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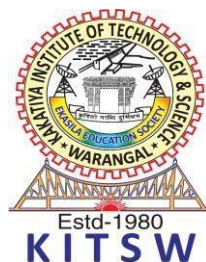
CURRICULUM

ACADEMIC YEAR: 2024-25

DEPT OF COMPUTER SCIENCE & ENGINEERING (NETWORKS)

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

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



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

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (NETWORKS)

History:

PROGRAM	DESCRIPTION	
	INTAKE	NBA ACCREDITATION
UG in B.Tech. Computer Science & Engineering (Networks)	- Started with 60 seats in 2019 - Intake increased to 120 in 2022	NBA Accredited

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 for catering to the changing needs of the industry and commerce
M3	■ To inculcate a sense of brotherhood and National Integrity

DEPT. OF COMPUTER SCIENCE & ENGINEERING (NETWORKS): VISION & MISSION

VISION

Develop the department into a full-fledged center of learning in various fields of Computer Science and Engineering (Networks) 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 (Networks) with an overall background 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. |

PROGRAM EDUCATIONAL OBJECTIVES

PEO1:	Technical competence: Continue to develop technical skills within and across disciplines in Computer Science & Engineering and Networks for a productive and successful career maintaining professional ethics.
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PEO2:	Successful Career Develop and exercise their capabilities to demonstrate their creativity in engineering practice and teamwork with increasing responsibility and leadership
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PEO3:	Soft Skills and Life-long Learning Refine their knowledge and skills to attain professional competence through life-long learning such as higher education, advanced degrees, and professional activities
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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	Mapped strongly as the students will gain technical knowledge in the field of Computer Science and Engineering (Networks) that will enable them to have successful careers.
	M2	3	Mapped strongly as, with the interaction with research organizations and industries, students will be exposed to state-of-the-art offerings in the field of CSE(N) and will be motivated to pursue successful professional lives.
	M3	2	Mapped moderately as students will work on real-life problems as a part of their careers keeping in view the various ethical concerns.
	M1	2	Mapped moderately as the graduates will practice the various ethical and social responsibilities in their professional lives.

PEO2	M2	2	Mapped moderately as the graduates will practice the various ethical and social responsibilities in their professional lives by being exposed to the working of the organizations.
	M3	3	Mapped strongly as the graduates will be practicing the various ethical practices in their field of employment while solving various societal problems.
PEO3	M1	3	Mapped strongly as the graduates will be requiring state-of-the-art technical know-how for lifelong learning.
	M2	2	Mapped moderately as graduates will be required to keep themselves updated with the latest technologies to be successful in their professional careers.
	M3	3	Mapped strongly as the graduates will require strong technical and ethical know-how to be successful entrepreneurs while solving socially relevant problems.

PROGRAM SPECIFIC OBJECTIVES

PSO1:	apply the fundamental knowledge of computer science and engineering (networks) in developing effective software for real-world complex engineering problems adapting advanced technologies
PSO2:	design and configure networking solutions for various network applications using contemporary hardware and software tools, implement effective security standards and investigate the efficiency of existing security measures by continuous adaptation of latest updates in security domains

PO/PSOTOPEOMAPPING

PO's		PEO1	PEO2	PEO3
PO1	Engineering Knowledge	3	1	3
PO2	Problem Analysis	3	1	3
PO3	Design/Development of solutions	3	2	3
PO4	Conduct investigation of complex problems	3	1	3
PO5	Engineering tool usage	3	2	3
PO6	The engineer and The World	1	3	1
PO7	Ethics	2	3	3
PO8	Individual and Collaborative Teamwork	3	3	2
PO9	Communication	2	3	3
PO10	Project management and Finance	1	2	2
PO11	Life-Long Learning	3	2	3
PSO1	Apply the fundamental knowledge of COMPUTER SCIENCE & ENGINEERING (NETWORKS) in developing effective software for real world complex engineering problems adapting advanced technologies	3	2	3
PSO2	design and configure networking solutions for various network applications using contemporary hardware and software tools, implement effective security standards and investigate efficiency of existing security measures by continuous adaptation of latest updates in security domains	2	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 a ward off 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 15 courses and 4 baskets of program electives to ensure the breadth and depth in a chosen domain of studies. Program electives are arranged either to grow in a specified vertical or have diversified exposure.
- Full semester industry internship to the interested students.
- Aggressive model of—Learning-by-doing|| in the form of PRACTICUM.
- Activity Based Learning (ABL) about Life, Literature and Culture is embedded in to the curriculum in four semesters, ensuring all dimensional holistic growth of the learner. These four activity based mini courses are offered as two sequels namely Social Empowerment Activities (SEA) and Self Accomplishment Activities (SAA).
- These regulations follow holistic approach of education, ensures strong science, mathematics foundation and program core, develops expertise in domain vertical through sequel of electives, ensures significant exposure of additional discipline through —Minor|| programme, challenges good learners through —Honours|| programme and for the research oriented students through—Honours with Research|| programme.
- Along with Major and Minor disciplinary courses, students are expected to learn Multidisciplinary open elective courses (MOPEC), skill enhancement courses (SEC), ability enhancement courses (AEC), value added courses (VAC), activity based learning (AL) and experiential learning (EL) towards multidisciplinary holistic education and for increased employability.
- These regulations provide competency-focused outcome based curriculum

(CF-OBC) for skill development, multidisciplinary learning, wider access, inclusiveness and entrepreneurship.

- In our CF-OBC, each course has an additional component of —Contents for self-study||, which is carefully designed to ensure additional hours of learners engagement. The learner thus is nurtured towards the —Self-Learning|| and —lifelong learning|| which are essential attributes of a 21st Century learner. The same is incorporated in the scheme of instructions in the form of (i) Outside the class work (self-study) hours, (ii) total engagement hours for every course.
- In summary, these regulations are expected to develop technical competencies, through courses from programme core, programme electives, engineering science and basic science; and also develop generic competencies, soft skills, social, physical, mental and spiritual personality through carefully articulated courses from MOPEC baskets, Liberal Learning and Humanities sequels. Thus, offers a unique —T-Shaped|| liberal—Pi-Model|| of Engineering Education

The Curriculum consists of the following components of study:

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

Multidisciplinary Open Electives Courses (MOPEC)

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

Practicum

The curriculum provides ample opportunities for experiential learning (learning-by-doing) to impart important skills like problem solving, critical thinking and communication. Under experiential learning the PRACTICUM is a semester long project work included in I to IV semesters, having a weightage of 1 credit in each semester. Under PRACTICUM, the students are expected to implement a micro level project (at a level of course project) solving a practical

problem or a project based on the combination of different theory or lab courses being studied in a corresponding semester. The experiential learning is continued in the form of a Seminar in fifth semester, a mini project in sixth semester, major project in seventh & eighth 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. The 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 the tutorial matrix.

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

Managing network through desktop.

- 1. Monitoring the network traffic through port scanning*
- 2. Simulate Data Transmission using TCP with packet drop*
- 3. Simulate distance vector routing protocol*
- 4. Simulate on demand routing protocol*
- 5. Packet analysis using Wireshark*
- 6. Simulate a VPN Network*
- 7. Simulating routed networks using different protocols*

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

Program Core Courses (PCC)

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

Program Elective Courses (PEC)

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

(Note to HoDs: For example, the CSE(N) programme shall offer verticals in “Cloud computing”, “Cyber Security”, “Data Science”, etc.)

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

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

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

The NEP-2020 quotes, "Higher education must develop good, well-rounded and creative individuals, with intellectual curiosity, spirit of service and a strong ethical compass". Moving towards a more liberal undergraduate education is one of the most important features of the NEP 2020. "The needs of the 21st century require, that liberal broad-based multidisciplinary education become the basis for all higher

education. This will help develop well-rounded individuals that possess critical 21st century capacities in fields across arts, humanities, sciences, social sciences, and professional, technical, and vocational crafts, an ethic of social engagement, and rigorous specialization in a chosen field or fields. Such a liberal education would be, in the long run, the approach across all undergraduate programs, including those in professional, technical, and vocational disciplines. Imaginative and flexible curricular structures will enable creative combinations of disciplines for students to study, thus demolishing currently prevalent rigid boundaries and creating new possibilities for lifelong learning. The notion of „knowledge of many arts“ - i.e. what is called „liberal arts“ in modern times – must be brought back to Indian education, as it is exactly the kind of education that will be required for the 21st century.”

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

(END OF THE SALIENT FEATURES OF URR24)

Undergraduate Rules and Regulations-2024(URR24)
InaccordancewiththeNationalEducationPolicy2020,
w.e.fAY2024-25

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. DurationofProgrammes:

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 programme 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(Networks);
UG
Diploma in CSE(Networks) after the study of two academic years (four semesters);
and

B. Voc in CSE(Networks) 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(Networks) degree with optional Minor/Honours/ Honours with Research.

4. Credit Requirement:

As per the guidelines released by UGC under National Higher Education

Qualification Framework (NHEQF), for Multiple Entry and Multiple Exit (MEME) in Academic Programmes offered in Higher Educational Institutions, the student 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		
NHEQ F 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 (Honors/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 a bachelor's degree).	72-80
7	Master's Degree (Programme duration: One year or two semesters after obtaining a four-year bachelor's degree (Honors/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 the 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.

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

6. Eligibility Criteria:

- (i) **Level 4.5:** The students who have successfully completed Grade 12 / Intermediate with MPC or its equivalent course shall be eligible for admission to the first year degree programme
- (ii) **Level 5:** The students who have successfully completed Level 5 of the undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal
- (iii) **Level 5.5:** The students who have successfully completed Level 6 of the undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal
- (iv) **Level 6:** The students who have successfully completed Level 7 (bachelor degree of three years or six semesters) of undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal

7. Academic Bank of Credits (ABC):

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

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 course
in any of the eligible HEIs. The eligibility of HEIs to offer courses
shall be as per UGC (Establishment and Operationalization of ABC
scheme in Higher Education) Regulations 2021 dated 28.7.2021 and
changes therein notified by the UGC from time to time.

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

Monitoring, Support and Quality by Universities and ABC:

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

section shall
be responsible for addressing the Grievance and appeals related to ABC

8. Building Competencies through Pedagogy:

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

centric pedagogical approaches:

- (i) Classroom process must encourage rigorous thinking, reading and writing, debate, discussion, peer learning and self-learning
- (ii) The emphasis is on critical thinking and challenge to current subject orthodoxy and develop innovative solutions. Curricular content must be presented in ways that invite questioning and not as a body of ready knowledge to be assimilated or reproduced. Faculty should be facilitators of questioning and not authorities on knowledge.
- (iii) Classroom teaching should focus on the 'how' of things i.e. the application of theory and ideas. All courses including social sciences and humanities shall have design project and practicums to enable students get relevant hands-on experiences
- (iv) Learning must be situated in the Indian context to ensure that there is no sense of alienation from their context, country and culture
- (v) Classroom processes must address issues of inclusion and diversity since students are likely to be from diverse cultural, linguistic, socio-economic and intellectual backgrounds
- (vi) Cooperative and peer supported activities shall be part of empowering students to take charge of their own learning
- (vii) Faculty shall have the freedom to identify and use the pedagogical approach that is best suited to a particular course and student
- (viii) Pedagogy PBL (Problem/Project Based Learning) shall be brought into practice as part of curriculum. Experiential learning in the form of practicum, seminar, 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 class work learning (self-learning). The learner thus is nurtured towards the —Self-Learning|| and —lifelong learning|| which are essential attributes of a 21st Century learner
- (x) Blended Learning (BL) mode shall be used to help learners develop 21st century skills. BL should be carefully implemented and should not be replacing class room 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 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 platformssuch as:

- (i) SWAYAM
- (ii) IIM-B
- (iii) University LMS
- (iv) CEC
- (v) NPTEL
- (vi) IGNOU
- (vii) Infosys SpringBoard
- (viii) Future Skills Prime (digital skilling ecosystem developed by Govt. Of India and NASSCOM)
- (ix) Wadha Vani 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

11.1 MULTIPLE EXIT OPTIONS

Sl. No.	Exit Description	Exit Point	Degree/Certificate offered	Goal
1.	First Exit	After completion of First year	UG Certificate in CSE(N)	The student should be employable as a Technical Assistant (Computer Networks) in any industry/organization.
2.	Second Exit	After completion of Second	UG Diploma in CSE(N)	The student should be employable as a Technician (Computer Networks) in any industry/organization.

		year.		
3.	Third Exit	After completion of Third year.	B.Voc in CSE(N)	The student should be employable as a Network Associate in any industry/organization.
4.	Normal Exit	After completion of the Fourth year.	B.Tech in CSE(N)	The student should be employable as an Engineer (Networks) in any relevant industry/organization.

10.2 MULTIPLE ENTRY OPTIONS

Sl. No.	Entry Descriptions	Entry Point	Eligibility
1.	Normal (First) Entry	I-Sem. of the program	As per the TGSCHE guidelines & through the Entrance Examination TSEAPCET
2.	Second Entry	III-Sem. of the program	The successful completion of first year with UG certificate in CSE(N) from our institute.
3.	Third Entry	V-Sem. of the program	The successful completion of UG Diploma in CSE(N) from our institute.
4.	Fourth Entry	VII-Sem. of the program	The successful completion of B.Voc in CSE(N) from our institute.

- (i) **No. of maximum exits:** as per NEP 2020 / UGC / AICTE guidelines on MEME
- (ii) **No. of maximum entry:** as per NEP 2020 / UGC / AICTE guidelines on MEME
- (iii) **Maximum gap between exit and entry:** as per NEP 2020 / UGC / AICTE guidelines on MEME
- (iv) **Academic Bank of Credit shall be maintained**

11. Options for Degree Certificate

(i). Learners who earn a minimum of total 168 credits will be awarded *"B.Tech" degree which confirms to NEP 2020 requirements of multidisciplinary holistic education.*

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

a) B.Tech with—Minor//degree (with additional 18 credits): 172+18 Credits

Students opting for Minor degree in identified cutting-edge technologies offered

by other departments, have to successfully complete four theory courses (each of 4 credits) and two lab courses (each of 1 credit) during the semester break. One

theory & One lab course have to be completed during 5th and 6th semesters. During

ng 7th and 8th semesters one theory course to be completed. All four theory courses will have to be completed through MOOCS and lab courses will be offered by respective department offering the Minor Degree.

b) B.Tech with—Honours//degree (with additional 18 credits): 172+18 Credits

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

c) B.Tech—Honours with Research//degree(with additional 18 credits by research): 172+18 credits

Students are expected to complete 2-months research internship in summer after 2nd year (5 credits), 3rd year (5 credits) and work towards individual research based project during 4th year. They have to complete one course on —Research Methodology// through MOOCS or can complete a one week FDP on —Research Methodology//, during 7th semester (4 credits) and finally publish a research paper in a journal indexed by SCI/SCOPUS/WEB OF SCIENCE (4 credits).

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(4Credits)
Totaladditional 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	24	22	20	15	172
B.Tech with Minor	22	21	24	24	23+5*	22+5*	20+4*	15+4*	172+18*
B.Tech with Honours	22	21	24	24	23+5*	22+5*	20+4*	15+4*	172+18*
B. Tech. Honours with Research	22	21	24	24	23+5*	22	20+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		Maximum Limit
1	SuccessintheGATEExam	Percentile	Points	8 Points
		Above98	8	
		Above95	6	
		Above90	4	
		Qualifie d	2	
2	ResearchPublicationindex ed bySCI / SCOPUS / Web of Science*	SCIJournal:8Points		8 Points
		SCOPUS / Web of Science Journal: 4 Points		
		Patent:4Points		
3	WinningPrestigious Technical CompetitionatNationalLevel #	Rank	Points	6 Points
		1	4	
		2	3	
		3	2	
4	CompletionofPGlevel MOOCS	Percentile	Points	6 Points
		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 (HSSM)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	HSMC01	U24MH205	English Communication and Report Writing	II	2
2.	HSMC02	U24MH508	Technical English	V	1
3.	HSMC03	U24MB605	Management Course Basket	VI	3
Total:					6

(ii) Basic Science Courses (BSC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	BSC01	U24MH101	Engineering Mathematics-I	I	3
2.	BSC02	U24CY102B	Engineering Chemistry	I	4
3.	BSC03	U24MH201	Engineering Mathematics-II	II	3
4.	BSC04	U24PY202B	Engineering Physics	II	4
5.	BSC05	U24MH401D	Probability, Statistics and Discrete Mathematics	IV	3
Total:					17

(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	U24CS204	Data Structures through C	II	4
5.	ESC05	U24EE205B	Basic Electrical Engineering	II	4
Total:					16

(iv) Program Core Courses (PCC)

Sr.No.	Course Type	Course Code	Course Name	Semester	Credits
1	PCC01	U24CN203	Computer Architecture and Organization	II	3
2	PCC02	U24CN301	Automata Theory and Compiler Design	III	3
3	PCC03	U24CN302	Advance Data Structures	III	4
4	PCC04	U24CN303	Computer Networks	III	4
5	PCC05	U24CN304	Operating Systems	III	3
6	PCC06	U24CN305	Python Programming	III	4
7	PCC07	U24CN402	Database Management Systems	IV	4
8	PCC08	U24CN403	Design and Analysis of Algorithms	IV	3
9	PCC09	U24CN404	Internet Networks and Virtualization	IV	4
10	PCC10	U24CN405	Object oriented programming through java	IV	4
11	PCC11	U24CN502	Artificial Intelligence and Machine Learning	V	4
12	PCC12	U24CN503	Web Programming	V	4
13	PCC13	U24CN504	Network Automation	V	4
14	PCC14	U24CN602	Cryptography and Network Security	VI	4
15	PCC15	U24CN603	DevOps	VI	4
16	PCC16	U24CN604	Internet of Things	VI	4
17	PCC17	U24CN703	Computer Aided Software Engineering	VII	4
18	PCC18	U24CN704	Data Center Networking	VII	4
Total:					68

(v) Program Elective Courses (PEC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1	PEC01	U24CN602A	Principles of Cloud Computing	VI	3
2.		U24CN602B	Platforms and Systems Security		
		U24CN602C	Computer Vision and Image Processing		
		U24CN602D	Statistical Fundamentals		

2	PEC02	U24CN702A	HighPerformanceComputing	VII	3	
		U24CN702B	Fundamentalsof CyberSecurity andTools			
		U24CN702C	DeepLearning			
		U24CN702D	PrinciplesofDataScience			
3	PEC03	U24CN802A	FogandEdgeComputing	VIII	3	
		U24CN802B	BlockchainSecurity			
		U24CN802C	NaturalLanguageProcessing			
		U24CN802D	DataMining&Modeling			
4	PEC04	U24CN803A	CloudSecurity	VIII	3	
		U24CN803B	EthicalHacking			
		U24CN803C	IntroductiontoGenerativeAIMode ls			
			U24CN803D	DataAnalysis&Visualization		
	Total:					12

(vi) Experiential Learning Courses (ELC)

Sr.No.	Course Type	Course Code	Course Name	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	U24EL509	Seminar	V	1
6.	ELC06	U24EL608	Mini Project	VI	1
7.	ELC07	U24EL706	Internship Evaluation	VII	1
8.	ELC08	U24EL707	Major Project Phase-1/Industrial Internship-1	VII	4
9.	ELC09	U24EL804	Major Project Phase-2/Industrial Internship-2	VIII	6
Total:					17

(vii) Indian Knowledge System Courses (IKSC)

Sr.No.	Course Type	Course Code	Course Name	Semester	Credits
1.	IKSC	U24IK100	AICTE Mandated Student Induction Programme	Student Induction	-

			(Universal Human Values-I)	Programme	
2.	IKSC	U24IK506A	EITK	5	2
3.	IKSC	U24IK606B	UHV-II	6	2
Total:					4

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

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	MOPEC 01	U24OE501YYX	MOPEC Elective-I#	V	3
2.	MOPEC 02	U24OE701YYX	MOPEC Elective-II	VII	3
3.	MOPEC 03	U24OE801YYX	MOPEC Elective-III	VIII	3
Total:					9

(ix) ValueAddedCourses(VAC)

Sr. No.	Course Type	CourseCode	CourseName	Semester	Credits
1.	VAC 01	U24VA106	Sports&Yoga	I	1
2.	VAC 02	U24VA109XXX XX	SEA-I/SAA-I	I	1
3.	VAC 03	U24CY206	EnvironmentalStudies	II	-
4	VAC 04	U24VA309XXX XX	SEA-2/SAA-2	II	1
5	VAC 05	U24VA306B	SEA-3/SAA-3	III	1
6.	VAC 06	U24VA306B	SoftandInterpersonal Skills@	III	1
7.	VAC 07	U24VA406A	QALR@	IV	2
8.	VAC 08	U24VA409XXX XX	SEA-4/SAA-4	IV	1
Total:					8

(x) Skill Enhancement Courses (SEC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	SEC01	U24SE208	Programming Skill Development (PSD) Lab-1	II	1
2.	SEC02	U24SE307	PSD Lab-02	III	1
3.	SEC03	U24SE407	PSD Lab-03	IV	1
4.	SEC04	U24SE507	PSD Lab-04	V	1
5.	SEC05	U24CN607	PSD Lab-5	VI	1
Total:					5

(xi) Ability Enhancement Courses (AEC)

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	AEC01	U24AE110	Expert Talk Series-1	I	1
2.	AEC02	U24AE207	Idea Lab Makers Space	II	1
3.	AEC03	U24AE211	Expert Talk Series-2	II	1
4.	AEC04	U24AE310	Expert Talk Series-3	III	1
5.	AEC05	U24AE410	Expert Talk Series-4	IV	1
6.	AEC06	U24AE510	Expert Talk Series-5	V	1
7.	AEC07	U24AE609	Expert Talk Series-6	VI	1
Total:					7

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

Sr. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	STE01	U24ST605X	S&E Basket Basket *	VI	3
Total:					3

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

Activity Based Learning (ABL) @ Value Added Courses

- Students are required to earn 4 credits through the first four semesters (2 credits from Social Empowerment Activities-SEA and 2 credits from Self Accomplishment Activities-SAA)

2 If a student is not able to attend / fulfill performance requirements, he / she shall

be dropped from the course and will have to repeat by enrolling in the forthcoming semesters.

- The Student Activity Centre (SAC) and Centre for Innovation Incubation Research and Entrepreneurship (C-i2RE) shall act as nodal units for activities listed under SEA/SAA.

Social Empowerment Activities-SEA

- These activities are designed to uplift and empower a group or community. The emphasis is on collective benefit, social change, and improving the conditions or capabilities of a community or specific group within society.

- These are categorized under four groups namely

1. **Swachh Bharat** (Clean India)

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

2. **Shikshita Bharat** (Educated India)

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

3. **Samruddha Bharat** (Prosperous India)

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

4. **Surakshit Bharat** (Safe India)

The aim of activities under Surakshit Bharat is to ensure the safety, security, and well-being of all citizens.

Self-Accomplishment Activities-SAA

- These activities are centered on individual growth, personal development, and self-improvement. The emphasis is on enhancing one's own skills, knowledge, and well-being.
- These are categorized under four groups namely

1. **SochoBharat**(ThinkIndia)

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

2. **SanskritBharat**(CulturedIndia)

The aim of activities under Sanskrit 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 communities with the skills, resources, and opportunities needed to achieve self-reliance and economic independence by fostering physical fitness, discipline, teamwork, leadership and mental resilience.

