIT-II			9Hrs
Combinational circuits: Design of combinational circuits using logic gates – Half adder, Full adder, Half subtractor, Full subtractor, Parallel adder, Carry look ahead adder, BCD adder and 1's & 2's complement adder/subtractors; Decoders, Encoders, Priority encoders; Multiplexers, Demultiplexers, Realization of switching functions using Multiplexers. Self Learning Topics (SLTs): Serial adder (Text1: topic 4.3), BCD to Seven Segment Decoder (Text1: topic 5.5), Solved problems on multiplexers (Ref.2: 4.29).			
UNIT-III			9Hrs
Sequential circuits: NAND RS latch, NOR RS latch; Flip flops- SR, JK, D and T, preset and clear inputs, truth tables, excitation tables, race around condition, Master slave flip flop, conversion of one flip flop to other; Binary counters – ripple and synchronous counters; Shift registers – modes of operation, Ring and Johnson counters. Self Learning Topics (SLTs): Mod-n asynchronous counters (Ref.2: topic 6.26), Solved problems on synchronous counters (Ref.2: topic 6.29).			
UNIT-IV			9Hrs
Programmable logic devices (PLDs): Introduction to PLDs, read only memories (ROMs), programmable logic array devices (PLAs), programmable array logic devices (PALs), implementation of Boolean functions on various PLDs, Introduction to FPGAs and CPLDs. Self Learning Topics (SLTs): Combinational circuit implementation (Ref.2: topic 8.4), Solved problems on ROM implementation (Ref.2: Example 8.1, 8.2, 8.3).			
Course Learning Outcomes (COs): <i>After completion of this course, the student should be able to,</i>			

CO1: apply Karnaugh maps for minimization of switching functions

CO2: design combinational circuits for real world applications

CO3: design sequential circuits for real world applications

CO4: design logic circuits using PLDs

Textbook(s):

1. Moris Mano, *Digital Design*, PHI, 4th edition, New Delhi, 2003
2. Zvi. Kohavi, *Switching and Finite Automata Theory*, Tata McGraw-Hill, New Delhi, 2nd edition, 2008

Reference Book(s):

1. R.P. Jain, *Modern Digital Electronics*, Tata McGraw-Hill, 3rd edition, New Delhi, 2003
2. A. Anand Kumar, *Fundamentals of Digital Circuits*, PHI, 3rd edition, New Delhi, 2014
3. Herbert Taub and Donald Schilling, *Digital Integrated Circuits*, Tata McGraw-Hill New Delhi, 2008

Web and Video link(s):

1. [NPTEL :: Electrical Engineering - NOC: Digital Circuits](#); NPTEL Video Lecture on Digital Circuits

Course Articulation Matrix (CAM):				U24CI103 DIGITAL LOGIC DESIGN										
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24CI103.1	2	2	-	1	1	-	-	-	-	-	1	1	1
CO2	U24CI103.2	2	2	2	1	1	-	-	-	-	-	1	1	1
CO3	U24CI103.3	2	2	2	1	1	-	-	-	-	-	1	1	1
CO4	U24CI103.4	2	2	2	1	1	-	-	-	-	-	1	1	1
U24IN103		2	2	1.5	1	1	-	-	-	-	-	1	1	1
3-HIGH, 2-MEDIUM, 1-LOW														

PROGRAMMINGFORPROBLEMSOLVING WITHC			
Class:B.Tech.I-Semester		Branch:CSE(Networks)	
CourseCode:	U24IN104	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
TotalNumberofTeaching Hours:	60Hrs	ESE:	40%
CourseLearningObjectives(LOs):			
Thiscoursewilldevelopstudents'knowledgein/on...			
LO1:algorithms,flowchartsanddevelopprogramswithbasic constructs			
LO2:controlstructuresandarrayoperations			
LO3:stringoperationsandmodularprogrammingconceptswithfunctionsandrecursion			
LO4:structures,unions,pointersandfilesinCprogramming			
THEORYCOMPONENT			
UNIT-I		9Hrs	
IntroductiontoProgramming:Artofprogrammingthroughalgorithmsandflowcharts			
OverviewofC:HistoryofC,ImportanceofC,BasicstructureofCprograms			
Constants, Variables and Data Types:Character set, C tokens, Declaration of variables, Defining symbolic constants			
Managing Input and Output Operations:Readinga 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			
SelfLearningTopics(SLTs):Componentsofacomputer,conceptofhardwareandsoftware(Text1: chapter 1),ExecutingaCprogram (Text1:chapter2),Typeconversionsinexpression(Text1:chapter 4) Solved problems (Text1: chapter 2 to chapter 5), Review questions, debugging exercises, programmingexercises,interviewquestions(Text1:chapter2tochapter5)			
UNIT-II		9Hrs	
Decision Making and Branching: Simple if statement, if-else statement, Nesting of if-else statements,elseifladder,switchstatement,Conditionaloperator,gotostatement			
DecisionMakingandLooping:whilestatement,do-whilestatement,forstatement,Nested loops, Jumps in loops			
Arrays:One-dimensional arrays, Declaration of one-dimensional arrays, Initialization of one-dimensional arrays, Linear search, Two-dimensional arrays, Initializing two dimensional arrays, Multi-dimensional arrays			
Self Learning Topics (SLTs): Concise test expressions (Text1: chapter 7) Dynamic arrays (Text1: chapter8),Solvedproblems(Text1:chapter6tochapter8),Reviewquestions,debuggingexercises, programmingexercises,interviewquestions(Text1:chapter6tochapter8)			
UNIT-III		9Hrs	
CharacterArraysandStrings:Declaringandinitializingstringvariable,Readingstrings from terminal, Writing strings to screen, String handling functions, Table of strings			
ModularProgrammingwithUserDefinedFunctions:Needforuser-definedfunctions, Elementsofuser-definedfunctions,Definitionoffunctions,Returnvaluesandtheirtypes, Functioncalls,Functiondeclaration,Categoryoffunctions,Recursion,Thescope,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	9Hrs
Structures and Unions: Defining a structure, Declaring and initializing structure variables, Accessing structure members, Array of structures, Structures within structures, Unions Pointers: Understanding pointers, Declaring and initializing pointer variables, Pointer expressions, Pointers and arrays, Pointers and character strings, Pointers to functions, Pointers and structures File Management in C: Defining and opening a file, Closing a file, Input and output operations on sequential text files Self Learning Topics (SLTs): Operations on individual members (Text1: chapter 11), Chain of pointers, array of pointers (Text1: chapter 12), Random access to files, Command line arguments (Text1: chapter 13). Solved problems (Text1: chapter 11 to chapter 13), Review questions, debugging exercises, programming exercises, interview questions (Text1: chapter 11 to chapter 13).	
LABORATORY COMPONENT	
List of Experiments 1. Programs using input-output functions, operators (arithmetic, relational and conditional) 2. Programs using operators (bit-wise, logical, increment and decrement) 3. Programs using conditional control structures: if, if-else, nested if 4. Programs using else-if ladder, switch and goto statements 5. Programs using loop control structures: while 6. Programs using loop control structures: do-while and for 7. Programs on one-dimensional array and two-dimensional arrays 8. Programs on String operations and string handling functions 9. Programs on different types of functions, parameter passing using call-by-value & call-by-address, recursion and storage classes 10. Programs using structures, unions, pointers to arrays and pointers to strings 11. Programs using array of pointers and pointers to structures 12. Programs on File operations and file handling functions for sequential text files	
<u>Textbook(s):</u>	
1. Balagurusamy, E., <i>Programming in ANSI C</i> , McGraw Hill, 8 th edition, 2022	
<u>Reference Book(s):</u>	
1. Paul Deitel, Harvey Deitel, <i>C How to Program: With Case Studies Introducing Applications Programming and Systems Programming</i>, Pearson Education Limited, 9th edition, 2022 2. Brian W. Kernighan and Dennis Ritchie, <i>The C Programming Language</i>, Pearson Education India, 2nd edition, 2015 3. Reema Thareja, <i>Programming in C</i>, Oxford University Press, 3rd edition, 2023 4. Yashavant Kanetkar, <i>Let Us C</i>, BPB Publications, 19th edition, 2022 5. A.K. Sharma, <i>Computer Fundamentals and Programming in C</i>, 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):

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 student 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):					U24IN104: PROGRAMMING FOR PROBLEM SOLVING WITH C									
CO		P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	U24IN104.1	2	1	1	1	-	-	-	1	-	1	2	1	2
CO2	U24IN104.2	2	2	2	1	-	-	-	1	-	1	2	2	2
CO3	U24IN104.3	2	2	3	1	-	-	-	1	-	1	2	2	2
CO4	U24IN104.4	2	2	3	2	-	-	-	1	-	1	2	2	2
CO5	U24IN104.5	1	1	1	1	1	-	-	1	1	1	2	1	2
CO6	U24IN104.6	1	2	2	2	1	-	-	1	1	1	2	2	2
CO7	U24IN104.7	1	2	3	2	1	-	-	1	1	1	2	2	2
CO8	U24IN104.8	1	2	3	2	1	-	-	1	1	1	2	2	2
U24IN104		1.5	1.75	2.25	1.5	1	-	-	1	1	1	2	1.75	2

ENGLISH COMMUNICATION AND REPORT WRITING			
Class: B.Tech.I		Branch: Common to all branches	
Course Code:	U24MH105	Credits:	2
Hours/Week (L-T-P-O-E):	2-0-0-3-5	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: 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			9Hrs
GRAMMAR - Tenses-Structures-usage-examples-exercises for practice - Sentence Correction-Correct use of Tenses, Verb forms, Punctuation. VOCABULARY - Word formation: Prefixes-Suffixes-Sentence Formation with newly formed words READING SKILL - Definition-Subskills of Reading-Emphasis on Skimming-Purpose-How to skim through the text-Examples, Exercises for practice WRITING PRACTICES - 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	9Hrs
GRAMMAR • Tenses-Revision-Exercisesforpractice • Subject-VerbAgreement • ReportedSpeech-Transformation • SentenceCorrection-EmphasisConcord,ReportSpeech,SentenceStructures VOCABULARY • Synonyms-Antonyms-SingleWordSubstitutes-PopularAbbreviations READINGSTRATEGY • EmphasisonScanningtheText-Purpose-Advantages-Examples,ExercisesandPracticethroughTeamwork • WRITINGPRACTICES • LetterWriting-EffectiveLetterWritingTechniques-InformationSeekingLetters-JobApplicationLetters-ApologyLetters-ExplanationtoMemos-E-mails-CoverLetters-Resume LIFESKILLS:Determination • HowIBecameaPublicSpeaker:AnessaybyGeorgeBernardShaw • <i>SelfLearningTopics(SLTs):EnglishVocabulary(Text2,Unit-I,Unit-II,Unit-III),Tenses(Referencebook3,Topic-30,Exercises,30.1,30.2,30.3)</i>	
UNIT-III	9Hrs
GRAMMAR • Tenses-Revision-ExercisesforPractice • Nouns-Prepositions-Adverbs-Adjectives • SentenceCorrection:CorrectUseoftenses,nouns,prepositions,adverbsandadjectives VOCABULARY • PhrasalVerbs-TechnicalWords-LatinWords READINGSTRATEGY • IntensiveReading-purpose-TypesofComprehensionQuestions-	

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 (Textbook 1, Unit-I), Tenses (Reference book 1, Topics-16, 17, 18, 19)

Phrasal Verbs (Reference book 3)

UNIT-IV

9Hrs

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.

C02: create effective letters, e-mails, reply to Memos and do the given tasks with confidence.

C03: analyze the given texts and write clear and unambiguous reports.

C04: 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" As per the latest AICTE syllabus, 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/previous
Technical English for Engineers by Aisha Icbal, IIT Madras
2. https://onlinecourses.swayam2.ac.in/cec21_lg13/preview
Indian Writing in English by Dr. Bindu Ann Philip, St Mary's College Trissur

CourseArticulationMatrix(CAM):				U24MH105:ENGLISHCOMMUNICATION&REPORTWRITING										
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24MH105.1	-	-	-	-	-	1	-	2	2	2	2		
CO2	U24MH105.2	-	-	-	-	-	1	-	2	2	2	2		
CO3	U24MH105.3	-	-	-	-	-	1	-	2	2	2	2		
CO4	U24MH105.4	-	-	-	-	-	1	-	2	2	2	2		
U24MH105		-	-	-	-	-	1		2	2	2	2		

SPORTSAND YOGA			
Class: B.Tech. I-Semester		Branch: Common to all branches	
Course Code:	U24VA106	Credits:	1
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 its 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 Asanas
<u>Textbook(s):</u> 1. 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>Reference Book(s):</u> 1. Dr. Sakure Girish Madhwarao, <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=mDw7lgM8ePoCarr 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=bLrJGWvWI4UV>

olleyball game Video Link:

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

00Q1UCricket game Video Link:

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

wQHandball game Video Link:

https://www.youtube.com/watch?v=VCa_0USaq8kKa

baddi game Video Link:

<https://www.youtube.com/watch?v=ai1m7ARNyNIK>

ho-Kho game Video Link:

https://www.youtube.com/watch?v=P3_z3LKdLdgYo

ga 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 students should be able to demonstrate...

CO1: demonstrate physical fitness by performing yoga asanas

CO2: demonstrate physical fitness through various games & sport events with defined benchmarks CO3: demonstrate sportsman spirit and ethics

CO4: demonstrate physical, psychological, social and emotional balance

Course Articulation Matrix (CAM):			U24VA106 Sports and Yoga											
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24VA106.1	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	U24VA106.2	-	-	-	-	-	-	-	-	1	-	-	1	1
CO3	U24VA106.3	-	-	-	-	-	-	-	2	-	-	-	1	1
CO4	U24VA106.4	-	-	-	-	-	-	-	-	-	1	1	1	1
U24VA106		-	-	-	-	-	-	-	2	1	1	1	1	1
3-HIGH, 2-MEDIUM, 1-LOW														

ENGINEERING GRAPHICSTHROUGH CAD			
Class:B.Tech.I–Semester		Branch:Common to all(except CE&ME)	
CourseCode:	U24ME107	Credits:	1
Hours/Week(L-T-P-O-E):	0-0-2-2-4	CIE:	100%
TotalNumberofTeachingHours:	36Hrs	ESE:	-
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> 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 projection of solids inclined to both the planes 7. Draw the Section of solids 8. Draw the Orthographic projection 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., <i>Elementary Engineering Drawing</i> , Charotar Publishing House, Anand, India, 2017. 2. Kulkarni D. M., Rastogi A. P., and Sarkar A., <i>Engineering Graphics with AutoCAD</i> , PHI publisher, revised edition, July 2010.			
Reference Book(s): 1. Dhananjay A Jolhe, <i>Engineering Drawing</i> , Tata McGraw-Hill, 2008. 2. Venugopal K. <i>Engineering Graphics with AutoCAD</i> , New Age International Publishers Ltd., Hyderabad, 2012. 3. Luzadder W.J and Duff J.M, <i>Fundamentals of Engineering Drawing</i> , 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 Graphicst through CAD Laboratory Manual & Record Book*, Dept. of ME, KITSW.

Course Learning Outcomes (COs)

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

CO1: draw projections of points and straight lines inclined to one plane with AutoCAD. CO2:

develop the projections of planes using AutoCAD

CO3: construct the projections of solids and sections of solids using AutoCAD

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

Course Articulation Matrix (CAM): U24ME107 ENGINEERING GRAPHICST THROUGH CAD

CO		P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	U24ME107.1	2	1	1	-	2	-	-	1	-	2	1	1	1
CO2	U24ME107.2	2	1	1	-	2	-	-	1	-	2	1	1	1
CO3	U24ME107.3	2	1	1	-	2	-	-	1	-	2	1	1	1
CO4	U24ME107.4	2	1	1	-	2	-	-	1	-	2	1	1	1
U24ME107		2	1	1	-	2	-	-	1		2	1	1	1

PRACTICUM-1						
Class:B.Tech.ISemester	Branch:Commontoallbranches					
CourseCode:	U24EL108	Credits:	1			
Hours/Week(L-T-P-O-E):	0-0-0-4-4	CIEMarks:	100%			
TotalNumberofTeachingHours:	-	ESEMarks:	-			
CourseLearningObjectives(LOs):						
Thiscoursewilldevelopstudents'knowledgein/on...						
LO1:literaturereviewandidentifyingresearchgaps						
LO2:implementingaprojectindependentlybyapplyingknowledgetopractice						
LO3:preparingwell-documentedreportandinformativePPT						
LO4:effectivetechnicalpresentationandcreatingvideopitch						
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 knowledgeanddevelop their ability to apply thisknowledgeto the solutionof 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). Practicumisamandatorysemesterprojectwork.						
(ii). Practicumisofferedasaonecreditcourse.Studenthastoearn4credits(onein each semester from I to IV semesters)						
(iii). AllotmentofPracticumtopicsforstudents:						
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 allotmentofgroupofstudentstothedifferentcoursefacultyofthesection, asshownbelow.						
Course	U24MH101	U24CY102	U24CI103	U24IN104	U24MH105	U24CH106
Students allottedto 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 :

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

Note:

1. The student 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 classwork 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 all 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 rubric 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
Videopitch	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 student should be able to...

C01:synthesizeliteraturesurvey,identifyresearchgapsanddefineobjective&scopeof practicum problem

C02: applyknowledge todesign& conduct experiments, utilizemoderntools for solution of practicum problem and develop working model/ process/ system

C03:demonstratethegenericcompetenciesinmakingawell-documentedreport portraying knowledge, skills, qualities acquired through practicum

C04:createavideopitchonpracticumandmakeaneffectiveoralpresentationusingPPTs

SOCIALEMPowerMENTACTIVITY/SELFACCOMPLISHMENTACTIVITY (SEA-I/SAA-I)			
Class: B.Tech.I Semester	Branch: Common to all branches		
Course Code:	U24VA109XXXXX	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): <i>This course will develop students' knowledge in/on...</i> 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, students shall work outside the classwork 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, students have to take up fieldwork on the chosen activity, as part of SEA/SAA course.

- i. This student-driven Fieldwork allows 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 Socialworkers/NGOs,otherinspiringandgreatpersonalities

(b). **In case of Sports / Games and Cultural activities of SEA/SAA:** Eminent coaches/trainers/gurus,achieverswhorepresented/wonstatelevel/nationallevel /internationallevelcompetitions,otherinspiringand 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 learning 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 identify 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 fieldwork, 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
Fieldwork	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 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 time slot from the nodal centre and demonstrate the skills learnt/improved during the allotted time slot.
- The necessary arrangements for demonstration shall be looked after by 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 sensibility

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

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

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/SA Coordinator

EXPERT TALK SERIES-I			
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	CIEMarks:	100%
Total Number of Teaching Hours:	-	ESEMarks:	-
Course Learning Objectives(LOs): <i>This course will develop students' knowledge in/on...</i> LO1: 21 st 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 a 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 than 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 student 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

II SEMESTER**Stream-II**

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	BSC	U24MH201	MatrixTheoryandVector Calculus	2	1	-	6	9	3
2	BSC	U24PY202B	EngineeringPhysics	2	1	2	5	10	4
3	PCC	U24IN203	ComputerArchitectureand Organisation	2	1	-	4	7	3
4	ESC	U24IN204	DataStructuresthroughC	2	1	2	5	10	4
5	ESC	U24EE205B	BasicElectricalEngineering	2	1	2	5	10	4
6	VAC	U24CY206	EnvironmentalStudies	2	-	-	2	4	-
7	AEC	U24AE207	IdeaLabMakerspace	-	-	2	2	4	1
8	SEC	U24SE208	ProgrammingSkill Development(PSD)Lab-1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210XXXXX	SEA-2/SAA-2	-	-	-	2	2	1
11	AEC	U24AE211	ExpertTalkSeries-2	-	-	-	1	1	1
Total:				12	5	10	38	65	23
Summer/ Inter-semBridgeCourses(Approved byBoS and Dean,AA):1 weekto10days:1credittoeachBridgecourseunderadditionallearning (will be printed on grade sheet)									

Pool-I(Physics)		
S.No.	CourseCode	CourseTitle
1.	U24PY202A	EngineeringPhysics (forMechanicalEngineering)
2.	U24PY202B	EngineeringPhysics (Common to CSM, CSD, CSN, CSO & IT)

Pool-II(BasicElectrical&ElectronicsEngineering)		
S.No.	CourseCode	CourseTitle
1.	U24EE205A	BasicElectricalandElectronicsEngineering (forMechanicalEngineering)
2.	U24EE205B	BasicElectricalEngineering (Common to CSM, CSD, CSN, CSO & IT)

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(IOT))

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

Exit Options to Qualify for UG Certificate in CSE(IOT) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IN211X	Arduino Programming	2	-	2	-	4	3
2	PCC	U24IN212X	Web Development	2	-	2	-	4	3
3	PCC	U24IN213X	Raspberry Pi Programming	2	-	2	-	4	3

(OR)

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

Exit Options to Qualify for UG Certificate in CSE(IOT) : Any Two (02) Skill-based Courses:-									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE212X	Programming with C++ Reference: https://trainings.internshala.com/c-plus-plus-course	-	-	6	-	6	3
2	SEC	U24SE213X	Advance Excel https://trainings.internshala.com/excel-course	-	-	6	-	6	3
3	SEC	U24SE214X	CISCO: IT Essentials Reference: Offered by CISCO CoE, KITSW	-	-	6	-	6	3
4	SEC	U24SE215X	CISCO: Introduction to Networks Reference: Offered by CISCO CoE, KITSW	-	-	6	-	6	3

MATRIX THEORY AND VECTOR CALCULUS			
Class: B.Tech.II-Semester		Branch: Common to all branches	
Course Code:	U24MH201	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-6-9	CIE:	60%
Total Number of Teaching Hours:	36Hrs	ESE:	40%
Course Learning Objectives (LOs):			
This course will develop students' knowledge in/on...			
LO1: various methods of solving system of linear equations and eigenvalue 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			9Hrs
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, Eigenvalue problems arising from Markov processes, Eigenvalue 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			9Hrs
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 a 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			9Hrs
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	9Hrs
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 student should be able to... CO1: analyze eigenvalue 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., <i>Higher Engineering Mathematics</i>, Khanna Publishers, Delhi, 44th edition, 2017 (Chapters 2, 7, 8) - Kreyszig E, <i>Advanced Engineering Mathematics</i>, Inc, U.K, John Wiley & sons, 10th edition, 2020 (Chapter 8 (8.2))	
Reference Book(s): - Spiegel M, <i>Vector Analysis</i> - Schaum's Series, McGraw Hill, 2nd edition, 2017 - S.S. Sastry, <i>Engineering Mathematics, Vol. II</i>, Prentice Hall of India, 3rd edition, 2014. - Gilbert Strang, <i>Introduction to Linear Algebra</i>, Wellesley-Cambridge Press, 5th edition	
Web and Video link(s): https://youtu.be/L4crGhtEX14?si=hyjAPgDheJOHxYtYZ: 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	

CourseArticulationMatrix(CAM):				U24MH201MATRIXTHEORYANDVECTOR CALCULUS										
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24MH201.1	2	2	1	1	-	-	-	1	1		1	1	1
CO2	U24MH201.2	2	2	1	1	-	-	-	1	1		1	1	1
CO3	U24MH201.3	2	2	1	1	-	-	-	1	1		1	1	1
CO4	U24MH201.4	2	2	1	1	-	-	-	1	1		1	1	1
U24MH201		2	2	1	1	-	-	-	1	1		1	1	1
3-HIGH,2-MEDIUM,1-LOW														

ENGINEERINGPHYSICS (common to CSM, CSD, CSN, CSO & IT)			
Class: B.Tech.II-Semester		Branch: Common to CSM, CSD, CSN, CSO & IT	
Course Code:	U24PY202B	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
Total Number of Teaching Hours:	60Hrs	ESE:	40%
Course Learning Objectives(LOs): This course will develop students' knowledge in/on... 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		9Hrs	
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 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) Self Learning Topics (SLTs): Concept of wave and basic concepts - amplitude, wavelength, frequency, phase, phase angle and general wave equation (Text 1: topic 1.9), types of waves (Text 1: topic 1.10), reflection laws (Text 1: topic 1.11).			
UNIT-II		9Hrs	
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 Magnetic and Superconducting materials: Introduction, Permeability, Magnetization, Susceptibility, Origin of magnetism, Bohr magneton, Ferro, Antiferro and ferrimagnetic 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 Self Learning Topics (SLTs): magnetisation, susceptibility & their relations (Text 1: topic 41.2), London penetration depth (Text 1: topics 42.4.7), Solved problems (Text 1: Prob 42.9 to 42.14).			