4. **SunderBharat**(BeautifulIndia)

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 (U24VAYY Y) *	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	Peermentoring/ MentoringofSchool Children
		SE202	Ruraldigitalrevolution/ DigitalLiteracyfor yielders&Participationin—Teach-for-India movement
SEA Group-2: Shikshit Bharat		SE203	Empoweringlearners–schools/ Value additionfordeprivedschools
		SE204	PeerMentoring/ Mentoringjunior(firstyear) studentsatKITSW
		SE205	Learning byTeaching /Teaching AssistantshipatKITSW/ TeachingAIDE
		SE206	EnrichingEducation/ Developmentof learningmaterialforschools/ ITIs
		SE210	AnyotheractivityapprovedbyDean AcademicAffairs
SEA Group-3: Samruddha Bharat	C-i2RE	SE301	GreatGrassRootInnovations
		SE302	InnovationandCreativity/ CriticalThinking andProblemsolving
		SE303	Teamworkandcollaboration
		SE304	Leadership&Entrepreneurship
		SE305	DesignThinking
		SE306	WorkwithSTART-UPatKITSW
		SE310	AnyotheractivityapprovedbyDean AcademicAffairs
SEA Group-4: Surakshit Bharat	NCC	SE401	NCCparticipation/ NationalIntegrity
		SE402	Basicsof fire safety/ Communitysafety
		SE403	DisasterManagement
		SE404	Environmentalhealth&sustainability
		SE405	Roadsafety
		SE406	Pollutioncontrol
		SE410	AnyotheractivityapprovedbyDean AcademicAffairs

Thecodeofeachactivityshallbe:U24VAYYY+activitycodeofSEA/SAA

Example:U24VAYYYSE101(fortheactivityCleanIndia – GreenIndia(River/Beach /Mohalla/School/Campus/GovtofficesCleaning)underSEAGroup1SwacchBharath)

Table:SAA

Group	Guiding club/ center	Code of activity (U24VAYYY)*	Titleofactivity
SAA Group-1: Socho Bharat	Literary Club	SA101	StudyofGreen&WhiteRevolutionsinIndia
		SA102	Studyofany2GovernmentMissionsor NationalPolicies
		SA103	StudyofIndia'stop2problems
		SA104	StudyofWorld'stop2problems
		SA105	StudyofonedepartmentoftheCentral/ State Government
		SA106	StudyofoneoftheidentifiedBooks on

			leadership or innovation
		SA110	Any other activity approved by Dean Academic Affairs
SAA Group-2: Sanskrit Bharat	Team-UHV	SA201	Values and Ethos of KITSW
		SA202	Philosophy of religion (any)
		SA203	Study of Life Management / Kindle Life / Life Empowerment and Enriching Program or any other book cited.
		SA204	Study of any of GREAT sons of INDIA (Ex. Gandhi, Ambedkar, Phule, Savarkar, Sardar Patel, Nehru, Shivaji, JRD Tata etc)
		SA205	Harmony in FAMILY & SOCIETY
		SA206	Harmony in NATURE
		SA210	Any other activity approved by Dean Academic Affairs
SAA Group-3: Saksham Bharat	Sports Club	SA301	Physical Fitness, Self-defence for Women, Target based Physical Exercise for example- Running (Test 5 kms in a stretch), Swimming (Test 1 km in a stretch), Walking (Test 20 kms in a stretch), Trekking (7 days), Cycling
		SA302	Sports - Representation of Institute University level / Inter college level and above in ANY sport
		SA303	Pran-vidya (Yoga & Pranayama), Jeevan-vidya (work-life balance)
	Technical club	SA304	Participation in National Tech Fest, AICTE-Hackathon, industry floated global and National competitions, Robocon, 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	Institute representation in prestigious cultural fests/competitions
		SA402	Dance(Bharatanatyam/ Kathak/ Lavani /WesternDance).Onlyforbeginners
		SA403	Musiccomposition/ Learningmusical instrument(Anytype).Onlyforbeginners.
		SA404	Film Appreciation/Dramatics/ Seeing through Painting
		SA405	Makingshortfilm/Photography
		SA406	Sculptures(focusingonthemesofunity, peace andenvironmentalconservation)
		SA410	AnyotheractivityapprovedbyDean
			AcademicAffairs

Thecodeofeachactivityshallbe:U24VAYYY+activitycodeofSEASAA

Example: U24VAYYYSA101 (forthe activityStudy of Green & White Revolutions in India under SAA Group1 Socho Bharat)

13. SUMMARY OF CURRICULUM COMPONENTS

S.NO	CATEGORY	COURSE COMPONENT	TOTAL COURSES	TOTAL CREDITS	CURRICULUM CONTENT (% OF CREDITS)
1	HSMC	Humanity, Social Sciences and Management Courses	3	6	3.48
2	BSC	Basic Science Courses	5	17	9.88
3	ESC	Engineering Science Courses	8	29	16.86
4	PCC	Program Core Courses	18	55	31.97
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	8	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			71	172	100

The curriculum supports approximately 60% of Theory and 40% of Lab including P.W. Online courses are optional.

14. SEMESTERWISE COURSE/CREDIT DISTRIBUTION

Semester	Number of Courses / Number of Credits (Course Category wise)												TOTAL
	BSC	ESC	HSM C	PCC	MOPE C	PEC	SEC	VAC	ELC	AEC	IKSC	STE	
I	2/7	3/8	1/2					1/1	1/1	1/1			10/20
II	2/7	2/8		1/3			1/1	2/1	1/1	2/2			11/23
III	1/3			4/15			1/1	2/3	1/1	1/1			11/24
IV				5/18			1/1	2/3	1/1	1/1			11/24
V			2/1	3/11	1/3		1/1		1/1	1/1	1/2		10/23
VI			1/3	3/11	1/3	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						2/6			1/6				4/15
Total	5/17	5/16	3/6	19/68	3/9	4/12	5/5	8/8	9*/17	7/7	2/4	1/3	71/172
% Weightage of Course Category	9.88% (17/172)	9.30% (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, MiniProject-1C, Internship Evaluation-1C, Major Project: 4+6

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

Abbreviations

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

I SEMESTER

Stream-II

Sl. No.	Category	Course Code	Course Title	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	U24CI111	Digital Logic Design	2	1	-	4	7	3
4	ESC	U24CN104	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	3	5	1
7	AEC	U24AE107	Engineering Graphics & CAD	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-1	-	-	-	4	4	1
9	VAC	U24VA109XXXX	SEA-I/SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
Total:				10	4	8	35	57	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)									

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

Sl. 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	U24CN203	ComputerArchitectureand Organization	2	1	-	4	7	3
4	ESC	U24CN204	DataStructuresthrough C	2	1	2	5	10	4
5	ESC	U24EE205B	BasicElectricalEngineering	2	1	2	5	10	4
6	VAC	U24VA206	EnvironmentalStudies	2	-	-	2	4	-
7	ESC	U24AE207	IDEALabMakerspace	-	-	2	2	4	1
8	SEC	U24SE208	Programming Skill Development (PSD) Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210XX XX X	SEA-2/SAA-2	-	-	-	2	2	1
11	AEC	U24AE211	Expert TalkSeries-2	-	-	-	1	1	1
Total:				10	5	12	38	65	23
Summer/Inter-semBridge Courses (Approved byBoS and Dean,AA): 1 weekto10days:1credittoeach Bridge course underadditionallearning (willbeprintedongradesheet)									

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

Pool-II(BasicElectrical&ElectronicsEngineering)		
Sr.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(N))

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

Exit Option to Qualify UG Certificate in CSE(N) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CN212X	Computer Networks Fundamentals	2	-	2	-	4	3
2	PCC	U24CN213X	Java Programming	2	-	2	-	4	3
3	PCC	U24CN214X	Fundamentals of DBMS	2	-	2	-	4	3
4	PCC	U24CN215X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

(OR)

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

Exit Option to Qualify UG Certificate in CSE(N) : 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++ (https://trainings/internshala.com/Cplusplus-course/)	-	-	-	6	6	3
2	SEC	U24SE213X	Advance Excel (https://trainings/internshala.com/excel-course/)	-	-	-	6	6	3
3	SEC	U24SE214X	CISCO: IT Essentials (offered by CISCO Co EKITS W)	-	-	-	6	6	3
4	SEC	U24SE215X	CISCO CCNA: Introduction to Networks (offered by CISCO Co EKITS W)	-	-	-	6	6	3

5	SEC	U24SE216X	Any others skill based course approved by BoS Chair and Dean AA	-	-	-	6	6	3
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III SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	
1	PCC	U24CN301	Automata Theory and Compiler Design	2	1	-	6	9	3
2	PCC	U24CN302	Operating Systems	2	1	-	4	7	3
3	PCC	U24CN303	Advanced Data Structures	2	1	2	5	10	4
4	PCC	U24CN304	Computer Networks	2	1	2	5	10	4
5	PCC	U24CN305	Object oriented programming through java	2	1	2	5	10	4
6	VAC	U24VA306B	Soft & Interpersonal Skills	-	-	2	2	4	1
7	SEC	U24SE307	Programming Skill Development Lab-02	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309XXX	SEA-3/SAA-3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
Total:				10	5	10	36	61	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 **Soft & Interpersonal Skills, QALR** to the branches as per Stream-I and Stream-II.

IV SEMESTER

Sl. No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
1	BSC	U24MH401D	DiscreteMathematics and Probability, Statistics	2	1	-	4	7	3
2	PCC	U24CN402	DatabaseManagement Systems	2	1	2	5	10	4
3	PCC	U24CN403	DesignandAnalysisof Algorithms	2	1	-	4	7	3
4	PCC	U24CN404	Internetworksa nd Virtualization	2	1	2	5	10	4
5	PCC	U24CN405	PythonProgramming	2	1	2	5	10	4
6	VAC	U24VA406A	Quantitative Aptitude and Logical Reasoning	2	-	-	2	4	2
7	SEC	U24SE407	Programming Skill DevelopmentLab-03	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409XXX XX	SEA-4/SAA-4	-	-	-	2	2	1
10	AEC	U24AE410	Expert TalkSeries-4	-	-	-	1	1	1
11	VAC*	U24CH411*	EnvironmentalStudies*	2*	1*	-	2*	5*	3*
Total:				12	5	8	34	59	24
Summer/Inter-semBridgeCourses(ApprovedbyBoSand Dean,AA):1weekto10days:1credittoeachBridgecourseunder additional learning (will be printed on grade sheet)									

**ForLateralEntryStudentsOnly*

***BranchSpecificMathematics:**

BranchSpecificMathematics(Pool-4)			
S. No.	Course Code	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	Anyother Course approvedbyBoS chairand DeanAA	-
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**@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(N))

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

Exit Option to Qualify UG Diploma in CSE(N) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
2	PCC	U24CN412X	Artificial Intelligence and Machine Learning	2	-	2	-	4	3
3	PCC	U24CN413X	Cryptography and Network Security	2	-	2	-	4	3
4	PCC	U24CN414X	Internet of Things	2	-	2	-	4	3
5	PCC	U24CN415X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

(OR)

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

Exit Option to Qualify UG Diploma in CSE(N) : 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 CISCOCOE, 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

5	SEC	U24SE416X	Anyotherskillbasedcourse approved by BoS Chair and DeanAA	-	-	-	6	6	3
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B.TechHonourswithResearch:

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

V SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	
1	MOP EC	U24OE501Y YX	MOPEC Elective-I	2	1	-	3	6	3
2	PCC	U24CN502	Artificial Intelligence and Machine Learning	2	1	2	5	10	4
3	PCC	U24CN503	Web Programming	2	1	2	5	10	4
4	PCC	U24CN504	Network Automation	2	1	2	5	10	4
5	HSM C	U24MB505X	Management Basket	2	1	-	2	5	3
6	IKSC	U24IK506B	UHV-II	2	-	-	2	4	2
7	SEC	U24CN507	Design and Analysis of Algorithms Lab	-	-	2	2	4	1
8	HSM C	U24MH508	Technical English	-	-	2	2	4	1
9	ELC	U24CN509	Seminar	-	-	-	2	2	1
10	AEC	U24AE510	Expert Talk Series-5	-	-	-	1	1	1
Total:				12	5	10	29	56	24
Additional Learning@: Maximum credits allowed for Honours/Minor				-	-	-	-	-	5
Total credits for Honours/Minor students:				-	-	-	-	-	29
Summer/Inter-sem Bridge Courses (Approved by BoS and Dean, AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

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

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

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

Management Courses Basket		
Sr. No.	Course Code	Course Title
1.	U24MB505A	Managerial Economics and Accountancy
2.	U24MB505B	Industrial Psychology
3.	U24MB505C	E-Commerce and Digital Marketing
4.	U24MB505D	Organizational Behavior
5.	U24MB505E	Any other course approved by BoS Chair and Dean A

VI SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	
1	PEC	U24CN601X	Program Elective-I/MOOCs-I	2	1	-	3	6	3
2	PCC	U24CN602	Cryptography and Network Security	2	1	2	5	10	4
3	PCC	U24CN603	DevOps	2	1	2	5	10	4
4	PCC	U24CN604	Internet of Things	2	1	2	5	10	4
5	STEC	U24ST605X	S&E Basket	2	1	-	2	5	3
6	IKSC	U24IK606A	EITK	2	-	-	2	4	2
7	SEC	U24CN607	Full Stack Development	-	-	2	2	4	1
8	ELC	U24CN608	Mini Project	-	-	2	2	4	1
9	AEC	U24AE609	Expert Talk Series-6	-	-	-	1	1	1
Total:				12	5	10	27	54	23
Additional Learning@: Maximum credits allowed for Honours/Minor				-	-	-	-	-	5
Total credits for Honours/Minor students:				-	-	-	-	-	28
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 gradesheet)									

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

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

B. Tech Honours with Research:

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

Startups & Entrepreneurship Basket		
Sr. No.	Course Code	Course Title

1.	U24ST605A	DesignThinking
2.	U24ST605B	Innovative ProductDesignandDevelopment
3.	U24ST605C	Entrepreneurship
4.	U24ST605D	DesignStudio
5.	U24ST606E	AnyothercourseapprovedbyBoSChairandDeanA A

Courses for exit:

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

OR

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

C. After Third Year: (B.Tech (Vocational) in CSE(N))

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

Exit Option to Qualify B.Voc in CSE(N) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CN610X	Fundamentals of Cybersecurity	2	-	-	-	4	2
2	PCC	U24CN611X	Blockchain Security	2	-	-	-	4	2
3	PCC	U24CN612X	Ethical Hacking	2	-	-	-	4	2
4	PCC	U24CN613X	Software Engineering	2	-	-	-	4	2
5	PCC	U24CN614X	Any other course approved by BoS Chair and Dean AA	2	-	-	-	4	2

(OR)

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

Exit Option to Qualify B.Voc in CSE(N) : 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 CISCO CoE, KITSW	-	-	-	6	6	3
4	SEC	U24SE613X	Business Analytics Reference: https://trainings.internshala.com/business-analytics-course	-	-	-	6	6	3

5	SEC	U24SE614X	Any other skill based course approved by BoS Chair and Dean AA	-	-	-	6	6	3
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(Note to HoDs on PCC: Under PCC the departments shall plan appropriate courses upto 6th semester covering GATE syllabus).

VII SEMESTER

Sl. No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
1	MOP EC	U24OE701Y YX	MOPECElective-II	2	1	-	3	6	3
2	PEC	U24CN702	PE-II/MOOCs-II	2	1	-	4	7	3
3	PCC	U24CN703	Computer Aided Software Engineering	2	1	2	5	10	4
4	PCC	U24CN704	DataCenterNetworking	2	1	2	5	10	4
5	ELC	U24CN705	InternshipEvaluation*	-	-	2	-	2	1
6	ELC	U24CN706	MajorProject,Phase-1/IndustrialInternship-1	-	-	8	6	14	4
Total:				10	5	12	25	52	19
AdditionalLearning@:Maximumcreditsallowedfor Honours/Minor				-	-	-	-	-	4
TotalcreditsforHonours/Minorstudents:				-	-	-	-	-	23

#MULTIDISCIPLINARYOPENELECTIVES:Studenthastoselectonecourseas 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

Sl. No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
1	MOP EC	U24OE801Y YX	MOPECElective-III	2	1	-	3	6	3
2	PEC	U24CN802	PE-III/MOOCs-III	2	1	-	4	7	3
3	PEC	U24CN803	PE-IV/MOOCs-IV	2	1	-	4	7	3
4	ELC	U24CN804	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:Studenthastoselectonecourseas 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

StudentsoptingforB.TechHonourswithResearch,shallPublisharesearchpaperina reputed journal indexed by SCI/ SCOPUS/Web of Science(4 Credits).

SUMMARY

SEMESTER	I	II	III	IV	V	VI	VII	VIII	TOTAL
CREDITS	21	25	23	24	24	23	19	15	172

MULTIDISCIPLINARY OPEN ELECTIVE COURSES (MOPEC) BASKETS:

Note to HoDs: There are four slots for MOPEC Courses (5th to 8th semesters). Students can opt any four courses (one course per semester under MOPEC slot) from the available 14 MOPEC Baskets.

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

(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	U24OEX01CE EA	Engineering Mechanics
2	U24OEX01CE B	Strength of Materials
3	U24OEX01CE EC	Fluid Mechanics
4	U24OEX01CE D	Advanced Surveying
5	U24OEX01CE E	Energy Efficient Buildings
6	U24OEX01CE F	Net Zero Buildings
7	U24OEX01CE G	Forensic Engineering
8	U24OEX01CE H	Smart and Resilient Buildings
9	U24OEX01CE I	Infrastructure Engineering & Management
10	U24OEX01CE J	Disaster Response & Preparedness
11	U24OEX01CE EK	Introduction to Sustainable Development
12	U24OEX01CE L	Lifeline Services & Disasters
13	U24OEX01CE Z	Any other course approved by BoS Chair and Dean AA

(II) MECHANICAL ENGINEERING: ME-MOPEC BASKET

The following Courses will be offered by Mechanical Engineering Department under MOPEC

basket to the students of other branches:

V/VII/VIII SEMESTER		
1	U24OEX01MEA	3D Printing Technologies
2	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-MOPEC BASKET

The following Courses will be offered by ECE 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	U24OEX01EC	Radar Engineering

	L	
13	U24OEX01EC M	Optical Communications and Networks
14	U24OEX01EC N	Wireless and Mobile Communications
15	U24OEX01EC O	Satellite Communications
16	U24OEX01EC P	Wireless Sensor Networks
17	U24OEX01EC Q	Microwave Communications
18	U24OEX01EC R	Introduction to Nanotechnology
19	U24OEX01EL Z	Any other course approved by BoS Chair and Dean A A

(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	Ethical hacking
2	U24OEX01ITB	Programming with C++
3	U24OEX01ITC	Web Design Technologies
4	U24OEX01ITD	Software Project Management
5	U24OEX01ITE	Java Fullstack development

6	U24OEX01ITF	DevOps
7	U24OEX01ITG	NETProgramming
8	U24OEX01ITH	SoftwareTestingandQualityAssurance
9	U24OEX01ITz	AnyothercourseapprovedbyBoSChairandDeanAA

(VII) ELECTRICAL ENGINEERING:EE-MOPEC BASKET

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

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

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

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

V/VII/VIII SEMESTER		
1	U24OEX01DSA	Exploratory Data Analysis with R Programming
2	U24OEX01DSB	Predictive Analytics and Data Mining
3	U24OEX01D	Big data Analytics

	SC	
4	U24OEX01DS D	MachineLearning
5	U24OEX01DS E	DeepLearning
6	U24OEX01DS F	DataVisualization
7	U24OEX01DS G	Social andInformationNetworkAnalysis
8	U24OEX01DS H	WebScrapingwithPython
9	U24OEX01D SI	IntroductiontoMLOps
10	U24OEX01D SZ	AnyothercourseapprovedbyBoSChairandDeanAA

(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	U24OEX01AI A	Artificial Intelligence
2	U24OEX01AI B	Machine Learning
3	U24OEX01AI C	Deep Learning
4	U24OEX01AI D	Computer Vision and Image Processing
5	U24OEX01AI E	Natural Language Processing
6	U24OEX01AI F	Exploratory Data Analysis with Python
7	U24OEX01AI G	Robotic Process Automation
8	U24OEX01AI H	Prompt Engineering for Generative AI
9	U24OEX01AI II	MLOps Architecture for LLMs
10	U24OEX01AI Z	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	U24OEX01CN A	Computer Networks
2	U24OEX01CN B	Cloud Computing
3	U24OEX01CN C	Block Chain Technologies
4	U24OEX01C ND	Internet Networks and Virtualization
5	U24OEX01C NE	Network Automation
6	U24OEX01C NF	Platforms and System Security
7	U24OEX01C NG	Data Centre Networking
8	U24OEX01C NH	Fundamentals of Cyber Security & Tools
9	U24OEX01C NI	SDN for real networks
10	U24OEX01CN Z	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	U24OEX01IN A	Programming with IoT boards
2	U24OEX01IN B	Python for IoT
3	U24OEX01IN C	IoT Architecture and Protocols
4	U24OEX01IN D	Artificial IoT
5	U24OEX01IN E	IoT frameworks
6	U24OEX01I NF	IIoT
7	U24OEX01IN G	Cyber Physical Systems
8	U24OEX01IN H	Privacy & Security for IoT
9	U24OEX01I NI	Edge and fog computing
10	U24OEX01IN Z	Any other course approved by BoS Chair and Dean AA

(XII) MATHEMATICS: MT-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01MT A	Operations Research
2	U24OEX01MT B	Computational Number Theory
3	U24OEX01M TC	Integral Equations & Integral Transforms
4	U24OEX01MT D	Fuzzy Set Theory and Its Applications
5	U24OEX01MT E	Complex Analysis and Applications
6	U24OEX01MT F	Discrete Mathematics and Graph Theory
7	U24OEX01MT A	Partial Differential Equations and Applications
8	U24OEX01MT B	Probability Theory and Stochastic Processes
9	U24OEX01M TC	Descriptive Statistics with R software
10	U24OEX01MT D	Numerical Linear Algebra
11	U24OEX01MT E	Applied Linear Algebra in AI and ML
12	U24OEX01MT F	Matrix Computation and Applications
13	U24OEX01MT A	Reliability Theory
14	U24OEX01MT B	Numerical Methods for Partial Differential Equations

15	U24OEX01MT Z	Any other course approved by BoS Chair and Dean AA
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(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	U24OEX01EN A	Creative Writing
2	U24OEX01E NB	Public Speaking
3	U24OEX01EN C	Conversational English
4	U24OEX01EN D	Exam Skills
5	U24OEX01EN E	English for Competitive Examinations
6	U24OEX01EN F	Comprehensive Reading
7	U24OEX01EN G	Corporate Writing
8	U24OEX01EN H	Scientific English
9	U24OEX01EN I	Foundation for IELTS/TOEFL
10	U24OEX01EN J	Narrative Skills
11	U24OEX01EN K	Professional Writing
12	U24OEX01EN L	English Language Enhancement
13	U24OEX01E NZ	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	U24OEX01PY A	Science and Technology of Non-Conventional Energy
2	U24OEX01PY B	Laser Systems for Industrial and Engineering Applications
3	U24OEX01PY C	Optical Fiber Communication
4	U24OEX01PY D	Nanomaterials
5	U24OEX01PY E	Fundamentals of Electromagnetism
6	U24OEX01PY F	Solid State Physics
7	U24OEX01PY G	Modern Materials
8	U24OEX01PY H	Experimental Physics
9	U24OEX01PYI	Thermodynamics
10	U24OEX01PY Z	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	U24OEX01CY A	NanoBio-Technology
2	U24OEX01CY B	Computational Chemistry
3	U24OEX01C YC	Biosensors and Applications
4	U24OEX01CY D	Fundamentals of Quantum Chemistry
5	U24OEX01CY E	Stereochemistry
6	U24OEX01CY F	Advanced Polymer Chemistry
7	U24OEX01CY G	Principles and Applications of NMR Spectroscopy
8	U24OEX01CY H	Organic Reaction Mechanisms

9	U24OEX01C YI	Basic Organic Chemistry
10	U24OEX01C HZ	Any other course approved by BoS Chair and Dean AA

(XVI) COMMERCE & MANAGEMENT: CM-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01C MA	Principles of Accountancy
2	U24OEX01C B	Finance for Engineers
3	U24OEX01C MC	Management Principles
4	U24OEX01C MD	Organizational Behavior
5	U24OEX01C E	Project Management
6	U24OEX01C F	Operations Management
7	U24OEX01C MG	Consumer Psychology
8	U24OEX01C MH	Principles of Marketing Management
9	U24OEX01C Z	Any other course approved by BoS Chair and Dean AA

(XVII) LIBERAL ARTS* :LI-MOPECBASKET

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

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

*Through MOOCS only

(XVIII) ARTS*:AR-MOPECBASKET

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

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

*Through MOOCS only

(XIX) LAW*:LW-MOPECBASKET

Students opting Law courses under MOPEC shall complete the courses through

SWAYAM/ NPTEL or any other MOOCS platform:

V/VII/VIII SEMESTER		
1	U24OEX01LW A	Law for Engineers
2	U24OEX01LW B	Environmental Law
3	U24OEX01LW C	Labour Law
4	U24OEX01LW D	IP and Patent Law
5	U24OEX01LW E	Industrial Law
6	U24OEX01LW F	Company Law
7	U24OEX01LW G	Administrative Law
8	U24OEX01LW H	Alternative Dispute Resolution
9	U24OEX01LW Z	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	U24OEX01IE A	Understanding Incubation & Entrepreneurship
2	U24OEX01IEB	Innovation, Business Models & Entrepreneurship
3	U24OEX01IEC	Innovation & Startup Policy
4	U24OEX01IE D	Entrepreneurship & IP Strategies
5	U24OEX01IEE	Digital Marketing Strategies
6	U24OEX01IEF	Leadership, Innovation and Entrepreneurship
7	U24OEX01IE G	Economics of Innovation
8	U24OEX01IE H	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 & Engineering (Networks)

PROGRAM ELECTIVE COURSES (PEC)

There are four slots allotted to Program Elective Courses (PECs).

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: Platforms and Systems Security	U24IN702B: Fundamentals of Cyber Security and Tools	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 & Modeling	U24IN803D: Data Analysis & Visualization
	(OR)			
	<i>Equivalent MOOC approved by BoS Chair and Dean AA</i>			

ISEMESTER**Stream-II**

Sl. 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	U24CI111	Digital Logic Design	2	1	-	4	7	3
4	ESC	U24CN104	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	-	-	3	5	-
7	AEC	U24AE107	Engineering Graphics & CAD	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-1	-	-	-	4	4	1
9	VAC	U24VA109XXXXX	SEA-I/SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
Total:				12	4	6	35	57	20
Summer/Inter-sem Bridge Courses (Approved by BoS and Dean, AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

Pool-III (Chemistry)		
S. No.	CourseCode	CourseTitle
1.	U24CY102A	Engineering Chemistry (for Mechanical Engineering)

2.	U24CY102B	Engineering Chemistry (Common to CSM, CSD, CSN, CSO & IT)
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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)] <i>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))]</i>			
UNIT-II			9Hrs
Partial differentiation and its applications: Functions of two or more variables, Partial derivatives, Total derivative, Change of variables, Jacobians, Functional relationship, Geometrical Interpretation- Tangent plane and Normal to a surface, Taylor's theorem for function of two variables (without proof), Errors and approximations, Total differential, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers, Differentiation under the integral sign			

Self-Learning Topics (SLTs):

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) Solutions of Non-exact DEs by Inspection Method [(Text 1: topic 11.12(1), Solved Problems: 11.30, Practice problems: exercise 11.8 (1,3)]

Additional problems on Non-exact DEs [(Text 1: topic 11.12(2,3,4,5), Solved problems: 11.33, 11.35, 11.36, Practice problems: exercise 11.8 (9,15)]

Orthogonal Trajectories of family of curves in polar coordinates [(Text 1: topic 12.3(3), Solved problems: 12.7, 12.8, Practice problems: exercise 12.2(9,10)]

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. ShantiNarayan,Dr.MittalP.K, <i>DifferentialCalculus</i> ,S.Chand&Co.,NewDelhi,1 st edition, Reprint 2014													
2. KreyszigE, <i>AdvancedEngineeringMathematics</i> ,Inc,U.K,Johnwiely&sons,10 th edition, 2020													
3. S.S. Sastry, <i>EngineeringMathematics</i> ,Vol.II,PrenticeHallofIndia,3 rd edition,2014.													
WebandVideolink(s):													
1. https://youtu.be/4EYko9rdF7g?si=WUu12NPTEL NPTEL Video Lecture on Infinite series by Prof. S.K.Ray,ProfessorofMathematics,IITKKanpur.													
2. https://youtu.be/0apMXhWG_W8?si=M-abw2Gq3buX5HLM NPTEL Video Lecture on Fundamental mean value theorems by Prof. Jithedra Kumar, Professor of Mathematics, IITK Kharagpur.													
3. https://youtu.be/6r5jfT8xrXM?si=ryLXYVJr4-iUkdIV ;NPTELVideoLectureonExact Differential Equations, Prof. Jithedra Kumar, Professor of Mathematics, IIT Kharagpur.													
4. https://youtu.be/kbGhrqV9AOM?si=yGyK_V7kJKGa3OaR NPTEL Video Lecture on OrthogonalTrajectoriesoffamilyofcurvesbyProf.AdityaSharma,ProfessorofPhysics,IIS EBhopal.													
5. https://youtu.be/btOCUmJkrrg?si=zq3nB00kplm7b5se ; NPTEL Video Lecture on Higher Order LinearDifferentialEquations,Prof.JithedraKumar,ProfessorofMathematics,IITKh aragpur.													

Course Articulation Matrix (CAM):				U24MH101DIFFERENTIALCALCULUSAND 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 1	PO 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													

ENGINEERING CHEMISTRY			
(Common to CSM, CSD, CSN, CSO & IT)			
Class: B.Tech. I Semester		Branches: CSM, CSD, CSN, CSO & IT	
Course Code:	U24CY102B	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: electrochemical energy systems, batteries and fuel cells			
LO2: water analysis and corrosion with its preventive methods			
LO3: engineering materials and spectroscopic techniques of chemical analysis			
LO4: polymers, principles of green chemistry and their applications			
THEORY COMPONENT			
UNIT-I		9 Hrs	
Electrochemical Technology and Engineering: Introduction, Specific conductance, Equivalent conductance, Effect of dilution; Conductometric titrations-Acid base titrations-Strong acid vs strong base, Strong acid vs weak base, Weak acid vs strong base, Weak acid vs weak base, Advantages of conductometric titrations; Galvanic cell, Electrode potential, Electrochemical series, Nernst equation; Potentiometric titrations-Acid base titrations and advantages of potentiometric titrations Batteries: Classification, Lead-acid battery, Li-ion battery Fuel cells: Hydrogen-oxygen fuel cell			
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		9 Hrs	
Applied Chemistry: Water Technology: Introduction, Hardness of water, Estimation of hardness of water by complexometry, Alkalinity, Determination of alkalinity, Numerical problems. Determination of dissolved oxygen (DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Softening methods-Ion exchange method, Desalination processes, Reverse osmosis; Quality parameters of potable water (BIS and WHO) Corrosion: Introduction, Dry corrosion, Pilling-Bedworth rule, Wet corrosion; Factors effecting corrosion-Purity of the metal, Relative areas of anodic and cathodic parts, Nature of surface film, Humidity, pH and Temperature; Prevention methods of corrosion-Cathodic protection-Impressed current cathodic protection, Sacrificial anodic protection			

Self Learning Topics (SLTs): Unit of hardness (Text 1: Jain & Jain chapter 1 topic 5), Introduction to corrosion (Text 1: Jain & Jain: chapter 7 topic 1)

UNIT-III

9Hrs

Engineering Materials: Nanomaterials-

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

Spectroscopy: Introduction to spectroscopy, Microwave spectroscopy- Principle,

Selection rules, Applications; Infra-red spectroscopy- Principle, Selection rules,

Applications; UV Spectroscopy-Lambert-Beer's law and its applications
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

9 Hrs

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 & bi carbonate in ground water
3. Estimation of alkalinity of water sample containing (i) bicarbonate; (ii) carbonate & hydroxide in potable water
4. Determination of hardness of water by complexometric method
5. Determination of dissolved oxygen in a sample of water
6. Standardization of sodium hydroxide (NaOH) by conductometry using standard hydrochloric acid (HCl)
7. Standardization of acetic acid (CH₃COOH) by conductometry using standard sodium hydroxide (NaOH)
8. Standardization of strong acid hydrochloric acid (HCl) by potentiometry using standard sodium hydroxide (NaOH)
9. Colorimetric analysis- verification of Lambert-Beer's law
10. Estimation of ferrous (Fe²⁺) ion in the given solution using potassium permanganate
11. Preparation of nanoparticles of cadmium sulphide (CdS)
12. Synthesis of polymer (phenol-formaldehyde)

Text Book(s):

1. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, 17th Edn., 2019 (chapters 1, 3, 5, 6, 7, 35, 36, 37)
2. Dornfeld, D.A., *Green manufacturing: fundamentals and applications*, Springer Science & Business Media, 2012 (chapters 5, 8, 9)

Reference Book(s):

1. J.C. Kuriacose and J. Rajaram, *Chemistry in Engineering and Technology* (vol. I), Tata Mc. Graw-Hills Education Pvt. Ltd., 2010
2. Shashi Chawla, *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,

(based on cognitive skills acquired from theory component)

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

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

CO3: apprise manufacturing of engineering materials and spectroscopic techniques of chemical analysis

CO4: apprise the synthesis, applications of engineering materials and principles of green chemistry

(based on psychomotor skills acquired from laboratory component)

CO5: determine water quality parameters-alkalinity,

hardness **CO6:** make use of analytical instruments for

chemical analysis **CO7:** determine metals present in their ores

CO8: design the synthesis of nanomaterial and polymer

Course Articulation Matrix (CAM):			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	PS O 1	PS O 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: U24IN103 **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):

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

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):

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

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):				U24IN103 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	U24IN103.1	2	2	-	1	1	-	-	-	-	-	1	1	1
CO2	U24IN103.2	2	2	2	1	1	-	-	-	-	-	1	1	1
CO3	U24IN103.3	2	2	2	1	1	-	-	-	-	-	1	1	1
CO4	U24IN103.4	2	2	2	1	1	-	-	-	-	-	1	1	1
U24IN103		2	2	1.5	1	1	-	-	-	-	-	1	1	1
3-HIGH, 2-MEDIUM, 1-LOW														

PROGRAMMINGFORPROBLEMSOLVINGWITHC			
Class: B.Tech.I-Semester		Branch: CSE(Networks)	
CourseCode:	U24CN104	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,flowchartsanddevelopprogramswithbasicconstructs LO2: controlstructuresandarrayoperations LO3: stringoperationsandmodularprogrammingconceptswithfunctionsandrecursion LO4: structures,unions,pointersandfilesinCprogramming			
THEORYCOMPONENT			
UNIT-I		9Hrs	
IntroductiontoProgramming: Artofprogrammingthroughalgorithmsandflowcharts Overview ofC: HistoryofC,ImportanceofC, BasicstructureofCprograms Constants,VariablesandDataTypes: Character set,Ctokens,Declarationofvariables, Defining symbolic constants ManagingInputandOutputOperations: Reading a character, Writing a character, Formatted input, Formatted output OperatorsandExpressions: Arithmetic, Relational, Increment, Decrement, Conditional, Logical, Bit-wise, Special operators, Arithmetic expressions, Evaluation of expressions, Operator precedence and associativity SelfLearningTopics(SLTs): Componentsof a computer, concept of hardware and software(Text1: chapter1),Executing a C program(Text1:chapter2),Type conversions in expression(Text1:chapter 4)Solved problems(Text1:chapter2tochapter5),Review questions,debugging exercises, programming exercises,interview questions(Text1:chapter2tochapter 5)			
UNIT-II		9Hrs	
DecisionMakingandBranching: Simpleifstatement,if-elsestatement,Nesting ofif-else statements,elseifladder,switchstatement,Conditionaloperator,gotostatement DecisionMakingandLooping: whilestatement,do-whilestatement,forstatement,Nested loops,Jumpsinloops Arrays: One-dimensionalarrays,Declaration ofone-dimensionalarrays,Initialization of one-dimensional arrays, Linear search, Two-dimensional arrays, Initializing two dimensionalarrays,Multi-dimensionalarrays SelfLearningTopics(SLTs): Concisetestexpressions(Text1:chapter7)Dynamicarrays(Text1: chapter8),Solved problems(Text1:chapter6tochapter8),Review questions,debugging exercises, programming exercises,interview questions(Text1:chapter6tochapter 8)			
UNIT-III		9Hrs	
CharacterArraysandStrings: Declaringandinitializingstringvariable,Readingstrings fromterminal,Writingstringstoscreen,Stringhandlingfunctions,Tableofstrings ModularProgrammingwithUserDefinedFunctions: Needforuser-definedfunctions, Elementsofuser-definedfunctions,Definitionoffunctions,Returnvaluesandtheirtypes, Functioncalls,Functiondeclaration,Categoryoffunctions,Recursion,Thescope,visibilty andlifetimeofvariables(storageclasses) SelfLearningTopics(SLTs): Arithmeticoperationsoncharacters,comparisonofstrings(Text1: chapter9),Nestingoffunctions,(Text1:chapter10),Solved problems (Text1:chapter9&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	
Textbook(s):	
1. Balagurusamy.E, <i>Programming in ANSI C</i> , McGraw Hill, 8 th edition, 2022	

Reference Book(s):

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

Web and Video link(s):

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

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

Laboratory Manual (for laboratory component):

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):					U24CN104: PROGRAMMING FOR PROBLEM SOLVING WITH C									
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CN104.1	2	1	1	1	-	-	-	1	-	1	2	1	2
CO2	U24CN104.2	2	2	2	1	-	-	-	1	-	1	2	2	2
CO3	U24CN104.3	2	2	3	1	-	-	-	1	-	1	2	2	2

CO4	U24CN104. 4	2	2	3	2	-	-	-	1	-	1	2	2	2
CO5	U24CN104. 5	1	1	1	1	1	-	-	1	1	1	2	1	2
CO6	U24CN104. 6	1	2	2	2	1	-	-	1	1	1	2	2	2
CO7	U24CN104. 7	1	2	3	2	1	-	-	1	1	1	2	2	2
CO8	U24CN104. 8	1	2	3	2	1	-	-	1	1	1	2	2	2
U24CN104		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 & II - Semesters		Branch: Common to all branches	
Course Code:	U24MH105/U24MH205	Credits:	2
Hours/Week (L-T-P-O-E):	2-0-0-3-5	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: 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-exercisesforpractice
- SentenceCorrection-CorrectuseofTenses,Verbforms,Punctuation.

VOCABULARY

- Wordformation:Prefixes-Suffixes-SentenceFormationwithnewlyformedwords

READINGSKILL

- Definition-SubskillsofReading-EmphasisonSkimming-Purpose-Howtoskimthroughthe text-Examples, Exercises for practice

WRITINGPRACTICES

- ParagraphWriting-Definition-OrganizingPrinciplesofparagraphs-Makinga paragraph through hints/ graphs and pictures-Coherence-Linking Devices- Systematic Development of Ideas
- Paraphrasing-Précisinglengthyexpressionsforclarityandbrevity

LIFE SKILLS:EthicalValuesand
Humanity TheLastLeaf:A
ShortStorybyO.Henry

SelfLearningTopics(SLTs):

Articles-(Text2,Unit-II),EnglishVocabulary(Text2,Unit-I,Unit-II,Unit-III)

VerbForms(Referencebook1,Topic:31),Tenses(Referencebook1,Topics:16,17,18,19)

ReportedSpeech(Referencebook2,ExercisesforPractice,Topics:161-167)

UNIT-II

9Hrs

GRAMMAR

- Tenses-Revision-Exercisesforpractice
- Subject-VerbAgreement
- ReportedSpeech-Transformation
- SentenceCorrection-EmphasisConcord,ReportSpeech,SentenceStructures

VOCABULARY

- Synonyms-Antonyms-SingleWordSubstitutes-PopularAbbreviations

READINGSTRATEGY

- Emphasison Scanning theText-Purpose-Advantages-Examples, Exercises andPractice through Teamwork
- **WRITINGPRACTICES**
- Letter Writing- Effective Letter Writing Techniques-Information Seeking Letters-Job ApplicationLetters-ApologyLetters-ExplanationtoMemos-E-mails-CoverLetters- Resume

LIFESKILLS:Determination

- HowIBecameaPublicSpeaker:AnessaybyGeorgeBernardShaw

SelfLearningTopics (SLTs): English Vocabulary(Text 2,Unit-I,Unit-II,Unit-III),Tenses(Referencebook 3,Topic-30, Exercises,30.1,30.2,30.3)

UNIT-III

9Hrs

GRAMMAR

- Tenses-Revision-ExercisesforPractice
- Nouns-Prepositions-Adverbs-Adjectives
- SentenceCorrection:CorrectUseoftenses,nouns,prepositions,adverbsandadjectives

VOCABULARY

- PhrasalVerbs-TechnicalWords-LatinWords

READINGSTRATEGY

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

WRITINGPRACTICES

- ReportWriting-Definition-Purpose-QualitiesofaGoodReport-FormalandInformal Reports-Report Format-Sample Reports-Exercises
- EmphasisonTechnicalReports

LIFESKILLS:PositiveAttitude

- BetheBestof WhateverYouAre:APoembyDouglasMalloch

SelfLearningTopics(SLTs):

Partsof Speech(Textbook1,Unit-I),Tenses (Referencebook1,Topics-16,17,18,19) Phrasal Verbs(Referencebook 3)

UNIT-IV**9Hrs**

GRAMMAR

- Tenses-Revision-ExercisesforPractice
- Clauses-Conjunctions-TransformationofSentences
- SentenceCorrection(BasedonPartsofSpeech)-Clauses-Tenses

VOCABULARY

- AppropriateUseofWordsinCommunication-CommonlyConfused Words

ACTIVEREADINGandNOTE-MAKING

- Note-Making-Definition-Purpose-Effectiveness

WRITINGPRACTICES

- PrécisWriting-Definition-Purpose-Uses-ExamplesandExercises-PracticethroughTeamwork
- PreparingStatementofPurpose(SoP)

LIFESKILLS:EmotionalBalanceAPoisonTree:PoembyWilliamBlake

Self-LearningTopics(SLTs):

Tenses(Referencebook 2,Topics:152-157))

CourseLearningOutcomes (COs):

Aftercompletionofthis course, thestudents should beable to,

CO1:applybasicgrammarprinciplesinspeechandwriting,readfast,formnewwords,make coherent paragraphs and adapt the real value of life.

CO2:createeffectiveletters,e-mails,replytoMemosanddothegiventaskswithconfidence.

CO3:analyzethegiventextsandwriteclearandunambiguousreports.

CO4:deductthesuperfluousinformationfromlengthytext,prepareSoP(StatementofPurpose) effectively andsolvecritical problems in life with emotional balance.

Textbook(s):

1. SanjayKumar & Pushp Lata, " *English Language and Communication Skills for Engineers*" As per thelatestAICTESyllabus,OxfordUniversityPress,1st edition2018
2. " *Language and Life: A Skill's Approach*"Based on the latest AICTE model curriculum Orient Blackswan Private Limited 2ndEdition 2019.

ReferenceBook(s):

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

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc20_hs56/preview Technical English for Engineers by Aisha Icbal, IIT Madras
2. https://onlinecourses.swayam2.ac.in/cec21_lg13/preview

Indian Writing in English by Dr. Bindu Ann Philip, St Mary's College Trissur

Course Articulation Matrix (CAM):		U24MH105/205: ENGLISH COMMUNICATION & REPORT WRITING												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	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		
U24MH105/205		-	-	-	-	-	1		2	2	2	2		

SPORTS and 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:	36Hrs	ESE:	40(%)																																
Course Learning Objectives (LOs): This course will develop students' knowledge in/on... LO1: Yoga and its benefits LO2: various sports & game LO3: sportsman spirit LO4: all round development																																			
Sports and Games																																			
<table border="1"> <thead> <tr> <th colspan="4">List of Sports and Games</th></tr> <tr> <th>Sl.No.</th><th>Game</th><th>Sl.No</th><th>Game</th></tr> </thead> <tbody> <tr> <td>1</td><td>Badminton</td><td>7</td><td>Volleyball</td></tr> <tr> <td>2</td><td>Basketball</td><td>8</td><td>Cricket</td></tr> <tr> <td>3</td><td>Chess</td><td>9</td><td>Hand Ball</td></tr> <tr> <td>4</td><td>Carrom</td><td>10</td><td>Kabaddi</td></tr> <tr> <td>5</td><td>Football</td><td>11</td><td>Kho-Kho</td></tr> <tr> <td>6</td><td>Table Tennis</td><td>12</td><td>Yoga Asanas</td></tr> </tbody> </table>				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	Football	11	Kho-Kho	6	Table Tennis	12	Yoga Asanas
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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 Madhaorao, <i>Foundation of Physical Education and Sports</i> , Sports Publication, New Delhi.																																			
<u>Web and Video link(s):</u> Badminton game Video Link: https://www.youtube.com/watch?v=HucIqi8Lw3E&t=22s Basketball game Video Link:																																			

<https://www.youtube.com/watch?v=tkE2lJoR58C>

Chess Video Link:

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

Carrom game Video Link:

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

Football game Video Link:

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

Table Tennis game Video Link:

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

Volleyball game Video Link:

<https://www.youtube.com/watch?v=BJJb3-00Q1U>

Cricket game Video Link:

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

Handball game Video Link:

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

Kabaddi game Video Link:

<https://www.youtube.com/watch?v=ai1m7ARNy>

NIkho-Kho game Video Link:

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

Yoga Aasanas Video Link :

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

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

Course Learning Outcomes (COs):

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

CO1: demonstrate physical fitness by performing yoga asanas

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

CO4: demonstrate physical, psychological, social and emotional balance

Course Articulation Matrix (CAM):		U24VA106/206 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	U24VA106/206.1	-	-	-	-	-	-	-	-	-	-	1	1	1

CO2	U24VA106/206. 2	-	-	-	-	-	-	-	-	1	-	-	1	1
CO3	U24VA106/206. 3	-	-	-	-	-	-	-	2	-	-	-	1	1
CO4	U24VA106/206. 4	-	-	-	-	-	-	-	-	-	1	1	1	1
U24VA106/206		-	-	-	-	-	-	-	2	1	1	1	1	1
3-HIGH,2-MEDIUM,1-LOW														

ENGINEERING GRAPHICS THROUGH CAD

Class: B. Tech. II-Semester				Branch: Common to all (except CE & ME)			
Course Code:		U24ME107/ U24ME207		Credits:		1	
Hours/Week (L-T-P-O-E):		0-0-2-2-4		CIE:		100%	
Total Number of Teaching Hours:		36 Hrs		ESE:		-	

Course Learning Objectives (LOs):

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

LO1: AutoCAD commands, projections of points and straight line inclined to one plane
LO2: projections of oblique planes

LO3: projections of solids and sections of solids

LO4: conversion of isometric, orthographic projections and simple circuit 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., *Elementary Engineering Drawing*, Charotar Publishing House, Anand, India, 2017
2. Kulkarni D. M., Rastogi A. P., and Sarkar A., *Engineering Graphics with AutoCAD*, PHI publisher, revised edition, July 2010

Reference Book(s):

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

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc20_me79/preview

NPTEL video link for Engineering drawing and computer graphics By Prof. Rajaram Lakkaraju, IIT Kharagpur

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs)

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

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

Auto CAD. CO2: develop the projections of planes using Auto CAD

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

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

Course Articulation Matrix (CAM): U24ME107/207 ENGINEERING GRAPHIC THROUGH CAD

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24ME107/207.1	2	1	1	-	2	-	-	1	-	2	1	1	1
CO2	U24ME107/207.2	2	1	1	-	2	-	-	1	-	2	1	1	1
CO3	U24ME107/207.3	2	1	1	-	2	-	-	1	-	2	1	1	1
CO4	U24ME107/207.4	2	1	1	-	2	-	-	1	-	2	1	1	1
U24ME107/207		2	1	1	-	2	-	-	1		2	1	1	1

PRACTICUM-1			
Class: B.Tech.I/ II/ III/ IV-Semester	Branch: Common to all branches		
Course Code:	U24EL108	Credits:	1
Hours/Week(L-T-P-O-E):	0-0-0-4-4	CIEMarks(%):	100
Total Number of Teaching Hours:	-	ESEMarks(%):	-
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). (i). Practicum is a mandatory semester project work. (ii). Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters) (iii). Allotment of Practicum topics for students: ○ Practicum matrix: In week (-1), the class teacher, in consultation with HoD, shall prepare the practicum matrix of the section. The practicum matrix is the allotment of group of students to the different course faculty of the section, as shown below.			

course 24MH101U24PS102 24EC103 24CS104 U24EE105 24CH106

	B24XX001	24XX011	B24XX021 B24XX031	24XX041	B24XX051
	B24XX002	24XX012	B24XX022 B24XX032	24XX042	B24XX052
	B24XX003	24XX013	B24XX023 B24XX033	24XX043	B24XX053
udent	B24XX004	24XX014	B24XX024 B24XX034	24XX044	B24XX054
s					
allott				24XX045	B24XX055
e d to	B24XX005	24XX015	B24XX025 B24XX035		
differ				24XX046	B24XX056
ent	B24XX006	24XX016	B24XX026 B24XX036	24XX047	B24XX057
cour					
s es	B24XX007	24XX017	B24XX027 B24XX037		
	B24XX008	24XX018	B24XX028 B24XX038	24XX048	B24XX058
	B24XX009	24XX019	B24XX029 B24XX039	24XX049	B24XX059
	B24XX010	24XX020	B24XX030 B24XX040	24XX050	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 classteacher,inconsultationwithHoDshallallothepracicumtopics tothestudentsofthat sectioninthefollowingformat.

CIRCULAR

AllotmentofPracticumtopicstostudents Section :

.....

No.	ollnumberof thestudent	Practicumtopicallotted			acticumunder	Course
					thecourse	faculty

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Note:

1. The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
2. To complete the Practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the classwork timetable and also outside the 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 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). Asamplerubricsforassessmentandevaluationofpracticumisasfollows:

Literaturesurvey&Identificationofresearchgaps	10marks
Workingmodel/process/softwarepackage/systemdeveloped	30marks
Reportwriting(subjectedtomaxof30%plagiarism)	20marks
OralpresentationwithPPTandviva-voce	20marks
Videopitch	20marks
Total	100marks

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-I/SAA-I)			
Class: B.Tech. I to VI-Semesters	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 class work hours, during weekends, holidays, semester breaks, etc.,
- (e) If a student is not able to attend/fulfil performance requirements, he/she shall be dropped from the course and shall have to enrol in the forthcoming semesters.

Monitoring SEA/SAA:

- (a) **Nodal units:** The Student Activity Centre (SAC) and Centre for Innovation Incubation Research and Entrepreneurship (C-i²RE) shall act as nodal units for activities listed under SEA/SAA.
- (b) During the semester period, the student has to **acquire requisite knowledge, conduct fieldwork**, acquire skills and propose unique solutions to the real-life problems
- (c) **Knowledge Acquisition & Skilling:**
 - i. Students have to identify goals, acquire and accumulate knowledge on the chosen SEA/SAA activity
 - ii. For the activities related to social awareness/issues/challenges that affect society, use the knowledge base, apply relevant skills to analyse the issue and propose unique possible solutions to the social issues/challenges.

Practice to acquire necessary skills to seek new opportunities in their personal and professional life.

iii. For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions under supervision of expert/guru are to be planned and executed to acquire the benchmark skills to be demonstrated.

(d) **Fieldwork:** Fieldwork is an essential component of learning for gaining real-life experiences. In addition to knowledge acquisition & skilling, student has to take up fieldwork on the chosen activity, as part of SEA/SA course.

- i. This student-driven Fieldwork allow students to interact with the 'real world'. It is an autonomous learning (self-learning) situation that students are more actively involved during the activity and develop a deeper understanding and develop a more positive attitude.
- ii. Fieldwork consists of three phases: preparation, the actual activity and feedback
- iii. **As part of fieldwork, student has to interact with at least two eminent personalities/achievers/renowned persons/inspiring and great personalities related to the activity chosen.**
- iv. Fieldwork will benefit students for any careers where they need to work with communities of people or which involves analysis of complex processes, especially social and cultural.
- v. Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more
- vi. Other skills important for fieldwork practice include the ability to act in a crisis, to plan, set priorities, mobilize resources, and implement the plan effectively. These skills used in an integrated manner help students solve their problems and to develop one's own leadership style based on the need and culture of the place.
- vii. **Eminent personalities/achievers/renowned persons/inspiring and great personalities**

Eminent personalities/Achievers/Renowned personalities:

(a).In caseof sociallyrelevant problems/activitiesof SEA/SAA:Eminent

personalities/ achievers include district administrative officers, Eminent Social workers/NGOs, other inspiring and great personalities

(b). **In case of Sports / Games and Cultural activities of SEA/SAA:** Eminent coaches/trainers/gurus, achievers who represented / won state level / national level / international level competitions, other inspiring and great personalities.