UNIT-III	9Hrs
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) 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 Self Learning Topics (SLTs): Heisenberg's uncertainty principle (Text 1: topics 27.2), Observables and operators (Text 1: topics 27.19), Solved problems (Text 1: Prob 27.13, Prob 27.17).	
UNIT-IV	9Hrs
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) 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 Self Learning Topics (SLTs): drift & diffusion current (Text 2: topic 4.9), diode current equation (Text 2: topic 4.15), Solved problems (Text 2: Prob 4.17 to 4.21).	
LABORATORY COMPONENT	
List of Experiments 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): 7. M. Avadhanulu and Kshirsagar, TVS Arun Murthy, <i>A Text Book of Engineering Physics</i>, S. Chand & Company Ltd, 11th edition, 2018 (Unit-I, II & III- Chapter 5, 6, 27, 41, 42, 44 & 47) 8. S. Salivahanan, N. Suresh Kumar, <i>Electronic devices and circuits</i>, McGraw Hill edition, 2017 (Unit-IV- Chapter 4, 5 & 6) (Unit-IV- Chapter 4, 5 & 6) 9. Michael Nielsen and Isaac Chuang, <i>Quantum Computation and Quantum Information</i>, Cambridge University Press, 2010 (Unit-III- Chapter 1.1, 1.2 & 1.3)	

ReferenceBook(s): 1. NeilGershenfeld,<i>PhysicsofInformationTechnology</i>,CambridgeUniversityPress, 1stedition, 2000 2. V.Rajendran,<i>EngineeringPhysics</i>,McGrawHilledition,2013 3. EleanorRieffelandWolfgangPolak,<i>QuantumComputing:AGentleIntroduction</i>,The MIT Press Cambridge, Massachusetts London, England, 2011 4. R.K.Gaur and S.L.Gupta,<i>EngineeringPhysics</i>,DhanpathRaiandSons,2013 5. David Halliday, Robert Resnick and S Krane, <i>Physics Volume I&II</i>, Wiley India Limited, 5thedition, 2014
WebandVideolink(s): 1. https://onlinecourses.nptel.ac.in/noc24_ph28/preview;NPTELvideo lecture on Concepts in Magnetism andSuperconductivitybyProf. Arghya TaraphderIIT Kharagpur 2. https://onlinecourses.nptel.ac.in/noc24_lw07/preview; NPTEL video lecture onIntroduction to Law on Electricity by Prof. UdayShankar, IIT Kharagpur 3. https://onlinecourses.nptel.ac.in/noc24_ph45/preview;NPTEL Video Lecture on Introduction to LASER - Courseby 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 onIntroduction to Quantum Computing: Quantum Algorithms and Qiskit by Prof. Prabha Mandayam, Prof. Anupama Ray, Prof. Sheshashayee Raghunathan,IIT Madras
LaboratoryManual(for laboratory component): 1. <i>EngineeringPhysicsLaboratory Manual&Record Book</i>,DepartmentofPS,KITSW 2. A.K.Katiyar,C.K.Pandey,<i>EngineeringPhysicsTheoryandPractical</i>,WileyIndiaPvt. Ltd,2ndedition, 2017
CourseLearningOutcomes(COs): Aftercompletionofthiscourse,thestudentsshouldbeableto, <i>(basedoncognitiveskillsacquiredfrom theorycomponent)</i> C01:evaluatepropertiesoflasersandopticalfibrepameters C02:calculatetheelectricfield,electricpotential,magneticfieldandfluxdensity;determine properties ofmagnetic and superconducting materials C03:evaluatetheenergyvaluesofaparticleinaninfinitepotentialwellandapplythe quantum principles in quantum computing C04:analyzeV-Icharacteristicsofsemiconductor diodesandsuggesttheirapplications; determine resistances oftransistor biasing circuits <i>(basedonpsychomotorskillsacquiredfromlaboratorycomponent)</i> C05:measurediameterofwireandhollowtubesusingVerniercallipersandscrewgauge C06:determinethewidthofanarrowslitandwavelengthoflaserusingdiffractionphenomenon and numerical aperture of an optical fiber C07:calculatethedielectricconstantofamaterialandplotthehysteresiscurveof ferromagnetic material C08:determineforwardvoltageandcurrentsfromV-Icharacteristicsofsemiconductor diodes;identifycut-off,saturationandactiveregionsofNPNtransistor

Course Articulation Matrix (CAM):				U24PY202B-ENGINEERING PHYSICS (common to CSM, CSD, CSN, CSO & IT)										
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24PY202B.1	2	1	1	-	-	1	1	1	1	-	1	-	-
CO2	U24PY202B.2	2	1	-	-	-	1	1	1	1	-	1	-	-
CO3	U24PY202B.3	2	1	-	-	-	1	1	1	1	-	1	-	-
CO4	U24PY202B.4	2	1	-	-	-	1	1	1	1	1	1	-	-
CO5	U24PY202B.5	2	1	1	-	1	1	1	1	2	-	1	-	-
CO6	U24PY202B.6	2	1	-	-	1	1	1	1	2	-	1	-	-
CO7	U24PY202B.7	2	1	-	-	1	1	1	1	2	-	1	-	-
CO8	U24PY202B.8	2	1	-	1	1	1	1	1	2	1	1	-	-
U24PY202B		2	1	1	1	1	1	1	1	1.5	1	1	-	-
3-HIGH, 2-MEDIUM, 1-LOW														

COMPUTERARCHITECTUREANDORGANIZATION			
Class:B.Tech.II –Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24IN203	Credits:	3
Hours/Week(L-T-P-O-E):	2-1-0-4-7	CIE:	60%
TotalNumberofTeaching Hours:	36Hrs	ESE:	40%
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents’knowledgein /on... LO1:functionalunitsofacomputer,principlecomponentsandinstructionset architecture LO2:processingunitandcomputationof arithmeticoperations LO3:memoryunitanddata transferbetweenprocessor,memory&I/O LO4:operationsofhigh-performancecomputingsystems			
UNIT-I			9Hrs
BasicStructureofComputers:Functionalunits,basicoperationalconcepts, performance of computer. Instruction Set Architecture:Memory locations and addresses, memory operations, instructions and instruction sequencing, instruction formats, addressing modes, assembly language, and assembler directives. SelfLearningTopics(SLTs):Digitalcomputers(Text2:topic1),Complementofa function(Text2:Topic1.3)			
UNIT-II			9Hrs
Basic Processing Unit:Fundamental concepts, instruction execution, hardware components, Instruction fetch and execution steps, control signals, hard-wired control, CISC-style processors Arithmetic:Addition and subtraction of signed numbers, multiplication of unsigned numbers, multiplication of signed numbers, fast multiplication, integer division, floating-point numbers and operations SelfLearningTopics(SLTs):NumberRepresentationandArithmeticOperations(Text1: topic1.4.1&1.4.2),BooleanAlgebra(Text2:Topic1.3)			
UNIT-III			9Hrs
The Memory System:Basic concepts, semiconductor RAM memories-Internal organization of memory chips, static memories, dynamic RAMs; read-only memories, memory hierarchy, cache memory mapping functions, performance considerations, secondary storage Input-OutputOrganization:Input-outputinterface-I/Obusandinterfacemodules,I/Ovs memory bus, Isolated vs. memory-mapped I/O; asynchronous data transfer- strobe control, handshaking,asynchronous serial transfer SelfLearningTopics(SLTs):RegisterTransferLanguage(Text2:Topic4.1),Busand Memorytransfers(Text2:Topic4.3)			
UNIT-IV			9Hrs
ModesofTransfer:Modesoftransfer,priorityinterrupt,directmemoryaccess,interconnection standards PipelineandVectorProcessing:Parallelprocessing,pipelining,arithmeticpipeline,instruction pipeline, vector processing MultiProcessors:Characteristicsofmultiprocessors,Interconnectionstructures SelfLearningTopics(SLTs):CommonBusSystem(Text1:Topic5.2)			
CourseLearningOutcomes(COs):			

After completion of this course, the student should be able to,	
CO1:	analyze instruction formats and addressing modes of assembly language
CO2:	examine hardwired & CISC style processors and solve arithmetic operations using signed and unsigned integers
CO3:	assess cache memory mapping techniques and examine data transfer between processor, memory & I/O
CO4:	evaluate different modes of data transfer, classify interconnection structures
Textbook(s):	
1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, Computer Organization and Embedded Systems, 6th ed., New Delhi: McGraw-Hill Education, 2012. (Chapters 1, 2, 5, 7-9)	
2. Morris Mano, Digital Design, PHI, 3rd edition, 2003, New Delhi.	
3. David B. Kirk and Wen-mei W. Hwu, Programming Massively Parallel Processors A Hands-on Approach, 2nd ed., USA: Morgan Kaufmann, 2013. (Chapters 1, 2)	
Reference Book(s):	
1. B Ram, Sanjay Kumar, Computer Fundamentals: Architecture and Organization, 5th ed., New Delhi: New Age International Publishers, 2018.	
2. W. Stallings, Computer Organization and Architecture- Designing for Performance, 7th ed., New Delhi: Pearson Education, 2009.	
3. John P. Hayes, Computer Architecture and Organization, 3rd ed., New Delhi: McGraw-Hill Education, 1998.	
4. Vincent P. Heuring, Harry F. Jordan, Computer Systems Design and Architecture, 2nd ed., United States: Pearson Education, 2004.	
Web and Video link(s):	
1. https://onlinecourses.nptel.ac.in/noc20_cs64/preview	

CourseArticulationMatrix(CAM):					U24IN203-COMPUTERARCHITECTUREAND ORGANIZATION									
CourseOutcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24IN203.1	2	2	2	1	-	1	1	1	-	1	1	1	1
CO2	U24IN203.2	2	2	2	2	-	1	1	1	-	1	1	1	1
CO3	U24IN203.3	2	2	2	2	-	1	1	1	-	1	1	2	1
CO4	U24IN203.4	2	2	2	2	-	1	1	1	-	1	1	2	1
U24IN203		2	2	2	1.8	-	1	1	1	-	1	1	1.5	1

DATA STRUCTURESTHROUGH C			
Class:B.Tech.II –Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24IN204	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
TotalNumberofTeachingHours:	60Hrs	ESE:	40%
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents'knowledgein/on... LO1:timecomplexity,spacecomplexity,arrayoperations,anddynamicmemoryallocation LO2:stacksandvariousformsofqueues LO3:varioustypesoflinkedlists LO4:varioussorting techniquesandhashingtechniques			
THEORYCOMPONENT			
UNIT-I		9Hrs	
DataStructures: Basicterminology,Classificationofdatastructures,Applicationsand operations on data structures, Time and space complexity Arrays: Operationsonarrays-traversinganarray,Insertinganelementinanarray,Deleting an element fromanarray, Searchingan elementusingbinarysearchand their complexities, DynamicMemoryAllocation: Memoryallocationfunctions,Dynamicmemoryallocation for single and two dimensional arrays SelfLearningTopics(SLTs): Threedimensionalandn-dimensionalarrays(Text1:topics2.4.3), passingarraystofunctionsandpointers(Reference1:topics3.6,3.7),Practiceproblems(Text1: Prob 2.3,Reference1:Prob1,Prob2,Prob3,Prob 4)			
UNIT-II		9Hrs	
Stacks: stacks,Arrayrepresentationofstacks,Operationsonastack–pushandpop;Multiple stacks, Applications of stacks- recursion, Fibonacci series, tower of Hanoi, evaluation of expressions (infix to postfix conversion, evaluation ofpostfix expression) Queues: queues,Arrayrepresentationofqueues,Doubleendedqueues,Circularqueues Self Learning Topics (SLTs): Infix to prefix (Reference1: topics 7.7.3), priority Queue(Reference1: 8.4.3),Solvedproblems(Reference1:Prob7.7.1,Prob7.7.2),Practiceproblems(Text1:Prob4.5,Prob 4.11, Prob5.7, Prob 5.9)			
UNIT-III		9Hrs	
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 SelfLearningTopics(SLTs): Merging(Text1:topics3.3),Skiplist(weblink: https://www.geeksforgeeks.org/skip-list/), Deallocation strategy(Text1: topic 3.9), Solved problems (Text1: Prob3.6.1,Prob3.6.2),Practice problems (Reference1:Prob5.5,Prob5.7, Prob5.9)			
UNIT-IV		9Hrs	
SortingTechniques: Selectionsort,InsertionSort,Shellsortandradixsort,Time complexities of sorting Hashing: Hashingtechniques,Collisionresolutiontechniques,Closedhashing,Open hashing, Comparison of collision resolution techniques SelfLearningTopics(SLTs): Twowayinsertionsort(Text1:topics10.3.4),Comparisonof sortingtechniques(Reference1:topics14.16)Solvedproblems(Reference1:Prob15.5,Prob15.6,Prob			

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 Multi Stack

Experiment-VI

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

Experiment-VII

19. Program to create single linked list and implement its operations

Note:- Linked list Operations: i) traversing ii) inserting iii) deleting iv) searching v) reversing vi) concatenation

Experiment-VIII

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

Experiment-IX

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

Experiment-X

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

Experiment-XI

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

Experiment-XII

27. Program to implement shell sort

28. Program to implement radix sort
29. Program to implement hashtable.
Textbook(s): 1. Debasis Samanta, <i>Classic Data Structures</i> , Prentice Hall India, 2 nd edition, 2009
Reference Book(s): 1. Reema Thareja, <i>Data Structures Using C</i> , Oxford University Press, 2 nd edition, 2014 2. Balagurusamy E, <i>Data Structure Using C</i> , McGraw Hill Education, 1 st edition, 2017 3. Richard F. Gilberg and Behrouz A. Forouzan, <i>Data Structures: A Pseudocode Approach with C</i> , Cengage Learning, 2 nd Edition, 2007
Web and Video link(s): https://nptel.ac.in/courses/106106130 ; NPTEL Video Lecture on Programming and Data Structures Dr. N. S. Narayana Swamy, CSE, IIT Madras.
Laboratory Manual (for laboratory component): 1. <i>Data Structures through C Laboratory Manual and Record Book</i> , Department of CSE (AI & ML), KITSW.
Course Learning Outcomes (COs): <i>After completion of this course, the student should be able to,</i> <i>(based on cognitive skills acquired from theory component)</i> CO1: analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities CO2: analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities CO3: analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities CO4: develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies <i>(based on psychomotor skills acquired from laboratory component)</i> CO5: develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity CO6: apply the linear data structures such as stacks and queues and perform various operations using LIFO or FIFO order respectively CO7: solve problems using various linked list representations for efficiently storing and retrieving the data CO8: apply different sorting techniques on unsorted data and sort them in an order, able to store the data using hashing technique to retrieve the data very effectively

Course Articulation Matrix (CAM):					U24IN204 DATA STRUCTURE 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	PSO 1	PSO 2
C01	U24IN204.1	2	2	2	1	-	-	-	1	-	1	1	2	1
C02	U24IN204.2	2	2	2	2	-	-	-	1	-	1	2	2	2
C03	U24IN204.3	2	2	2	2	-	-	-	1	-	1	2	2	2
C04	U24IN204.4	2	2	2	2	-	-	-	1	-	1	2	2	2
C05	U24IN204.5	2	2	2	1	-	-	-	1	1	1	1	2	1
C06	U24IN204.6	2	2	2	2	-	-	-	1	1	1	2	2	2
C07	U24IN204.7	2	2	2	2	-	-	-	1	1	1	2	2	2
C08	U24IN204.8	2	2	2	2	-	-	-	1	1	1	2	2	2
U24IN204		2	2	2	1.75	-	-	-	1	1	1	1.75	2	1.75

BASICELECTRICALENGINEERING			
Class:B.Tech.II-Semester		Branch:Common to CSM, CSD, CSN, CSO & IT	
CourseCode:	U24EE205B	Credits	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE	60%
TotalNumberofTeachingHours:	60Hrs	ESE	40%
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents'knowledgein/on... LO1:networkelementsandDCcircuits LO2:DCnetworktheorems LO3:1-ØACand3-ØACcircuits LO4: construction, principles andapplications ofDC & AC machines andconcept of Lighting sources			
THEORYCOMPONENT			
UNIT-I			9Hrs
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. DC Circuit analysis:Source transformation, Star-Delta conversion, Mesh analysis & Nodal analysis (T & π networks only). Self-LearningTopics(SLTs):Definitionsofcharge,current,&voltage(Text1:Topics1.2.),Solved problems(Text1:Prob3.10,3.11&3.12),Practiceproblems(Text1:Chap-3,Prob4,5,7&8).			
UNIT-II			9Hrs
DC network theorems (Independent sources only): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (T & π networks only). Self-LearningTopics(SLTs):Conditionformaximumpowertransfer(Text1:Topics3.9),Solved problems(Text1:Prob3.15,3.18,3.23&3.25),Practiceproblems(Text1:Chap-3,Prob9,10,13&14).			
UNIT-III			9Hrs
1-ØACcircuits: R.M.Svalue,Averagevalue,Peakfactorandformfactor ofasine 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. 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. Self-LearningTopics(SLTs):ExpressionforRMS&Averagevalue(Text1:Topic,4.4&4.5) Solved problems (Text1: Prob4.10,4.12,4.13 & 4.14), Practice problems (Text1: Chap-4,Prob 8,9,12&12).			
UNIT-IV			9Hrs
ElectricalMachines&ElectricalLighting(Qualitativetreatment): Construction,Principle ofoperation,Characteristics &applications of1- Øtransformer,3- Ø induction motor, 1- Ø induction motor and DC motor and Types of DC motor. ElectricallightingsourcesandEnergycalculations: Lightingsources-incandescent,Fluorescent,CFL&LEDlamps,Elementarycalculationsforenergy consumption. Self-LearningTopics (SLTs): EMFequationofa Transformer(Text1: Part-II Topic,4.4.2)Solved problems(Text1:Part-IIProb4.5,4.6&4.7),Practiceproblems(Text1:Part-IIProb5.2,5.3& 5.4),Practiceproblems(Text1:Part-IIProb6,7&8)			

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 Kirchhoff's laws using PSPICE/MATLAB 12. Interfacing Sensors with Arduino using TINKERCAD i. LED blinking ii. IR Sensor iii. Ultrasonic Sensor iv. Voltage Sensor v. Current Sensor vi. Speed Sensor	
<u>Textbook(s):</u> 1. K. Uma Rao, <i>Basic Electrical Engineering</i>, Pearson Education, Edition, 2011	
<u>Reference Book(s):</u> 1. B.L. Thereja, A.K. Thereja, <i>Electrical Technology Vol. I & II</i>, S. Chand & Company Ltd, Edition , 2005. 2. Edward Hughes, <i>Electrical & Electronics Technology</i>, Pearson Education, 10th Edition., 2010. 3. D. P. Kothari and I. J. Nagrath, <i>Basic Electrical Engineering</i> , Tata McGraw Hill, Edition , 2010. 4. Chakravarthy A, Sudhipanath and Chandan Kumar, <i>Basic Electrical Engineering</i>, Tata McGraw Hill Ltd, 4th Edition, 2013	
<u>Web and Video link(s):</u> 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.	
<u>Laboratory Manual (for laboratory component):</u> 1. <i>Basic Electrical Engineering Laboratory Manual and Record Book</i>, Department of EEE,	

KITSW.

Course Learning Outcomes (COs):

After completion of this course, the student 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- ϕ AC circuits & determine line and phase quantities in 3- ϕ 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):			U24EE205B: 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	PSO 1	PSO 2
CO1	U24EE205B.1	2	1	-	-	-	-	-	1	1	1	1	1	1
CO2	U24EE205B.2	2	2	-	-	-	-	-	1	1	1	1	1	1
CO3	U24EE205B.3	3	3	1	1	1		1	1	1	1	1	1	1
CO4	U24EE205B.4	3	3	1	1	1	1	1	1	1	1	1	1	1
CO5	U24EE205B.5	2	1	-	-	-	-	-	1	1	1	1	1	1
CO6	U24EE205B.6	2	2	-	-	-	-	-	1	1	1	1	1	1
CO7	U24EE205B.7	3	3	1	1	1		1	1	1	1	1	1	1
CO8	U24EE205B.8	3	3	1	1	1	1	1	1	1	1	1	1	1
U24EE205B		2.5	2.25	1	1	1	1	1	1	1	1	1	1	1
3-HIGH, 2-MEDIUM, 1-LOW														

ENVIRONMENTAL STUDIES			
Class: B.Tech.II Semester		Branch: Common to ME, CSM, CSD, IT, CSN & CSO	
Course Code:	U24CY206	Credits:	0
Hours/Week(L-T-P-O-E):	2-0-0-2-4	CIE:	60%
Total Number of Teaching Hours:	24 Hrs	ESE:	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: natural resources and their use more equitably LO2: ecosystem and the importance of biodiversity conservation LO3: environmental pollution and its control measures LO4: environmental legislation and green methodology			
UNIT-I			6Hrs
The Multidisciplinary Nature of Environmental Studies: Definition, Scope and importance Natural Resources: Forest Resources-Use and over exploitation of forests, Deforestation, Timber extraction, Mining, Dams and their effects on forests and tribal people; Water Resources-Use and over-utilization of surface and groundwater, Floods, Drought, Conflicts over water; Mineral Resources-Environmental effects of extracting and using mineral resources; Energy Resources-Renewable and non-renewable energy sources, Use of alternate energy sources Self Learning Topics (SLTs): Use and over-utilization of surface and groundwater (Text 1: unit 2, topic: 2.2.2) world food problems (Text 1: unit 2, topic 2.2.2)			
UNIT-II			6Hrs
Ecosystem and Biodiversity: Ecosystem: Concepts of an ecosystem, Food chain, Food webs, Ecological pyramids, Energy flow in the ecosystem and ecological succession Biodiversity and its Conservation: Introduction, Definition, Genetic, Species and ecosystem diversity, Value of biodiversity, Biodiversity in India, Hot spots of biodiversity, Man-wildlife conflicts, Endangered and endemic species of India; In-situ and Ex-situ conservation Self Learning Topics (SLTs): Introduction and definition of biodiversity (Text 1: unit 4, topic 4.1)			
UNIT-III			6Hrs
Environmental Pollution: Global issues-Global climatic change, Greenhouse gases, Effects of global warming, Ozone layer depletion International Conventions/Protocols: Earth summit, Kyoto protocol, Montreal protocol Environmental Pollution- Causes and effects of air, Water, Soil, Marine and noise pollution with case studies Solid and Hazardous Waste Management: Introduction, Types, Effects of urban industrial and nuclear waste Natural Disaster Management: Introduction to disaster, Management of disaster, Disaster management of flood, earthquake, cyclone and landslides Role of information technology in environment and human health Self Learning Topics (SLTs): Role of individual in prevention of pollution (Text 1: unit 5, topic 5.10)			
UNIT-IV			6Hrs
Social Issues and the Environment: Role of Individual and Society, Water conservation, Rain water harvesting Environmental Protection/Control Acts: Air (prevention and control of pollution) act 1981, Forest conservation act (1980 and 1992), Wildlife protection act 1972, Environment protection act 1986, Issues involved in enforcement of environmental legislations			

Green Methodology: Principles of green chemistry, Green methods in electronic production, Impact of electronic waste on public health and environment
The Sustainable Development Goals (SDGs): United Nations Sustainable Development Goals
Self Learning Topics (SLTs): Water (prevention and control of pollution) act 1974 (Text 1: unit 6, topics 6.10), Water pollution cess act 1977 (Text 1: unit 6, topics 6.11)

Textbook(s):

1. Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Courses*, 2nd Edn., Universities Press (India) Pvt. Ltd, 2013

Reference Book(s):

1. Y. Anjaneyulu, *Introduction to Environmental Science*, B.S. Publications, 2004.
2. Gilbert M. Masters, *Introduction to Environmental Engineering & Science*, 3rd Edn., Prentice Hall of India, 1991
3. Anubha Kaushik, C.P. Kaushik, *Environmental Studies*, 4th Edn., New Age International Publishers, 2014
4. R. Rajagopalan, *Environmental Studies from crisis to cure*, Oxford University Press, 2nd Edn., 2011

Web and Video link(s):

1. <https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ch27/videolecture> on renewable energy resources by Prof. Vaibhav. V. Goud and Dr. R. Anandalakshmi, Dept. Of Chemical Engineering, Guwahati.
2. <https://sdgs.un.org/goals>; UN's webpage on 17 sustainable Development Goals
3. https://onlinecourses.nptel.ac.in/noc23_hs57/preview United Nations Sustainable Development Goals

Course Learning Outcomes (COs):

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

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

Course Articulation Matrix (CAM):					U24CY206 ENVIRONMENTAL STUDIES									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24CY206.1	2	1	2	1	-	2	1	1	1	-	-	-	-
CO2	U24CY206.2	-	-	2	-	-	1	1	1	1	1	-	-	-
CO3	U24CY206.3	1	2	1	-	-	1	1	1	1	1	1	-	-
CO4	U24CY206.4	-	-	1	-	-	1	1	1	1	-	1	-	-
U24CY206		1.50	1.50	1.50	1.00	-	1.25	1.00	1.00	1.00	1.00	1.00	-	-

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

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

Text/Reference Book(s):

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy., "Element of Workshop Technology", Media Promoters and publishers Pvt. Ltd, India, Vol-I-2008 & Vol-II-2010.

2. IanGibson,DavidRosen,BrentStucker,MahyarKhorasani,“AdditiveManufacturingTechnologies-3DPrinting, Rapid Prototyping, and Direct Digital Manufacturing” Springer Nature, 2ndEdition 2021.
3. R.S.Khandpur,“PrintedCircuitBoards:Design,Fabrication,AssemblyandTesting”,NewDelhiTataMc Graw Hill-2008.
4. SudeepMishra,AnandarupmukherjeeandArijitRoy,“IntroductiontoIoT”,NewDelhi:University CambridgePress,2021.

CourseLearningOutcomes(COs):

After completion ofthiscourse, the studentsshould beable to...

(basedonpsychomotorskills acquiredfrom laboratorycomponent)

CO1:producewoodenjointsandintricatearticlesusingcarpentryandCNCwoodrouterrespectively

CO2:implementprocedurestopreparethemouldcavityforsandcastingandarcweldingjoints

CO3:produceinnovativeprototypesusinglaserengravingand3Dprinting

CO4: designanddevelopsystemsbasedonPCBandIoTforgivenapplications

CourseArticulationMatrix(CAM):				U24EE207:IDEALabMakerspace										
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS 01	PSO 2
CO1	U24AE107.1	2	2	1	1	2	1	-	1	2	2	1	1	1
CO2	U24AE107.2	2	2	1	1	2	1	-	1	2	2	1	1	1
CO3	U24AE107.3	2	2	1	1	2	1	-	1	2	2	1	1	1
CO4	U24AE107.4	2	2	1	1	2	1	-	1	2	2	1	1	1
U24AE107		2	2	1	1	2	1	-	1	2	2	1	1	1

PROGRAMMING SKILL DEVELOPMENT LAB 1			
Class: B.Tech.II-Semester		Branch: CSE (Internet of Things)	
Course Code:	U24SE208	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): <i>This course will develop students' knowledge in/on...</i> LO1: a solid foundation in C programming, focusing on fundamental concepts such as variables, data types, control structures, loops, and functions to solve computational problems LO2: apply logical and analytical thinking to devise solutions for moderate to complex problems by writing efficient and optimized C programs LO3: identify, analyze, and fix errors in C programs by mastering debugging techniques and utilizing testing strategies to ensure code reliability and performance LO4: developing real-world applications by designing, coding, and implementing projects that simulate industry-standard challenges, thereby preparing for placements and professional careers			
LABORATORY COMPONENT			
S.No.	List of Experiments		
13.	Programs using input/output functions, operators		
14.	Programs using conditional control structures: if, if-else, nested if		
15.	Programs using else-if ladder, switch and goto statements		
16.	Programs using iterative statements		
17.	Programs using iterative statements		
18.	Programs on one-dimensional array and two-dimensional arrays		
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 on different types of functions, parameter passing using call-by-value & call-by-address, recursion and storage classes		
23.	Programs using structures, unions, pointers to arrays and pointers to strings		
24.	Programs using array of pointers and pointers to structures		
Text/Reference Book(s): 5. Balagurusamy, E., <i>Programming in ANSI C</i> , McGraw Hill, 8 th edition, 2022 6. Paul Deitel, Harvey Deitel, <i>C How to Program: With Case Studies Introducing Applications Programming and Systems Programming</i> , Pearson Education Limited, 9 th edition, 2022 7. Brian W. Kernighan and Dennis Ritchie, <i>The C Programming Language</i> , Pearson Education India, 2 nd edition, 2015 8. Reema Thareja, <i>Programming in C</i> , Oxford University Press, 3 rd edition, 2023 9. Yashavant Kanetkar, <i>Let Us C</i> , BPB Publications, 19 th edition, 2022 10. A.K. Sharma, <i>Computer Fundamentals and Programming in C</i> , Universities Press, 2 nd edition, 2018			

Course Learning Outcomes (COs):

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

(based on psychomotor skills acquired from laboratory component)

CO1: develop efficient and optimized C programs to solve a range of moderate to complex problems, demonstrating a strong understanding of programming fundamentals and algorithm design

CO2: analyze and debug C programs to identify errors and optimize code performance, employing appropriate debugging techniques and tools

CO3: apply advanced programming concepts such as dynamic memory allocation, data structures, and file handling in C to create robust and scalable solutions

CO4: design, implement, and test real-world applications in C, simulating industry scenarios and preparing for technical roles in software development and problem-solving

Course Articulation Matrix (CAM):					U24SE208: Programming Skill Development Lab 1									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS 01	PSO 2
CO1	U24SE208.1	2	2	1	1	1	-	-	1	1	1	1	2	2
CO2	U24SE208.2	2	2	1	1	1	-	-	1	1	1	1	2	2
CO3	U24SE208.3	2	2	1	1	1	-	-	1	1	1	1	2	2
CO4	U24SE208.4	2	2	1	1	1	-	-	1	1	1	1	2	2
U24SE208		2	2	1	1	1	-	-	1	1	1	1	2	2

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	CIEMarks:	100%		
Total Number of Teaching Hours:	-	ESE Marks:	-		
Course Learning Objectives(LOs): <i>This course will develop students' knowledge in/on...</i> 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 all 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. Practicum also prepares 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 this section. The practicum matrix is the allotment of group of students to the different course faculty of this section, as shown below.					
Course	U24MH201	U24PY202	U24IN203	U24IN204	U24IN205
Students allotted to different courses	B24XX001	B24XX011	B24XX021	B24XX031	B24XX041
	B24XX002	B24XX012	B24XX022	B24XX032	B24XX042
	B24XX003	B24XX013	B24XX023	B24XX033	B24XX043
	B24XX004	B24XX014	B24XX024	B24XX034	B24XX044
	B24XX005	B24XX015	B24XX025	B24XX035	B24XX045
	B24XX006	B24XX016	B24XX026	B24XX036	B24XX046
	B24XX007	B24XX017	B24XX027	B24XX037	B24XX047

B24XX008	B24XX018	B24XX028	B24XX038	B24XX048
B24XX009	B24XX019	B24XX029	B24XX039	B24XX049
B24XX010	B24XX020	B24XX030	B24XX040	B24XX050

- 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 :

.....

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 students 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 teachers 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 course work 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 student 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

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA-II / SAA-II)			
Class: B.Tech. II Semester	Branch: Common to all branches		
Course Code:	U24VA210XXXXX	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): <i>This course will develop students' knowledge in/on...</i> 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 field work 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. - Each SEA/SAA activity is treated as one credit course - Student must select one activity per semester, through first 04 semesters, from the courses listed under SEA/SAA, before commencement of the semester. - Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA - To complete these activities students shall work outside the class work hours, during weekends, holidays, semester breaks, etc., - 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. <u>Monitoring SEA/SAA:</u> 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. - During the semester period, the student has to acquire requisite knowledge, conduct			

fieldwork,acquireskillsandpropose uniquesolutionstothereal-life problems

(c) **KnowledgeAcquisition& 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 toseek newopportunities in theirpersonalandprofessional life.
- iii. For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions under supervision ofexpert/guru are to be plannedand 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. Fieldworkconsistsofthreephases:preparation,theactualactivityandfeedback
- 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 mannerhelp 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/Renownedpersonalities:

- (a). **Incaseofsociallyrelevantproblems/activitiesofSEA/SAA:**Eminent personalities/achievers include district administrative officers, Eminent Social workers / NGOs, other inspiring and great personalities
- (b). **IncaseofSports/GamesandCulturalactivitiesofSEA/SAA:**Eminent coaches/trainers/gurus,achieverswhorepresented/wonstatelevel/nationallevel /internationallevelcompetitions,otherinspiringandgreatpersonalities.
- viii. **For appointment to interact eminent personalities:**Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes forgetting appointment and time for interaction
- ix. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
 - x. **Ethicsoffieldwork:**Fieldworkisaneducationalprocesswithcommitmentto positivevalues.Allfieldworkshouldbeplannedandconductedinawaythat 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' experienced during fieldwork. Therefore, the students 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 identify 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 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 time slot from the nodal centre and demonstrate the skills learnt/improved during the allotted time slot.
 - 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 student 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 sensibility

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

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

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, student shall refer to textbooks and web resources relevant to the course selected. Plan for fieldwork/practice sessions in coordination with SEA/SA coordinator

EXPERT TALK SERIES-II			
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	CIEMarks:	100%
Total Number of Teaching Hours:	-	ESEMarks:	-
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: 21 st 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 a 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 than 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:
- ETS is offered from I semester to VI semester.
 - ETS, in any given semester, is treated as one credit course
 - Students are required to earn six credits (from I to VI semester)
 - Head, Centre for i²RE shall be the institute level ETS coordinator**
 - Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode** by the parent department/Centre for i²RE.
 - 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.
 - The Head C-i²RE shall share the marks obtained by the students in each of the quizzes/test to the respective department ETS coordinators.**
 - Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.
 - Report on ETS:** At the end of semester, the students shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.
 - Evaluation:** There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks
 - 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: 2 Hrs) 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 student 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

III SEMESTER

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	PCC	U24IN301	Fundamentals of IoT	2	1	2	5	10	4
2	PCC	U24IN302	Operating Systems	2	1	-	4	7	3
3	PCC	U24IN303	Advanced Data Structures	2	1	2	5	10	4
4	PCC	U24IN304	Computer Networks	2	1	-	4	7	3
5	PCC	U24IN305	Object oriented programming through java	2	1	2	5	10	4
6	VAC	U24VA306B	Soft and Interpersonal Skills	-	-	2	2	4	1
7	SEC	U24SE307	PSD Lab-02	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309XXXXX	SEA-3/SAA-3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
Total:				10	5	10	34	59	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)									

@Dean AA will allot the courses QALR (Stream-I), Soft & Interpersonal Skills (Stream-II), to the branches as per Stream-I and Stream-II.

FUNDAMENTALS OF INTERNET OF THINGS			
Class: B.Tech.III – Semester		Branch: CSE (Internet of Things)	
Course Code:	U24IN301	Credits:	4
Hours/Week (L-T-P-O-E):	2-1-2-5-10	CIE:	60%
Total Number of Teaching Hours:	60 Hrs	ESE:	40%
Course Learning Objectives (LOs):			
This course will develop students' knowledge in/on...			
LO1: fundamentals of IoT, sensors, actuators and IoT boards			
LO2: basic elements of Arduino, i/o functions, working with LED and buttons, Node MCU			
LO3: integration of sensors and actuators with Arduino			
LO4: analog and digital communication protocols			
THEORY COMPONENT			
UNIT-I		9Hrs	
Introduction: Introduction to Internet of Things (IoT), Evolution of IoT versus Machine to Machine (M2M), IoT versus cyber physical systems (CPS), IoT versus Web of Things (WoT), Enabled technologies, Networking components, Challenges and applications			
Sensors: Definition, Characteristics, Deviations, Types-scalar, Multimedia, Hybrid and virtual, Considerations			
Actuators: Definition, Types-hydraulic, Pneumatic, Electric, Thermal or Magnetic, Mechanical, Soft and shape memory polymers, Characteristics			
Classification of IoT boards: Microcontroller boards, Single board controller, System on Chipboard			
<i>Self-Learning Topic (SLTs): Addressing Strategies in IoT (Text1: topic 5.4), Wireless sensor networks (Text1: topic 3.2)</i>			
UNIT-II		9Hrs	
Programming with Arduino: Features, Components, Integrated Development Environment (IDE), Basic programs, Time function, I/O function, Connecting Light Emitting Diode (LED) and button			
Node MCU: Components of ESP32/8266, Wi-Fi and Bluetooth connectivity, Connecting temperature sensor, controlling LED with mobile application			
<i>Self-Learning Topic (SLTs): Arduino installation and setup (Text1: chapter 16.1.3) Esp32/8266 Installation with diode (Text1: chapter 16.1.3)</i>			
UNIT-III		9Hrs	
Integration of Sensors: Interfacing with potentiometer, Detecting motion using PIR sensor, Measuring distance using ultrasonic sensor			
Integration of Actuators: Controlling DC motor, DC motors with transistors and diode, Controlling speed with Pulse Width Modulation (PWM), Servo motor, Stepper motor			
<i>Self-Learning Topic (SLTs): Servomotor interface with Node MCU (Text1: chapter 16.3.7)</i>			
UNIT-IV		9Hrs	
Analog and Digital Communication: Serial communication, Parallel communication			
Universal Asynchronous Receiver-Transmitter (UART) Communication: send data from the			

Arduino to the computer via UART and receive a response, Interfacing Liquid Crystal Display (LCD)

Inter-Integrated Circuit (I2C) Communication: Master and slave communication, Interfacing ADXL345 module and BMP180 module

Serial Peripheral Interface (SPI) Communication: Master and slave communication, Interfacing with SD Card

Case Study: Smart Green House

Self-Learning Topic (SLTs): Data transmission between Node MCU and remote server (Text 1: topic 16.3.9)

LABORATORY COMPONENT

List of Experiments

1. Basic programming of Arduino
2. Demonstrate LED and Button
3. Demonstrate the RGB LED and 7-segment display
4. Demonstrate Node MCU with temperature sensor
5. Demonstrate controlling LED with mobile application by using Node MCU
6. Demonstrate interfacing of potentiometer
7. Demonstrate interfacing of PIR sensor
8. Demonstrate interfacing of infrared and ultrasonic sensor
9. Demonstrate interfacing of DC motor, servomotor and stepper motor
10. Demonstrate I2C communication protocol
11. Demonstrate UART communication protocol
12. Demonstrate SPI communication protocol

Textbook(s):

1. Sudip Misra, Anandarup Mukherjee, Arjit Roy, *INTRODUCTION TO IOT*, New Delhi: Cambridge University Press, 2020 (chapter 7, 8)
2. Cornel Amariei, *Arduino Development Cookbook*, Birmingham: Packet Publishing Ltd., 2015 (Chapter 2-6)

Reference Book(s):

1. Arshdeep Bahga and Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Hyderabad: University Press, 2015
2. Marco Schwartz, *Internet of Things with ESP8266*, Birmingham: Packt Publishing Ltd., 2016
3. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, *Internet of Things With Raspberry Pi and Arduino*, Boca Raton: CRC Press, Taylor & Francis Group, 2020
4. Brian Evans, *Beginning Arduino Programming*, New York: Apress, 2011

Web and Video link(s): [https://nptel.ac.in/courses/106105191NPTEL Video Lecture on internet of things](https://nptel.ac.in/courses/106105191NPTEL%20Video%20Lecture%20on%20internet%20of%20things) Prof. Supidmistra, Professor of CSE, IIT Kharagpur.