- viii. **For appointment to interact eminent personalities:** Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes for getting appointment and time for interaction
- ix. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
- x. **Ethics of fieldwork:** Fieldwork is an educational process with commitment to positive values. All fieldwork should be planned and conducted in a way that is ethical, responsible and safe, for people, students, visited communities, if any, and all other stakeholders. Student is expected to maintain integrity and honesty. Avoid bias and deception. Protect the rights and well-being of people involved in fieldwork. The privacy, confidentiality and respect for the eminent people interacted should be maintained and their time, inputs & guidance are to be acknowledged
- xi. Student is expected to take care of health and safety practices for fieldwork and travel
- xii. Student should remember that contrary to a *field trip or company visit*, **the emphasis in fieldwork is on acquiring skills**, and not on casually presenting theory and assessing.
- xiii. For the fieldwork, student shall go with a scientifically designed questionnaire and record the responses during interaction. These response sheets, along with geo-tagged pic of fieldwork (at the time of interaction & practise sessions, if any) shall be appended as annexures in the report to be submitted for course evaluation.

xiv. ~~**Feedback:** The learnings the student made out of interaction with eminent~~

achievers shall be presented in the report as one of the chapters.

- During feedback, the central focus is on the elaboration of the students' experience during fieldwork. Therefore, the 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	Mark to be awarded by
Goal setting, Planning & Knowledge Acquisition	20	Nodal centre
Fieldwork	40	Nodal centre
Demonstration/Presentation	20	Nodal centre

	Reportsubmission	20	Facultycounsellor
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	Total	100	-
Note: (a) <u>Presentation/ Demonstration:</u>It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informativeslides 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 timeslotfromthenodalcentreanddemonstratetheskillslearnt/improvedduring the allotted timeslot. ▪ The necessary arrangements for demonstration shall be looked after thestudentinconsultationwiththecoordinatorwithduepermissionfromHead of the department. (b) <u>Report:</u>Eachstudentisrequiredtosubmitawell-documentedreportonthechosen SEA/SAA topicspertheformatspecifiedbydepartmentlevelSEA/SAA coordinator. (c) <u>Anti-Plagiarism Check:</u>The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute. (d) <u>Requirementsforpassingthecourse:</u>Astudentisdeemedtohavepassed SEA/SAA if he/she a. successfully demonstrates/presents the skills attained at the end of course asper the schedule notified by the nodal centre, <u>and</u> b. scoresaminimumof40marksintheCIEofthecourse (e) <u>Supplementaryexamination:</u>IfastudentfailsinSEA/SAAactivityofaparticular semester,hemustcompletethesamebyenrollingitinthenexthighersemesters.			

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 text books and web resources relevant to the course selected. Plan for fieldwork/ practice sessions in coordination with SEA/SAA 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 that textbooks don't explain.

- (g) Students have the opportunity to learn from professionals who have achieved success in their respective fields. These speakers often share their personal experiences, case studies, and anecdotes, providing students with real-world examples and perspectives that go beyond theoretical concepts.
- (h) Our competency-focussed curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses
- (i) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.
- (j) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability enhancement category of courses**.
- (k) Through ETS sessions, students get the chance to interact with industry regularly which helps them focus on the needs and requirements of current industry. This will not only enthuse the students with new ideas but also motivate them to understand what kind of 21st century skills are needed in industry and how they need to groom themselves.
- (l) Through ETS sessions, another benefit is that students learn the importance of soft skills like communication, presentation, email etiquettes, corporate grooming and dressing styles. Conversing with successful people is the biggest motivation and students gain in more ways than one through ETS sessions.
- (m) ETS enhances your learning in many ways for global opportunities for your career.
- (n) All in all, learning from industry experts, is a wonderful opportunity for student to getting acquainted with professional etiquette, acquiring professional knowledge, and getting to know the internal workings of an organization.
- (o) Salient features of ETS are hereunder:
 - (i) ETS is offered from I semester to VI semester.
 - (ii) ETS, in any given semester, is treated as one credit course
 - (iii) Students are required to earn six credits (from I to VI semester)

- (iv) **Head, Centre for i²RE** shall be the institute level ETS coordinator
- (v) Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode** by the parent department/ Centre for i²RE.
- (vi) Each expert talk shall be for a minimum duration of 45 minutes (*but not exceeding 90 minutes*) followed by **online quiz/test** for 10 marks (10 MCQs/ FiBs ; *duration: 10-15 mins*), on the contents covered in the expert talk.
- (vii) **The Head C-i²RE** shall share the marks obtained by the students in each of the quizzes / tests to the respective **department ETS coordinators**.
- (viii) Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.
- (ix) **Report on ETS:** At the end of semester, the student shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.
- (x) **Evaluation:** There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks
- (xi) The department ETS coordinator shall, in coordination with institute level ETS coordinator, submit the final scores to the CoE in week (N+1).
- (p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

ii. Supplementary Exam:

- (a) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE
- (b) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks (MCQs/FiBs; duration: 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

II SEMESTER**Stream-II**

Sl. No.	Category	Course Code	Course Title	Lectures/week					Credits
				L	T	P	O	E	
1	BSC	U24MH201	Matrix Theory and Vector Calculus	2	1	-	6	9	3
2	BSC	U24PY202B	Engineering Physics	2	1	2	5	10	4
3	PCC	U24CN203	Computer Architecture and Organization	2	1	-	4	7	3
4	ESC	U24CN204	Data Structures through C	2	1	2	5	10	4
5	ESC	U24EE205B	Basic Electrical Engineering	2	1	2	5	10	4
6	VAC	U24VA206	Environmental Studies	2	-	-	2	4	-
7	ESC	U24AE207	IDEALab Makerspace	-	-	2	2	4	1
8	SEC	U24SE208	Programming Skill Development (PSD) Lab-1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210XX XX X	SEA-2/SAA-2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
Total:				10	5	12	38	65	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)									

Pool-I (Physics)		
Sr.No.	Course Code	Course Title
1.	U24PY202A	Engineering Physics (for Mechanical Engineering)
2.	U24PY202B	Engineering Physics (Common to CSM, CSD, CSN, CSO & IT)

Pool-II (Basic Electrical & Electronics Engineering)		
Sr.No.	Course Code	Course Title
1.	U24EE205A	Basic Electrical and Electronics Engineering (for Mechanical Engineering)
2.	U24EE205B	Basic Electrical Engineering (Common to CSM, CSD, CSN, CSO & IT)

MATRIX THEORY AND VECTOR CALCULUS			
Class: B.Tech.II-Semester		Branch: Common to all branches	
Course Code:	U24MH201	Credits:	3
Hours/Week (L-T-P-O-E):	2-1-0-6-9	CIE:	60%
Total Number of Teaching Hours:	36 Hrs	ESE:	40%
Course Learning Objectives (LOs): This course will develop students' knowledge in/on... LO1: various methods of solving system of linear equations and 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 homogeneous equations, Eigenvalues, Eigenvectors, Properties of Eigenvalues, Cayley Hamilton's theorem, Reduction to diagonal form, Factorization method (LU Decomposition) Applications of Eigenvalue 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 Eigenvalues and Eigenvectors [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, ∇ applied to scalar point functions - Gradient, Geometrical interpretation, Directional derivative, ∇ applied to vector point functions-Divergence, Curl, Physical interpretation of divergence, Physical interpretation of curl, ∇ applied twice to point functions, ∇ 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 students 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-Schaum's Series</i>, 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):

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

Course Articulation Matrix (CAM):**U24MH201 MATRIX THEORY AND VECTOR CALCULUS**

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														

ENGINEERING PHYSICS (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:	60 Hrs	ESE:	40%
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: basic principles, operation of lasers and optical fibers LO2: fundamental laws of electrostatics and magnetostatics, properties of magnetic and superconducting materials LO3: basic concepts of quantum mechanics and quantum computing LO4: semiconductor materials, semiconductor diodes and bipolar junction transistors (BJTs)			
THEORY COMPONENT			
UNIT-I		9 Hrs	
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		9 Hrs	
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 ferri magnetic materials, Hysteresis, Soft and hard magnetic materials and their applications; superconductivity, Meissner effect, Transition temperature, Isotope effect, Type-I and type-II superconductors. High			

Tc superconductors, Applications of superconductors

Self Learning Topics (SLTs): magnetisation, susceptibility & their relations (Text1: topic 41.2), London penetration depth (Text1: topics 42.4.7), Solved problems (Text1: Prob 42.9 to 42.14).

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 (Text1: topics 27.2), Observables and operators (Text1: topics 27.19), Solved problems (Text1: 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 (Text2: topic 4.9), diode current equation (Text2: topic 4.15), Solved problems (Text2: 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):

1. M. Avadhanulu and Kshirsagar, TVS Arun Murthy, *A Text Book of Engineering Physics*, S. Chand & Company Ltd, 11th edition, 2018 (Unit-I, II & III- Chapter 5, 6, 27, 41, 42, 44 & 47)
2. S Salivahanan, N Suresh Kumar, *Electronic devices and circuits*, Mc Graw Hill edition, 2017 (Unit-IV-Chapter 4, 5 & 6) (Unit-IV-Chapter 4, 5 & 6)
3. Michael Nielsen and Isaac Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 2010 (Unit-III-Chapter 1.1, 1.2 & 1.3)

Reference Book(s):

1. Neil Gershenfeld, *Physics of Information Technology*, Cambridge University Press, 1st edition, 2000
2. V. Rajendran, *Engineering Physics*, McGraw Hill edition, 2013
3. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, The MIT Press Cambridge, Massachusetts London, England, 2011
4. R.K. Gaur and S.L. Gupta, *Engineering Physics*, Dhanpath Rai and Sons, 2013
5. David Halliday, Robert Resnick and Krane, *Physics Volume I & II*, Wiley India Limited, 5th edition, 2014

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc24_ph28/preview;
NPTEL video lecture on
Concepts in Magnetism and Superconductivity by Prof. Arghya Taraphder IIT
Kharagpur
2. https://onlinecourses.nptel.ac.in/noc24_lw07/preview;
NPTEL video lecture on
Introduction to Law on Electricity by Prof. Uday Shankar, IIT Kharagpur
3. https://onlinecourses.nptel.ac.in/noc24_ph45/preview; NPTEL Video Lecture
on *Introduction to LASER - Course* by Prof. M. R. Shenoy, IIT Delhi
4. https://onlinecourses.nptel.ac.in/noc20_ee77/preview;

*NPTEL Video Lecture on
Semiconductor Devices and Circuits By Prof. Sanjiv Sambandan, IISc Bangalore*

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

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs):

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

CO1: evaluate properties of lasers and optical fibre parameters

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

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

CO4: analyze V-I characteristics of semiconductor diodes and suggest their applications; determine resistances of transistor biasing circuits

(based on psychomotor skills acquired from laboratory component)

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

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

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

CO8: determine forward voltage and currents from V-

I characteristics of semiconductor diodes; identify cut-off, saturation and active regions of NPN transistor

Course Articulation Matrix (CAM):

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	PSO1	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:ComputerScience& Engineering(Networks)	
CourseCode:	U24CN203	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,principlecomponentsandinstructionsetarchitecture LO2:processingunitandcomputationofarithmeticoperations LO3:memoryunitanddatatransferbetweenprocessor,memory&I/O LO4:operationsofhigh-performancecomputingsystems			
UNIT-I		9Hrs	
BasicStructureofComputers:Functionalunits,basicoperationalconcepts, performanceofcomputer 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	
BasicProcessingUnit:Fundamentalconcepts,instructionexecution,hardware components, Instruction fetch and execution steps, control signals, hard-wired control, CISC-style processors Arithmetic:Addition and subtraction of signed numbers, multiplication of unsignednumbers,multiplicationofsignednumbers,fastmultiplication,integer division, floating-point numbers and operations SelfLearningTopics(SLTs):NumberRepresentationandArithmetic Operations(Text1:topic1.4.1&1.4.2),BooleanAlgebra(Text2:Topic1.3)			
UNIT-III		9Hrs	
TheMemorySystem:Basicconcepts,semiconductorRAMmemories-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/O vs memory bus, Isolated vs. memory-mapped I/O; asynchronous data transfer- strobe control, handshaking, asynchronous serial transfer SelfLearningTopics(SLTs):RegisterTransferLanguage(Text2:Topic4.1),Bus andMemorytransfers(Text2:Topic4.3)			
UNIT-IV		9Hrs	

Modes of Transfer: Modes of transfer, priority interrupt, direct memory access, interconnection standards

Pipeline and Vector Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, vector processing

Multi Processors: Characteristics of multiprocessors, Interconnection structures

Self Learning Topics (SLTs): Common Bus System (Text 1: Topic 5.2)

Course Learning Outcomes (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 is a print of Elsevier, 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

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CN203.1	2	2	2	1	-	1	1	1	-	1	1	1	1
CO2	U24CN203.2	2	2	2	2	-	1	1	1	-	1	1	1	1
CO3	U24CN203.3	2	2	2	2	-	1	1	1	-	1	1	2	1
CO4	U24CN203.4	2	2	2	2	-	1	1	1	-	1	1	2	1
U24CN203		2	2	2	1.8	-	1	1	1	-	1	1	1.5	1

DATA STRUCTURE THROUGH C			
Class: B.Tech.II –Semester		Branch: Computer Science & Engineering (Networks)	
Course Code:	U24CN204	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: time complexity, space complexity, array operations, and dynamic memory allocation LO2: stacks and various forms of queues LO3: various types of linked lists LO4: various sorting techniques and hashing techniques			
THEORY COMPONENT			
UNIT-I			9Hrs
Data Structures: Basic terminology, Classification of data structures, Applications and operations on data structures, Time and space complexity Arrays: Operations on arrays- traversing an array, Inserting an element in an array, Deleting an element from an array, Searching an element using binary search and their complexities, Dynamic Memory Allocation: Memory allocation functions, Dynamic memory allocation for single and two dimensional arrays Self Learning Topics (SLTs): Three dimensional and n-dimensional arrays (Text 1: topics 2.4.3), passing arrays to functions and pointers (Reference 1: topics 3.6, 3.7), Practice problems (Text 1: Prob 2.3, Reference 1: Prob 1, Prob 2, Prob 3, Prob 4)			
UNIT-II			9Hrs
Stacks: Stacks, Array representation of stacks, Operations on a stack- push and pop; Multiple stacks, Applications of stacks- recursion, Fibonacci series, tower of Hanoi, evaluation of expressions (infix to postfix conversion, evaluation of postfix expression) Queues: queues, Array representation of queues, Double ended queues, Circular queues Self Learning Topics (SLTs): Infix to prefix (Reference 1: topics 7.7.3), priority Queue (Reference 1: 8.4.3), Solved problems (Reference 1: Prob 7.7.1, Prob 7.7.2), Practice problems (Text 1: Prob 4.5, Prob 4.11, Prob 5.7, 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 Self Learning Topics (SLTs): Merging (Text 1: topics 3.3), Skiplist (weblink: https://www.geeksforgeeks.org/skip-list/), Deallocation strategy (Text 1: topic 3.9), Solved			

problems (Text1:Prob 3.6.1,Prob 3.6.2),Practiceproblems(Reference1:Prob 5.5,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			

sorting techniques (Reference 1: topics 14.16) Solved problems (Reference 1: Prob 15.5, Prob 15.6, Prob 15.7), Practice problems (Text 1: Prob 6.4)

LABORATORY COMPONENT

List of Experiments

Experiment-I

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

Experiment-II

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

Experiment-III

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

Experiment-IV

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

Experiment-V

12. Program to evaluate given postfix expression
13. Program to define recursive function to solve tower of hanoi puzzle
14. Program to display the Fibonacci series with the help of recursive function
15. Program to implement 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
i) traversing ii) inserting iii) deleting iv) searching v) reversing vi) concatenation

Experiment-VIII

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

Experiment-IX

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

Experiment-X

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

Experiment-XI

25. Program to implement selection sort

26. Program to implement insertion sort

Experiment-XII

27. Program to implement shell sort

28. Program to implement radix sort

29. Program to implement hash table.

Textbook(s):

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

Reference Book(s):

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

Web and Video link(s):

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

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs):

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

- CO1:** analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities
- CO2:** analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities
- CO3:** analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities
- CO4:** develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies

(based on psychomotor skills acquired from laboratory component)

- CO5:** develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity
- CO6:** apply the linear data structures such as stacks and queues and perform various operations using LIFO or FIFO order respectively
- CO7:** solve problems using various linked list representations for efficiently storing and retrieving the data
- CO8:** apply different sorting techniques on unsorted data and sort them in an order, able to store the data using hashing technique to retrieve the data very effectively

Course Articulation Matrix(CAM):					U24CN204 DATA STRUCTURE THROUGH HC									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O 2
CO1	U24CN204.1	2	2	2	1	-	-	-	1	-	1	1	2	1
CO2	U24CN204.2	2	2	2	2	-	-	-	1	-	1	2	2	2
CO3	U24CN204.3	2	2	2	2	-	-	-	1	-	1	2	2	2
CO4	U24CN204.4	2	2	2	2	-	-	-	1	-	1	2	2	2
CO5	U24CN204.5	2	2	2	1	-	-	-	1	1	1	1	2	1
CO6	U24CN204.6	2	2	2	2	-	-	-	1	1	1	2	2	2
CO7	U24CN204.7	2	2	2	2	-	-	-	1	1	1	2	2	2
CO8	U24CN204.8	2	2	2	2	-	-	-	1	1	1	2	2	2
U24CN204		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: networkelementsandDC circuits LO2: DCnetworktheorems LO3: 1-ØACand3-ØACCircuits LO4: construction, principles and applications of DC & AC machines andconcept of Lighting sources			
THEORYCOMPONENT			
UNIT-I			9Hrs
DCcircuits: Networkelements,Linear &non-linearelements,Active&passiveelements, Unilateral& bilateral elements, Ohm's law, Power, Energy, Kirchhoff's laws, Resistances connected in series and parallel, Voltage divider rule & Current divider rule DCCircuitanalysis: Source transformation,Star-Deltaconversion,Meshanalysis& 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
DCnetwork theorems(Independentsources only): Superpositiontheorem,Thevenin's theorem,Norton'stheorem,Maximumpowertransfertheorem(T&πnetworksonly) 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,Peakfactorandformfactorofasine 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, ConceptofReactance,Impedance,Complexpower,RealPower,Reactivepowerand Power factor 3- Ø AC circuits: Generation of 3- Ø voltages, Advantages, Disadvantages, Applications ofa 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

Electrical Machines & Electrical Lighting (Qualitative treatment):

Construction, Principle of operation, Characteristics & applications of 1- ϕ transformer, 3- ϕ induction motor, 1- ϕ induction motor and DC motor and Types of DC motor

Electrical lighting sources and Energy calculations:

Lighting sources-incandescent, Fluorescent, CFL & LED lamps, Elementary calculations for energy consumption

Self-Learning Topics (SLTs): EM Fe equation of a Transformer (Text 1: Part-II Topic, 4.4.2) Solved problems (Text 1: Part-II Prob 4.5, 4.6 & 4.7), Practice problems (Text 1: Part-II Prob 5.2, 5.3 &

5.4), Practice problems (Text 1: Part-II Prob 6, 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**
 - a) LED blinking
 - b) IR Sensor
 - c) Ultrasonic Sensor
 - d) Voltage Sensor
 - e) Current Sensor
 - f) Speed Sensor

Textbook(s):

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

Reference Book(s):

1. B.L. Thereja, A.K. Thereja, *Electrical Technology Vol. I & II*, S. Chand & Company Ltd, Edition, 2005.
2. Edward Hughes, *Electrical & Electronics Technology*, Pearson Education, 10th Edition, 2010.
3. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, Edition, 2010.
4. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, Tata McGraw Hill Ltd, 4th Edition, 2013

Web and Video link(s):

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

Laboratory Manual (for laboratory component):

1. *Basic Electrical Engineering Laboratory Manual and Record Book*, 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, CS D, 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 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 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):				U24CY206ENVIRONMENTALSTUDIES									
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	P O 9	PO 10	P O 11	PS O1	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	-	-

Course Articulation Matrix(CAM):					U24VA206ENVIRONMENTALSTUDIES									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	P O 9	PO 10	P O 11	PS O1	PSO 2
CO1	U24VA206. 1	2	1	2	1	-	2	1	1	1	-	-	-	-
CO2	U24VA206. 2	-	-	2	-	-	1	1	1	1	1	-	-	-
CO3	U24VA206. 3	1	2	1	-	-	1	1	1	1	1	1	-	-
CO4	U24VA206. 4	-	-	1	-	-	1	1	1	1	-	1	-	-
U24VA206		1.50	1.50	1.50	1.00	-	1.25	1.00	1.00	1.00	1.00	1.00	-	-

IDEALABMAKERSPACE			
Class:B.Tech.I&II-Semester		Branch:Common to all branches	
Course Code:	U24AE107/U24AE207	Credits:	1
Hours/Week(L-T-P-O-E):	0-0-2-2-4	CIE:	100%
Total Number of Lab Hours:	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 flap 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 a Arc welding machine	
5.	Injection Moulding	Prepare a plastic product using Injection moulding machine	
6.	Laser Engraving	Perform key chain by using CO2 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		1.Students are required to create an affordable prototype as their course project, based on the knowledge and skills acquired during the course. 2.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:

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

Text/Reference Book(s):

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

Course Learning Outcomes (COs):

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

(based on psychomotor skills acquired from laboratory component)

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

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

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

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

Course Articulation Matrix (CAM):					U24AE207: IDEALab Makerspace									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PSO 2
CO1	U24AE207.1	2	2	1	1	2	1	-	1	2	2	1	1	1
CO2	U24AE207.2	2	2	1	1	2	1	-	1	2	2	1	1	1
CO3	U24AE207.3	2	2	1	1	2	1	-	1	2	2	1	1	1
CO4	U24AE207.4	2	2	1	1	2	1	-	1	2	2	1	1	1
U24AE207		2	2	1	1	2	1	-	1	2	2	1	1	1

PROGRAMMING SKILL DEVELOPMENT LAB1			
Class: B.Tech.II-Semester		Branch: Computer Science & Engineering (Networks)	
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: 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: develop 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		
1.	Programs using input/output functions, operators		
2.	Programs using conditional control structures: if, if-else, nested if		
3.	Programs using else-if ladder, switch and goto statements		
4.	Programs using iterative statements		
5.	Programs using iterative statements		
6.	Programs on one-dimensional array and two-dimensional arrays		
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 on different types of functions, parameter passing using call-by-value & call-by-address, recursion and storage classes		
11.	Programs using structures, unions, pointers to arrays and pointers to strings		
12.	Programs using array of pointers and pointers to structures		

Text/Reference Book(s):

1. Balagurusamy.E, *Programming in ANSIC*, McGrawHill, 8th edition, 2022
2. Paul Deitel, Harvey Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, Pearson Education Limited, 9th edition, 2022
3. Brian W. Kernighan and Dennis Ritchie, *The C Programming Language*, Pearson Education India, 2nd edition, 2015
4. Reema Thareja, *Programming in C*, Oxford University Press, 3rd edition, 2023
5. Yashavant Kanetkar, *Let Us C*, BPB Publications, 19th edition, 2022
6. A.K. Sharma, *Computer Fundamentals and Programming in C*, Universities Press, 2nd edition, 2018

Course Learning Outcomes (COs):

*After completion of this course, the students 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									
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	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.I/ II/ III/ IV-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:	-	ESEMarks(%):	-			
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. 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:						
1. Practicum matrix: In week (-1), the class teacher, in consultation with HoD, shall prepare the practicum matrix of the section. The practicum matrix is the allotment of group of students to the different course faculty of the section, as shown below.						
Course	U24MH101	U24PS102	U24EC103	U24CS104	U24EE105	U24CH106
Students allotted	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

	to differen t courses	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	
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2. 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.
3. 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 :

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

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:

Note: It is mandatory for the student to appear for oral presentation and viva-voceto 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.
1. What was the objective of the practicum assigned?
 2. What are the main responsibilities and tasks for practicum?
 3. What knowledge and skills from the course work are applied in the practicum?
 4. What new knowledge and skills are acquired during the practicum?
 5. In what ways, can the practicum be helpful for the professional career?
 6. What gaps are identified in your practicum work?
 7. 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 & pictures at the time of implementing the practicum and also key points about his

Literature survey & identification of research gaps and social impact	10 marks
Working model/process/software package/system developed	30 marks
Report writing (subjected to max of 30% plagiarism)	20 marks
Oral presentation using PPTs and viva-voce	20 marks
Videopitch	20 marks
Total	100 marks

(g) The student has to register for the Practicum as a supplementary examination

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

Course Learning Outcomes (COs):

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

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

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

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

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

SOCIALEMPOWERMENTACTIVITY/SELFACCOMPLISHMENTACTIVITY (SEA-II/SAA-II)			
Class:B.Tech.ItoVI-Semesters	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 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,acquireskillsandproposeuniquesolutionstothereal-lifeproblems

(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 to seeknew opportunities in theirpersonal and professional life.
- iii. For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions undersupervision of expert/guruare to be plannedandexecuted to acquire the benchmark skills to be demonstrated.

(d) **Fieldwork:**Fieldworkisanessentialcomponentoflearningforgainingreal-life experiences.Inadditiontoknowledgeacquisition&skilling,studenthastotakeup fieldworkonthechosenactivity,aspartofSEA/SAAcourse.

- 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 /Renowned personalities:

(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/nationalel

~~vel /internationallevelcompetitions,otherinspiring andgreatpersonalities.~~

- viii. **For appointment to interact eminent personalities:** Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes for getting appointment and time for interaction
- ix. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
- x. **Ethics of fieldwork:** Fieldwork is an educational process with commitment to positive values. All fieldwork should be planned and conducted in a way that is ethical, responsible and safe, for people, students, visited communities, if any, and all other stakeholders. Student is expected to maintain integrity and honesty. Avoid bias and deception. Protect the rights and well-being of people involved in fieldwork. The privacy, confidentiality and respect for the eminent people

interacted should be maintained and their time, inputs & guidance are to be acknowledged

- xi. Student is expected to take care of health and Safety practices for fieldwork and travel
- xii. Student should remember that contrary to a *field trip or company visit*, **the emphasis in fieldwork is on acquiring skills**, and not on casually presenting theory and assessing.
- xiii. For the fieldwork, student shall go with a scientifically designed questionnaire and record the responses during interaction. These response sheets, along with geo-tagged pic of fieldwork (at the time of interaction & practise sessions, if any) shall be appended as annexures in the report to be submitted for course evaluation.
- xiv. **Feedback:** The learnings the student made out of interaction with eminent achievers shall be presented in the report as one of the chapters.
 - During feedback, the central focus is on the elaboration of the students' experienced during fieldwork. Therefore, the students should create a 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, students 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	Mark 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 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 formats 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/SAA coordinator

EXPERTTALKSERIES-II			
Class: B.Tech.II-Semester	Branch: Common to all branches		
Course Code:	U24AEXYY	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 that textbooks don't explain.
- (g) Students have the opportunity to learn from professionals who have achieved success in their respective fields. These speakers often share their personal experiences, case studies, and anecdotes, providing students with real-world examples and perspectives that go beyond theoretical concepts.
- (h) Our competency-focussed curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses
- (i) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.
- (j) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability enhancement category of courses**.

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

- 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

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

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(N))

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

Exit Option to Qualify UG Certificate in CSE(N) : Any Two (02) Courses during the 2-Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CN212X	Computer Networks Fundamentals	2	-	2	-	4	3
2	PCC	U24CN213X	Java Programming	2	-	2	-	4	3
3	PCC	U24CN214X	Fundamentals of DBMS	2	-	2	-	4	3
4	PCC	U24CN215X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

(OR)

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

Exit Option to Qualify UG Certificate in CSE(N) : 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++ (https://trainings/internshala.com/Cplusplus-course)	-	-	-	6	6	3
2	SEC	U24SE213X	Advance Excel (https://trainings/internshala.com/excel-course)	-	-	-	6	6	3
3	SEC	U24SE214X	CISCO: IT Essentials (offered by CISCO Co EKITSW)	-	-	-	6	6	3
4	SEC	U24SE215X	CISCO CCNA: Introduction to Networks (offered by CISCO Co EKITSW)	-	-	-	6	6	3
5	SEC	U24SE216X	Any other skill based course Approved by BoS Chair and Dean AA	-	-	-	6	6	3

COMPUTER NETWORKS FUNDAMENTALS			
Class: B.Tech syllabiof Exit CourseforUG certificateinCSE(NETWORKS)		Branch: CSN	
CourseCode:	U24CN211X	Credits:	4
Hours/Week(L-T-P-O-E):	3-1-0-0-0	CIEMarks(%):	50
TotalNumberofTeachingHours:	32Hrs	ESEMarks(%):	50
CourseLearningObjectives(LOs):			
Thiscoursewilldevelopstudents"knowledgein/on...			
LO1:networkreferencemodelsandtransmissionmedia			
LO2:datalinklayerandmediumaccesscontrolprotocols			
LO3:routingalgorithmsandIPaddresses			
LO4:transportandApplicationLayerprotocolsusedinthenetworks			
THEORY COMPONENT			
UNIT-I		4Hrs	
Introduction: Uses of computer networks, Network hardware, Network software			
Reference models: OSI reference model, TCP /IP reference model, Comparison of OSI andTCP/IP reference model.			
IntroductiontoPhysicallayer:Transmissionmedia,Guidedtransmissionmedia, UnguidedTransmissionMedia			
UNIT-II		4Hrs	
IntroductiontoDatalinklayer:Datalinklayerdesignissues,Error detectionandcorrection			
Elementarydatalinkprotocols:Slidingwindowprotocols			
IEEEstandard 802.3,SwitchedEthernet, Fast Ethernet, Gigabit Ethernet,Bluetooth, Datalinklayer switching			
UNIT-III		4Hrs	
IntroductiontoNetworklayer:Networklayerdesignissues;Routingalgorithms,Optimality principle, Shortest path algorithm, Distance vector routing,			
Networklayerintheinternet:TheIPversion4protocol,IPaddresses,IPversion6			
UNIT-IV		4Hrs	
Introduction to Transport layer: The transport service, Elements of transport protocols, Connectionestablishmentand release,Internet transportprotocols-UDP,Internet transportprotocols-TCP			
IntroductiontoApplicationlayer,Domainnamesystem(DNS),Electronicmail,World WideWeb			
LABORATORY COMPONENT			

List of Experiments

1. Draw symbols of devices and connectors used in network diagrams and illustrate network diagram of different network types (LAN, MAN, WAN)
2. Illustrate physical and logical diagrams of a campus network and draw the network diagram of a campus network
3. (a) Identify different Ethernet cable categories and write down the detailed specifications
(b) Identify different devices, tools, connectors used in establishing a physical LAN
4. (a) Configure an IP address on a computer
(b) Establish a LAN network with two computers and check network connectivity between two computers using Ping command
5. Develop a socket program to implement date and time display from client to server using TCP
6. Develop a socket program to implement date and time display from client to server using UDP
7. Develop a socket program to implement chat application using TCP
8. Develop a Java program to implement sliding window protocol
9. Develop a program for error detection code using CRC-CITT (16-bits)
10. Develop a Java program to find subnet mask and network for given IP address
11. Develop a Java program that resolves IP address from a given domain name
12. Demonstration of Wireshark packet analyzer tool (a) Capture Packet
(b) Apply filter (c) Analyze Packet

Textbook(s):

1. *Computer Networks*, Andrew S. Tanenbaum, David J. Wetherall, 5th Edition. Pearson Education/PHI

Reference Book(S):

1. Jack L. Burbank, *An Introduction to Network Simulator 3*, First Edition, Wiley-Blackwell, 2015

Laboratory Manual (for laboratory component):

1. *Computer Networks Laboratory manual*, prepared by the faculty of Dept. of CSE (Networks)

Course Learning Outcomes (COs)

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

CO1: classify OSI and TCP/IP Reference models

CO2: examine data link and medium access control protocols

CO3: develop routing algorithms and congestion control

CO4: make use of Transport and Application Layer protocols in the networks

(based on psychomotor skills acquired from laboratory component)

CO5: make use of reference models OSI & TCP/IP.

CO6: develop error detection mechanism.

CO7: construct routing algorithms

CO8: develop required application level network services

Course Articulation Matrix(CAM):				U24CN211XCOMPUTERNETWORKS										
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O 2
CO1	U24CN211.1	2	2	1	1	-	-	-	-	-	-	1	1	1
CO2	U24CN211.2	2	2	2	1	-	-	-	-	-	-	1	1	1
CO3	U24CN211.3	2	2	2	1	-	-	-	-	-	-	1	1	1
CO4	U24CN211.4	2	2	2	1	-	-	-	-	-	-	1	1	1
CO5	U24CN211.5	2	2	2	1	2	1	-	1	2	1	2	1	1
CO6	U24CN211.6	2	2	2	1	2	1	1	-	2	1	2	1	1
CO7	U24CN211.7	2	2	2	1	2	1	-	-	2	1	2	1	1
CO8	U24CN211.8	2	2	2	1	2	1	1	1	2	1	2	1	1
U24CN211X		2.5	2.25	2.66	1.85	2	0.75	1	1.5	2	1	2.75	1	1
3-HIGH,2-MEDIUM,1-LOW														

JAVAPROGRAMMING			
Class:B.Techsyllabiof Exit CourseforUG certificate inCSE(NETWORKS)		Branch:CSN	
CourseCode:	U24CN212	Credits:	4
Hours/Week(L-T-P-O-E):	3-1-0-0-0	CIEMarks(%):	50
TotalNumberofTeachingHours:	32Hrs	ESEMarks(%):	50
CourseLearningObjectives(LOs):			
Thiscourse will developstudents"knowledgein/on...			
LO5:switchingalgebraandminimizationtechniquesofswitchingfunctions			
LO6:combinationalcircuitsandtheirapplications			
LO7:flipflopsandtheiruseinthedesignofsequentialcircuits			
LO8:finitestatemachinesandtheirminimization			
THEORYCOMPONENT			
UNIT-I		4Hrs	
JavaBasics:HistoryandevolutionofJava,Anoverviewofjava,Datatypes,Variablesand arrays, Operators, Control statements			
IntroducingClasses:StructuresinC,Classfundamentals,Objects,Methods,Objectreference variables			
UNIT-II		4Hrs	
Classes and Methods:Overloading methods, this keyword, Passing and returning objects, Recursion, Variable length arguments, Constructors, Overloading constructors, Static variables, Static blocks, Static methods, Nested and inner classes,Command line arguments			
Strings:ExploringString,StringBuffer,StringBuilderandStringTokenizerclasses			
UNIT-III		4Hrs	
Inheritance:Inheritancebasics,Typesofinheritance,superkeyword,Methodoverriding, Abstract classes, final with inheritance, Object class			
Interfaces:Defininganinterface,Implementinginterfaces,Nestedinterfaces,Interface scan be extended			
Packages:Packages,PackagesandMemberAccess,Importingpackages			
UNIT-IV		4Hrs	
UsingI/O:I/Obasics,Reading,Writingandcopyingfilesusingbyteandcharacter streams			
ExceptionHandling: Fundamentals,Exceptiontypes,Uncaughtexceptions,Usingtryand catch, Multiple catch clauses, throw, throws, finally			
Multithreading:Creatingathread,Creatingmultiplethreads,Synchronization, Interthread communication			
LABORATORYCOMPONENT			

List of Experiments

13. Program on operators and control structures
14. Program on arrays and for-each
15. Program on classes and objects
16. Programs variable length arguments, constructors, garbage collector, inner classes and static concepts
17. Program on command line arguments and wrapper classes
18. Program on String, StringBuffer and StringTokenizer classes
19. Program on Inheritance
20. Program on abstract classes, Dynamic Method Dispatch and Object Class
21. Program on interfaces
22. Program on packages
23. Program on exception handling
24. Program on files and multithreading

Textbook(s):

1. Herbert Schildt, Java The Complete Reference, 11th ed., New Delhi: McGraw-Hill Education, 2019

Reference Book(S):

1. Kathy Sierra, Bert Bates, Head First Java, 2nd ed., Boston: O'Reilly Publications 2005
2. Uttam K. Roy, Advanced JAVA Programming, England: Oxford Publications, 2013.
3. Balaguruswamy, Programming with Java: A Primer, 6th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd, 2019.
4. Tanweer Alam, Internet and Java Programming, New Delhi: Khanna Publishing House, 2010

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc24_cs105/preview; NPTEL Video Lecture on Programming in Java By Prof. Debasis Samanta | IIT Kharagpur.

Laboratory Manual (for laboratory component):

2. Java Programming, Department of CSN, 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: choose programming paradigms for developing programs

CO2: develop 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 programs using streams (I/O), exception handling and multithreading concepts

(based on psychomotor skills acquired from laboratory component)

CO5: develop java fundamental programs using operators, control structures and arrays.

CO6: develop java programs using classes, constructors and various string concepts.

CO7: make use of reusability concepts like inheritance, dynamic method dispatch, interfaces and packages to build java programs.

CO8: develop java programs using streams (I/O), exception handling and multithreading

Course Articulation Matrix (CAM):				U24CN212: 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	U24CN212.1	2	2	2	-	1	-	-	-	-	-	1	1	1
CO2	U24CN212.2	2	2	2	1	2	-	-	1	-	-	1	1	1
CO3	U24CN212.3	2	2	3	2	1	-	-	-	-	-	1	2	2
CO4	U24CN212.4	2	2	3	2	2	-	-	1	-	-	1	2	2
CO5	U24CN212.5	1	1	1	1	1	-	-	1	1	-	1	1	1
CO6	U24CN212.6	1	2	2	2	2	-	-	1	1	-	1	1	1
CO7	U24CN212.7	1	2	3	2	2	-	-	1	1	-	1	2	2
CO8	U24CN212.8	1	2	3	2	2	-	-	1	1	-	1	2	2
U24CN305		1.5	1.87	2.37	1.5	1.62	-	-	1	1	-	1	1.5	1.5

FUNDAMENTALS OF DBMS			
Class: B.Tech syllabiof Exit Course for UG certificate in CSE(NETWORKS)		Branch: CSE(Networks)	
Course Code:	U24CN213X	Credits:	3
Hours/Week(L-T-P-O-E):	2-0-2-0-4	CIEMarks(%):	50
Total Number of Teaching Hours:	32Hrs	ESEMarks(%):	50
Course Learning Objectives(LOs): This course will develop students "knowledge in/on . . .			
LO1: diverse issues in the design and implementation of a database management system			
LO2: physical and logical database designs and models			
LO3: distinct normalization techniques, query optimization techniques			
LO4: database structure, security, integrity and concurrency control			
THEORY COMPONENT			
UNIT-I		4Hrs	
Introduction: Introduction, Characteristics of database approach, Advantages of using DBMS, When not to use DBMS.			
Database System Concepts and Architecture: Data models, Schemas and Instances, Three-schema architecture and data independence, Database Languages and interfaces, The database system environment, Classification of database management systems.			
The Relational Data Model and its constraints: Relational model concepts, Relational constraints and the relational database schemas, Update operations and dealing with constraint violations.			
UNIT-II		4Hrs	
Data Modeling using the Entity-Relationship Model: Using high-level conceptual data models for database design, Entity types, Entity sets, Attributes and keys, Relationships types, Relationship sets, Roles and structural constraints, Weak entity types, ER diagrams.			
Basic SQL: SQL Data definition and data types, Specifying constraints in SQL, Basic retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL.			
UNIT-III		4Hrs	
Database Design Theory and Normalization: Informal design guidelines for relation schemas, Functional dependencies, Normal forms on Primary keys, General definitions of second and third normal form, Boyce-Codd Normal Form.			
UNIT-IV		4Hrs	

Introduction to Transaction Processing: Introduction to transaction processing, Transaction and system concepts, Desirable properties of a transactions, Characterizing schedules based on recoverability and serializability.

Concurrency Control Techniques: Two-Phase locking techniques for concurrency control, Concurrency control based on timestamp ordering.

LABORATORY COMPONENT

1. Design and implement DDL, DML, TCL and DCL commands
2. Design and implement Queries on types of constraints
3. Design and implement Queries using built-in functions of
NUMBER, CHARACTER and DATE datatypes
4. Design and implement Queries on Datatype conversion functions
5. Design and implement Queries on single row functions and operators
6. Design and implement Queries on aggregate functions
7. Design and implement Queries on joins and nested queries
8. Construct SQL statements to create simple, composite indexes, user-defined datatypes, views, sequences
9. Implementation of sample PL/SQL programs using conditional and iterative statements
10. Implementation of PL/SQL programs using cursors
11. Implementation of PL/SQL programs using parameterized cursors
12. Create PL/SQL programs to handle exceptions

Textbook(s):

1. Ramez Elmasri,
Shamakanth, B. Navathe, *Fundamentals of Database Systems*, 7th edition, New Delhi, 2017

Reference Book(S):

1. Raghu Rama Krishnan, Johannes Gehrke, *Database Management Systems*, 4th edition., New Delhi: Mc-Graw Hill, 2014
2. Abraham Silberschatz, Henry F. Korth and
S. Sudarshan, *Database System Concepts*, 6th edition., New Delhi: McGraw-Hill, 2011

Web and Video link(s):

<https://www.youtube.com/playlist?list=PLlwC9bZ0rmjSkm1VRJROX4vP2YMI4Ebh>

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 the schemata, illustrate the relational data model and consistency

constraints effectively, and develop effective queries

CO2: design the database with an ER and EER models

CO3: apply the normalization on database to eliminate redundancy and

query optimization

techniques to determine the most efficient way to execute query plans

CO4: apply correctness of data and control over access on database.

(based on psychomotor skills acquired from laboratory component)

CO5: develop SQL queries using the concepts related to DDL, DML, TCL, and DCL constructs of Oracle

CO6: develop SQL queries using functions, joins, indexes, sequences and

views **CO7:** develop SQL queries using the PL/SQL programs, cursors

and exceptions. **CO8:** create PL/SQL programs using procedures,

functions, packages and triggers.

Course Articulation Matrix (CAM):					U24CN402 DATABASE MANAGEMENT SYSTEMS									
CO		PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	U24CN402.1	2	1	2	1	-	-	-	-	-	-	1	2	1
CO2	U24CN402.2	2	1	2	1	-	-	-	-	-	-	1	2	1
CO3	U24CN402.3	2	1	2	2	-	-	-	-	-	-	1	2	1
CO4	U24CN402.4	2	1	1	1	-	-	-	-	-	-	1	1	1
CO5	U24CN402.5	2	1	2	1	1	1	1	-	-	-	1	2	1
CO6	U24CN402.6	2	1	2	1	1	1	1	-	-	-	1	2	1
CO7	U24CN402.7	1	1	1	1	1	1	1	-	-	-	1	1	1
CO8	U24CN402.8	2	1	2	1	1	1	1	-	-	-	1	2	2
U24CN402		1.87	1	1.75	1.2	1	1	1	-	-	-	1	1.75	1.12

III.SEMESTER

Sl. No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
1	PCC	U24CN301	AutomataTheoryand CompilerDesign	2	1	-	6	9	3
2	PCC	U24CN302	OperatingSystems	2	1	-	4	7	3
3	PCC	U24CN303	AdvancedDataStructur es	2	1	2	5	10	4
4	PCC	U24CN304	ComputerNetworks	2	1	2	5	10	4
5	PCC	U24CN305	Object oriented programming through java	2	1	2	5	10	4
6	VAC	U24VA306B	Soft & InterpersonalSkills	-	-	2	2	4	1
7	SEC	U24SE307	Programming Skill DevelopmentLab-02	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309XXX	SEA-3/SAA-3	-	-	-	2	2	1
10	AEC	U24AE310	ExpertTalkSeries-3	-	-	-	1	1	1
Total:				10	5	10	36	61	23
Summer/Inter-semBridge Courses(ApprovedbyBoSand Dean, AA):1weekto10days:1credittoeachBridgecourseunder Additional learning (will be printed on gradesheet)									

*DeanAA will all other courses **Soft & Interpersonal Skills, QALR** to the branches as per Stream - I and Stream-II.

AUTOMATA THEORY AND COMPILER DESIGN			
Class: B.Tech.III-Semester		Branch: CSE (Networks)	
Course Code:	U24CN301	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):			
This course will develop students "knowledge in/on...			
LO1: fundamental concepts of automata theory and finite automata			
LO2: regular expressions, pumping lemma of regular languages and context-free grammars			
LO3: pushdown automata, Turing machine, and the structure of a compiler			
LO4: syntax analysis, intermediate code and code generation of compiler construction			
THEORY COMPONENT			
UNIT-I		9Hrs	
Automata Theory: Introduction to finite automata, Structural representations and the central concepts of automata theory			
Finite Automata: Deterministic finite automata (DFA), Non-deterministic finite automata (NFA), Finite automata with epsilon transitions, Conversion of NFA with ϵ -transitions to NFA without ϵ -transitions. Conversion of NFA to DFA, Moore and Mealy machines, Minimization of DFA			
<i>Self Learning Topics (SLTs): NFA an application: text search (Text1: Topics: 2.4), Minimization of DFA (Text1: Topics: 4.4.3)</i>			
UNIT-II		9Hrs	
Regular Expressions: Introduction, Algebraic laws for regular expressions, From DFA to regular expressions, Conversion of regular expressions to automata, Pumping lemma for regular languages, Closure properties of regular languages			
Context-Free Grammars (CFG): Definition, Derivations using grammar, Leftmost and rightmost derivations, Parse trees, Ambiguity in grammars and languages, Removal of ambiguity in grammars, Pumping lemma of context-free languages, Simplification of CFG, Chomsky normal form (CNF)			
<i>Self Learning Topics (SLTs): application of regular expressions (Text1: Topics: 3.3), application of pumping lemma (Text1: Topics: 4.1.2)</i>			
UNIT-III		9Hrs	
Push Down Automata (PDA): Definition, Acceptance by final state, Acceptance by empty stack, Conversion of CFG to PDA			
Turing Machines: Introduction, Formal description, Instantaneous description, The language of a Turing machine, Design of basic Turing machine, Undecidability, Post correspondence problem			
Compiler Design: Language processors, The structure of a compiler			
Lexical Analysis: The role of the lexical analyzer, Input buffering, Recognition of tokens			
<i>Self Learning Topics (SLTs): Deterministic pushdown automata (Text1: Topics: 6.4.1), A language that is not recursively enumerable (Text1: Topics: 9.1), Recursive languages (Text1: Topics: 9.2.1)</i>			
UNIT-IV		9Hrs	

Syntax Analysis: Introduction, Top-down parsing, Bottom-up parsing, Introduction to LR parsing: simple LR, More powerful LR parsers

Intermediate-code Generation: Intermediate languages, Syntax trees, Three-address code

Code Generation: Issues in the design of the code generator, Basic blocks and flow graphs, Direct acyclic graphs for basic blocks

Self Learning Topics (SLTs): syntax trees (Text 2: Topics: 4.4), Dag for basic blocks (Text 2: Topics: 8.5.1)

Course Learning Outcomes (COs):

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

CO1: apply finite automata to solve basic computational problems

CO2: apply regular expressions and context-free grammars for generating languages

CO3: evaluate pushdown automata and Turing machines for an efficient language processing system

CO4: analyse syntax, intermediate code, and code generation in the development of a compiler

Textbook(s):

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, *Introduction to Automata Theory, Languages, and Computation*, 3rd ed., USA: Pearson Education, 2007
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, *Compilers: Principles, Techniques and Tools*, 2nd ed., USA: Pearson Education, 2007

Reference Book(s):

1. Mishra, Chandrashekar, *Theory of Computer Science – Automata languages and computation*, 2nd ed., India: Prentice Hall India Learning Private Limited, 2006
2. Michael Sipser, *An Introduction to the Theory of Computation*, 3rd ed., USA: Cengage Learning 2013
3. Kamala Krithivsan, Rama R, *Introduction to Formal languages Automata Theory and Computation*, 1st ed., India: Pearson education 2013
4. Peter Linz, Jones & Bartlett, *An Introduction to Formal Languages and Automata*, 6th ed., USA: Jones & Bartlett Learning 2017

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc21_cs83/preview, nptel video lecture on theory of computation by prof. raghunath Tewari, IIT Kanpur
2. https://onlinecourses.nptel.ac.in/noc21_cs07/preview, nptel video lecture on compiler design by prof. Santanu Chattopadhyay, IIT Kharagpur

Course Articulation Matrix (CAM):				U24CN301 AUTOMATA THEORY AND COMPILER 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	U24CN301.1	2	2	2	2	1	-	-	1	-	1	2	1	1
CO2	U24CN301.2	2	2	2	2	1	-	-	1	-	1	2	1	1
CO3	U24CN301.3	2	2	3	3	1	-	-	1	-	1	3	1	1
CO4	U24CN301.4	2	2	3	3	1	-	-	1	-	1	3	1	1
U24CN301		2	2	2.5	2.5	1			1		1	2.5	1	1
3-HIGH, 2-MEDIUM, 1-LOW														

OPERATING SYSTEMS			
Class: B.Tech.III-Semester		Branch: CSE(Networks)	
Course Code:	U24CN302	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:Systemmodel,Deadlockcharacterization,Methodsforhandlingdeadlocks,D eadlock 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

FileSystem:Fileconcept,Accessmethods,Directorystructure,Implementingfilesystems- Allocation methods, Free space management

MassStorageStructure:Overviewofmasstoragestructure,Diskstructure,Diskschedulin g, Disk management, Swap-space management

SystemProtection:Goals of protection, Principles of protection, Domain of protection

SelfLearningTopics(SLTs):Solidstatedisksandmagnetictapes(Text1:topics10.1.2,10.1.3),Filetypes andfilestructure(Text1:topics11.1.3,11.1.4),Practiceproblems(Text1:Prob10.11),AnExample: UNIX,Anexample:MULTICS(Text1:topics14.3.2,14.3.3)

Course Learning Outcomes (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, synchronizationalgorithmsbasedonnumberofresourceallocations

CO3: assess the deadlock problems based on mutual exclusion, hold& wait, no-preemption and circular wait conditions and memory management issues based on page 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, *Operating System Concepts*, 10th ed., Newyork: Wiley publications, ISBN-978-1-119-32091-3, 2018

Reference Book(s):

1. Ekta Walia, *Operating System Concepts*, 2nd ed., Delhi: Khanna Publishers, ISBN-10: 9789380016658, ISBN-13: 978-9380016658, 2019

2. Dhananjay M. Dhamdhere, *Operating Systems A Concept- Based Approach*, 1st ed., Newdelhi: McGraw Hill Education, ISBN-10: 0072957697 ISBN-13: 978-0072957693, 2008