Laboratory Manual (for laboratory component):

1. Internet of things *Manual and Record Book*, Department of CSN, KITSW.

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

CO1: identify the basics of IoT, sensors, actuators and IoT boards in real-time environment

CO2: make use of Arduino IDE, i/o functions for problem solving

CO3: distinguish analog and digital communications with Arduino

CO4: design a real-time application using sensors, actuators and Arduino board compare

(based on psychomotor skills acquired from laboratory component)

CO5: develop Arduino programming for problem solving

CO6: develop Arduino programming with LED and button

CO7: interpret analog and digital communications with Arduino

CO8: develop Arduino programming for connecting sensors and actuators to control the applications

Course Articulation Matrix (CAM):					U18IN301 FUNDAMENTALS OF INTERNET OF THINGS									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U18IN301.1	2	2	2	2	1	-	-	1	-	1	1	2	2
CO2	U18IN301.2	2	2	2	2	1	-	-	1	-	1	1	2	2
CO3	U18IN301.3	2	2	2	2	1	-	-	1	-	1	1	2	3
CO4	U18IN301.4	2	2	2	2	1	-	-	1	-	1	1	3	3
CO5	U18IN301.5	2	2	2	2	1	-	-	1	-	1	1	2	2
CO6	U18IN301.6	2	2	2	2	1	-	-	1	-	1	1	2	2
CO7	U18IN301.7	2	2	2	2	1	-	-	1	-	1	1	2	3
CO8	U18IN301.8	2	2	2	2	1	-	-	1	-	1	1	2	3
U24IN301		2	2	2	2	1	-	-	1	-	1	1	2	2.5

OPERATING SYSTEMS			
Class: B.Tech.III-Semester		Branch: CSE(Internet of Things)	
Course Code:	U24IN302	Credits:	3
Hours/Week(L-T-P-O-E):	2-1-0-4-7	CIE:	60%
Total Number of Teaching Hours:	36Hrs	ESE:	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: operating system functions, services and its structure LO2: scheduling algorithms, process synchronization techniques LO3: deadlocks related problems, memory management issues and virtual memory management techniques LO4: file and directory structures, disk management and system protection techniques			
UNIT-I			9Hrs
Introduction: Operating systems fundamentals, Operating-system operations, Process management, Memory management, Input-output management, Secondary storage management, Computing environments System Structures: Operating-system services, System calls, Types of system calls, System programs, Operating-system structure, System boot 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)			
UNIT-II			9Hrs
Process Concept: Process concept, Interprocess communication 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 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)			
UNIT-III			9Hrs
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 page tables Virtual-Memory Management: Background, Demand paging, Page replacement, Allocation of frames, Thrashing 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)			
UNIT-IV			9Hrs
File System: File concept, Access methods, Directory structure, Implementing file systems - Allocation methods, Free space management			

MassStorageStructure: Overview of mass storage structure, Disk structure, Disk scheduling, Disk management, Swap-space management SystemProtection: Goals of protection, Principles of protection, Domain of protection SelfLearningTopics(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)
CourseLearningOutcomes(COs): After completion of this course, the student should be able to, CO1: use the operating system services and system calls CO2: analyze CPU scheduling algorithms based on scheduling criteria, synchronization algorithms based on number of resource allocations CO3: assess the deadlock problems based on mutual exclusion, hold&wait, no-preemption and circular wait conditions and memory management issues based on page replacement techniques CO4: evaluate file access and allocation methods based on memory space requirement, disk scheduling algorithms based on tracking time, system protection techniques based on their domains
Textbook: 1. Abraham Silberschatz, Peter B Galvin, Gerg Gagne, <i>Operating System Concepts</i>, 10th ed., New York: Wiley publications, ISBN-978-1-119-32091-3, 2018
ReferenceBook(s): 1. Ekta Walia, <i>Operating System Concepts</i>, 2nd ed., Delhi: Khanna Publishers, ISBN-10: 9789380016658, ISBN-13: 978-9380016658, 2019 2. Dhananjay M. Dhamdhere, <i>Operating Systems A Concept-Based Approach</i>, 1st ed., New Delhi: McGraw Hill Education, ISBN-10: 0072957697 ISBN-13: 978-0072957693, 2008 3. William Stallings, <i>Operating Systems</i>, Maxwell, McMillan International Editions, ISBN 81-203-1187-6, 1992
Web and Video link: https://www.youtube.com/watch?v=jciGlvn7UfM&list=PLyqSpQzTE6M9SYI5RqwFYtFYab94gJpWk; NPTEL Video Lecture on Introduction to Operating Systems By Prof. Chester Rebeiro, IIT Madras

Course Articulation Matrix (CAM):				U24IN302 OPERATING SYSTEMS										
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	U24IN302.1	2	1	2	1	-	-	-	1	1	-	1	2	2
CO2	U24IN302.2	3	2	2	2	-	-	-	1	1	-	1	2	2
CO3	U24IN302.3	3	2	2	2	2	-	-	1	1	-	1	2	2
CO4	U24IN302.4	2	2	2	1	2	-	-	1	1	-	1	2	2
U24IN304		2.5	1.75	2	1.5	2	-	-	1	1	-	1	2	2

ADVANCED DATA STRUCTURES			
Class: B.Tech.III – Semester		Branch: CSE (Internet of Things)	
Course Code:	U24IN303	Credits:	4
Hours/Week (L-T-P-O-E):	2-1-2-5-10	CIE:	60%
Total Number of Teaching Hours:	60Hrs	ESE:	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: trees, binary trees, expression trees, binary search trees, heap trees and threaded binary trees LO2: height balanced binary tree, red-black tree, splay trees, B trees and B+ trees LO3: interval trees, tries, sorting and searching techniques LO4: graphs, string matching algorithms			
THEORY COMPONENT			
UNIT-I		9Hrs	
Trees: Basic terminologies, Definitions and concepts, Representations of binary tree, Operations on a binary tree Types of Binary Trees: Expression tree, Binary search tree- Searching a binary search tree, Inserting a node into a binary search tree, Deleting a node from a binary search tree Heap Trees: Representation of a heap tree, Operations on a heap tree- Insertion, Deletion Threaded binary trees: Representation of threaded binary trees Self Learning Topics (SLTs): Formation of binary tree from its traversals (Text 1: topic 7.4.3.2), Determining the Height of a Binary Search Tree (Reference 1: topic 10.2.4), Practice problems (Text 1: Prob 7.5, Reference 1: Prob 9.11, Prob 9.12, Prob 9.13)			
UNIT-II		9Hrs	
Height Balanced Binary Tree: Definition, Adelson-Velsky and Landis (AVL) rotations, Insertion operation Red-Black Tree: Definition of a red-black tree, Operation on a red-black tree- Insertion Splay Tree: Definition. Operations on splay tree, Splaying operation B Trees: B tree indexing, Operations on a B tree- Inserting, Deleting B+ Tree Indexing: Searching, Inserting, B tree vs. B+ tree Self Learning Topics (SLTs): Huffman's trees (Reference 1: topic 9.5), AVL tree deletion (Text 1: topic 7.5.5), Practice problems (Text 1: Prob 7.17)			
UNIT-III		9Hrs	
Interval Tree: Construction of interval trees Trie Tree Indexing: Trie structure, Operations on trie, Applications of tree indexing Sorting: Heapsort, Quicksort, Merge sort, Bitonic generator sort Searching: Fibonacci search, Interpolation search Self Learning Topics (SLTs): Linked representation of binomial heap (Reference 1: topic 12.2.1), operations of binomial heap (Reference 1: topic 12.2.2), Jump search (Reference 1: topic 14.3), Hash tree (http://originstamp.com/blog/what-is-a-hash-tree-or-merkle-tree/)			

UNIT-IV	9Hrs
Graphs: Introduction, Graph terminology, Representation of graphs Application of Graph Structures: Topological sorting, Minimum spanning trees-Prim's algorithm, Kruskal's algorithm; Graph traversal methods- Breadth first search, Depth first search; Kosaraju's algorithm String Matching Algorithms: Brute force method, Rabin-karp string matching algorithm, Knuth-morris-pratt (KMP) algorithm, Boyer-moore algorithm Self-Learning Topics (SLTs): Directed graphs (Reference 1: topic 13.3.1), practice problems (Reference 1: Prob 13.18) String compression-Run Length Encoding (https://www.naukri.com/code360/library/run-length-encoding)	
LABORATORY COMPONENT	
List of Experiments - Program to perform following binary tree operations - creation - insertion of a node - traversal using recursion - Program to perform following binary search tree traversal operations without recursion - in order - pre order - post order - spiral order - Program to perform following binary search tree operations. - creation - insertion of a node - deletion of a node - Program to implement AVL tree construction - Program to implement search and insert operations on Trie - Program to implement the following sorting techniques. - Heapsort - Quicksort - Program to implement the following sorting techniques. - Mergesort - Bitonic generator sort - Program to implement the following search algorithms. - Fibonacci search - Interpolation search - Program to implement the following - Graph Representations - Topological sort - Program to implement the following graph traversal techniques. - Depth first search - Breadth first search - Program to implement following shortest path algorithms. - Kruskal's algorithm - Prim's algorithm - Program to implement the following string matching algorithms. - Knuth-morris-pratt algorithm - Boyer-moore algorithm - Rabin-karp algorithm	
<u>Textbook:</u> 1. Debasis Samanta, <i>Classic Data Structures</i>, 2nd ed., New Delhi: Prentice Hall India, 2009 (Chapters 7 to 11)	
<u>Reference Book(s):</u>	

1. ReemaThareja, *Data Structures Using C*, 2nd ed., New Delhi: Oxford University Press, 2014
2. Narasimha Karumanchi, *Data Structures and Algorithms Made Easy*, 5th ed., Bombay: Careermonk, 2017

Web and Video link(s):

<https://nptel.ac.in/courses/106102064>; NPTEL Video Lecture on Data Structures and Algorithms Prof. Naveen Garg, IIT Delhi

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

Laboratory Manual (for laboratory component):

3. *Advanced Data Structures Laboratory Manual and Record Book*, Department of CSE(N), KITSW

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from the theory component)

CO1: construct binary trees and binary search trees to organise and retrieve the data

CO2: construct AVL and red-black trees to optimise database queries

CO3: develop different sorting and searching techniques

CO4: construct graphs, spanning trees and develop string matching algorithms

(based on psychomotor skills acquired from laboratory component)

CO5: implement and test binary trees and binary search trees to organise and retrieve data efficiently

CO6: implement and test AVL trees and red-black trees to optimise data storage

CO7: develop and test sorting techniques on unsorted data and searching techniques to retrieve the data effectively

CO8: develop and test graphs and string manipulation algorithms to organise and retrieve the data

Course Articulation Matrix (CAM):				U24IN303 ADVANCED DATA STRUCTURES										
CO		P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	U24IN303.1	2	2	2	1	1	-	-	1	-	1	1	2	2
CO2	U24IN303.2	2	2	2	1	1	-	-	1	-	1	1	2	2
CO3	U24IN303.3	2	2	2	2	1	-	-	1	-	1	1	2	2
CO4	U24IN303.4	2	2	2	2	1	-	-	1	-	1	1	2	2
CO5	U24IN303.5	2	2	3	2	1	-	-	1	-	1	1	1	1
CO6	U24IN303.6	2	2	3	2	1	-	-	1	-	1	1	1	1
CO7	U24IN303.7	2	2	3	2	1	-	-	1	-	1	1	1	1
CO8	U24IN303.8	2	2	3	2	1	-	-	1	-	1	1	1	1
U24IN303		2	2	2.5	1.75	1	-	-	1	-	1	1	1.5	1.5

COMPUTERNETWORKS			
Class:B.Tech.III – Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24IN304	Credits:	3
Hours/Week(L-T-P-O-E):	2-1-0-5-8	CIE:	60%
TotalNumberofTeachingHours:	36Hrs	ESE:	40%
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents'knowledgein/on...			
LO1:computernetworksreferencemodels,physicallayercomponentsandnetworkswitching			
LO2:datalinkandmediumaccesscontrolprotocols			
LO3:routingalgorithms,congestioncontrolalgorithmsandinternetworking			
LO4:transportandapplicationlayerprotocolsusedinthenetworks			
THEORYCOMPONENT			
UNIT-I		9Hrs	
Introduction:Usesofcomputernetworks,Typesofcomputernetworks,Networktechnologyfrom local to global , Network protocols			
ReferenceModels:OSIreferencemodel,TCP/IPreferencemodel			
PhysicalLayer:Transmissionmedia-Guidedtransmissionmedia,Wirelesstransmission,Using the Spectrum for transmission,Communication satellites,Multiplexing			
Switching:Circuitandpacketswitching			
Self-Learning Topics (SLTs):Acritique of the OSI model and protocols(text: Topic 1.6.3), Acritique of theTCP/IPReferencemodelandprotocols(Text:Topic1.6.4),Digitalmodulation(Text:Topic2.4.3)			
UNIT-II		9Hrs	
DataLinkLayer:Datalinklayerdesignissues,Errordetectionandcorrection,Elementarydata link protocols, Sliding window protocols			
Medium Access Control Sub Layer:Channel allocation problem, ALOHA, Carriers sense multiple access, Collision free protocols, Limited contention protocol, Ethernet-Switched ethernet, Fast Ethernet, Gigabit Ethernet, Data link layer switching			
Self-LearningTopics(SLTs):10-GigabitEthernet(Text:Topic4.3.7),40-and100-GigabitEthernet(Text: Topic4.3.8),Bluetooth(Text:4.5)Virtual LANs(Text: Topic 4.7.5)			
UNIT-III		9Hrs	
Network Layer:Network layer design issues, Routing algorithms - Optimality principle, shortest path algorithm, Flooding, Distance vector routing, Link state routing, Hierarchical routing, broadcast routing, Multicast routing			
TrafficManagementatNetworkLayer:Congestion,Approachestotrafficmanagement,Traffic aware routing, Admission control, Traffic throttling, Load shedding			
Internetworking:Hownetworksdiffer,Connectingheterogeneousnetworks,Connecting endpointsacrossheterogeneousnetworks,Internetworkrouting,Packetfragmentation			
NetworkLayerInTheInternet:IPversion4protocol,IPaddresses,IPversion6protocol, Internetcontrolprotocols,OSPF–Interiorgatewayroutingprotocol,BGP–Exteriorgateway routing protocol, Internet multicasting			
Self-LearningTopics(SLTs):QualityofserviceandapplicationQOE(Text:Topic5.4),policyatthe network layer(Text: Topic5.8)			

UNIT-IV	9Hrs
Transport Layer: Transport services, Primitives, Elements of transport protocols – Addressing, Connection establishment and release, Error control and flow control, Multiplexing, Crash recovery, Congestion control, Internet transport protocols-UDP, TCP Application Layer: Domain Name System (DNS), Electronic mail, World Wide Web Self-Learning Topics (SLTs): Streaming audio and video (Text: Topic 7.4), Content delivery (Text: Topic 7.5)	
Textbook: 1. Andrew S. Tanenbaum, David J. Wetherall, Nick Feamster, <i>Computer Networks</i> , 6th ed., London: Pearson Education, ISBN-978-9356063600, 2023	
Reference Book(s): 2. William Stallings, <i>Data and Computer Communications</i> , 10th ed., Pearson Education, ISBN-9780137561704, 2014 3. Behrouz Forouzan, <i>Data Communication and Networking</i> , 5th ed., Tata McGraw Hill, ISBN-13 978-1259064753, 2017 4. Larry L. Peterson, Bruce S. Davie, <i>Computer Networks</i> , 5th ed., Morgan Kaufmann Publishers, ISBN-978-0123850591, 2011 5. James F. Kurose and Keith W. Ross, <i>Computer Networking a Top-Down Approach</i> , 7th ed., Pearson Education, ISBN-978-0133594140, 2016	
Web and Video link(s): 1. https://www.youtube.com/watch?v=O--rkQNKqls Video Lecture on Computer Networks and Internet Protocol, Multiplication by Prof Soumya Kanti Ghosh & Prof Sandip Chakraborty, NPTEL IIT Kharagpur	
Course Learning Outcomes (COs): After completion of this course, the student should be able to, CO1: evaluate the OSI and TCP/IP reference models in terms of their operational frameworks, layer functionalities, and support for switching infrastructures CO2: analyze data link layer mechanisms and medium access control protocols to ensure efficient and reliable communication CO3: apply routing and congestion control algorithms to optimize network performance CO4: analyze the functionalities and performance of transport and application layer protocols by examining services like connection management, reliability, flow control, and port addressing.	

Course Articulation Matrix (CAM):					U24IN304 COMPUTER NETWORKS									
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24IN304.1	3	2	-	1	2	-	-	1	1	-	1	3	2
CO2	U24IN304.2	3	3	-	2	3	-	-	1	1	-	1	3	3
CO3	U24IN304.3	2	3	-	1	3	-	-	1	1	-	1	3	3
CO4	U24IN304.4	2	2	-	1	2	-	-	1	1	-	1	3	2
U24IN304		2.5	2.5	-	1.25	2.5	-	-	1	1	-	1	3	2.5

OBJECTORIENTEDPROGRAMMINGTHROUGH JAVA			
Class:B.Tech.III–Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24IN305	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
TotalNumberofTeachingHours:	60Hrs	ESE:	40%
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents'knowledgein/on... LO1:programmingparadigms,javabasicsandclassfundamentals LO2:classesandmethods,strings LO3:inheritance,dynamicmethoddismatch,interfacesandpackages LO4:usingI/O,exception handlingandmulti-threading			
THEORYCOMPONENT			
UNIT-I			9Hrs
ProgrammingParadigms: Proceduralprogramming,Modularprogramming,Object oriented programming (OOP), Generic programming Java Basics: TheHistoryand evolution ofJava,Anoverviewof java,Datatypes,Variables and arrays, Operators, Control statements IntroducingClasses: Classfundamentals,Declaringobjects,Objectreferencevariables, Introducing methods SelfLearningTopics(SLTs): <i>LexicalIssueslikeKeywords,identifiers,Literalsandcomments (TextBook-Chapter2),Typeconversionsandcasting(TextBook-Chapter3)</i>			
UNIT-II			9Hrs
ClassesandMethods: Overloadingmethods,thiskeyword,Passingandreturning objects, Recursion, Variable length arguments, Constructors, Overloading constructors, Garbage collection, Static variables, Static blocks, Static methods, Nested and inner classes, Command line arguments, Wrapper classes Strings: ExploringString,StringBuffer,StringBuilderandStringTokenizerclasses Self Learning Topics (SLTs): <i>Overloading Vararg Methods, Varargs and Ambiguity (TextBook-Chapter: 7),Anonymous Inner classes(TextBook-Chapter-25)</i>			
UNIT-III			9Hrs
Inheritance: Inheritancebasics,Typesofinheritance,Usingsuper,Methodoverriding,Order ofconstructorsExecution,Dynamicmethoddismatch,Abstractclasses,finalwithininheritance, Object class Interfaces: Defining an interface, Implementing interfaces, Nested interfaces, Variables in interfaces, Interfaces can be extended Packages: Definingapackage,PackagesandMemberAccess,Importingpackages Self Learning Topics (SLTs): <i>Accessing implementations through interface references, Default interfacemethods,Usestaticmethodsinaninterface,privateinterfacemethods(TextBook-Chapter-9)</i>			
UNIT-IV			9Hrs
Using I/O: I/O basics, Reading, Writing and copying files using byte and character streams ExceptionHandling: Fundamentals,Exceptiontypes,Uncaughtexceptions,Usingtryand catch,Multiplecatchclauses,Nestedtrystatements,throw,throws,finally,Creatingyourown exceptionsubclasses.			