3. William Stalling, *Operating Systems*, Maxwell, McMillan International Editions, ISBN 81-203-

1187-6,1992

Web and Video link:

<https://www.youtube.com/watch?v=jciGIvn7UfM&list=PLyqSpQzTE6M9SYI5RqwFYtFYab94gIpWk>; NPTEL Video Lecture on Introduction to Operating Systems By Prof. Chester Rebeiro, IIT Madras

Course Articulation Matrix (CAM):				U24CN302 OPERATING SYSTEMS										
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CN302.1	2	1	2	1	-	-	-	1	-	-	2	2	2
CO2	U24CN302.2	3	2	2	2	-	-	-	-	-	-	2	2	2
CO3	U24CN302.3	3	2	2	2	2	-	-	-	-	1	2	2	2
CO4	U24CN302.4	2	2	2	1	2	1	-	1	-	1	1	2	2
U24CN302		2.5	1.75	2	1.5	2	1	-	1	-	1	1.75	2	2
3-HIGH, 2-MEDIUM, 1-LOW														

ADVANCED DATA STRUCTURES			
Class: B.Tech.III–Semester		Branch: CSE (Networks)	
Course Code:	U24CN303	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: 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 a 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 "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, Mergesort, Bitonic generatorsort			
Searching: Fibonacci search, Interpolation search			
Self Learning Topics (SLTs): Linked representation of binomial heap (Reference 1: topic 12.2.1), operation 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; Graphs 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 - RunLength Encoding (<https://www.naukri.com/code360/library/run-length-encoding>)

LABORATORY COMPONENT

List of Experiments

1. Program to perform following binary tree operations
 - i) creation ii) insertion of a node iii) traversal using recursion
2. Program to perform following binary search tree traversal operations without recursion
 - i) in order ii) pre order iii) post order iv) spiral order
3. Program to perform following binary search tree operations.
 - i) creation ii) insertion of a node iii) deletion of a node
4. Program to implement AVL tree construction
5. Program to implement search and insert operations on Trie
6. Program to implement the following sorting techniques.
 - a) Heapsort
 - b) Quicksort
7. Program to implement the following sorting techniques.
 - a) Mergesort
 - b) Bitonic generatorsort
8. Program to implement the following search algorithms.
 - a) Fibonacci search
 - b) Interpolation search
9. Program to implement the following
 - i) Graph Representations ii) Topological sort
10. Program to implement the following graph traversal techniques.
 - i) Depth first search ii) Breadth first search
11. Program to implement following shortest path algorithms.
 - i) Kruskal's algorithm ii) Prim's algorithm
12. Program to implement the following string matching algorithms.
 - i) Knuth-morris-pratt algorithm
 - ii) Boyer-moore algorithm
 - iii) Rabin-karp algorithm

Textbook:

1. Debasis Samanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009 (Chapters 7 to 11)

Reference Book(s):

1. Reema Thareja, *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):

1. Advanced Data Structures 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: 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 manipulative algorithms to organise and retrieve the data

Course Articulation Matrix (CAM):				U24CN303 ADVANCED DATA STRUCTURES										
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CN303.1	2	2	2	1	1	-	1	1	-	1	1	2	2
CO2	U24CN303.2	2	2	2	1	1	-	1	1	-	1	1	2	2
CO3	U24CN303.3	2	2	2	2	1	-	1	1	-	1	1	2	2
CO4	U24CN303.4	2	2	2	2	1	-	1	1	-	1	1	2	2
CO5	U24CN303.5	1	1	3	2	1	-	1	1	-	1	1	1	1
CO6	U24CN303.6	1	1	3	2	1	-	1	1	-	1	1	1	1
CO7	U24CN303.7	1	1	3	2	1	-	1	1	-	1	1	1	1
CO8	U24CN303.8	1	1	3	2	1	-	1	1	-	1	1	1	1
U24CN303		1.5	1.5	2.5	1.75	1	-	1	1	-	1	1	1.5	1.5

COMPUTERNETWORKS			
Class:B.Tech.III–Semester		Branch:CSE(Networks)	
CourseCode:	U24CN304	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:computernetworksreference models,physicallayer componentsandnetwork switching			
LO2:datalinkandmediumaccesscontrolprotocols			
LO3:routingalgorithms,congestioncontrolalgorithmsandinternetworking			
LO4:transportandapplicationlayerprotocolsusedinthenetworks			
THEORYCOMPONENT			
UNIT-I			9Hrs
Introduction: Usesofcomputernetworks,Typesofcomputernetworks,Network technologyfromlocaltoglobal,ExamplesofNetworks-WiFi,Networkprotocols			
ReferenceModels: OSIreferencemodel,TCP/IPreferencemodel,			
PhysicalLayer: Transmissionmedia- Guidedtransmissionmedia,Wirelesstransmission,Using the Spectrum for transmission, Communication satellites, Multiplexing			
Switching: Circuitandpacketswitching			
<i>Self-LearningTopics(SLTs): AcritiqueoftheOSImodelandprotocols(Text:Topic1.6.3),Acritiqueof theTCP/IPreferencemodelandprotocols(Text:Topic1.6.4),Digitalmodulation(Text:Topic2.4.3)</i>			
UNIT-II			9Hrs
DataLinkLayer: Datalinklayerdesignissues,Error detectionandcorrection, Elementarydatalinkprotocols,Slidingwindowprotocols			
MediumAccessControlSubLayer: Channelallocationproblem,ALOHA,Carrierssense multipleaccess,Collisionfreeprotocols,Limitedcontentionprotocol,Ethernet-Switched ethernet, Fast Ethernet, Gigabit Ethernet, Data link layer switching, Wireless LANS - 802.11 Architecture and protocol stack, 802.11 Physical layer, 802.11 MAC Sublayer protocol, 802.11Frame structure, Services			
<i>Self-Learning Topics (SLTs):10-Gigabit Ethernet(Text: Topic 4.3.7), 40-and 100-Gigabit Ethernet(Text: Topic 4.3.8),Bluetooth(Text:4.5)Virtual LANs(Text: Topic 4.7.5)</i>			
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 Traffic Management at Network Layer: Congestion, Approaches to traffic management, Traffic aware routing, Admission control, Traffic throttling, Load shedding Internetworking: How networks differ, Connecting heterogeneous networks, Connecting endpoints across heterogeneous networks, Internetwork routing, Packet fragmentation Network Layer In The Internet: IP version 4 protocol, IP addresses, IP version 6 protocol, Internet control protocols, OSPF-Interior gateway routing protocol, BGP-Exterior gateway routing protocol, Internet multicasting Self-Learning Topics (SLTs): Quality of service and application QOE (Text: Topic 5.4), policy at the network layer (Text: Topic 5.8)	
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)	
LABORATORY COMPONENT	

List of Experiments

1. Practicing basic UNIX commands:
 - a) General Utility Commands: login, cal, date, who, uname, echo, passwd, pwd, exit
 - b) File and Directory Related Commands: ls, cd, mkdir, rmdir, cat, cp, rm, mv, wc, comm, diff, split, ln, touch, chmod, chown, chgrp
 - c) Filters: (Data Processing Commands): more, head, tail, cut, paste, sort, uniq, nl, tr
 - d) Communication Commands: write, mail, talk, finger, news
 - e) Pattern Searching Commands: grep, egrep, fgrep
2. Practicing the following examples:
 - a) Display the contents of file (filenames starting with _a' and ending with X)
 - b) Copy the contents of directory 1 to directory 2
 - c) Remove the all .c files from current directory
 - d) Merge the three different files into single one
 - e) Set given file as read only
 - f) Display the details of all users in an order they logged onto system (based on time) who are working on the system
 - g) Practicing the Vieditor commands
3. Write shell script for the following:
 - a) To check given number is even or odd
 - b) To perform all basic arithmetic operations using switch statement
 - c) To accept login name as command line argument and find out at how many terminals the user has logged in
 - d) To display IP address configuration details
 - e) To store PING status output into a file
 - f) To check port availability, service details, checking IP
 - [Note: Create script to display 3-Menu options, for selecting any of the operation]
 - g) To fetch and display Data center information from given domain name
4. Do the following related to computer networks:
 - a) Study of system administration, network administration and identify the responsibilities of a network engineer and network administrator
 - b) Draw symbols of devices and connectors used in network diagrams
 - c) Illustrate network diagram of different network topologies

- d) Illustratenetworkdiagramofdifferentnetworktypes(LAN,MAN,WAN)
- e) Illustratephysicalandlogicaldiagramsofacampusnetwork
- 5. Building aLANnetworkandchecknetworkconnectivity
 - a) Identify different Ethernet cable categories and write down the detailed specifications
 - b) Identifydifferentdevices,tools,connectorsusedinestablishingaphysicalLAN network
 - c) Performcrimpingoperationforstraightthroughcableandcrossovercable
 - d) Configurean IPaddressonacomputerandverifyusing command
 - e) CreateaLANnetworkusingtwocomputersandchecknetwork connectivity
- 6. a)Studyofsocketprogrammingandimplementasimplesocket
 - b) Developasocketprogramtoimplementdateandtimedisplayfromclienttoserver using TCP
 - c) Develop asocketprogram to implementdate and time display from clientto server using UDP
 - d) DevelopasocketprogramtoimplementchatapplicationusingTCP
 - e) DevelopaprogramforfiletransferusingTCP sockets
- 7. a)DevelopaprogramforerrordetectioncodeusingCRC
 - b) Developaprogramtoimplementstopandwaitprotocol
 - c) Developa programtoimplementslidingwindowprotocol
- 8. a)Developaprogramtoimplementdistancevectorrouting
 - b) DevelopaprogramforsimulatingARPandRARPprotocols
- 9. a)DevelopaprogramtofindsubnetmaskandnetworkidforgivenIPaddress
 - b) DevelopaprogramthatresolvesIPaddressfromagivendomainname
 - c) DevelopaprogramforSNMPapplication
- 10. ImplementingsimulationsusingNS3
 - a) StudyofnetworksimulationtoolNS3
 - b) createnodesandconnectnodes
- 11.ImplementingsimulationsusingNS3
 - a) simulateasimplenetwork
 - b) simulatetofindnumberofpacketsdroppedduetocongestion
- 12.DemonstrationofWiresharkpacketanalyzer tool.
 - a) CaptureaHTTPpacket
 - b) Viewthecapturedpacket
 - c) Applyfilters
 - d) Analyzethepacket

<u>Textbook:</u> 1. Andrew S. Tanenbaum, David J. Wetherall, Nick Feamster, <i>Computer Networks</i>, 6th ed., London: Pearson Education, ISBN- 978-9356063600, 2023
<u>Reference Book(s):</u> 1. William Stallings, <i>Data and Computer Communications</i>, 10th ed., Pearson Education, ISBN-9780137561704, 2014 2. Behrouz Forouzan, <i>Data Communication and Networking</i>, 5th ed., Tata McGraw Hill, ISBN-13978-1259064753, 2017 3. Larry L. Peterson, Bruce S. Davie, <i>Computer Networks</i>, 5th ed., Morgan Kaufmann Publishers, ISBN- 978-0123850591, 2011 4. James F. Kurose and Keith W. Ross, <i>Computer Networking a Top-Down Approach</i>, 7th ed., Pearson Education, ISBN-978-0133594140, 2016
<u>Web and Video link(s):</u> 1. https://www.youtube.com/watch?v=O--rkQNKqIs Video Lecture on Computer Networks and Internet Protocol, Multiplication by Prof Soumya Kanti Ghosh & Prof Sandip Chakraborty, NPTEL IIT Kharagpur
<u>Laboratory Manual (for laboratory component):</u> <i>Computer Networks Manual and Record Book, Department of CSE (Networks), KITSW</i>
<u>Course Learning Outcomes (COs):</u> <i>After completion of this course, the student should be able to, (based on cognitive skills acquired from theory component)</i> 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. <i>(based on psychomotor skills acquired from laboratory component)</i> CO5: apply basic UNIX/Linux commands, shell scripting, and text processing tools to perform file management, user operations, and automate system tasks CO6: implement and test basic networking concepts including network device identification, topology diagrams, LAN setup, IP configuration, and network connectivity CO7: develop socket-based applications using TCP and UDP protocols and simulate key data link and network layer protocols such as CRC, Stop-and-Wait, Sliding Window, and routing CO8: simulate and analyze network behaviour using tools like NS3 and Wireshark for understanding packet-level communication, protocol performance, and congestion handling

Course Articulation Matrix (CAM):					U24CN304 COMPUTER NETWORKS									
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CN304.1	3	2	-	1	2	2	1	1	1	1	1	3	2
CO2	U24CN304.2	3	3	-	2	3	1	1	1	1	1	1	3	3
CO3	U24CN304.3	2	3	-	1	3	2	1	1	1	1	2	3	3
CO4	U24CN304.4	2	2	-	1	2	2	1	1	1	1	2	3	2
CO5	U24CN304.5	3	3		2	2						2	3	
CO6	U24CN304.6	3	3		2	2						2	3	2
CO7	U24CN304.7	3	3	2	2	2						2	3	3
CO8	U24CN304.8	3	2		2	2						2	3	2
U24CN304		2.75	2.62	2	1.62	2.25	1.75	1	1	1	1	1.75	3	2.12
3-HIGH,2-MEDIUM,1-LOW														

OBJECTORIENTEDPROGRAMMINGTHROUGHJAVA			
Class:B.Tech.III-Semester		Branch:CSE(Networks)	
CourseCode:	U24CN305	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,dynamicmethoddispatch,interfacesandpackages			
LO4:usingI/O,exceptionhandling andmulti-threading			
THEORYCOMPONENT			
UNIT-I			9Hrs
ProgrammingParadigms:Proceduralprogramming,Modularprogramming,Object oriented programming (OOP), Generic programming			
Java Basics:The History and evolution of Java, An overview of java, Data types, Variablesand arrays, Operators, Control statements			
IntroducingClasses:Classfundamentals,Declaringobjects,Objectreferencevariable s, Introducing methods			
SelfLearningTopics(SLTs):LexicalIssueslikeKeywords,identifiers,Literalsandcomments (TextBook-Chapter2),Typeconversionsandcasting(TextBook-Chapter3)			
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): Overloading Vararg Methods, Varargs and Ambiguity (TextBook- Chapter: 7),Anonymous Inner classes(TextBook-Chapter-25)			
UNIT-III			9Hrs
Inheritance:Inheritancebasics,Typesofinheritance,Usingsuper,Methodoverriding,Ord er of constructors Execution, Dynamic method dispatch, Abstract classes, final with inheritance, 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): Accessing implementations through interface references, Default interfacemethods,Usestaticmethodsinaninterface,privateinterfacemethods(TextBook-Chapter-9)			
UNIT-IV			9Hrs

Using I/O: I/O basics, Reading, Writing and copying files using byte and character streams

Exception Handling: Fundamentals, Exception types, Uncaught exceptions, Using *try* and *catch*, Multiple catch clauses, Nested try statements, *throw*, *throws*, *finally*, *Creating your own exception sub classes*.

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

Self Learning Topics (SLTs): *try-with resource, multicatch, chained exception, precise-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 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 *equals()* 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>throw</i> an exception, and <i>finally</i> block 12. a) Develop a java program to demonstrate <i>read / write / copy</i> a file using <i>byte stream</i> b) Develop a java program to demonstrate <i>read / write / copy</i> 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:</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/106105191 NPTEL Video Lecture on Java Programming by Prof. Debasis Samanta, Professor of CSE, IIT Kharagpur.
<u>Laboratory Manual (for laboratory component):</u> 1. <i>Object Oriented Programming through java Manual and Record Book</i>, 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: 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

(based on psychomotor skills acquired from laboratory component)

CO5: develop and test java fundamental programs using operators, control structures and arrays

CO6: develop and test java programs using classes, constructors and various string concepts

CO7: build java programs on

inheritance, dynamic method dispatch, interfaces and packages

CO8: implement and test java programs using I/O, exception handling and multithreading concepts

Course Articulation Matrix (CAM):					U24CN305: 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	U24CN305.1	2	2	2	-	1	-	-	-	-	-	1	1	1
CO2	U24CN305.2	2	2	2	1	2	-	-	1	-	-	1	1	1
CO3	U24CN305.3	2	2	3	2	1	-	-	-	-	-	1	2	2
CO4	U24CN305.4	2	2	3	2	2	-	-	1	-	-	1	2	2
CO5	U24CN305.5	1	1	1	1	1	-	-	1	1	-	1	1	1
CO6	U24CN305.6	1	2	2	2	2	-	-	1	1	-	1	1	1
CO7	U24CN305.7	1	2	3	2	2	-	-	1	1	-	1	2	2
CO8	U24CN305.8	1	2	3	2	2	-	-	1	1	-	1	2	2
U24CN305		1.5	1.87	2.37	1.5	1.62	-	-	1	1	-	1	1.5	1.5

SOFTANDINTERPERSONALSKILLS			
Class: B.Tech.III-Semester&IV-Semester		Branch: Common to all Branches	
Course Code:	U24VA306B	Credits:	2
Hours/Week(L-T-P-O-E):	0-0-2-2-4	CIE	100%
Total Number of Teaching Hours:	24Hrs	ESE	-
Course Learning Objectives (LOs): <i>This course will develop students' knowledge in/on...</i> LO1: self and learning to overcome possible threats LO2: group dynamics to demonstrate respect for the opinions and beliefs of group LO3: preparation of effective presentations using visual aids LO4: professional communication, preparation of resume in line with industry expectations			
LIST OF ACTIVITIES Activity1 Reading Comprehension Activity2 Listening & Observation (Video Source) Activity3 Group Discussion Activity4 Presentations through PPTs Activity5 Self-Introduction Activity6 JAM Activity7 Email Etiquette Activity8 Resume Writing Activity9 Interview Etiquette Activity10 —My Career Plan SWOT Analysis			
Course Learning Outcomes (COs): <i>After completion of this course, the student should be able to...</i> CO1: introspect to convert strengths into opportunities, identify weaknesses, and bypass threats CO2: present views on various issues confidently in a group CO3: make effective PPT presentations CO4: prepare a professional resume, communicate effectively to attain better opportunities			
Textbook(s): 1. Krishna Mohan, Meera Benerji, <i>Developing Communications Skills</i> , 1st ed., New Delhi: Mcmillan Publications, 2005			

Course Articulation Matrix (CAM):			U24VA406B SOFT 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	PS O 1	PS O 2
CO1	U24VA406B.1	-	-	-	-	-	-	-	-	2	3	-	-	-
CO2	U24VA406B.2	-	-	-	-	-	-	-	2	3	3	-	-	-
CO3	U24VA406B.3	-	-	-	-	-	-	-	-	2	3	-	-	-

CO4	U24VA406B.4	-	-	-	-	-	-	-	1	2	3	-	-	-
U24VA406B		-	-	-	-	-	-	-	1.5	2.25	3	-	-	-
3-HIGH,2-MEDIUM,1-LOW														

PROGRAMMING SKILL DEVELOPMENT LAB-2			
Class: B.Tech.III-Semester		Branch: CSE(Networks)	
Course Code:	U24SE307	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: solid foundation in C programming, focusing on fundamental concepts LO2: analyse the effective time and space complexity and dynamic memory allocations LO3: stacks, linked list and various forms queues LO4: various sorting and hashing techniques.			
LABORATORY COMPONENT			
Sl.No	List of Experiments		
1	Implementation of arrays		
2	Implementation of searching techniques		
3	Implementation of sorting techniques		
4	Implementation of string operations		
5	Implementation of string operations		
6	Implementation of dynamic memory allocation function		
7	Implementation of linked list operations using c		
8	Implementation of stack operations using c		
9	Implementation of stack operations using c		
10	Implementation of queue operations		
11	Implementation of queue operations		
12	Implementation of hashing function		
Text Book: 1. Balagurusamy, E., <i>Programming in ANSI C</i> , 8th ed., India: McGraw Hill Education Private Limited 2022			
Reference Book(s): 1. Paul Deitel, Harvey Deitel, <i>C How to Program: With Case Studies Introducing Applications Programming and Systems Programming</i> , 9th ed., Pearson Education Limited, 2022 2. Brian W. Kernighan and Dennis Ritchie, <i>The C Programming Language</i> , 2nd ed., India: Pearson Education, 2015 3. Reema Thareja, <i>Programming in C</i> , 3rd ed., Oxford University Press, 2023 4. Yashavant Kanetkar, <i>Let Us C</i> , 19th ed., BPB Publications, 2022 5. A.K.Sharma, <i>Computer Fundamentals and Programming in C</i> , 2nd ed., Universities Press, 2018			
Course Learning Outcomes(Cos): After completion of this course, the students 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 CO2: analyze and debug C programs to identify errors and optimize code CO3: apply advanced programming concepts such as dynamic memory allocation CO4: design, implement and test real-world applications in C			

Course Articulation Matrix (CAM):						U24SE307 Programming Skill Development Lab1								
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	U24SE208.1	2	2	1	1	1	-	-	1	1	1	1	1	2
CO2	U24SE208.2	2	2	1	1	1	-	-	1	1	1	1	1	2
CO3	U24SE208.3	2	2	1	1	1	-	-	1	1	1	1	1	2
CO4	U24SE208.4	2	2	1	1	1	-	-	1	1	1	1	1	2
U24SE308		2	2	1	1	1	-	-	1	1	1	1	1	2
3-HIGH,2-MEDIUM,1-LOW														

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:	-	ESEMarks(%):	-			
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. 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). (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: 1. 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	U24MH101	U24PS102	U24EC103	U24CS104	U24EE105	U24CH106
	B24XX001	B24XX011	B24XX021	B24XX031	B24XX041	B24XX051
	B24XX002	B24XX012	B24XX022	B24XX032	B24XX042	B24XX052
	B24XX003	B24XX013	B24XX023	B24XX033	B24XX043	B24XX053
	B24XX004	B24XX014	B24XX024	B24XX034	B24XX044	B24XX054

	Students allotted to different courses	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
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2. 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.
3. 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:

4. The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
5. 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.
6. 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 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.*
- (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). As a sample rubrics for assessment and evaluation of practicum is as follows:

Note: It is mandatory for the student to appear for oral presentation and viva-voceto 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.
 1. What was the objective of the practicum assigned?
 2. What are the main responsibilities and tasks for practicum?
 3. What knowledge and skills from the course work are applied in the practicum?
 4. What new knowledge and skills are acquired during the practicum?
 5. In what ways, can the practicum be helpful for the professional career?
 6. What gaps are identified in your practicum work?
 7. 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

Literaturesurvey&Identification of research gaps	10marks
Workingmodel/process/softwarepackage/systemdeveloped	30marks
Reportwriting(subjectedtomaxof30%plagiarism)	20marks
OralpresentationwithPPTandviva-voce	20marks
(m) VideoPitch: 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 & pictures	20marks
Total	100marks

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...

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

SOCIALEMPOWERMENTACTIVITY/SELFACCOMPLISHMENTACTIVITY (SEA-III/SAA-III)			
Class:B.Tech.III-Semesters	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 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.

- (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 classwork 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.

Monitoring SEA/SAA:

- (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**, acquires skills and propose unique solutions to the real-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 practices 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). **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.
- xxii. **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
- xxiii. **Onfieldwork,**studentisexpectedtodemonstratesolidtimemanagement,

organisational and not 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 a 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, students 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	Mark 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:

- (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 demonstrations 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, students shall refer to text books and web resources relevant to the course selected. Plan for fieldwork/practice sessions in coordination with SEA/SAA coordinator

EXPERTTALKSERIES-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, a 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?

- (a) The answer is Industry Expert Talk Series (ETS). Through ETS, we invite industry experts in different fields to deliver talks and interact with students.
- (b) Through Industry expert talks students get to know so much more that textbooks don't explain.
- (c) 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.
- (d) 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
- (e) ETS helps students gain improved industry engagement for an easier transition into the

workplace, broader career progression opportunities and personal development.

- (f) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability enhancement category of courses**.
- (g) 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.
- (h) 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.
- (i) ETS enhances your learning in many ways for global opportunities for your career.
- (j) 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.
- (k) 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 / tests 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).
- (l) 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(<i>out of 10 quizzes</i>)	20marks
Report in prescribed format(<i>max 30% plagiarism</i>)	20marks
Total	100marks

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...

- 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

IV SEMESTER

Sl. No.	Category	CourseCode	CourseTitle	Lectures/week					Credits
				L	T	P	O	E	
1	BSC	U24MH401D	DiscreteMathematics and Probability, Statistics	2	1	-	4	7	3
2	PCC	U24CN402	DatabaseManagement Systems	2	1	2	5	10	4
3	PCC	U24CN403	Design and Analysis of Algorithms	2	1	-	4	7	3
4	PCC	U24CN404	Internetworksand Virtualization	2	1	2	5	10	4
5	PCC	U24CN405	PythonProgramming	2	1	2	5	10	4
6	VAC	U24VA406A	QuantitativeAptitudeand Logical Reasoning	2	-	-	2	4	2
7	SEC	U24SE407	Programming Skill DevelopmentLab-03	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409XXX	SEA-4/SAA-4	-	-	-	2	2	1
10	AEC	U24AE410	ExpertTalkSeries-4	-	-	-	1	1	1
11	VAC*	U24CH411*	EnvironmentalStudies*	2*	1*	-	2*	5*	3*
Total:				12	5	8	34	59	24
Summer/Inter-semBridgeCourses(ApprovedbyBoSandDean, AA):1weekto10days:1credittoeachBridgecourseunder Additional learning (will be printed on grade sheet)									

**ForLateralEntry Students Only*

***BranchSpecificMathematics:**

BranchSpecificMathematics(Pool-4)			
S. No.	Course Code	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	AnyotherCourseapprovedbyBoSchairandDean AA	-

@DeanAAwillallofthecoursesQALR(Stream-I),Softand
InterpersonalSkills(Stream-II),tothebranchesasperStream-I
andStream-II.

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):	2-1-0-1-7	CIE:	60%
Total Number of Teaching Hours:	36Hrs	ESE:	40%
Course Learning Objectives (LOs): This course will develop students' knowledge in/on... 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. <i>Self-Learning Topics (SLTs):</i> 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, Multi graphs 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., Baker, T. P., *Discrete Mathematics for Computer Scientists*, PHI 2/e, New Delhi, 1999
2. Grewal, B. S., *Higher Engineering Mathematics*, Khanna Publishers, 44/e, Delhi, 2017

Reference Book(s):

1. Gupta, S. C. and Kapoor, V. K., *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi, 2020
2. Tremblay, J. P., Manohar, R. *Discrete Mathematical Structures with Applications to Computer Science*, MGH New York, 1977.
3. Zohar Manna., *Mathematical Theory of Computation*, MGH, New Delhi
4. C. L. Liu, *Elements of Discrete mathematics*, 3/e, Tata Mc. Graw Hill, 2008

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc25_cs26/course: NPTEL Video Lecture on Discrete Mathematics by Prof. Sudarshan Iyengar, IIT Ropar
2. 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. S. Dharmaraja, IIT Delhi

Course Articulation Matrix (CAM):						U24MH401: 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	PS O 1	PS O 2
CO1	U24MH401.1	2	2	1	1	-	-	-	1	1	-	1		
CO2	U24MH401.2	2	2	1	1	-	-	-	1	1	-	1		

CO3	U24MH401.3	2	2	1	1	-	-	-	1	1	-	1		
CO4	U24MH401.4	2	2	1	1	-	-	-	1	1	-	1		
U24MH401D		2	2	1	1	-	-	-	1	1	-	1		

DATABASEMANAGEMENT SYSTEMS			
Class:B.Tech.IV–Semester		Branch:CSE(Netwoks)	
CourseCode:	U24CN402	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: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 thescene,Workersbehindthescene,AdvantagesofusingaDBMS			
Database System Concepts and Architecture:Data models, Schemas and instances, Three- schema architecture anddata independence, Database languages and interfaces, Classificationof database management systems			
Data Modeling using the Entity-Relationship(ER) Model:High-level conceptual data models for database design, Entity types, Entity sets, Attributes and keys, Relationships types, Relationship sets, Roles and structural constraints, Weak entity types, ER diagrams			
SelfLearningTopics(SLTs):Thedatabasesystemenvironment(Text1:Topic2.4),TheEnhancedEntity-Relationship(EER)Model(Text1:chapter8)			
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 Relational Database Design by ER-to-Relational Mapping: Relational database design using ER-to-Relational mapping, EER-to-Relational mapping Self Learning Topics (SLTs): Additional features of SQL (Text1: Topic 4.5), NoSQL databases (Text1: chapter 24.1)	
UNIT-III	9Hrs
The Relational Algebra and Relational Calculus: Basic relational algebra operations, Examples of queries in relational algebra, The tuple relational calculus 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 Self Learning Topics (SLTs): Domain relational calculus (Text1: Topic 6.7), Multivalued dependency and fourth normal form (Text1: Topic 15.6), Join dependencies and fifth normal form (Text1: Topic 15.7)	
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. 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)	
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

Textbook:

1. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems*, 6th ed., Pearson Education 2010

Reference book(s):

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, McGraw-Hill Education, 3rd ed., 2002
2. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, *Database System Concepts*, McGraw-Hill Education, 3rd ed., 1997

3. Thomas Connolly and Carolyn Begg, *Database Systems*, Pearson Education, 3rd ed., 2003

Web and Video link:

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

Laboratory Manual (for laboratory component):

Database Management Systems 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: 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

(based on psychomotor skills acquired from laboratory component)

CO5: design entity relationship diagrams, implement SQL queries to create and manipulate data in database by enforcing constraints

CO6: implement and test various database objects using SQL queries

CO7: implement and test 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 and test pre-compiled stored programs, run-time error checking, database

objects collection in PL/SQL high-level security using triggers

Course Articulation Matrix (CAM):					U24CN402 DATABASE MANAGEMENT SYSTEMS									
CO		PO 1	PO2	PO3	PO 4	PO5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	U24CN402.1	2	1	2	1	-	-	-	-	-	-	1	2	1
CO2	U24CN402.2	2	1	2	1	-	-	-	-	-	-	1	2	1
CO3	U24CN402.3	2	1	2	2	-	-	-	-	-	-	1	2	1
CO4	U24CN402.4	2	1	1	1	-	-	-	-	-	-	1	1	1
CO5	U24CN402.5	2	1	2	1	1	1	1	-	-	-	1	2	1
CO6	U24CN402.6	2	1	2	1	1	1	1	-	-	-	1	2	1
CO7	U24CN402.7	1	1	1	1	1	1	1	-	-	-	1	1	1
CO8	U24CN402.8	2	1	2	1	1	1	1	-	-	-	1	2	2
U24CN402		1.87	1	1.75	1.2	1	1	1	-	-	-	1	1.75	1.12

DESIGN AND ANALYSIS OF ALGORITHMS			
Class: B.Tech.IV-Semester		Branch: CSE(Networks)	
Course Code:	U24CN403	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: time and space complexity, asymptotic notations, set operations, problems solving with divide and conquer strategy LO2: greedy and backtracking method to solve computational problems LO3: principle of optimality and problems solving with dynamic programming method LO4: branch and bound method, classes of P, NP, NP-Hard and NP-Complete			
UNIT-I			9Hrs
Introduction: Algorithm analysis, Performance analysis, Space complexity and time complexity, Big_O notation, Omega notation, Theta notation, Different mathematical approaches for solving time complexity of algorithms Sets and Disjoint Set Union: Introduction, Union, Find operations Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication Self Learning Topics (SLTs): Weighted union, Collapsing find (Text: topics 2.5.2), Finding the maximum and minimum (Text: topic 3.4)			
UNIT-II			9Hrs
Greedy Method: General method, Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge patterns, Single source shortest paths Back Tracking: General method, N-Queens problem, Sum of subsets, Graph coloring Problem Self Learning Topics (SLTs): Huffman codes (Text: topic 4.8.1), Hamiltonian cycles (Text: topic 7.5)			
UNIT-III			9Hrs
Dynamic Programming: General method, Multi-stage graphs, All pair shortest paths, Single source shortest paths, Optimal binary search trees, String editing, 0/1 Knapsack problem, Reliability design problem, Travelling sales person problem Self Learning Topics (SLTs): 0/1 Knapsack problem using set representation (Text 1: topics 5.7), Bi connected components and DFS (Text 1: topics 6.4)			
UNIT-IV			9Hrs
Branch and Bound: General method, Least cost (LC) search, Control abstractions for LC search, 0/1 Knapsack problem-LC Branch and bound, FIFO Branch and bound, Travelling salesperson problem NP Hard and NP Complete Problems: Basic concepts - Nondeterministic algorithms, The classes NP hard and NP complete; COOK's theorem, NP hard graph problems - Clique decision problem, Node cover decision problem Self Learning Topics (SLTs): The 15-puzzle problem (Text: topic 8.1.1)			

Textbook:

1. E. Horowitz, S. Sahni, S. Rajasekaran, *Fundamentals of Computer Algorithms*, 2nd ed., Hyderabad: Universities Press, 2018(Chapters:1,2,3,4,5,6,7,8)

Reference Book(s):

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithms*, 3rd ed., New Delhi: Prentice-Hall of India, 2010
2. Gajendra Sharma, *Design and Analysis of Algorithms*, 4th ed., Rajput: Khanna Publishing, 2019
3. S. Sridhar, *Design and Analysis of Algorithms*, 3rd ed., UK: Oxford University Press, India, 2015
4. Mark Allen Weiss, *Data Structures and Algorithm Analysis in Java*, 3rd ed., New Delhi: Pearson, 2012
5. Rajiv Chopra, Shipra Raheja, *Design and Analysis of Algorithms*, New Delhi: New Age International Publishers, 2019

Web and Video link:**Course Learning Outcomes (COs):**

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

CO1: apply divide and conquer strategy to improve performance in searching and sorting techniques

CO2: apply greedy and backtracking methods to find optimal solutions

CO3: apply dynamic programming approach to solve optimal solution

CO4: analyze NP-Hard and NP-Complete problems to find appropriate solutions to improve the efficiency

Course Articulation Matrix (CAM):			U24CN403 DESIGN AND ANALYSIS OF ALGORITHMS											
CO		PO 1	PO2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO10	PO11	PSO1	PSO2
CO1	U24CN403.1	2	2	2	2	1	-	1	1	-	1	1	2	2
CO2	U24CN403.2	2	2	2	2	1	-	1	1	-	1	1	2	2
CO3	U24CN403.3	2	2	2	2	1	-	1	1	-	1	1	2	2
CO4	U24CN403.4	2	2	2	2	1	-	1	1	-	1	1	2	2
U24CN403		2	2	2	2	1	-	1	1	-	1	1	2	2
3-HIGH, 2-MEDIUM, 1-LOW														

INTERNETWORKS AND VIRTUALIZATION			
Class:B.Tech.IV-Semester		Branch:CSE(Networks)	
CourseCode:	U24CN404	Credits:	4
Hours/Week(L-T-P-O-E):	2-1-2-5-10	CIE:	60%
TotalNumberofTeachingHours:	60Hrs	ESE:	40%
Course Learning Objectives(LOs): Thiscoursewilldevelopstudents"knowledgein/on... LO1: internetworkingandinternetaddressing LO2: mappingofinternetaddresstophysicaladdressandworkingofinternetprotocol LO3: routingarchitecture,routingamongtheautonomousandwithintheautonomoussystem LO4: networkvirtualizationandnetworkmanagement			
THEORY COMPONENT			
UNIT-I		9Hrs	
IntroductionAndOverview: Themotivationforinternetworking,TheTCP/IPinternet,internet services,Historyandscope,IAB,RFC,Internetgrowth,NewversionofIP,IPv4andIPv6 relationship,IPv6migration,Dualstacksystems Internetworking Concept And Architectural Model: Introduction, Application-level interconnection,Network-levelinterconnection,Propertiesofinternet,Internetarchitecture, InterconnectionofmultiplenetworkswithIProuters,Theuser'sview InternetAddressing: Universalhostidentifiers,IPv4-Classfulladdressingscheme,Dotteddecimal notationusedwithIPv4,IPv4Subnetaddressing,Fixedlengthsubnets,Variablelengthsubnets, classlessaddressingscheme,addressblocksandCIDRslashnotation,CIDRblocksreservedfor privatenetworks,IPv6-Addressingscheme,Colonhexadecimalnotation,Addressspace assignment,EmbeddingIPv4addressinIPv6fortransition <i>Self-Learning Topics (SLTs): RFC(Text1: Topics: 1.7), Implementation of IPv4 subnets with masks (Text1: Topics: 5.8, 5.9), IPv6 Unicast address and /64(Text1: Topic: 5.18), Interface identifiers and MACAddresses(Text1:Topic:5.19),SpecialaddressesInternetaddressassignmentanddelegation ofauthority(Text1:Topic:5.23)</i>			
UNIT-II		9Hrs	
MappingInternetAdrestoPhysicalAddress: Introduction,Addressresolutionproblem,Types ofhardwareaddresses,Resolutionthroughdirectmapping,IPv4addresstranslationthrough dynamicbinding,AddressResolutionProtocol(ARP)-Cache,Refinements,Implementation, Encapsulationandidentification,Messageformat,AutomaticARPcacherevalidation.Reverse addressresolutionprotocol(RARP),ProxyARP InternetProtocolConnectionlessDatagramDelivery: Purposeandimportance,TheIPdatagram, Datagram:Typeofserviceanddifferentiatedservices,Encapsulation,Size,NetworkMTU, Fragmentation,Reassembly,Headerfields,Timetolive,Hop limit			

Internet Protocol Error And Control Messages (ICMP): Introduction, ICMP, Message delivery, Conceptual layering, Message format, ICMP message types used with IPv4 & IPv6, Testing destination reachability and status, Echo request and reply message format, Checksum computation and pseudo header, Reports of unreachable destinations, Error reports regarding fragmentation, Route change request from routers
Self-Learning Topics (SLTs): ARP Caches in Layer 3 Switches (Text1: Topic 6.16), IPv6 Neighbor discovery (Text1: Topic 6.18), Optional IP Items (Text1: Topic 7.14)

UNIT-III	9Hrs
Routing Architecture: Introduction, Origin of forwarding tables, Forwarding with partial information, Original Internet architecture and cores, Peer backbones, Automatic route propagation and a FIB, Distance-Vector (Bellman-Ford) routing, Link state (SPF) Routing. Routing Among Autonomous Systems: Introduction, Scope of route update protocol, Practical limit on group size, Autonomous system concept, Exterior gateway protocols and reachability, Border Gateway Protocol (BGP)- Characteristics, Functionality and message types, Message header, OPEN message, UPDATE message Routing Within an Autonomous System: Introduction, Static Vs Dynamic routes, Routing information Protocol (RIP), Slow convergence problem, RIP message format, Fields in a RIP message, RIP for IPv6 (RIPng), Open Shortest Path First (OSPF)- OSPFv2 Message formats, OSPFv3 to support IPv6, IS-IS route propagation protocol <i>Self-Learning Topics (SLTs): BGP KEEPALIVE Message (Text1: Topic 13.14), BGP Notification Message (Text1: Topic 13.18), Delay metric HELLO (Text1: Topic 14.10)</i>	
UNIT-IV	9Hrs
Network Virtualization: Virtualization, Virtual Private Network (VPN), VPN Tunneling and IP- in-IP Encapsulation, VPN Addressing and Forwarding, Network Address Translation (NAT), Translation table creation, Variant of NAT, Interaction between NAT and ICMP, Interaction between NAT and Applications, Overlay networks Network Management: Introduction, The level of management protocols, Architectural model, Protocol framework, Examples of MIB variables, Structure of management information, Structure and representation of MIB object names, MIB changes and additions for IPv6, Simple network management protocol (SNMP), SNMP Message format, An example encoded SNMP message, Security in SNMPv3. <i>Self-Learning Topics (SLTs): Extending VPN to individual hosts (Text1: Topic 19.6), Using a VPN with private address (Text1: Topic 19.7), NAT in different OS (Text1: Topic 19.16), Formal definitions using ASN.1 (Text1: Topic 27.7)</i>	
LABORATORY COMPONENT	

List of Experiments

1. (a) Installing and configuring network simulation tool—Cisco Packet Tracer||
(b) Explore Packet Tracer tool Real-Time mode
(c) Explore physical and logical workspace
 2. (a) Identifying different networking devices Hub, Switch, Router
(b) Configure IPv4 address on a computer (IP, Subnet, Gateway, Primary DNS, Secondary DNS)
(c) Implement basic network commands (1) Ping (2) Traceroute (3) nslookup (4) Pathping
 3. Design a simple LAN network with two PCs PC1 and PC2, connect with a switch and check network connectivity between PC1 and PC2
 4. Visualize and analyze a PDU in a network with Packet Tracer
 5. ARP analysis over a device connected to internet
 6. Design a network and analyze ICMP message
 7. Design and configure a network with static route
 8. Design and configure a network using DVRP RIP
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9. Design and configure a network using OSPF link state routing protocol 10. Design and configure a VPN 11. Design and configure a NAT network 12. Analyze SNMP messages in a network
Textbook: 1. Douglas E. Comer, <i>Internetworking with TCP/IP Vol I: Principles, Protocols, and Architecture</i> , 6th ed., United States of America: Pearson Education, 2014
Reference Book(s): 1. James F. Kurose, Keith W. Ross, <i>Computer networking, A Top Down approach</i> , 6th ed., United States of America: Pearson Education, 2013 2. Shah, Ambawade, Mehra, Agarwal, <i>Advanced Computer Networks</i> , revised ed., New Delhi, Dreamtech, Press, 2011
Laboratory Manual: 1. <i>Internetworks Laboratory Manual</i> , Dept. of CSE (Networks), KIT Warangal
Course Learning Outcomes (COs): After completion of this course, the students should be able to, <u>(based on cognitive skills acquired from theory component)</u> CO1: design subnets in LAN using CIDR, VLSM CO2: identify the functions of internet protocol and ICMP CO3: develop network routing architecture with routing algorithms CO4: design of a VPN, NAT and use of network management protocols in managing the networks <u>(based on psychomotor skills acquired from laboratory component)</u> CO5: identify network devices, install and configure network simulation tool CO6: analyze PDU, ARP, ICMP in a network with Packet Tracer CO7: develop a network with static route, DVR RIP and OSPF link state routing protocol CO8: develop a VPN, NAT in a network, SNMP messages in network management

Course Articulation Matrix (CAM):				U24CN404: INTERNETWORKS AND VIRTUALIZATION										
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CN404.1	2	1	1	1	-	-	-	1	1	1	2	1	2
CO2	U24CN404.2	2	2	2	2	-	-	-	1	1	1	2	2	2
CO3	U24CN404.3	2	2	2	3	-	-	-	1	1	1	2	2	2
CO	U24CN404	2	2	2	2	-	-	-	1	1	1	2	2	2

4	.4													
CO 5	U24CN404 .5	2	2	1	1	3	-	-	1	1	1	2	1	2
CO 6	U24CN404 .6	2	2	2	2	3	-	-	1	1	1	2	2	2
CO 7	U24CN404 .7	2	2	3	2	3	-	-	1	1	1	2	2	2
CO 8	U24CN404 .8	2	2	3	2	3	-	-	1	1	1	2	2	2
U24CN404		2	2	2	1.8	3	-	-	1	1	1	2	2	2.5

PYTHON PROGRAMMING			
Class: B.Tech.IV-Semester		Branch: CSE(Networks)	
Course Code:	U24CN405	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: basics of python programming, operators, control statements & functions in Python LO2: namespaces, modules, collections, string handling methods & regular expressions LO3: object oriented programming, inheritance, polymorphism, files & database connectivity using SQLite LO4: numpy, pandas and matplotlib libraries of python			
THEORY COMPONENT			
UNIT-I		9Hrs	
Introduction: Features of Python, The future of Python, Writing and executing python programs Python Preliminaries: Literal constants, Variables and identifiers, Datatypes, Input operation, Comments, Reserved words, Indentation, Operators, Expressions in Python, Type conversion Decision Control Statements: Selection/ Conditional branching statements, Loop structures / iterative statements, Nested loop, The continue statement, the pass statement, The else statement used with loops Functions: Function definition, Function call, Variable scope and lifetime, The return statement , Advances in defining in functions, Lambda functions, Recursive functions Self Learning Topics (SLTs): <i>More on Defining Functions (Text 1: chapter 5)</i>			
UNIT-II		9Hrs	
Modules and Name Spaces: The from...import statement, Naming module, The dir() function, Packages in Python, Standard library modules, Globals (), locals(), and reload(), Function redefinition Python Strings: String operations, String formatting operator, Built-in string methods and functions, Slice operation, ord() and Chr() Functions, In and not in operators, Comparing strings, Regular expressions and meta characters Data Structures: Lists, Tuples, Sets, Dictionaries Self Learning Topics (SLTs): <i>List Comprehension and Tuples, Variable-length Argument Tuples, The zip() Function. (Text 1: chapter 8)</i>			
UNIT-III		9Hrs	
Python Object Oriented Programming: Classes and objects, Class method and self-argument, The init() method, Class variables and object variables, The del() method, Public and private data members, Private methods, Calling a class method from another class method, Built-in class attributes, Class methods, Static methods, Inheritance and polymorphism, Operator overloading Error and Exception handling: Introduction to Errors and Exceptions, Handling Exceptions, Multiple Except Blocks, Built-in and User-defined Exceptions, The finally Block File Handling: Opening and closing files, Reading and writing files, File positions, Renaming and deleting files, Directory methods Database Connectivity: SQLite, Creating a database table, Insert and retrieve data from database Self Learning Topics (SLTs): <i>Abstract classes and interfaces, Garbage Collection (Text 1: chapter 9), Multiple Exceptions in a Single Block, Serialization, Database browser for SQLite (Text 1: chapter 12)</i>			

UNIT-IV	9Hrs
NumPy: ThebasicsofNumPyarrays,Arrayindexing,Arrayslicing,Reshapingofarray,Concatenationandsplittingarrays,IntroducingUFuncs DataManipulationwithPandas: InstallingandusingPandas,IntroducingPandasobjects,Data indexingandselection,Handlingmissingdata,Combiningdatasets,Mergeandjoin,Aggregation andgrouping	
VisualizationwithMatplotlib: ImportingMatplotlib,Savingfigurestofiles,Simplelineplots, Simple scatter plots, Histograms, Binnings, and density SelfLearningTopics(SLTs): Plottingdataonmaps,Pythonadvancedlibrariesintroduction:Scikit-learn, Seaborn,SciPy	
LABORATORYCOMPONENT	

List of Experiments

1. Demonstrate the setup and basic usage of Python by completing the following tasks:
 - a. Installation of Python and verifying PATH environment variable
 - b. Running instructions in Interactive interpreter and a python script
 - c. Running python scripts in IDLE
 - d. Write a program to demonstrate importance of indentations. Purposefully raise indentation error and correct it
 - e. Write a program to take input text as command line argument and display it on screen
2. Develop a series of Python programs to perform basic mathematical and logical operations using conditional statements, loops, and command line arguments.
 - a. Write a program that takes 2 numbers as command line arguments and prints their sum
 - b. Write a program to check whether the given number is even or odd
 - c. Write a program to calculate GCD of 2 numbers
 - d. Write a program to find Exponentiation (Power) of a number
 - e. Write a program to find given year is leap year or not
 - f. Write a program to develop a simple calculator
3. Design and implement a series of Python programs that demonstrate the use of loops, recursion, and control structures to solve basic mathematical problems. Perform the following tasks:
 - a. Write a program to find the Factorial of a given number
 - b. Write a program to evaluate the Fibonacci series for a given number `_n'`
 - c. Write a program to find the Armstrong for a given number
 - d. Write a program to find sum of N numbers
 - e. Write a program to take a number as input, and print countdown from that number to zero (use while loop)
 - f. Write a program to find circulating `_n'` values
4. Demonstrate the concept of modular programming in Python by implementing and using modules and packages.
 - a. Write a program to implement a module using import statement (Use python source file as a Module and implement import statement another python source files)
 - b. Write a program to implement from, import statement
 - c. Write a program to implement `dir()` function
 - d. Write a program to demonstrate packages in python
5. Write a Python program to perform various string operations and manipulations.
6. Develop a Python program to demonstrate various string operations and list manipulations using functions and built-in methods.
7. Write Python programs to explore and demonstrate the use of advanced data types and pattern matching.
 - a. Write a program to demonstrate tuple, set and related functions

- b. Write a program to demonstrate dictionaries
- c. Write a program to demonstrate RegEx functions

- d. Write a program to demonstrate regular expressions using Metacharacters
8. Develop Python program to demonstrate object-oriented programming concepts and file handling operations:
 - a. Demonstrate the creation and usage of **classes and objects**
 - b. Show the difference and usage of **class methods and static methods**
 - c. Implement **inheritance** to show how one class can derive from another
 - d. Perform file handling operations using python
9. Write Python program to demonstrate database connectivity using SQLite
 - a. Install and verify SQLite Connector for Python
 - b. To connect check SQLite Database connectivity
 - c. To retrieve and display data from a table
 - d. To insert data into a table
 - e. To delete rows in a table
10. Write a Python program to demonstrate the basic functionalities of NumPy
11. Write a Python program to demonstrate basic operations using the Pandas library
12. Write a Python program to demonstrate basic plotting using the Matplotlib library

Textbook(s):

1. Reema Thareja, *Python Programming using problem solving approach*, New Delhi: Oxford University Press, 2017. (Chapter 1 to 7)
2. Jake VanderPlas, *Python Data Science Handbook-Essential Tools for Working with Data*, California: O'Reilly Media Inc., 2016. (Chapter 2 to 4)

Reference Book(s):

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

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc23_cs99/ NPTEL Video Lecture on Python For Data Science by B. y Prof. Ragunathan Rengasamy, IIT Madras

https://onlinecourses.nptel.ac.in/noc25_cs17/ NPTEL Video Lecture on Data Analytics with Python By Prof. A Ramesh, IIT Roorkee

https://onlinecourses.nptel.ac.in/noc25_cs69/ NPTEL Video Lecture on The Joy of Computing using Python By Prof. Sudarshan Iyengar, IIT Ropar

Laboratory Manual (for laboratory component):

Python Programming 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 theory component)*

CO1: make use of syntax, control statements, operators and functions for writing basic python programs

CO2: design programs using collections, namespaces, packages, strings & regular expressions

CO3: develop python programs using object oriented programming principles, files & database handling mechanisms

CO4: build visualization graphs with Matplotlib and adapt packages like Numpy, Pandas for statistical analysis & data handling

(based on psychomotor skills acquired from laboratory component)

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

CO6: implement and test namespaces, packages, string handling methods, regular expressions, and data structures in Python

CO7: build new classes, create objects, perform operations on files and implement database operations in Python

CO8: design visualization graphs

with Matplotlib and experiment with Numpy & Pandas libraries for data analysis programs in Python