Multithreading: Creating a thread, Creating multiple threads, Thread priorities, Synchronization, Interthread communication

Self Learning Topics (SLTs): try-with resource, multi catch, chained exception, precise re-throw (TextBook-Chapter: 10), Serialization- Writing and reading objects to and from the file (TextBook-Chapter-22)

LABORATORY COMPONENT

List of Experiments

1. a) Develop a java program to demonstrate different operators in java
b) Develop a java program to demonstrate control structures
c) Develop a java program to demonstrate switch statement
2. a) Develop a java program to read an array and display them using *for-each* control. Finally display the sum of array elements
b) Develop a java program to read a matrix and display whether it is an identity matrix or not. Use *civilized form* of *break* statement
c) Develop a java program to define a two dimensional (2D) array where each row contains different number of columns. Display the 2D-array using *for-each*
3. a) Develop a java program to demonstrate class concept
b) Develop a java program to demonstrate *this* keyword
c) Develop a java program to demonstrate object reference variable
d) Develop a java program to demonstrate overloading of methods
e) Develop a java program to demonstrate passing and returning objects
4. a) Develop a java program to demonstrate variable length argument (using array and ellipsis notation)
b) Develop a java program to demonstrate constructors and garbage collection
c) Develop a java program to demonstrate nested and inner classes
d) Develop a java program to demonstrate static variables, static methods, and static blocks
5. a) Read at least five strings from command line argument and display them in sorted order
b) Develop a java program to demonstrate wrapper class by reading N number of integers from command line and display their sum
c) Develop a java program to demonstrate wrapper class by reading N floating point numbers from command line and display their average
6. a) Develop a java program to accept a string, count number of vowels and remove all vowels
b) Develop a java program to accept a string, count number of vowels and remove all vowels using *StringBuffer* class
c) Develop a java program to accept a line of text, tokenize the line using *StringTokenizer* class and print the tokens in reverse order
7. a) Develop a java program to demonstrate single level inheritance
b) Develop a java program to demonstrate multi level inheritance using super
c) Develop a java program to demonstrate method overriding
8. a) Develop a java program to demonstrate dynamic method dispatch
b) Develop a java program to demonstrate use of abstract class

c) Develop a java program to demonstrate the use of overriding <i>equals()</i> method of an Object class 9. a) Develop a java program to implement interfaces b) Develop a java program to extend the interfaces c) Develop a java program to demonstrate implementation of nested interfaces 10. Develop a java program to create a <i>package</i>, and demonstrate to import the <i>package</i> into any java program (Consider the behavior of all access specifiers) 11. a) Develop a java program to demonstrate <i>try-catch</i> block b) Develop a java program to demonstrate <i>throw</i> clause c) Develop a java program to demonstrate <i>throws</i> clause d) Develop a java program to demonstrate <i>try-with-resources</i> block 12. a) Develop a java program to demonstrate read/write/copy a file using <i>byte stream</i> b) Develop a java program to demonstrate read/write/copy a file using <i>character stream</i> c) Develop a java program to create a thread (using <i>Thread</i> class or <i>Runnable</i> interface) d) Develop a java program to demonstrate <i>synchronization</i> of threads e) Develop a java program to demonstrate <i>inter-thread communication</i>
<u>Textbook(s):</u> 1. Herbert Schildt, <i>Java The Complete Reference</i>, 13th ed., New Delhi: McGraw-Hill Education, 2019
<u>Reference Book(s):</u> 1. Balaguruswamy, <i>Programming with Java: A Primer</i>, 7th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd., 2019 2. Kathy Sierra, Bert Bates, <i>Head First Java</i>, 2nd ed., Boston: O'Reilly Publications, 2005, 3. Harvey Deitel, Paul J. Deitel, <i>Java How to Program</i>, 11th ed., India: Pearson Publications, 2018
<u>Web and Video link(s):</u> https://nptel.ac.in/courses/106105191NPTELVideoLectureonJavaProgrammingbyProf.DebasisSamanta,ProfessorofCSE,IITKharagpur.
<u>Laboratory Manual (for laboratory component):</u> 4. <i>Object Oriented Programming through java Manual and Record Book</i>, Department of CSE (Networks), KITSW.
<u>Course Learning Outcomes (COs):</u> <i>After completion of this course, the student should be able to,</i> <i>(based on cognitive skills acquired from theory component)</i> CO1: distinguish various programming paradigms and develop java fundamental programs CO2: develop java programs using classes, constructors and various string concepts CO3: make use of reusability concepts like inheritance, dynamic method dispatch, interfaces and packages to build java programs CO4: develop java programs using I/O, exception handling and multithreading concepts <i>(based on psychomotor skills acquired from laboratory component)</i>

C05: develop java fundamental programs using operators, control structures and arrays
C06: develop java programs using classes, constructors and various string concepts
C07: build java programs on inheritance, dynamic method dispatch, interfaces and packages
C08: implement and test java programs using I/O, exception handling and multithreading Concepts

Course Articulation Matrix (CAM):					U24IN305 OBJECT ORIENTED PROGRAMMING THROUGH JAVA									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24IN305.1	2	2	2	-	1	-	-	1	1	-	1	1	1
CO2	U24IN305.2	2	2	2	1	2	-	-	1	1	-	1	1	1
CO3	U24IN305.3	2	2	3	2	1	-	-	1	1	-	1	2	2
CO4	U24IN305.4	2	2	3	2	2	-	-	1	1	-	1	2	2
CO5	U24IN305.5	1	1	1	1	1	-	-	1	1	-	1	1	1
CO6	U24IN305.6	1	2	2	2	2	-	-	1	1	-	1	1	1
CO7	U24IN305.7	1	2	3	2	2	-	-	1	1	-	1	2	2
CO8	U24IN305.8	1	2	3	2	2	-	-	1	1	-	1	2	2
U24IN305		1.5	1.87	2.37	1.5	1.62	-	-	1	1	-	1	1.5	1.5

SOFTANDINTERPERSONALSKILLSLABORATORY			
Class: B.Tech.III-Semester		Branch: CommontoallBranches	
CourseCode:	U24VA306B	Credits:	1
Hours/Week(L-T-P-O-E):	0-0-2-2-4	CIE:	100%
TotalNumberofTeachingHours:	24Hrs	ESE:	-
CourseLearningObjectives(LOs): <i>Thiscoursewilldevelopstudents'knowledgein/on...</i> L01: analysingselfandlearningtoovercomepossiblethreats L02: groupdynamicstodemonstraterespectfortheopinionsandbeliefsofgroup L03: effectivepresentationsusingvisualaidsandanalyzingthevideos L04: communicatingprofessionally,makingresumelinewithindustryexpectations			
<u>LISTOFACTIVITIES</u> Activity1: Ice-breaking,Self-AwarenessandJustaMinute(JAM) Activity2: Self-Introduction&PersonalSWOTAnalysis Activity3: ReadingComprehension&CriticalThinking Activity4: ActiveListening&Non-VerbalObservation(Video+PeerPractice) Activity5: GroupDiscussion-1 Activity6: ResumeBuilding&LinkedInProfileReview Activity7: GroupDiscussion-2 Activity8: PresentationSkillswithPPT/Storytelling Activity9: GroupDiscussion-3 Activity10: MockInterviews:Technical&HR Activity11: EmailEtiquette&ProfessionalCommunication Activity12: WorkplaceEtiquette&ConflictResolution			
CourseLearningOutcomes(COs): <i>Aftercompletionofthiscourse,thestudentsshouldbeableto...</i> C01: deliverconcise&effectiveself-introductionanddemonstrateconfidence,spontaneousspeaking skills within a limited time C02: conducta personalSWOTanalysisto identifyareasfor self-improvement andcareer development C03: demonstrate clear& respectful communication, leadership, positive attitude and improve interpersonal relationship by actively participating in group discussions, collaborative tasks & mock interviews C04: create a professional resume, develop a LinkedIn profile and demonstrate effective video communicationby makingeffectivevideosonself-introduction, personal SWOT analysis&spontaneousspeakingactivityalongwithemail&workplaceetiquette			
<u>Textbook(s):</u> 1.KrishnaMohan& MeeraBenerji, <i>DevelopingCommunicationsSkills</i> , 2nded., NewDelhi: Mcmillan Publications, 2005			

Course Articulation Matrix (CAM):		U24VS306B SOFTWARE AND INTERPERSONAL SKILLS LABORATORY												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
C01	U24VA306B.1	-	-	-	-	-	-	-	2	3	-	1	-	-
C02	U24VA306B.2	-	-	-	-	-	-	2	3	3	-	1	-	-
C03	U24VA306B.3	-	-	-	-	-	-	-	2	3	-	1	-	-
C04	U24VA306B.4	-	-	-	-	-	-	1	2	3	-	1	-	-
U24VA306B		-	-	-	-	-	-	1.5	2.25	3	-	1	-	-
3-HIGH, 2-MEDIUM, 1-LOW														

PROGRAMMINGSKILLDEVELOPMENTLAB-2			
Class:B.Tech.III–Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24SE307	Credits:	1
Hours/Week(L-T-P-O-E):	0-0-2-2-4	CIE:	100%
TotalNumberofLabHours:	36Hrs	ESE:	-
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents’knowledgein /on... LO1: solidfoundationinCprogramming,focusingon fundamentalconceptsofarrays LO2: analysethestringsanddynamicmemoryallocations LO3: variousformsofstacksandlinkedlist LO4: variousformsofqueuesandhashingtechniques			
LABORATORYCOMPONENT			
Sl.No	ListOfExperiments		
1	Implementationofarrays		
2	Implementationofsearchingtechniques		
3	Implementationofsortingtechniques		
4	Implementationofstringoperations		
5	Implementationofstringoperations		
6	Implementationofdynamictimoryallocationfunction		
7	Implementationoflinkedlistoperationsusingc		
8	Implementationofstacksoperationsusingc		
9	Implementationofstacksoperationsusingc		
10	Implementationofqueuesoperations		
11	Implementationofqueuesoperations		
12	Implementationofhashingfunction		
Textbook: 1.Balagurusamy.E, <i>ProgramminginANSIC</i> ,8thed.,2022			
ReferenceBook(s): 1. Paul Deitel, Harvey Deitel, C How to Program: With Case Studies <i>IntroducingApplications ProgrammingandSystemsProgramming</i> , Pearson Education Limited, 9th ed., 2022 2. Brian W. Kernighan and Dennis Ritchie, <i>The C Programming Language</i> , Pearson EducationIndia, 2nd ed., 2015 3. ReemaThareja, <i>Programmingin C</i> ,OxfordUniversity Press, 3rded.,2023 4. YashavantKanetkar, <i>LetUsC</i> ,BPBPublications,19thed.,2022 5. A.K.Sharma, <i>Computer Fundamentals and Programming in C</i> , Universities Press, 2nd ed., 2018			
CourseLearningOutcomes(COs): Aftercompletionofthiscourse,thestudentsshouldbeableto... (<u>based on psychomotor skills acquired from laboratory component</u>): CO1: develop programs on arrays including searching and sorting CO2: develop programs on strings and DMA CO3: developprogramsonstacks CO4: developprogramsonqueuesandhashing			

CourseArticulationMatrix(CAM):					U24SE307ProgrammingSkillDevelopmentLab2									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS 01	PS 02
CO1	U24SE307.1	2	2	1	1	1	-	-	1	1	-	1	1	2
CO2	U24SE307.2	2	2	1	1	1	-	-	1	1	-	1	1	2
CO3	U24SE307.3	2	2	1	1	1	-	-	1	1	-	1	1	2
CO4	U24SE307.4	2	2	1	1	1	-	-	1	1	-	1	1	2
U24SE307		2	2	1	1	1	-	-	1	1	-	1	1	2

PRACTICUM-3						
Class:B.Tech.III-Semester		Branch:Common to all branches				
Course Code:	U24EL308	Credits:	1			
Hours/Week(L-T-P-O-E):	0-0-0-4-4	CIEMarks:	100%			
Total Number of Teaching Hours:	-	ESE Marks:	-			
Course Learning Objectives(LOs): <i>This course will develop students' knowledge in/on...</i> 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). (x). Practicum is a mandatory semester project work. (xi). Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters) (xii). 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 this section, as shown below.						
Course	U24IN301	U24IN302	U24IN303	U24IN304	U24IN305	U24IN306
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 topic to the students of that section in the following format.

CIRCULAR*Allotment of Practicum topic to students Section :*

.....

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

Note:

- The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
- 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.
- The course faculty are advised to guide the allotted students for practicum during the semester course work.

(Signature of class teacher)

- (xiii). ***To complete the practicum, the students 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.***
- (xiv). There shall be only continuous Internal Evaluation (CIE) for practicum for a maximum of 100 marks.
- (xv). The practicum course faculty shall evaluate & submit the final marks of the allotted students in week (N+1) to the respective class teacher.
- (xvi). The class teacher shall collect the final marks of practicum of the students allotted to each course teacher and submit them to the CoE.
- (xvii). 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

viii). A sample rubric for assessment and evaluation of practicum is as follows:

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

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

- (h) **Practicum Topic:** Each student shall be allotted a topic for practicum by the course faculty member attached to him/her. Interested students can work on their own title for practicum, but with due approval from course faculty.
- (i) **Working Model:** Each student is required to develop a prototype / process / system / simulation model on the given practicum topic and demonstrate / present, during the allotted time, before the course teacher.
- (j) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and ppt presentation.
 - What was the objective of the practicum assigned?
 - What are the main responsibilities and tasks for practicum?
 - What knowledge and skills from the course work 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 this / 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 student should be able to...

C01: synthesize literature survey, identify research gaps and define objective & scope of practicum problem

C02: apply knowledge to design & conduct experiments, utilize modern tools for solution of practicum problem and develop working model/ process/ system

C03: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through practicum

C04: create a video pitch on practicum and make an effective oral presentation using PPTs

SOCIAL EMPOWERMENT ACTIVITY/SELF ACCOMPLISHMENT ACTIVITY (SEA-III/SAA-III)			
Class: B.Tech.III Semester	Branch: Common to all branches		
Course Code:	U24VA309XXXXX	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): <i>This course will develop students' knowledge in/on...</i> 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 field work 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. (f) Each SEA/SAA activity is treated as one credit course (g) Student must select one activity per semester, through first 04 semesters, from the courses listed under SEA/SAA, before commencement of the semester. (h) Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA (i) To complete these activities students shall work outside the class work hours, during weekends, holidays, semester breaks, etc., (j) 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. <u>Monitoring SEA/SAA:</u> (h) 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. (i) During the semester period, the student has to acquire requisite knowledge, conduct			

fieldwork,acquireskillsandpropose uniquesolutionstothereal-life problems

(j) Knowledge Acquisition & Skilling:

- iv. Students have to identify goals, acquire and accumulate knowledge on the chosen SEA/SAA activity
- v. 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.
- vi. 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.

(k) 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.

- xv. 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.
- xvi. Fieldwork consists of three phases: preparation, the actual activity and feedback
- xvii. **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.**
- xviii. 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.
- xix. Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more
- xx. 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.
- xxi. **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.
- xxii. **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
- xxiii. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
- xxiv. **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

- xxv. Student is expected to take care of health and Safety practices for fieldwork and travel
 - xxvi. 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.
 - xxvii. 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.
 - xxviii. **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' experienced during fieldwork. Therefore, the students 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.
- (l) **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.
- (m) **Flow process for completion of SEA/SAA course:**
- vi. **Faculty counsellor approval:** In week (-1), in consultation with faculty counsellor, every student shall identify 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.

(n) **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:

- (f) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) 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 time slot from the nodal centre and demonstrate the skills learnt/improved during the allotted time slot.
- The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.
- (g) **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.
- (h) **Anti-Plagiarism Check:** The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.
- (i) **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
- (j) **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 student 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 sensibility

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

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

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, student shall refer to textbooks and web resources relevant to the course selected. Plan for fieldwork/practice sessions in coordination with SEA/SA coordinator

EXPERT TALK SERIES-III			
Class: B.Tech. III-Semester	Branch: Common to all branches		
Course Code:	U24AE310	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-1-1	CIEMarks:	100%
Total Number of Teaching Hours:	-	ESEMarks:	-
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: 21 st 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 a successful career, degree alone won't suffice. Competencies are much more important. (q) 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. (r) Learning from industry experts with real-world examples, is important to enhance your educational experience. (s) 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. (t) 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? (u) The answer is Industry Expert Talk Series (ETS). Through ETS, we invite industry experts in different fields to deliver talks and interact with students. (v) Through Industry expert talks students get to know so much more than textbooks don't explain. (w) 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. (x) 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. (y) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development. (z) In URR24 curriculum, Expert talk series (ETS) is offered as a course under ability enhancement category of courses.			

- (aa) 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.
- (bb) 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.
- (cc) ETS enhances your learning in many ways for global opportunities for your career.
- (dd) 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.
- (ee) Salient features of ETS are hereunder:
- (xii) ETS is offered from I semester to VI semester.
 - (xiii) ETS, in any given semester, is treated as one credit course
 - (xiv) Students are required to earn six credits (from I to VI semester)
 - (xv) **Head, Centre for i²RE** shall be the **institute level ETS coordinator**
 - (xvi) Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode** by the parent department/Centre for i²RE.
 - (xvii) 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.
 - (xviii) **The Head C-i²RE** shall share the marks obtained by the students in each of the quizzes/test to the respective **department ETS coordinators**.
 - (xix) Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.
 - (xx) **Report on ETS:** At the end of semester, the students shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.
 - (xxi) **Evaluation:** There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks
 - (xxii) The department ETS coordinator shall, in coordination with institute level ETS coordinator, submit the final scores to the CoE in week (N+1).
- (ff) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

iii. Supplementary Exam:

- (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: 2 Hrs*) 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 student should be able to...

CO5: 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

CO6: 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

CO7: interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects

CO8: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

IV SEMESTER

S. No.	Category	CourseCode	CourseTitle	Lectures/ week					Credits
				L	T	P	O	E	
1	BSC	U24MH401D	DiscreteMathematicsand Probability,Statistics	2	1	-	6	9	3
2	PCC	U24IN402	WebTechnologies	2	1	2	5	10	4
3	PCC	U24IN403	DatabaseManagement Systems	2	1	2	5	10	4
4	PCC	U24IN404	IoTArchitecturesand Protocols	2	1	-	4	7	3
5	PCC	U24IN405	PythonProgrammingfor IoT	2	1	2	5	5	4
6	VAC	U24VA406A	QALR@	2	-	-	2	4	2
7	SEC	U24SE407	PSDLab-03	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409XXXXX	SEA-4/SAA-4	-	-	-	2	2	1
10	AEC	U24AE410	ExpertTalkSeries-4	-	-	-	1	1	1
11	VAC*	U24CH411*	EnvironmentalScience*	2*	-	-	3	5	-
Total:				14	5	8	39	61	24
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA):1weekto10days:1credittoeachBridgecourseunder additional learning (will be printed on grade sheet)									

**ForLateralEntryStudentsOnly*

***BranchSpecificMathematics:**

BranchSpecificMathematics(Pool-4)			
S. No.	CourseCode	CourseTitle	Common to
1.	U24MH401A	NumericalandStatisticalMethods	CE
2.	U24MH401B	AppliedMathematicsforMechanicalEngineering	ME
3.	U24MH401C	AppliedMathematics	EEE,ECE,ECI
4.	U24MH401D	DiscreteMathematicsandProbability,Statistics	CSE, IT,CSN,CSO
5.	U24MH401E	EssentialMathematicsandStatisticsforMachine learning	CSM
6.	U24MH401F	EssentialMathematicsandStatisticsforDatascience	CSD
7.	U24MH401X	AnyotherCourseapprovedbyBoSchair andDeanAA	-

@ Dean AA will allot the courses QALR (Stream-I), Soft and Interpersonal Skills (Stream-II), to the branches as per Stream-I and Stream-II.

Coursesforexit:

Successfulcompletionoftwosubjects(6-Credits)during2-monthsinternshipattheinstitute OR
Successfulcompletionoftwosuitableskillbasedcourses(external)toqualifyforCertification

B.AfterSecondYear:(UGDiplomainCSE(IOT))

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

ExitOptionstoQualifyfor UGDiplomainCSE(IOT) :AnyTwo(02)Coursesduringthe2-Monthsinternship									
S. No.	Category	CourseCode	CourseTitle	L	T	P	O	E	C
1	PCC	U24IN412X	FundamentalsofAlgorithms	2	-	2	-	4	3
2	PCC	U24IN413X	MachineLearningforIoT	2	-	2	-	4	3
3	PCC	U24IN414X	FundamentalsofDevOps	2	-	2	-	4	3

(OR)

(ii) AnytwosuitableskillbasedcoursestoqualifyforDiploma.

ExitOptionstoQualifyfor UGDiplomainCSE(IOT) :AnyTwo(02)SkillbasedCourses:-									
S. No.	Category	CourseCode	CourseTitle	L	T	P	O	E	C
1	SEC	U24SE412X	DronePilot Reference: https://agnipathvayu.cdac.in	-	-	6	-	6	3
2	SEC	U24SE413X	CISCO: Switching Routing and Wirelss Essentials Reference: OfferedbyCISCOCoE,KITSW	-	-	6	-	6	3
3	SEC	U24SE414X	GraphicDesign Reference: https://trainings.internshala.com/graphic-design-course	-	-	6	-	6	3
4	SEC	U24SE415X	AndrioidApp Development Reference: https://trainings.internshala.com/andrioid-course/	-	-	6	-	6	3

B.TechHonourswithResearch:

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

DISCRETE MATHEMATICS AND PROBABILITY STATISTICS			
Class: B.Tech.IV-Semester		Branch: Common to CSE, CSN, CSO & IT	
Course Code:	U24MH401D	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-6-9	CIE:	60%
Total Number of Teaching Hours:	36Hrs	ESE:	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: fundamentals of logic. LO2: elementary combinatorics and recurrence relations. LO3: various types of graphs, trees and their properties. LO4: correlation, regression, curve fitting, and probability distributions.			
UNIT-I			9Hrs
Foundation: Sets and operations on sets, Relations, Binary relations, Equivalence relations, Partial order relations, Hasse diagram and lattices, Digraphs, Adjacency matrices of binary relations Fundamentals of Logic: Propositions and connectives, Truth tables, Propositional functions, Logical inferences, First order logic, Predicate calculus and quantified logic Application: Transitive closure of a relation using Warshall's algorithm Self-Learning Topics (SLTs): Monoids, Groups. (Ref 2: topic 3.2), Pigeonhole principle (Text 1: topic 1.7, problems 1.7.13(2,3,4)), Mathematical Induction (Text 1: topic 1.10, problems 1.10.1, 1.10.3, 1.10.6)			
UNIT-II			9Hrs
Elementary Combinatorics and Recurrence Relations: Basic concepts of permutations and combinations, Enumeration with unlimited repetition and applications, Enumeration with constrained repetitions and applications Generating function of sequences: Coefficients of generating function, Recurrence relations and its applications, Solution of recurrence relations by method of substitution, Characteristic roots, Solving non-linear recurrence relations Application: Using recurrence relations find the computational complexity of binary search, Towers of Hanoi problem, and Sorting Self-Learning Topics (SLTs): Solution of recurrence relations by generating function method (Text 1, topic: 3.4, problems: 3.4.4, 3.4.5) Additional problems on recurrence relations (Text 1, topics: 3.5 and 3.6, problems: 3.5.5, 3.5.6, 3.6.6, 3.6.8, 3.6.10)			
UNIT-III			9Hrs
Graphs: Basic concepts, Isomorphism, Sub graphs, Trees and their properties, Spanning trees, Binary trees, Planner graphs, Euler's formula, Multigraphs and Eulerian circuits, Hamiltonian graphs, Chromatic number, Four color problem Applications: Find the shortest path of a network problem Self-Learning Topics (SLTs): Additional problems on isomorphism of two graphs (Text 1, topic: 5.2, problems: 5.2.3, 5.2.4, 5.2.5)			
UNIT-IV			9Hrs
Statistics: Statistical data, Review of measures of central tendency and measures of dispersion, correlation coefficient, rank correlation, regression – Linear regression equations. Curve Fitting: Method of least squares – fitting of (i) Straight line (ii) Second degree parabola Probability: Random variables, Discrete and continuous probability distributions, mean and			

variance of a distribution, Binomial distribution, Poisson distribution, and fitting of these probability distributions to the given data.