Course Articulation Matrix (CAM)		U24CN405: PYTHON PROGRAMMING												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CN405.1	1	1	1	1	2	-	-	1	1	-	1	2	1
CO2	U24CN405.2	1	1	2	1	2	-	-	1	1	-	1	2	1
CO3	U24CN405.3	2	2	2	2	3	-	-	1	1	-	1	2	2
CO4	U24CN405.4	2	2	2	2	3	-	-	1	1	-	1	2	2
CO5	U24CN405.5	2	2	2	2	2	-	-	2	1	-	1	2	2
CO6	U24CN405.6	2	2	2	2	2	-	-	2	1	-	1	2	2
CO7	U24CN405.7	2	2	2	2	3	-	-	2	1	-	1	2	2
CO8	U24CN405.8	2	2	2	2	3	-	-	2	1	-	1	2	2
U24CN405		1.75	1.75	1.75	1.87	1.75	-	-	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:	48Hrs	ESE	40%
Course Learning Objectives (LOs): <i>This course will develop students "knowledge in/on...</i> LO1: quantitative aptitude & problem-solving skills LO2: computation of abstract quantitative information LO3: application of basic mathematics skills & critical thinking to draw conclusions LO4: evaluation of validity & possible biases in arguments presented in authentic contexts			
UNIT-I			12Hrs
Quantitative Aptitude-I: Numbers system, Averages, Percentages, Ratios & proportions, Time, Speed & distance, Time and work			
UNIT-II			12Hrs
Quantitative Aptitude-II: Simple interest, Compound interest, Profit & loss, Ages, Permutations & Combinations, Probability			
UNIT-III			12Hrs
Logical Reasoning-I: Series completion, Analogy, Coding and decoding, Blood relations, Number, Ranking & Time sequence test, Linear & Circular arrangements			
UNIT-IV			12Hrs
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: solve arithmetic relationships and interpret data using mathematical models CO2: apply the concepts of simple interest, compound interest, profit & loss, ages, permutations & probability to real world situations. CO3: compare & categorize the quantitative information for making decisions. CO4: evaluate the validity & possible biases in arguments presented in authentic contexts logically & sensibly			
Textbook(s): 1. RS Agarwal , <i>Quantitative Aptitude for Competitive Examinations</i> , 3rd ed. New Delhi :S. Chand Publications, 2019. (Chapters 1,6,7,8,10,11,12,15,17,21,22,30,31) 2. 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)			
Reference Book(s): 1. Dinesh Khattar , <i>Quantitative Aptitude for Competitive Examinations</i> , New Delhi: Pearson India, 2019. 2. Nishit K Sinha , <i>Reasoning for Competitive Examinations</i> , New Delhi: Pearson India, 2019 3. R.N.Thakur , <i>General Intelligence and Reasoning</i> , New Delhi: McGraw Hill Education, 2017			

Course Articulation Matrix (CAM):				U24VA406 AQUANTITATIVE APTITUDE & 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	PO 12	PSO 1	PSO 2
CO1	U24VA406.1	1	2	-	1	-	-	-	-	-	-	-	1	1	-
CO2	U24VA406.2	1	2	-	1	-	-	-	-	-	-	-	1	1	-
CO3	U24VA406.3	-	1	-	2	-	2	-	-	-	-	-	1	1	-
CO4	U24VA406.4	-	1	-	2	-	2	-	-	-	-	-	1	1	-
U24VA406		1	1.5	-	1.5	-	2	-	-	-	-	-	1	1	-
3-HIGH, 2-MEDIUM, 1-LOW															

PROGRAMMING SKILL DEVELOPMENT LAB-3			
Class: B.Tech.IV-Semester		Branch: CSE(Networks)	
Course Code:	U24SE407	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: operators, control statements, loops in java programming LO2: arrays, strings, functions and recursion LO3: exceptions and multithreading LO4: trees, searching and sorting			
LABORATORY COMPONENT			
Sl.N O	List of Experiments		
1	Implementation of operators and data types using java.		
2	Implementation of control statements using java.		
3	Implementation of loops using java.		
4	Implementation of simple arrays and strings using java.		
5	Implementation of arrays and strings using java.		
6	Implementation of functions and recursion using java.		
7	Implementation of exceptions using java.		
8	Implementation of multithreading using java.		
9	Implementation of binary tree using java.		
10	Implementation of binary search tree using java.		
11	Implementation of spanning tree using java.		
12	Implementation of searching and sorting using java.		
Textbook: 1. Herbert Schildt, Java The Complete Reference, 9th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd, 2014 2. Debasis Samanta, Classic Data Structures, 2nd ed., New Delhi: Prentice Hall India, 2009 (Chapters 3 to 8, 10, 11)			
Reference Book(s): 1. Kathy Sierra, Bert Bates, Head First Java, 2nd ed., Boston: O'Reilly Publications, 2013 2. Uttam K. Roy, Advanced JAVA Programming, 1st ed., England: Oxford Publication, 2013 3. Balaguruswamy, Programming with Java: A Primer, 6th ed., New Delhi: McGraw Hill Education India Pvt. Ltd, 2019 4. Tanweer Alam, Internet and Java Programming, 1st ed., New Delhi: Khanna Publishing House, 2010 5. Reema Thareja, Data Structures Using C, 2nd ed., Noida: Oxford University Press, 2014 6. E Balagurusamy, Data Structure Using C, 1st ed. New Delhi: McGraw Hill Education, 2017 7. Richard F. Gilberg, Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd ed., Noida: Cengage Learning, 2007 8. Yashavant P. Kanetkar, Data Structure Through C, 2nd ed., New Delhi: BPB Publications,			

2003

Course Learning Outcomes (COs):

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

... (based on psychomotor skills acquired from laboratory component): **CO1:** implement programs on operators and control structures.

CO2: develop programs using arrays, strings, exception handling and multithreading

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

COURSE ARTICULATION MATRIX(CAM):		PO 1	PO 2	PO 3	P O 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2
CO1	U24SE407.1	1	1	1	1	-	-	-	-	-	1	-	1	2
CO2	U24SE407.2	2	2	2	1	-	-	-	-	-	1	2	2	3
CO3	U24SE407.3	2	2	2	1	-	-	-	-	-	1	2	2	3
CO4	U24SE407.4	2	2	2	1	-	-	-	-	-	1	2	2	3
U24SE407		2	1.75	1.75	1.75	1	-	-	-	-	-	1	2	1.75

PRACTICUM-4						
Class:B.Tech.IV-Semester	Branch:Common to all branches					
Course Code:	U24EL407	Credits:	1			
Hours/Week(L-T-P-O-E):	0-0-0-4-4	CIEMarks(%):	100			
Total Number of Teaching Hours:	-	ESEMarks(%):	-			
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).						
(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: 1. 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 groups of students to the different course faculty of this section, as shown below.						
Course	U24MH101	U24PS102	U24EC103	U24CS104	U24EE105	U24CH106
Students	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

	allotted to different courses	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

2. 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.
3. 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 :

Note:

4. The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
5. 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.
6. 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

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

knowledge, skills & qualities acquired by the student during the practicum course
xvii). A sample rubrics for assessment and evaluation of practicum is as follows:

Note: It is mandatory for the student to appear for oral presentation and viva-voceto 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.
 1. What was the objective of the practicum assigned?
 2. What are the main responsibilities and tasks for practicum?
 3. What knowledge and skills from the course work are applied in the practicum?
 4. What new knowledge and skills are acquired during the practicum?
 5. In what ways, can the practicum be helpful for the professional career?
 6. What gaps are identified in your practicum work?
 7. 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	10marks
Literature survey & identification of research gaps	30marks
Working model / process / software package / system developed	20marks
Report writing (subjected to max of 30% plagiarism)	20marks
Oral presentation with PPT and viva-voce	20marks
Videopitch	20marks
Total	100marks

(ii) 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 videopitch on practicum and make an effective oral presentation using PPTs

SOCIALEMPOWERMENTACTIVITY/SELFACCOMPLISHMENTACTIVITY (SEA-IV/SAA-IV)			
Class:B.Tech.IV-Semesters	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 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,acquireskillsandproposeuniquesolutionstothereal-lifeproblems

(c) **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 to seeknew opportunities in theirpersonal and professional life.
- ix. For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions undersupervision of expert/guruare to be plannedandexecuted to acquire the benchmark skills to be demonstrated.

(d) **Fieldwork:**Fieldworkisanessentialcomponentoflearningforgainingreal-life experiences.Inadditiontoknowledgeacquisition&skilling,studenthastotakeup fieldworkonthechosenactivity,aspartofSEA/SAAcourse.

- 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 /Renowned personalities:

- (a). **Incaseofsociallyrelevantproblems/activitiesofSEA/SAA:**Eminen
t 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.

- xxxvi. **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
- xxxvii. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork
- xxxviii. **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

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

xl. Students 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.

xl.ii. **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 a 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 report, in the prescribed format, to the faculty counsellor for award of grade.

(f) **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.

(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:

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
- successfully demonstrates/presents the skills attained at the end of course as per the schedule notified by the nodal centre, **and**
 - 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 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 assessment competencies in making marks documented report and an effective oral presentation with PPTs portraying Goal setting, Planning & knowledge, skills, qualities acquired through 20 fieldwork/practical sessions and social impact of the course learning

Text/Reference book(s)	Fieldwork	40	Nodal centre
For knowledge acquisition, students shall refer to text books and web resources relevant to the course selected by the faculty for presentation sessions in coordination with SEA/SAA	20	Nodal centre	
Reports submission	20	Faculty counsellor	
Total	100	-	

EXPERTTALKSERIES-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:	-	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, a 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?

- (a) The answer is **Industry Expert Talk Series (ETS)**. Through ETS, we invite industry experts in different fields to deliver talks and interact with students.
- (b) Through Industry expert talks students get to know so much more that textbooks don't explain.
- (c) 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.
- (d) 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
- (e) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.
- (f) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability**

enhancement category of courses.

- (g) 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.
- (h) 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.
- (i) ETS enhances your learning in many ways for global opportunities for your career.
- (j) 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.
- (k) 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 / tests 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 student 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).
- (l) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

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...

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

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(N))

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

Exit Option to Qualify UG Diploma in CSE(N) : Any Two (02) Courses during the 2-Months internship									
S.N.O.	Category	Course Code	Course Title	L	T	P	O	E	C
2	PCC	U24CN412X	Artificial Intelligence and Machine Learning	2	-	2	-	4	3
3	PCC	U24CN413X	Cryptography and Network Security	2	-	2	-	4	3
4	PCC	U24CN414X	Internet of Things	2	-	2	-	4	3
5	PCC	U24CN415X	Any other course approved by BoS Chair and Dean AA	2	-	2	-	4	3

(OR)

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

Exit Option to Qualify UG Diploma in CSE(N) : Any Two (02) Skill-based Courses:-									
S.N.O.	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-app-development	-	-	-	6	6	3

			droid-course/						
5	SEC	U24SE416X	Anyotherskillbasedcourse ApprovedbyBoSChairand DeanAA	-	-	-	6	6	3

B. TechHonourswithResearch:

Students opting for B.Tech Honours with Research, shall undergo a 2-Month Mandatory ResearchInternship-I(5Credits)atrespecteddepartmentduringthesummervacation afterIV Semester.

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING			
Class: B.Tech.IV-Semester		Branch: CSE(Networks)	
Course Code:	U24CN412X	Credits:	4
Hours/Week (L-T-P-O-E):	2-0-2-0-4	CIE:	60%
Total Number of Teaching Hours:	32Hrs	ESE:	40%
Course Learning Objectives (LOs): This course will develop students' knowledge in/on...			
LO1: basic concepts of Artificial Intelligence and its application in real-world problems solving LO2: machine learning techniques to supervised and unsupervised learning problems LO3: machine learning models using dimensionality reduction and regularization techniques LO4: deep learning models using neural networks			
THEORY COMPONENT			
UNIT-I			4Hrs
Introduction to Artificial Intelligence: History, Evolution, and applications Types of AI: Narrow, General, Strong AI Intelligent agents: Structure of AI, Learning agent Game Playing: Minimax algorithm and Alpha-Beta pruning Basic Knowledge Representation Techniques: Propositional & predicate logic			
UNIT-II			4Hrs
Introduction to Machine Learning: Relationship between AI, ML, and DL Types of Learning: Supervised, Unsupervised, Reinforcement (intro only) Supervised Learning Algorithms: Linear regression, Logistic regression, K-Nearest Neighbours (KNN), Decision trees Model Evaluation: Confusion matrix, Accuracy, Precision, Recall, F1 score, ROC curve and AUC			
UNIT-III			4Hrs
Unsupervised Learning: K-Means clustering, Hierarchical clustering Dimensionality Reduction: Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA) Ensemble Learning: boosting, bagging, random forests			
UNIT-IV			9Hrs
Artificial neural networks: Perceptron model, Activation functions (ReLU, Sigmoid, Tanh), Forward and backward propagation Deep Neural Networks: Multi-layer Perceptrons (MLPs), error propagation, Reinforcement learning overview, examples scenarios, Markov decision processes, value functions, SARSA, Q-learning, applications of reinforcement learning			
LABORATORY COMPONENT			

List of Experiments

1. Handle missing values using mean/median imputation in a dataset
2. Apply one-hot encoding to categorical features in a dataset
3. Perform feature scaling (normalization or standardization) on a dataset
4. Implement simple linear regression to predict a target variable (e.g., house prices)
5. Implement logistic regression for binary classification (e.g., email spam detection)
6. Implement KNN algorithm for classification on a dataset (e.g., IRIS dataset)
7. Implement Naïve Bayes for text classification (e.g., spam vs. not spam)
8. Implement SVM with a linear kernel for classification
9. Implement K-means clustering on an unlabeled dataset (e.g., customer segmentation)

10. Apply PCA for dimensionality reduction on a high-dimensional dataset

Textbook(s):

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd ed., Pearson publisher (Chapter 1 to 8), 2010
2. Tom M. Mitchell, *Machine Learning*, 1st ed., New Delhi: McGraw-Hill Education, (Chapter 1 to 10, 13) 2017

Reference Book(s):

1. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press, 4th edition, 2020, Massachusetts.
- Kathy Sierra, Bert Bates, *Head First Java*, 2nd edition, Boston: O'Reilly Publications, 2005
2. Harvey Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, 2nd edition, California: O'Reilly Media, 2019
3. Shai Shalev-Shwartz and Shai Ben-David, *Understanding Machine Learning: From Theory to Algorithms*, 1st edition, New York: Cambridge University Press, 2014

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc19_cs53NPTELVideoLectureonMachineLearningbyProf.BalaRavindran,ProfessorofCSE,IITMadras.

Laboratory Manual (for laboratory component):

1. *Artificial Intelligence & Machine Learning 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: understand basic AI concepts, intelligent agents and game play in

g CO2: apply supervised and algorithms with data preprocessing

CO3: apply unsupervised algorithms, ensemble methods and dimensionality reduction

CO4: analyze artificial neural networks and deep neural networks

based on psychomotor skills acquired from laboratory component)

CO5: apply data preprocessing techniques

CO6: implement and test supervised learning algorithms (Linear Regression, Logistic Regression)

CO7: implement and test unsupervised learning algorithms (KNN, Naive Bayes and SVM)

CO8: implement and test K-Means and PCA

Course Articulation Matrix(CAM):					U24CN412X:ARTIFICIALINTELLIGENCE&MACHINE LEARNING									
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	U24CN412 X.1	2	2	2	-	1	-	-	-	-	-	1	1	1
CO2	U24CN412 X.2	2	2	2	1	2	-	-	1	-	-	1	1	1
CO3	U24CN412 X.3	2	2	3	2	2	-	-	-	-	-	1	2	2
CO4	U24CN412 X.4	2	2	3	2	2	-	-	1	-	-	1	2	2

Course Articulation Matrix(CAM):					U24CN412X:ARTIFICIALINTELLIGENCE&MACHINE LEARNING									
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
CO5	U24CN412 X.5	2	2	1	1	2	-	-	1	1	-	1	1	1
CO6	U24CN412 X.6	2	2	2	2	2	-	-	1	1	-	1	1	1
CO7	U24CN412 X.7	2	2	3	2	2	-	-	1	1	-	1	2	2
CO8	U24CN412 X.8	2	2	3	2	2	-	-	1	1	-	1	2	2
U24CN412X		2	2	2.37	1.5	1.87	-	-	1	1	-	1	1.5	1.5

CRYPTOGRAPHYANDNETWORKSECURITY			
Class:B.Tech.IV–Semester(ExitCourse)		Branch:CSE(Networks)	
CourseCode:	U24CN413X	Credits:	3
Hours/Week(L-T-P-O-E):	2-0-2-0-4	CIE:	60%
TotalNumberofTeachingHours:	32Hrs	ESE:	40%
CourseLearningObjectives(LOs):			
Thiscoursewilldevelopstudents“knowledgein/on...			
LO1:basicconcepts ofnetwork security attacksand number theory			
LO2:symmetricandasymmetrickeycryptographicalgorithms			
LO3:cryptographicdataintegrityalgorithms,keymanagementanddistribution.			
LO4:networkandinternetsecurity,IPsecurity			
THEORYCOMPONENT			
UNIT-I		4Hrs	
Introduction:Computerandnetworksecurityconcepts,Securityattacks,Services,and mechanisms			
NumberTheory:Divisibilityandthedivisionalalgorithm,Modulararithmetic,Primenumbers,			
Integerfactorization,Euclideanalgorithm,Extendedeuclideanalgorithm			
UNIT-II		4Hrs	
SymmetricCiphers:Classicalencryptiontechniques,Blockcipher&StreamCipher,DESandAES.			
AsymmetricCiphers:Pubickeycryptography,RSA,Diffie-Hellman,Elgamal,Ellipticcurve arithmeticandcryptography			
UNIT-III		4Hrs	
CryptographicDataIntegrityAlgorithms:Hashfunction,Applicationsofhashfunction, requirements, and security of hash function. Secure Hash Algorithm(SHA)			
KeyManagementandDistribution:Symmetrickeydistributionusingsymmetric&asymmetric encryption			
UNIT-IV		4Hrs	
NetworkandInternetSecurity:Networkaccesscontrolandcloudsecurity.Transportlevel security, Wireless network security, E-mail security			
IPSecurity:Overview,Encapsulatingsecuritypayload,Authenticationheader,Combining securityassociations,Internetkeyexchange			
LABORATORYCOMPONENT			

List of Experiments	
1. Write a program to implement the Euclidean algorithm 2. Write a program to implement the Extended Euclidean algorithm 3. Write a program to implement Caesar Cipher 4. Write a program to implement the Hill Cipher 5. Write a program to implement the Playfair cipher 6. Write a program to implement the Vigenere Cipher 7. Write a program to implement a one-time pad 8. Write a program to implement the DES algorithm 9. Write a program to implement RSA	
10. Implement and analyze DES using CRYPTOOL	
Text Book:	
1. William Stallings, <i>Cryptography and Network Security: Principles and Practice</i> , 7th ed. Pearson Education, 2018.	
Reference Book(s):	
2. Menezes, P.C. van Oorschot, S.A. Vanstone: <i>Handbook of Applied Cryptography</i> : CRC Press, 1996.	
3. Abhijit Das and C.E. Veni Madhavan, <i>Public-key Cryptography: Theory and Practice</i>	
Laboratory Manual (for laboratory component):	
1. <i>Cryptography and Network Security Laboratory manual</i> , prepared by the faculty of Dept. of CSE (Networks)	
Course Learning Outcomes (COs)	
After completion of this course, the students should be able to, <u>(based on cognitive skills acquired from theory component)</u>	
CO1: illustrate the basic concepts of security, services, attacks, and mathematical concepts required for various cryptographic algorithms	
CO2: compare symmetric and asymmetric cryptosystems	
CO3: design and develop various security algorithms to achieve data integrity	
CO4: analyze security requirements in networks and internet-based communication <u>(based on psychomotor skills acquired from laboratory component)</u>	
CO5: implement and test mathematical hard problems, usage of appropriate parameters	
CO6: develop and test algorithms to implement symmetric ciphers	
CO7: develop and test security protocols using data encryption standard	
CO8: analyze internet security protocols for security using modern tools	

CourseArticulation Matrix (CAM):					U24CN413X:CryptographyAndNetworkSecurity									
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	U24CN413X.1	2	2	1	1	-	-	-	-	-	-	-	1	1

CO2	U24CN413X.2	2	2	2	1	-	-	-	-	-	-	-	1	1
CO3	U24CN413X.3	2	2	2	1	-	-	-	-	-	-	-	1	1
CO4	U24CN413X.4	2	2	2	1	-	-	-	-	-	-	-	1	1
CO5	U24CN413X.5	2	2	2	1	2	1	1	1	2	1	2	1	1
CO6	U24CN413X.6	2	2	2	1	2	1	1	1	2	1	2	1	1
CO7	U24CN413X.7	2	2	2	1	2	1	1	1	2	1	2	1	1
CO8	U24CN413X.8	2	2	2	1	2	1	1	1	2	1	2	1	1
U24CN413X		2	2	1.87	1	1	1	1	1	2	1	2	1	1

INTERNET OF THINGS

Class:B.Tech.IV-Semester(Exit Course)

Branch:CSE(Networks)

Course Code: U24CN414X **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):

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

LO5: fundamentals of IoT, Sensors, actuators and IoT boards

LO6: basic programming of Arduino, i/o functions, working with LED and buttons

LO7: analog and digital communication protocol

LO8: integration of sensors and actuators with Arduino

THEORY COMPONENT

UNIT-I

4Hrs

Introduction: Introduction to IoT, Evolution of IoT, challenges and applications, Sensors- characteristics, deviations, types- scalar, multimedia, hybrid and virtual, Actuators- Types- hydraulic, pneumatics, electric, thermal, Magnetic, Mechanical

Classification of IoT boards: Microcontroller boards, Single board controller, System on chip board

UNIT-II

4Hrs

Programming with Arduino: Introduction to Arduino, Time, I/O function, Controlling LEDs- Blinking LED without delay, Connecting an external LED, Working with buttons- Connecting a button, Button with no resistor

UNIT-III

4Hrs

Analog and Digital Communication: Serial communication, Parallel communication UART Communication: Message format, LCD character display I2C Communication: Data communication, Interfacing BMP180 module	
UNIT-IV	4Hrs
SPI Communication: SPI protocol, Interfacing with SD card Integration of Sensors and Actuators with Arduino: Temperature sensor, Detecting motion using PIR sensor, DC motor	
LABORATORY COMPONENT	
List of Experiments 1. Write an Arduino program to demonstrate variable, constant data types, operators 2. Write an Arduino program to demonstrate if statements, switch case, loops and arrays 3. Write an Arduino program to demonstrate time based functions, digital and analog I/O functions. 4. Write an Arduino program to demonstrate light an LED with button 5. Write an Arduino program to demonstrate RGB LED 6. Write an Arduino program for interfacing with temperature sensor 7. Write an Arduino program for interfacing with PIR sensor 8. Write an Arduino program for interfacing of infrared and ultrasonic sensor 9. Write an Arduino program for interfacing with DC motor 10. Write an Arduino program to demonstrate I2C and SPI communication protocol	
Textbook(s): 1. Sudeep Mishra, Anandarup mukherjee and Arijit Roy, <i>Introduction to IoT</i>, New Delhi: University Cambridge Press, 2021 (Chapter 4) 2. Cornel Amariei, <i>Arduino Development Cookbook</i>, Birmingham: Packt Publishing Ltd., 2015 (Chapter 2-6)	
Reference Book(s): 1. Arshdeep Bahga and Vijay Madisetti, <i>Internet of Things: A Hands-On Approach</i>, Hyderabad: University Press, 2015 2. Marco Schwartz, <i>Internet of Things with ESP8266</i>, Birmingham: Packt Publishing Ltd., 2016 3. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, <i>Internet of things with Raspberry Pi and Arduino</i>, Boca Raton: CRC Press, Taylor & Francis Group, 2020 4. Brian Evans, <i>Beginning Arduino Programming</i>, New York: Apress, 2011	
Web and Video link(s): https://onlinecourses.nptel.ac.in/noc24_cs115/ ; NPTEL Video Lecture on Fundamentals of Internet of Things by Prof. Sudip Misra, Professor of CSE, IIT Kharagpur	
Laboratory Manual (for laboratory component): 2. <i>Internet of Things Laboratory Manual and Record Book</i>, 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 theory component)*

CO1: identify sensors, actuators and IoT boards in real time environment

CO2: make use of syntax of i/o functions for problem solving

CO3: compare analog, and digital communications with Arduino

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

(based on psychomotor skills acquired from laboratory component)

CO5: develop and test arduino programming for problem

solving CO6: develop and test arduino programming with

LED and button CO7: interpret analog and digital

communications with arduino

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

Course Articulation Matrix (CAM):				U24CN414X 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	U24CN414X.1	2	2	2	2	2	1	1	1	-	1	-	2	2
CO2	U24CN414X.2	2	2	2	2	2	1	1	1	-	1	-	2	2
CO3	U24CN414X.3	2	2	2	2	2	1	1	1	-	1	-	2	3
CO4	U24CN414X.4	2	2	2	2	2	1	1	1	-	1	-	3	3
CO5	U24CN414X.5	2	2	2	2	2	1	1	1	-	1	-	2	2
CO6	U24CN414X.6	2	2	2	2	2	1	1	1	-	1	-	2	2
CO7	U24CN414X.7	2	2	2	2	2	1	1	1	-	1	-	2	3
CO8	U24CN414X.8	2	2	2	2	2	1	1	1	-	1	-	2	3
U24CN414X		2	2	2	2	2	1	1	1	-	1	-	2.12	2.5
3-HIGH,2-MEDIUM,1-LOW														