Self-Learning Topics (SLTs):

Review of the concepts of probability (Text 2, topic: 26.4 and 26.5, problems: 26.15, 26.20, 26.25), Conditional probability and Bayes theorem (Text 2, topic: 26.6, problems: 26.26, 26.27), Normal distribution (Text 2, topic: 26.16, problems: 26.45, 26.47, 26.48), Uniform, exponential distributions (Text 2, topic: 26.19)

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

- CO1:** apply fundamental logic to solve various engineering problems
- CO2:** solve different types of enumeration problems and apply them to real-life scenarios
- CO3:** solve various graph theory problems and apply them to real-world applications
- CO4:** interpret the data using various statistical measures and probability distributions

Textbook(s):

1. Mott. J.L, Kandel. K and, Baker. T.P., *Discrete Mathematics for Computer Scientists*, 2nd ed., New Delhi: PHI, 1999
2. Grewal, B.S., *Higher Engineering Mathematics*, 43rd ed., New Delhi: Khanna Publishers, 2017

Reference Book(s):

1. S.C. Gupta V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 12th ed., New Delhi: Sultan Chand & Sons Educational Publishers, 2020
2. Jean-Paul Tremblay, Manohar R., *Discrete Mathematical Structures with Applications to Computer Science*, 1st ed., New York: McGraw-Hill, 1975.
3. Zohar Manna., *Mathematical Theory of Computation*, 1st ed., New York: McGraw-Hill, 1974
4. C.L. Liu, *Elements of Discrete mathematics*, 3rd ed., New Delhi: Tata Mc. Graw Hill, 2008

Web and Video link(s):

3. [https://onlinecourses.nptel.ac.in/noc25_cs26/course:NPTel Video Lecture on Discrete Mathematics by Prof. Sudarshan Iyengar, IIT Ropar](https://onlinecourses.nptel.ac.in/noc25_cs26/course:NPTel%20Video%20Lecture%20on%20Discrete%20Mathematics%20by%20Prof.%20Sudarshan%20Iyengar,IIT%20Ropar)
4. [https://onlinecourses.nptel.ac.in/noc25_ma33/preview?user_email=dsreddy.hari@gmail.com: NPTEL Video Lecture on Introduction to Probability Theory and Statistics by Prof. SDharmaraja, IIT Delhi](https://onlinecourses.nptel.ac.in/noc25_ma33/preview?user_email=dsreddy.hari@gmail.com:NPTel%20Video%20Lecture%20on%20Introduction%20to%20Probability%20Theory%20and%20Statistics%20by%20Prof.%20SDharma%20Maraja,IIT%20Delhi)

Course Articulation Matrix (CAM):						U24MH401D: DISCRETE MATHEMATICS AND PROBABILITY STATISTICS								
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24MH401.1	2	2	1	1	-	-	-	1	1	-	1	2	1
CO2	U24MH401.2	2	2	1	1	-	-	-	1	1	-	1	2	1
CO3	U24MH401.3	2	2	1	1	-	-	-	1	1	-	1	2	1
CO4	U24MH401.4	2	2	1	1	-	-	-	1	1	-	1	2	1
U24MH401		2	2	1	1	-	-	-	1	1	-	1	2	1

WEBTECHNOLOGIES			
Class: B.Tech.IV–Semester		Branch: CSE(InternetofThings)	
CourseCode:	U24IN402	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
TotalNumberofTeachingHours:	60Hrs	ESE:	40%
CourseLearningObjectives(LOs): <i>Thiscoursewilldevelopstudents'knowledgein/on...</i> 1. staticwebpagesusingHTMLTags 2. dynamicwebpagesusingCSSandJavaScript 3. webserver-sideapplicationsusingPHPconcepts 4. enterprisedatabasesforweb-basedapplicationsusingPHPandMySQL			
THEORYCOMPONENT			
UNIT-I			9Hrs
HypertextMarkupLanguage (HTML): HTMLDocumentstructure,Basictags,Creatingheadings, Workingwithlinks,Creatingparagraph,Workingwithimages,Tables IntroductiontoFormsand Controls: creating HTML form, Specifying action URL and method to send the form, Using HTML controls Cascading style sheet (CSS) : CSS rules and properties, Types- inline, External and internal style sheets; Style classes Self learning Topics (SLTs): <i>CSS multiple styles(Text1: pg 105-106), Creating vertical and horizontal frames(Text1: pg 80-81)</i>			
UNIT-II			9Hrs
JavaScript: Javascript syntax, Embedding javascript in HTML page, Usage of variables, Working with operators, Control – flow statements, Arrays, Creating objects, Handling events JQuery: Introduction to jQuery, JQuery selectors and filters, JQuery events, DOM manipulation, Effects and animations, JQuery and AJAX(Asynchronous javaScript and XML),Bootstrap,Introduction to bootstrap& jQuery,Bootstrap basics, Bootstrap components, Bootstrap components with jQuery interactions,JQuery + AJAX (with bootstrap UI) SelflearningTopics(SLTs): <i>Javascriptworkingwithfunctions(Text1:pg143-144),CreatingajavaScript application with AJAX(Text1: pg 1151-1152)</i>			
UNIT-III			9Hrs
Introduction to Hypertext pre-processor (PHP) : PHP Overviewof PHP, Creating and running aPHPscript, Handlingerrors, Workingwithvariablesandconstants variables, Datatypes and operators, Working with functions, Files and directories Working with Forms: Submitting the form, Retrieving the form, Validating a web form, File upload Self learning Topics (SLTs): <i>Advantages of PHP over other Scripting languages (Text1: pg 159), Accessing array elements in PHP(Text1: pg 213-214)</i>			
UNIT-IV			9Hrs
DatabaseusingPHP: PHP&MySQLIntegrationbasics,CRUD(create,read,updateand delete) operations with PHP and MySQL Node.js: Introduction to node.js, Building with express.js, CRUD operations, REST(representationalstatetransfer)APIdevelopment			

SelflearningTopics(SLTs):CheckingconfigurationusingPHPandMySQL(Text1:pg250-251),
Alteringatableindatabase(Text1:pg254-255)

LABORATORYCOMPONENT

ListofExperiments

1. Designthefollowingstaticwebpageswiththefollowing attributes:
 - a. BasicTags.
 - b. HeadingTags.
 - c. List(Ordered, Un-OrderedandDescription).
 - d. Textbox,Buttons
2. Designthefollowingstaticwebpagesrequiredforanonlinebookstorewebsite.
 - a. Homepage.
 - b. Loginpage.
 - c. Cataloguepage.
3. FormvalidationsusingJavascript
 - a. Createaformforstudentregistrationwithfieldsname,rollno,gender,qualification,DOB, Emil-id, phone number and submit button.
 - b. BasicArithmeticCalculator:Createasimple calculatorusing HTML +JavaScript
Add, subtract, multiply, divide two numbers
- IntroductiontojQuery& Selectors:
 - a. UsejQueryselectorstomanipulateDOMelements
 - b.DemonstratevariouseventhandlersandAdd, removeandmodifyelements.
 - c.Load data asynchronously using AJAX to create simple responsive layout.
- IntroductiontoBootstrapComponents
 - a. UseBootstrapcomponentslike buttonsandcards.
 - b. CombineBootstrapwithjQuery.
 - c. DisplayliveAPIdatainBootstrapcards.
6. DynamicTableCreation: Takenumber ofrows/columns as inputandgenerate HTML table using JQuery
7. Show/Hide Elements:Use.show(),.hide(),.toggle()forparagraphsordivs,Apply effects like .fadeIn(), .fadeOut(), .slideToggle() on elements
8. DesignaPHPpagetodisplaystudentdetails
9. a.PHPprogramtodemonstratestringfunctions
b.CreateaPHPprogramtodemonstrateopeningandclosingafile
- 10.PHPprogramtodemonstratearrays(Numeric,Associative,Multidimensional)
1. a.PHPprogramtodemonstrateDate()andTime()functions
b.DevelopaPHPprogramtoinsertarecordintostudenttable(rollno,name,branch, section, CGPA) connecting with MySql
2. BuildHelloWorldServerusingExpressJsandHandleGETandPOSTRoutes,Buildan HTML form anduse Express tohandle formsubmission, Validateand display submitted data on the server and send response

Textbook:

- 1.Kogent, *WebTechnologiesHTML,CSS, JavaScript, ASP.NET, Servlets, JSP,PHP,ADO.NET, JDBC andXML*,1sted.,DreamtechPress(BlackBook),ISBN-13:9789351192510,2013(*Chapters2to7*)

ReferenceBook(S):

1. IvanBayross,*WebEnabledCommercialApplicationDevelopmentUsingHTML,JavaScript,*

DHTMLandPHP,4thed.,BPBPublications,ISBN-13:978-8183330084,2009
2. UttamK.Roy, <i>Web Technologies</i> , 7th ed., <i>Oxford Higher Education</i> , ISBN-10: 0- 19- 806622-8, ISBN-13:978-0-19-806622-4,2010
3. Luke Welling,Laura Thomson, <i>PHPand MySQLWeb Development</i> ,3rd ed., Sams Publications, ISBN: 0-672-32672-8, 2005
4. DavidHerron, <i>Node.jsWebDevelopment</i> ,5thed.,PacktPublishing,2022
<u>WebandVideolink(s):</u>
ps://onlinecourses.swayam2.ac.in/nou25_cs09/preview?;NPTELVideoLectureonWebTechnologyby Dr.AshutoshKumarBhatt,UttarakhandOpenUniversity,Haldwani.
<u>LaboratoryManual(for laboratory component):</u>
<i>WebTechnologiesLaboratoryManualandRecordBook,DepartmentofCSE(Networks),KITSW</i>
CourseLearningOutcomes(COs)
<i>Aftercompletionofthiscourse,thestudentsshouldbeableto,</i>
<i>(basedoncognitiveskillsacquiredfromtheorycomponent)</i>
CO1: buildstaticwebpagesusingHTMLTags
CO2: bulddynamicwebpagesusingCSSand JavaScriptconcepts
CO3: developserversidescriptsforwebapplicationsusingPHP
CO4: developdatabasesforweb-basedapplicationsusingPHPandMySQL
<i>(basedonpsychomotorskillsacquiredfromlaboratorycomponent)</i>
CO5 : createthestatic webpagesusingHTMLTags
CO6 : designdynamicwebpageforwebapplicationsusingCSSandJavaScript
CO7: developserversidescriptsforwebbaseapplicationsusingPHP
CO8: design webapplicationsforeffective storageandretrievalofdatainMySQLusingPHP

CourseArticulationMatrix (CAM):				U24IN402WEBTECHNOLOGIES										
CO		P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	U24IN402.1	3	2	2	-	3	-	-	1	1	-	1	3	2
CO2	U24IN402.2	3	2	2	-	3	-	-	1	1	-	1	3	2
CO3	U24IN402.3	3	2	3	2	3	-	-	1	1	-	1	3	3
CO4	U24IN402.4	3	2	3	2	3	-	-	1	1	-	1	3	3
CO5	U24IN402.5	3	2	-	-	2	-	-	1	1	-	1	3	2
CO6	U24IN402.6	3	2	2	-	3	-	-	1	1	-	1	3	2
CO7	U24IN402.7	3	2	3	2	3	-	-	1	1	-	1	3	3
CO8	U24IN402.8	3	2	3	2	3	-	-	1	1	-	1	3	3
U24IN402		3	2	2.25	1	2.9	-	-	1	1	-	1	3	2.5

DATABASEMANAGEMENTSYSTEMS			
Class:B.Tech.IV–Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24IN403	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
TotalNumberofTeachingHours:	60Hrs	ESE:	40%
CourseLearningObjectives(LOs): <i>Thiscoursewilldevelopstudents'knowledgein/on...</i> LO1: databasesystemconceptsandarchitecture,datamodelingusingtheentity-relationship model LO2: datamodelingusingrelationaldatamodel,relationaldatabaseconstraints LO3: nonprocedurallanguage,distinctnormalizationtechniquesondatabasesystemsand query optimization technique LO4: transactionprocessing,concurrencycontrol,databaserecoverytechniques			
THEORYCOMPONENT			
UNIT-I		9Hrs	
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 DatabaseSystemConceptsandArchitecture: Datamodels,Schemasandinstances,Three- schema architecture and data independence, Database languages and interfaces, Classification of database management systems Data Modeling using the Entity-Relationship(ER) Model: High-level conceptual datamodels for database design, Entity types, Entity sets, Attributes and keys, Relationships types, Relationship sets, Roles and structural constraints, Weak entity types, ER diagrams SelfLearningTopics(SLTs): <i>The databasesystemenvironment(Text1:Topic2.4),TheEnhancedEntity– Relationship (EER) Model (Text1: chapter 8)</i>			
UNIT-II		9Hrs	
The Relational Data Model, Relational Database Constraints: Relational model concepts, Relational constraints and the Relational database schemas, Update operations and dealing with constraint violations Basic Structured Query Language (SQL): SQL Data definition and data types, Specifying constraints in SQL, Basic retrieval queries in SQL,INSERT, DELETE, and UPDATE Statements in SQL RelationalDatabaseDesignbyER-to-RelationalMapping: Relationaldatabasesdesignusing ER-to-Relational mapping, EER-to-Relational mapping SelfLearningTopics(SLTs): <i>AdditionalfeaturesofSQL(Text1:Topic4.5),NoSQLdatabases (Text1:chapter24.1)</i>			
UNIT-III		9Hrs	
TheRelationalAlgebraandRelationalCalculus: Basicrelationalalgebraoperations,Examples ofqueriesinrelationalalgebra,The tuplerelationalcalculus			

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 Query Processing and Optimization: Translating SQL queries into relational algebra, Using heuristics in query optimization <i>Self Learning Topics (SLTs): Domain relational calculus (Text1: Topic6.7), Multivalued dependency and fourth normal form (Text1: Topic15.6), Join dependencies and fifth normal form (Text1: Topic15.7)</i>	
UNIT-IV	9Hrs
Introduction to Transaction Processing Concepts and Theory: Introduction to transaction processing, Transaction and system concepts, Desirable properties of transactions, Characterizing Schedules Based on Serializability Concurrency Control Techniques: Two-Phase Locking techniques for concurrency control, Concurrency control based on Timestamp Ordering Database Recovery Techniques: Recovery concepts, NO-UNDO/REDO Recovery Based on deferred update, Recovery techniques based on immediate update, Shadow paging. <i>Self Learning Topics (SLTs): Database Security and Authorization: Discretionary access control based on granting and revoking privileges, Mandatory Access Control and Role Based Access Control for Multilevel Security (Text1: chapter 24)</i>	
LABORATORY COMPONENT	
List of Experiments 1. Design Entity relationship diagrams of a database 2. Queries on Data definition language (DDL), Data manipulation language (DML), Transaction control language (TCL) and Data control language (DCL) commands 3. Queries on column level and table level constraints 4. Queries using built-in functions of NUMBER, CHARACTER, DATE data types 5. Queries on single row functions and operators and aggregate functions 6. Queries on joins and nested queries 7. Write SQL statements to create simple, composite indexes, user-defined data types, views, sequences 8. Write sample PL/SQL programs using conditional and iterative statements 9. Write PL/SQL programs using cursors and parameterized cursors 10. Write PL/SQL programs to handle exceptions 11. Write PL/SQL programs using stored procedures and functions 12. Write PL/SQL programs for creating triggers	
<u>Textbook:</u> 1. Ramez Elmasri and Shamkant B. Navathe, <i>Fundamentals of Database Systems</i>, Pearson Education, 6th ed., 2010	
<u>Reference Book(s):</u> 1. Raghu Ramakrishnan and Johannes Gehrke, <i>Database Management Systems</i>, McGraw-Hill Education, 3rd ed., 2002 2. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, <i>Database System Concepts</i>,	

McGraw-Hill Education, 3rd ed., 1997 3. Thomas Connolly and Carolyn Begg, <i>Database Systems</i> , Pearson Education, 3rd ed., 2003
Web and Video link: https://onlinecourses.nptel.ac.in/noc22_cs91/preview NPTEL Video Lecture: Data Base Management System by Prof. Partha Pratim Das, Prof. Samiran Chattopadhyay, IIT Kharagpur
Laboratory Manual (for laboratory component): <i>Database Management Systems Laboratory Manual and Record Book</i> , Department of CSE (Networks), KITSW
Course Learning Outcomes (COs) <i>After completion of this course, the student should be able to, (based on cognitive skills acquired from theory component)</i> CO1: design the databases using entity relationship model CO2: apply queries to manage the data that can efficiently store and retrieve CO3: apply normalization techniques to reduce redundancy CO4: apply locking techniques for concurrent transaction to recover the database failures <i>(based on psychomotor skills acquired from laboratory component)</i> CO5: design entity relationship diagrams, implement SQL queries 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 to reduce redundancy and maintain the performance of database CO8: implement pre-compiled stored programs, run-time error checking, database objects collection in PL/SQL high-level security using triggers

Course Articulation Matrix (CAM):					U24IN403 DATABASE MANAGEMENT SYSTEMS									
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24IN403.1	2	1	2	1	-	-	-	1	1	-	1	2	1
CO2	U24IN403.2	2	1	2	1	-	-	-	1	1	-	1	2	1
CO3	U24IN403.3	2	1	2	2	-	-	-	1	1	-	1	2	1
CO4	U24IN403.4	2	1	1	1	-	-	-	1	1	-	1	1	1
CO5	U24IN403.5	2	1	2	1	1	-	-	1	1	-	1	2	1
CO6	U24IN403.6	2	1	2	1	1	-	-	1	1	-	1	2	1
CO7	U24IN403.7	1	1	1	1	1	-	-	1	1	-	1	1	1
CO8	U24IN403.8	2	1	2	1	1	-	-	1	1	-	1	2	2
U24IN403		1.87	1	1.75	1.2	1	-	-	1	1	-	1	1.75	1.12

IOTARCHITECTUREANDPROTOCOLS			
Class:B.TechIV–Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24IN404	Credits:	3
Hours/Week(L-T-P-O-E):	2-1-0-4-7	CIE:	60%
TotalNumberofTeachingHours:	36Hrs	ESE:	40%
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents'knowledgein/on... LO1:fundamentalofIoTnetworkarchitectureanddesign,connectivitytechnologies LO2:IoTconnectivitytechnologiesandcommunicationtechnologies LO3:data protocolsanddiscoveryprotocols LO4:infrastructureprotocolsandsemanticprotocolsinIoT			
THEORYCOMPONENT			
UNIT-I		9Hrs	
IoT Network Architecture and Design:Drivers behind new network architectures, OneM2M IoT standardized architecture, IoT World Forum (IoTWF) standardized architecture, A Simplified IoT architecture,Core IoT Functional stack, IoT datamanagement and compute stack IoT Connectivity Technologies:IEEE 802.15.4-802.15 standards, Architecture, Topology, Addressing modes and Packet structure, Security, Zigbee-Overview, Physical layer and Media Access Control(MAC) Layer, Protocol stack, Addressing modes and packet structure, Topology, Security SelfLearningTopics(SLT): Datalinklayer addressingandNetworklayeraddressing (Text: chapter 1.4)			
UNIT-II		9Hrs	
IoT Connectivity Technologies:Long Range (LoRa),Physical layer, Media Access Control(MAC) layer and topology,Z-Wave, Thread, ISA100.11A, RFID,NFC,NB-IoT, Wi-Fi,Bluetooth IoTCommunicationTechnologies:Constrainednodes,Constrainednetworks,Typesof constrained devices, Low powerand lossy networks SelfLearningTopics(SLT):Weightless(Text1:chapter7.11)			
UNIT-III		9Hrs	
DataProtocols:MessageQueueTelemetryTransport(MQTT)-Publish-SubscribeArchitecture, Packet structure and communication format; Message Queue TelemetryTransport -Sensor Networks (MQTT-SN)-Architecture, Topology; Constrained Application Protocol(COAP)–Architecture,Messageformats;AdvancedMessageQueuing Protocol(AMQP), Extensible Messaging and Presence Protocol(XMPP), Simple Object Access Protocol(SOAP), Representational State Transfer(REST), Websocket Discoveryprotocols:Physicalweb,MulticastDNS(mDNS),Universalplugandplay(UPnP) SelfLearningTopics(SLTs):Identificationprotocols(Text1:Chapter8.5)			
UNIT-IV		9Hrs	

Infrastructure Protocols :Internet Protocols version6(IPv6),Lightweight On-demandAd-hoc distance vector Routing protocol – Next Generation(LOADng), Routing Protocols for Low-power(RPL),IPv6 over Low-Power Wireless Personal Area Networks(6LoWPAN), Quick UDP Internet Connections(QUIC), Micro Internet protocols(uIp), Nano Internet Protocols (NanoIP), Content-Centric Networking(CCN) Semantic Protocols:JavaScript Object Notation for Linked Data(JSON-LD), Web of things model(WoT) SelfLearningTopics(SLT):DeviceManagement(Text1:Chapter8.6)
Textbook(s): 1. SudipMisra,AnandarupMukherjee,Arljit Roy, <i>IntroductiontoIoT</i> ,NewDelhi Cambridge University Press , 2020 2. DavidHanes,GanzaloSalgueiro,PatrickGrosseteteRobertBarton,JeromeHenry, <i>IoTFundamentals networkingTechnolgies Protocols anduse case ofInternet of things</i>,IndianpolisCiscopress,2017
ReferenceBook(s): 1. JeevaJose,InternetofThings,NewDelhi,Khanna,Publishing,2018 2. KamalRAJ,Internet,ofThings,-Architecture andDesign Principles,NewDelhi 3. ManyurRamgir,InternetofThings-ArchitectureandImplementationandSecurity NewDelhi Pearson Education, 2019
WebandVideolink: https://onlinecourses.nptel.ac.in/noc25_cs44/preview
CourseLearningOutcomes(COs): <i>Aftercompletionofthiscourse,thestudentsshouldbeableto, (basedoncognitiveskillsacquiredfromtheorycomponent)</i> CO1:analyze variousIoT networks architecture and connectivity technologies CO2:examine various IoTcommunication protocols for wireless device CO3:interpretdataprotocolsanddiscoveryprotocolsinreal-worldscenarios CO4:analyzeinfrastructureandsemanticprotocolsforIoT

CourseArticulationMatrix(CAM):					U24IN404: IOTARCHITECTUREAND PROTOCOLS									
CO		P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	U24IN404.1	2	2	2	1	1	-	-	1	1	-	1	2	2
CO2	U24IN404.2	2	2	2	1	1	-	-	1	1	-	1	2	2
CO3	U24IN404.3	2	2	2	1	1	-	-	1	1	-	1	2	2
CO4	U24IN404.4	2	2	2	1	1	-	-	1	1	-	1	2	2
U24IN404		2	2	2	1	1	-	-	1	1	-	1	2	2

PYTHON PROGRAMMING FOR IOT			
Class: B.Tech.IV-Semester		Branch: CSE(Internet of Things)	
Course Code:	U24IN405	Credits:	3
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
Total Number of Teaching Hours:	60Hrs	ESE:	40%
Course Learning Objectives(LOs): <i>This course will develop students' knowledge in/on...</i> LO1: basics of Python Programming, functions, modules and namespaces LO2: data collections, NumPy, Pandas, and Matplotlib LO3: regular expressions, Raspberry Pi, cloud service providers LO4: Raspberry Pi and cloud integration, Security in cloud-IoT, weather forecasting as a Case study			
THEORY COMPONENT			
UNIT-I		9Hrs	
Python Programming: Introduction, Literal, Constants, Variables and identifiers, Data types, Input operation, Comments, Reserved words, Operators, Expressions in python, Type conversion, Decision control statements, Loops, Arrays Functions: Function definition, Function call, Variable scope and lifetime, return statement, Decorator functions, Lambda functions, Recursive functions, String handling functions Modules and Name Spaces: from...import statement, Naming module, Packages in python, Standard library modules, globals(), locals(), and reload(), Function redefinition <i>Self-Learning Topics (SLTs): More on Functions, String handling functions, and operations (Textbook1: Chapters- 6,7, & 8)</i>			
UNIT-II		9Hrs	
Data Collection: Lists, Tuple, Sets, Dictionaries, and Sequences Numpy: Importance of NumPy and installation, NumPy arrays Vs. Python lists, Creating arrays, Basic Array operations Pandas: Pandas objects, Data indexing and selection, Handling missing data, Combining datasets, Merge and join, Aggregation and grouping Matplotlib: Importing Matplotlib, Saving figures to files, Line plots, Scatter plots, Histograms, Pie chart, Bar charts, 3D plots <i>Self-Learning Topics (SLTs): More on numpy, pandas, matplotlib, plotting data (Text book1: Chapters- 10,11,&12)</i>			
UNIT-III		9Hrs	
Regular Expression: Introduction, Patterns and syntax, Regex functions in python, Groups and substitutions, Non -capturing groups, Greedy vs non greedy matching Raspberry Pi: components, Features, Installation of Rasbarian operating system, Essential packages of python for IoT, Interfacing camera with Pi, Interfacing display with Pi, Integrating of sensor and actuators Pi with Cloud: Introduction, Cloud service models, Cloud deployment models, Cloud providers (AWS, Azure, GCP) <i>Self Learning Topics (SLTs): More on Lookahead and lookbehind, greedy vs non greedy, Linux related Commands, cloud platforms (Textbook1: Chapters-11, Textbook2: Chapters-12)</i>			
UNIT-IV		9Hrs	

Integration of Cloud & Pi: Connecting Pi to the Internet, Setting up API keys for cloud services, Sending and receiving data from Pi to cloud, Store sensor data in cloud, Data visualization on ThinkSpeak cloud

Security in cloud-IoT integration: Securing data transmission (SSL/TLS, SSH keys), Device authentication in cloud platform

Case study: Weather forecasting

Self-Learning Topics (SLTs): Cloud Accounts, how cloud receives the data from RPi (Textbook 2: Chapters-7,8)

LABORATORY COMPONENT

List of Experiments

1. Python program to demonstrate data types, operators, input and output functions
2. Python program to demonstrate control statements and loops
3. Python program to demonstrate functions, lambda functions and decorators
4. Python program to demonstrate list, tuple, and dictionary
5. Python program to demonstrate NumPy library
6. Python program to demonstrate Pandas and Matplotlib libraries
7. Python program to demonstrate regular expression
8. Demonstrate installation of Raspbian OS on Pi, connecting LED and DHT sensor
9. Demonstrate integration of cloud and Pi with suitable examples
10. Demonstrate setting up connection between Blynk app on a mobile device and controlling an LED
11. Interfacing Camera with Raspberry Pi and take a snapshot, then use OpenCV to display the image and apply basic image processing
12. Greenhouse Monitoring System by Integrate multiple sensors (temperature, humidity, soil moisture) and send data to the cloud for real-time monitoring

Textbook(s):

1. Reema Thareja, *Python Programming using problem solving approach*, New Delhi, 2nd ed., Oxford University Press, 2021. (Chapter 1 to 7)
2. Rajesh Singh, Anitha Gehlot, Bhupendra Singh, *Internet of Things with Raspberry Pi and Arduino*, 1st ed., CRC Press, 2019

Reference Book(s):

1. Simon Monk *Programming the Raspberry Pi*, 1st ed., McGraw-Hill/Tab Electronics
2. Simon Monk *Raspberry Pi Cookbook*, 4th ed., O'Reilly Media
3. Derek Molloy *Exploring Raspberry Pi*, Wiley, 2016
4. Prof. Sudip Misra, Anandarup Mukherjee, Arijit Roy *Introduction to IoT*, Cambridge University Press, 2021

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc20_ee98/NPTELVideoLectureonIntroductiontoInternetofThingsbyProf.SudipMisrafromIITKharagpur

<https://core-electronics.com.au/courses/raspberry-pi-workshop-for-beginners> Video Lecture on Raspberry Pi Workshop for Beginners by Core Electronics

Laboratory Manual (for laboratory component):

Python for IoT Laboratory Manual and Record Book, Department of CSE (Networks), KITSW

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

CO1: develop solution to real-world problems by utilizing core Python programming constructs such as variables, operators, control statements, functions, and modules

CO2: analyse data by collecting, processing, and visualizing it using Python data structures, NumPy, Pandas, and Matplotlib

CO3: implement regular expressions to process data and interface a Raspberry Pi with sensors and actuators to build basic IoT applications

CO4: connect Raspberry Pi with other cloud platforms for data storage and visualization, and implement basic IoT data security practices

(based on psychomotor skills acquired from laboratory component)

CO5: develop and test Python programs using basic data types, decision control structures, loops, functions, and string operations

CO6: implement data structures and perform numerical and data analysis using NumPy and Pandas; visualize data using Matplotlib

CO7: utilize regular expressions, Raspberry Pi GPIO, and sensors for basic data acquisition and image processing tasks

CO8: integrate IoT devices with cloud platforms for data transmission, remote device control, and real-time monitoring applications

Course Articulation Matrix (CAM): U24IN405 PYTHON PROGRAMMING FOR IOT

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24IN405.1	1	1	1	1	2	-	-	1	1	-	1	2	1
CO2	U24IN405.2	1	1	2	1	2	-	-	1	1	-	1	2	1
CO3	U24IN405.3	2	2	2	2	3	-	-	1	1	-	1	2	2
CO4	U24IN405.4	2	2	2	2	3	-	-	1	1	-	1	2	2
CO5	U24IN405.5	2	2	2	2	2	-	-	2	1	-	1	2	2
CO6	U24IN405.6	2	2	2	2	2	-	-	2	1	-	1	2	2
CO7	U24IN405.7	2	2	2	2	3	-	-	2	1	-	1	2	2
CO8	U24IN405.8	2	2	2	2	3	-	-	2	1	-	1	2	2
U24IN405		1.75	1.75	1.87	1.75	2.5	-	-	1.5	1	-	1	2	1.75

QUANTITATIVE APTITUDE AND LOGICAL REASONING			
Class: B.Tech.IV-Semester		Branch: Common to all Branches	
Course Code:	U24VA406A	Credits:	2
Hours/Week(L-T-P-O-E):	2-0-0-2-4	CIE	60%
Total Number of Teaching Hours:	24Hrs	ESE	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> L01: quantitative aptitude & problem-solving skills L02: computation of abstract quantitative information L03: application of basic mathematics skills & critical thinking to draw conclusions L04: evaluation of validity & possible biases in arguments presented in authentic contexts			
UNIT-I			6Hrs
Quantitative Aptitude-I: Numbers system, Averages, Percentages, Ratios & proportions, Time, Speed & distance, Time and work			
UNIT-II			6Hrs
Quantitative Aptitude-II: Simple interest, Compound interest, Profit & loss, Ages, Permutations & Combinations, Probability			
UNIT-III			6Hrs
Logical Reasoning-I: Series completion, Analogy, Coding and decoding, Blood relations, Number, Ranking & Time sequence test, Linear & Circular arrangements			
UNIT-IV			6Hrs
Logical Reasoning-II: Data sufficiency, Logical Venn diagram, Syllogisms, Statement & Arguments, Statement & Assumptions, Directions sense test			
Course Learning Outcomes (COs): <i>After completion of this course, the student should be able to...</i> CO1: apply arithmetic concepts such as averages, percentages, ratios, and time-based calculations to solve real-life quantitative problems CO2: analyze and solve problems involving financial, arithmetic and probability using structured quantitative methods CO3: identify patterns and apply deductive reasoning to solve series, coding-decoding, and arrangement-based logical problems CO4: evaluate logical statements, assess validity, and draw conclusions using tools like syllogisms, Venn diagrams, and argument analysis			
Note: Students should go through the QALR course supplementary material made available on online learning platform - Contents covered in class shall be practiced through the material available on the online learning platform. At home practice problems and practice tests shall be made available on the online learning platform - Tutorial classes shall be conducted on the online learning platform and hence students shall attend the tutorial classes with laptop/tab - All assessment shall be conducted through online learning platform			
Textbook(s): 4. RS Agarwal , Quantitative Aptitude for Competitive Examinations, 3rd ed., New Delhi: S.Chand			

Publications,2019.(Chapters1,6,7,8,10,11,12,15,17,21,22,30,31-for UnitI&II)
5. RS Agarwal , <i>A Modern Approach to Verbal and Non-Verbal Reasoning</i> , 3rd ed., New Delhi: S. Chand Publications, 2019. (Chapters Section I: 1,3,4,5,6,8,16, Section II: 2,3-for Unit III & IV)
Reference Book(s):
10. Dinesh Khattar , <i>Quantitative Aptitude for Competitive Examinations</i> , 1 st ed., New Delhi: Pearson India, 2019.
11. Nishit K Sinha , <i>Reasoning for Competitive Examinations</i> , 1 st ed., New Delhi: Pearson India, 2019.
12. R.N. Thakur , <i>General Intelligence and Reasoning</i> , 1 st ed., New Delhi: McGraw Hill Education, 2017.

Course Articulation Matrix (CAM):		U24VA406A QUANTITATIVE APTITUDE AND LOGICAL REASONING												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24VA406A.1	1	2	-	1	-	-	-	-	-	-	1	1	-
CO2	U24VA406A.2	1	2	-	1	-	-	-	-	-	-	1	1	-
CO3	U24VA406A.3	-	1	-	2	-	2	-	-	-	-	1	1	-
CO4	U24VA406A.4	-	1	-	2	-	2	-	-	-	-	1	1	-
U24VA406A		1	1.5	-	1.5	-	2	-	-	-	-	1	1	-
3-HIGH, 2-MEDIUM, 1-LOW														

PROGRAMMINGSKILLDEVELOPMENTLAB-3			
Class:B.Tech.IV–Semester		Branch:CSE(InternetofThings)	
CourseCode:	U24SE407	Credits:	1
Hours/Week(L-T-P-O-E):	0-0-2-2-4	CIE:	100%
TotalNumberofLabHours:	36Hrs	ESE:	-
CourseLearningObjectives(LOs): Thiscoursewilldevelopstudents’knowledgein /on... LO1: operators,controlstatements,loopsinjavaprogramming LO2: arrays,strings, functionsandrecursion LO3: exceptions and multithreading LO4: trees, searching and sorting			
LABORATORYCOMPONENT			
SI.NO	ListofExperiments		
1	Implementationofoperatorsanddatatypesusingjava.		
2	Implementationofcontrolstatementsusingjava.		
3	Implementationofloopsusingjava.		
4	Implementationofsimplearraysandstringsusingjava.		
5	Implementationofarraysandstringsusingjava.		
6	Implementationoffunctionsandrecursionusingjava.		
7	Implementationofexceptionsusingjava.		
8	Implementationofmultithreadingusingjava.		
9	Implementationofbinarytreeusingjava.		
10	Implementationofbinarysearchtreeusingjava.		
11	Implementationofspanningtreeusingjava.		
12	Implementationofsearchingandsortingusingjava.		
Textbook(s): 1. Herbert Schildt, <i>Java The Complete Reference</i> , 9th ed.,New Delhi: McGraw-Hill EducationIndia Pvt. Ltd, 2014 2. DebasisSamanta, <i>ClassicDataStructures</i> ,2nded.,NewDelhi:PrenticeHallIndia,2009 (Chapters3to8,10,11)			
ReferenceBook(s): 1. KathySierraandBert Bates, <i>HeadFirst Java</i> ,2nded.,Boston:O’ReillyPublications, 2013 2. UttamK.Roy, <i>AdvancedJAVAProgramming</i> ,1sted.England:OxfordPublication,2013 3.Balaguruswamy, <i>ProgrammingwithJava:APrimer</i> ,6thed.,NewDelhi:McGraw-Hill Education India Pvt. Ltd, 2019 4. Tanweer Alam , <i>Internet and Java Programming</i> ,1st ed.,New Delhi: Khanna Publishing House,2010 5. ReemaThareja, <i>DataStructuresUsingC</i> ,2nded.,Noida:OxfordUniversityPress,2014 6. E Balagurusamy, <i>DataStructure Using C</i> , 1st ed. New Delhi: McGraw Hill Education, 2017 7. RichardF.GilbergandBehrouzA.Forouzan, <i>DataStructures:APseudocode Approachwith C</i> , 2nd ed.,Noida: Cengage Learning, 2007 8.YashavantP.Kanetkar, <i>DataStructureThroughC</i> ,2nded.,NewDelhi:BPBPublications, 2003			
CourseLearningOutcomes(COs): After completion of this course, the students should be able to ... (basedonpsychomotorskillsacquiredfromlaboratorycomponent):CO1: implement programs on operators and control structures. CO2: developprogramsusingarrays,strings,exceptionhandlingandmultithreading			

C03:buildprogramsusingbinarytrees,binarysearchtrees.
C04:developprogramsusingspanningtrees,searching,sorting.

CourseArticulationMatrix(CAM):			U24SE407:PROGRAMMINGSKILLDEVELOPMENTLAB-3											
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PSO 1	PSO 2
CO1	U24SE407.1	1	1	1	1	-	-	-	1	1	-	1	1	2
CO2	U24SE407.2	2	2	2	1	-	-	-	1	1	-	1	1	2
CO3	U24SE407.3	2	2	2	1	-	-	-	1	1	-	1	1	2
CO4	U24SE407.4	2	2	2	1	-	-	-	1	1	-	1	1	2
U24SE407		1.75	1.75	1.75	1	-	-	-	1	1	-	1	1	2

PRACTICUM-4						
Class:B.Tech.IV-Semester		Branch:Common to all branches				
Course Code:	U24EL408	Credits:	1			
Hours/Week(L-T-P-O-E):	0-0-0-4-4	CIEMarks:	100%			
Total Number of Teaching Hours:	-	ESE Marks:	-			
Course Learning Objectives(LOs): <i>This course will develop students' knowledge in/on...</i> 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).						
(xix). Practicum is a mandatory semester project work.						
(xx). Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters)						
(xxi). 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 this section, as shown below.						
Course	U24IN401	U24IN402	U24IN403	U24IN404	U24IN405	U24IN406
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

- 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 :

.....

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

Note:

- The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
- 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.
- The course faculty are advised to guide the allotted students for practicum during the semester course work.

(Signature of class teacher)

xxii). **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.**

xiii). There shall be only continuous Internal Evaluation (CIE) for practicum for a maximum of 100 marks.

xiv). The practicum course faculty shall evaluate & submit the final marks of the allotted students in week (N+1) to the respective class teacher.

xxv). The class teacher shall collect the final marks of practicum of the students allotted to each course teacher and submit them to the CoE.

xvi). 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

xvii). As a sample rubric 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.

- (o) **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.
- (p) **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.
- (q) **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 course work 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?
- (r) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute
- (s) **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
- (t) **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 this / her business idea / plan (if

any) and social impact

(u) The student has to register for the Practicum as a supplementary examination in the following cases:

- vii) he/she is absent for oral presentation and viva-voce
- viii) he/she fails to submit the report in prescribed format
- ix) he/she fails to fulfill the requirements of Practicum evaluation as per specified guidelines

Course Learning Outcomes (COs):

After completion of this course, the student 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

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA-IV / SAA-IV)			
Class: B.Tech.IV Semester	Branch: Common to all branches		
Course Code:	U24VA409XXXXX	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): <i>This course will develop students' knowledge in/on...</i> 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 field work 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. (k) Each SEA/SAA activity is treated as one credit course (l) Student must select one activity per semester, through first 04 semesters, from the courses listed under SEA/SAA, before commencement of the semester. (m) Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA (n) To complete these activities students shall work outside the class work hours, during weekends, holidays, semester breaks, etc., (o) 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. <u>Monitoring SEA/SAA:</u> (o) 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. (p) During the semester period, the student has to acquire requisite knowledge, conduct			

fieldwork,acquireskillsandpropose uniquesolutionstothereal-life problems
(q) **KnowledgeAcquisition&Skilling:**

- vii. Students have to identify goals, acquire and accumulate knowledge on the chosen SEA/SAA activity
 - viii. 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 toseek newopportunities in theirpersonalandprofessional life.
 - ix. For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions undersupervision ofexpert/guru are to be plannedand executed to acquire the benchmark skills to be demonstrated.
- (r) **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.
- xxix. 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.
 - xxx. Fieldworkconsistsofthreephases:preparation,theactualactivityandfeedback
 - xxxi. **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.**
 - xxxii. 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.
 - xxxiii. Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more
 - xxxiv. 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 mannerhelp students solve their problems and to develop one's own leadership style based on the need and culture of the place.
 - xxxv. **Eminent personalities/achievers/renowned persons/inspiring and great personalities**

Eminent personalities/Achievers/Renownedpersonalities:

- (a). **Incaseofsociallyrelevantproblems/activitiesofSEA/SAA:**Eminent personalities/achievers include district administrative officers, Eminent Social workers / NGOs, other inspiring and great personalities
- (b). **IncaseofSports/GamesandCulturalactivitiesofSEA/SAA:**Eminent coaches/trainers/gurus,achieverswhorepresented/wonstatelevel/nationallevel /internationallevelcompetitions,otherinspiringandgreatpersonalities.
- xxxvi. **For appointment to interact eminent personalities:**Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes forgetting appointment and time for interaction
- xxxvii. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
- xxxviii. **Ethicsoffieldwork:**Fieldworkisaneducationalprocesswithcommitmentto positivevalues.Allfieldworkshouldbeplannedandconductedinawaythat 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

xxxix. Student is expected to take care of health and Safety practices for fieldwork and travel

xl. 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.

xli. 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.

xlii. **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' experienced during fieldwork. Therefore, the students 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.

(s) **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.

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

xi. **Faculty counsellor approval:** In week (-1), in consultation with faculty counsellor, every student shall identify 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

xii. **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.

xiii. **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.

xiv. **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.

xv. **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.

- (u) **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:

- (k) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) 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 time slot from the nodal centre and demonstrate the skills learnt/improved during the allotted time slot.
- The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.
- (l) **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.
- (m) **Anti-Plagiarism Check:** The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.
- (n) **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
- (o) **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 student 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 sensibility

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

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

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, student shall refer to textbooks and web resources relevant to the course selected. Plan for fieldwork/practice sessions in coordination with SEA/SA coordinator

EXPERT TALK SERIES-IV			
Class: B.Tech.IV-Semester	Branch: Common to all branches		
Course Code:	U24AE410	Credits:	1
Hours/Week (L-T-P-O-E):	0-0-0-1-1	CIEMarks:	100%
Total Number of Teaching Hours:	-	ESE Marks:	-
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: 21 st 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 a successful career, degree alone won't suffice. Competencies are much more important. (gg) 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. (hh) Learning from industry experts with real-world examples, is important to enhance your educational experience. (ii) 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. (jj) 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? (kk) The answer is Industry Expert Talk Series (ETS). Through ETS, we invite industry experts in different fields to deliver talks and interact with students. (ll) Through Industry expert talks students get to know so much more that textbooks don't explain. (mm) 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. (nn) 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 (oo) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development. (pp) In URR24 curriculum, Expert talk series (ETS) is offered as a course under ability			

enhancement category of courses.

- (qq) 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.
- (rr) 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.
- (ss) ETS enhances your learning in many ways for global opportunities for your career.
- (tt) 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.
- (uu) Salient features of ETS are hereunder:
- (xxiii) ETS is offered from I semester to VI semester.
- (xxiv) ETS, in any given semester, is treated as one credit course
- (xxv) Students are required to earn six credits (from I to VI semester)
- (xxvi) **Head, Centre for i²RE shall be the institute level ETS coordinator**
- (xxvii) Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode** by the parent department/Centre for i²RE.
- (xxviii) 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.
- (xxix) **The Head C-i²RE shall share the marks obtained by the students in each of the quizzes/test to the respective department ETS coordinators.**
- (xxx) Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.
- (xxxi) **Report on ETS:** At the end of semester, the students shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.
- (xxxii) **Evaluation:** There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks
- (xxxiii) The department ETS coordinator shall, in coordination with institute level ETS coordinator, submit the final scores to the CoE in week (N+1).
- (vv) 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

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

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

iv. Supplementary Exam:

- (i) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE
- (j) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks (MCQs/FiBs; duration: 2 Hrs) on the content covered in ETS lectures.
- (k) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE
- (l) 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 student should be able to...

CO9: 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

CO10: 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

CO11: interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects

CO12: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

ENVIRONMENTAL STUDIES			
Class: B.Tech.IV Semester		Branch: Common to all branches	
Course Code:	U24CH411	Credits:	0
Hours/Week(L-T-P-O-E):	2-0-0-3-5	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: natural resources and their usage more equitably LO2: ecosystem and the importance of biodiversity conservation LO3: environmental pollution and its control measures LO4: environmental legislation and green methodology			
UNIT-I			6Hrs
The Multidisciplinary Nature of Environmental Studies: Definition, Scope and importance Natural Resources: Forest Resources-Use and over exploitation of forests, Deforestation, Timber extraction, Mining, Dams and their effects on forests and tribal people; Water Resources-Use and over-utilization of surface and ground water, Floods, Drought, Conflicts over water; Mineral Resources-Environmental effects of extracting and using mineral resources; Energy Resources-Renewable and non-renewable energy sources, Use of alternate energy sources Self Learning Topics (SLTs): Use and over-utilization of surface and ground water (Text 1: unit 2, topic: 2.2.2) world food problems (Text 1: unit 2, topic 2.2.2)			
UNIT-II			6Hrs
Ecosystem and Biodiversity: Ecosystem: Concepts of an ecosystem, Food chain, Food webs, Ecological pyramids, Energy flow in the ecosystem and ecological succession Biodiversity and its Conservation: Introduction, Definition, Genetic, Species and ecosystem diversity, Value of biodiversity, Biodiversity in India, Hot spots of biodiversity, Man-wildlife conflicts, Endangered and endemic species of India; In-situ and Ex-situ conservation Self Learning Topics (SLTs): Introduction and definition of biodiversity (Text 1: unit 4, topic 4.1)			
UNIT-III			6Hrs
Environmental Pollution: Global issues-Global climatic change, Greenhouse gases, Effects of global warming, Ozone layer depletion International Conventions/Protocols: Earth summit, Kyoto protocol, Montreal protocol Environmental Pollution- Causes and effects of air, Water, Soil, Marine and noise pollution with case studies Solid and Hazardous Waste Management: Introduction, Types, Effects of urban industrial and nuclear waste Natural Disaster Management: Introduction to disaster, Management of disaster, Disaster management of flood, earthquake, cyclone and landslides Role of information technology in environment and human health Self Learning Topics (SLTs): Role of individual in prevention of pollution (Text 1: unit 5, topic 5.10)			
UNIT-IV			6Hrs

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

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

Green Methodology: Principles of green chemistry, Green methods in electronic production, Impact of electronic waste on public health and environment

The Sustainable Development Goals (SDGs): United Nations Sustainable Development Goals

Self Learning Topics (SLTs): Water (prevention and control of pollution) act 1974 (Text 1: unit 6, topics 6.10), Water pollution cess act 1977 (Text 1: unit 6, topics 6.11)

Textbook(s):

1. Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Courses*, 2nd Edn., Universities Press (India) Pvt. Ltd, 2013

Reference Book(s):

1. Y. Anjaneyulu, *Introduction to Environmental Science*, B.S. Publications, 2004.
2. Gilbert M. Masters, *Introduction to Environmental Engineering & Science*, 3rd Edn., Prentice Hall of India, 1991
3. Anubha Kaushik, C.P. Kaushik, *Environmental Studies*, 4th Edn., New Age International Publishers, 2014
4. R. Rajagopalan, *Environmental Studies from crisis to cure*, Oxford University Press, 2nd Edn., 2011

Web and Video link(s):

1. [https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ch27/videolectureon renewable energy resources by Prof. Vaibhav. V. Goud and Dr. R. Anandalakshmi, Dept. Of Chemical Engineering, Guwahati.](https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ch27/videolectureon%20renewable%20energy%20resources%20by%20Prof.%20Vaibhav.%20V.%20Goud%20and%20Dr.%20R.%20Anandalakshmi%20Dept.%20Of%20Chemical%20Engineering%20Guwahati)
 2. <https://sdgs.un.org/goals>; UN's webpage on 17 sustainable Development Goals
 3. https://onlinecourses.nptel.ac.in/noc23_hs57/preview
- United Nations Sustainable Development Goals

Course Learning Outcomes (COs):

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

CO1: identify the natural resources and practice their usage more equitably

CO2: develop an action plan for sustainable alternatives and conserving biodiversity

CO3: examine and perceive the solutions for the environmental pollution

CO4: adapt issues involved in enforcement of environmental legislation and green methodology

Course Articulation Matrix (CAM):					U24CH411 ENVIRONMENTAL STUDIES									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24CH411.1	2	1	2	1	-	2	1	1	1	-	-	-	-
CO2	U24CH411.2	-	-	2	-	-	1	1	1	1	1	-	-	-
CO3	U24CH411.3	1	2	1	-	-	1	1	1	1	1	1	-	-
CO4	U24CH411.4	-	-	1	-	-	1	1	1	1	-	1	-	-
U24CH411		1.50	1.50	1.50	1.00	-	1.25	1.00	1.00	1.00	1.00	1.00	-	-

FUNDAMENTALS OF ALGORITHMS			
Class: B.Tech.IV – Semester (Exit Course)		Branch: CSE (Internet of Things)	
Course Code:	U24IN412X	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> - fundamentals of algorithms and algorithmic design paradigms - asymptotic notations and analysis of algorithms - data structures, divide and conquer approach - greedy, dynamic approaches and designing algorithms			
THEORY COMPONENT			
UNIT-I			4Hrs
Introduction: Algorithm definition, Mathematical notations, Contradiction, Mathematical induction Elementary Algorithms: The efficiency of algorithms, Elementary operations and example algorithms			
UNIT-II			4Hrs
Asymptotic Notations: Big oh, Omega, Theta, Little Oh, Little Omega notations, Problems on asymptotic notations Analysis of Algorithms: Analysing control structures, Solving recurrences and problems on analysis of algorithms			
UNIT-III			4Hrs
Some data Structures: Arrays, stacks and queues, records and pointers, lists, graphs, Trees, Associative tables, Heaps, Binomial heaps, Disjoint sets Divide and Conquer: Binary Search, Sorting, Finding the median, Matrix Multiplication			
UNIT-IV			4Hrs
Greedy Method: General characteristics, Minimum spanning trees, shortest path algorithm, Knapsack problem Dynamic Programming: Principle of optimality, 0/1 knapsack problem, shortest path algorithm using dynamic approach, DFS and BFS			
LABORATORY COMPONENT			
List of Experiments			
- Write a program to implement: - A Queue - A Stack - A Queue using two Stacks. - A Stack using two Queues - Write an algorithm and find the efficiency of the same for following problems: - Finding Factorial – Iterative Approach			

- b. FindingFactorial–RecursiveApproach
- c. PrintingFibonacciSeries–IterativeApproach
- d. PrintingFibonacciSeries–RecursiveApproach
- 3. DesignanalgorithmandimplementaprogramforSelectionSort
- 4. Designanalgorithmandimplementaprogramfor:
 - a. Linearsearch
 - b. Countsort
- 5. Designanalgorithmandimplementaprogramfor:
 - a. MergeSort
 - b. BinarySearch
- 6. DesignanalgorithmandimplementaprogramtosolveKnapsackProblem
- 7. Design an algorithmandimplementaprogramtosolveLongestCommon Subsequence
- 8. Designanalgorithmandwriteaprogramtoimplement:
 - a. DepthFirstSearchofagraph
 - b. BreadthFirstSearchofagraph
- 9. DesignanalgorithmandwriteaprogramtoimplementBreadth-FirstSearchofa Graph
- 10. Designanalgorithmandimplementaprogramfor:
 - a. Kruskal’smethodoffindingMinimumSpanningTree
 - b. Prim’smethodoffindingMinimumSpanningTree

Textbook(s):

1.Brassard,G.,&Bratley,P.*Fundamentalsofalgorithmics*.Prentice-Hall:Inc.,1996

ReferenceBook(s):

- 1. Cormen,T.H.,Leiserson,C.E.,Rivest,R.L.,&Stein,C.*Introductiontoalgorithms*.MIT press: 2022
- 2. Rajaraman,V.,&Adabala,N.*Fundamentalsofcomputers*.PHILearningPvt.Ltd2014

WebandVideolink(s):

<https://archive.nptel.ac.in/courses/106/105/106105157/>
<https://www.classcentral.com/course/swayam-fundamental-algorithms-design-and-analysis-58462>

Laboratory Manual (for laboratory component): Fundamentals ofAlgorithms
 LaboratoryManualandRecordBook,DepartmentofCSE(Networks),KITSW

CourseLearningOutcomes(COs):

Aftercompletionofthiscourse,thestudentsshouldbeableto,

(basedoncognitiveskillsacquiredfrom theorycomponent)

- CO1:** illustratetheconcepts of algorithms andits complexity
- CO2:** applymathematicalconceptstoderivethetimecomplexityofalgorithms
- CO3:** applyrecursiveanditerativealgorithmsforbasicdatastructures
- CO4:** analyzeproblemsbyapplyinguitableapproaches

(basedonpsychomotorskillsacquiredfromlaboratorycomponent)

- CO5:** implementbasicdatastructuresandtimecomplexity
- CO6:** developoptimizedalgorithmsforsortingtechniques

C07: develop graph algorithms for efficient searching and deriving time complexity

C08: build and compare recursive and iterative algorithms

Course Articulation Matrix (CAM):		U24IN412X: FUNDAMENTALS OF ALGORITHMS												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS 01	PSO 2
CO1	U24IN412X.1	2	2	2	2	1	-	-	1	1	-	1	1	1
CO2	U24IN412X.2	2	2	2	2	1	-	-	1	1	-	1	1	1
CO3	U24IN412X.3	2	2	2	2	1	-	-	1	1	-	1	1	1
CO4	U24IN412X.4	2	2	2	2	1	-	-	1	1	-	1	1	1
CO5	U24IN412X.5	2	2	2	2	2	-	-	1	1	-	1	1	1
CO6	U24IN412X.6	2	2	2	2	2	-	-	1	1	-	1	1	1
CO7	U24IN412X.7	2	2	2	2	2	-	-	1	1	-	1	1	1
CO8	U24IN412X.8	2	2	2	2	2	-	-	1	1	-	1	1	1
U24IN412X		2	2	2	2	1.5	-	-	1	1	-	1	1	1

MACHINE LEARNING FOR IOT			
Class: B.Tech.IV-Semester		Branch: CSE(Internet of Things)	
Course Code:	U24IN413X	Credits:	3
Hours/Week(L-T-P-O-E):	2-0-2-0-4	CIEMarks:	60%
Total Number of Teaching Hours:	32Hrs	ESEMarks:	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: data access and distribution processing of IoT LO2: data pre-processing techniques LO3: supervised learning algorithms LO4: unsupervised learning algorithms			
THEORY COMPONENT			
UNIT-I			4Hrs
Data Access and Distribution Processing For IoT: Data format, Importance of processing of IoT data, Processing topologies, IoT device design and selection considerations, Processing offloading, Data access and distributed processing for IoT, Role of AI in IoT			
UNIT-II			4Hrs
Data Pre-processing: Data cleaning-handling missing values, outliers; Feature engineering, Feature scaling -normalization, standardization; Label encoding, One-hot encoding, Train-test split, Cross-validation			
UNIT-III			4Hrs
Supervised Learning Algorithms: Linear regression, Logistic regression, K-Nearest Neighbors (KNN), Decision trees, Random forest, Naive Bayes (NB), Support Vector Machines (SVM)			
UNIT-IV			4Hrs
Unsupervised Learning: K-means, Hierarchical clustering, DBSCAN Dimensionality Reduction: Principal Component Analysis (PCA), t-SNE			
LABORATORY COMPONENT			
List of Experiments 1. Installation of Python 2. Write a program to demonstrate importance of indentations. Purposefully raise indentation error and correct it 3. Write a program to find circulating 'n' values and module using import statement. 4. Write python program on file operations for the following a) To open and read data from a file b) To write data into a file c) To compute number of characters, words, lines in a file 5. Demonstrate Numpy and Pandas libraries 6. Demonstrate Matplotlib library 7. Demonstrate Linear regression and Multiple Linear regression algorithm with			

suitable dataset

8. Demonstrate Logistic regression algorithm with suitable dataset
9. Demonstrate KNN algorithm with suitable dataset
10. Demonstrate K-Means algorithm with suitable dataset

Textbook(s):

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd ed., New Delhi: Prentice Hall Series in AI, 2010
2. Stephen Marsland, Taylor & Francis, *Machine Learning: An Algorithmic Perspective*, CRC, ISBN-13: 978-1420067187, 2009

Reference Book(s):

1. Jason Bell, *Machine Learning: Hands-On for Developers and Technical Professionals*, John Wiley & Sons, 1st ed., ISBN-13: 978-1118889060, 2014
2. Elaine Rich and Kevin Knight, *Artificial Intelligence*, 2nd ed., New Delhi: Tata McGraw-Hill, 2002
3. William H. Sieh, *Machine Learning Methods in the Environmental Sciences, Neural Networks*, Cambridge University Press, ISBN-13: 978-0805822410, 2009

Web and Video link(s):

[ptel#pythonprogramming#skumaredu](#); NPTEL Video Lecture on PROGRAMMING IN PYTHON by Dr. Rizwan Rehman, Assistant Professor of Dibrugarh University

Laboratory Manual (for laboratory component):

Machine Learning for IoT Laboratory Manual, Dept. of CSE(N), KITSW

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

- CO1:** analyze various data processing technologies in IoT applications
- CO2:** analyze the data using data pre-processing techniques
- CO3:** design and analyze IoT applications using supervised learning algorithms
- CO4:** design and analyze IoT applications using unsupervised learning algorithms

(based on psychomotor skills acquired from laboratory component)

- CO5:** develop code for implementing fundamental of python programming
- CO6:** develop python code for implementing numpy, pandas, matplotlib libraries
- CO7:** develop python code for implementing supervised learning algorithm used in IoT applications
- CO8:** develop python code for implementing unsupervised learning algorithm used in IoT applications

Course Articulation Matrix (CAM):						U24IN413X: MACHINE LEARNING FOR IOT								
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24IN413X.1	2	2	1	1	2	-	-	1	1	-	1	2	1
CO2	U24IN413X.2	2	2	2	1	2	-	-	1	1	-	1	2	1
CO3	U24IN413X.3	2	2	2	2	3	-	-	1	1	-	1	2	2
CO4	U24IN413X.4	2	2	2	2	3	-	-	1	1	-	1	2	2
CO5	U24IN413X.5	2	2	2	2	2	-	-	1	1	-	1	2	1
CO6	U24IN413X.6	2	2	2	2	2	-	-	1	1	-	1	2	1
CO7	U24IN413X.7	2	2	2	2	3	-	-	1	1	-	1	2	2
CO8	U24IN413X.8	2	2	2	2	3	-	-	1	1	-	1	2	2
U24IN413X		2	2	1.87	1.75	2.5	-	-	1	1	-	1	2	1.5

FUNDAMENTALS OF DEVOPS			
Class: B.Tech.IV – Semester (Exit Course)		Branch: CSE (Internet of Things)	
Course Code:	U24IN414X	Credits:	3
Hours/Week (L-T-P-O-E):	2-0-2-0-4	CIE:	60%
Total Number of Teaching Hours:	32 Hrs	ESE:	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: basics of DevOps, and cloud computing for DevOps environments LO2: linux and shell scripting LO3: git and continuous integration/continuous deployment (CI/CD) pipelines LO4: docker and kubernetes			
THEORY COMPONENT			
UNIT-I			4Hrs
Introduction to DevOps: Getting started with DevOps, The evolution of the DevOps culture, Understanding Infrastructure-as-a code (IaC) practices Introduction to Cloud Computing: Cloud Computing at a glance, Cloud computing architecture, Cloud platforms in industry			
UNIT-II			4Hrs
Linux Basics and Admin: Learning the shell, Navigation, Manipulating files and directories, Working with commands, Permissions, Processes, Visual interface (Vi) Shell Scripting: Introduction to shell script, Variables and constants, Shell functions			
UNIT-III			4Hrs
Managing Your Source Code with Git: Overviewing Git and its principal command lines, Git installation, Git configuration, Useful Git vocabulary, Git command lines, Managing branches Continuous Integration and Continuous Delivery (CI/CD): Installing and configuring Jenkins, Configuring a GitHub web hook, Configuring a Jenkins CI job, Creating a CI/CD pipelines			
UNIT-IV			4Hrs
Containerized Microservices with Docker and Kubernetes: Installing Docker, Docker Hub, Creating a Dockerfile, Building and running a container on a local machine, Getting started with Docker Compose, Executing Docker Compose Managing Containers Effectively with Kubernetes: Installing Kubernetes, Kubernetes architecture overview, Example of Kubernetes application deployment			
LABORATORY COMPONENT			
List of Experiments 1. Install Ubuntu (or any Linux distro) on a Virtual Machine			

2. Perform basic Linux file operations: create, delete, move, copy files and directories using terminal
3. Install Git and configure user details using git config
4. Create a local Git repository, perform commits, and manage branches
5. Install Jenkins on a local system or on AWS
6. Create a freestyle Jenkins project
7. Install Docker on Linux and verify using `docker --version`
8. Write a Dockerfile to containerize a simple Node.js or Python application
9. Build and run a custom Docker image locally
10. Use Docker Compose to run multi-container applications (e.g., web + DB)

Textbook(s):

1. **Mikael Krief**, *Learning DevOps Continuously Deliver Better Software*, 2nd ed., Mumbai: Birmingham, 2022
2. **Rajkumar Buyya, Christian Vecchio, S. Thamarai Selvi** *Mastering Cloud Computing Foundations and Applications Programming*, Australia: The University of Melbourne and Manjrasoft Pty Ltd, 2013
3. **William E. Shotts, Jr.**, *The Linux Command Line: A Complete Introduction*, 2nd ed., San Francisco: 245 8th Street, 2019

Reference Book(s):

3. **Gene Kim, Kevin Behr, and George Spafford**, *The Phoenix Project*, 4th ed., 2024
4. **Kelsey Hightower, Brendan Burns, and Joe Beda**, *Kubernetes Up & Running*, 3rd ed., 2022

Web and Video link(s):

1. <https://learn.microsoft.com/en-us/devops/what-is-devops>
2. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/cicd-DevOps-automation-and-devsecops-automation/?v=c86ee0d9d7ed>
3. <https://www.simplilearn.com/learn-DevOps-basics-free-skillup>

Laboratory Manual (for laboratory component): DevOps Laboratory Manual and Record Book, Department of CSE (Networks), KITSW

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

- CO1:** analyze DevOps principles, SDLC models, CI/CD concepts, and Cloud Computing service models
- CO2:** apply Linux command-line operations and write basic shell scripts to automate tasks
- CO3:** apply Git for version control and configure Jenkins to setup Continuous Integration and Continuous Deployment workflows
- CO4:** implement containerization using Docker and managed deployments with Docker Compose and Kubernetes

(based on psychomotor skills acquired from laboratory component)

- CO5:** apply command-line tools to develop a Linux environment and automate tasks

- C06:** applyGitandGitHubtomanagecodeversionsandcollaborateeffectivelywith teams
- C07:** applyJenkinstoautomatebuildandintegrationprocesses
- C08:** ImplementDockerandDockerComposetocontainerizeandorchestrate applications

CourseArticulationMatrix (CAM):		U24IN414X:FUNDAMENTALSOFFDEVOPS												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS 01	PSO 2
C01	U24IN414X.1	2	2	1	1	2	1	-	1	1	-	1	2	1
C02	U24IN414X.2	2	2	2	1	2	1	-	1	1	-	1	2	1
C03	U24IN414X.3	2	2	2	2	3	1	-	1	1	-	1	2	2
C04	U24IN414X.4	2	2	2	2	3	1	-	1	1	-	1	2	2
C05	U24IN414X.5	2	2	2	2	2	1	-	1	1	-	1	2	1
C06	U24IN414X.6	2	2	2	2	2	1	-	1	1	-	1	2	1
C07	U24IN414X.7	2	2	2	2	3	1	-	1	1	-	1	2	2
C08	U24IN414X.8	2	2	2	2	3	1	-	1	1	-	1	2	2
U24IN414X		2	2	1.87	1.75	2.5	1	-	1	1	-	1	2	1.5